IEEE Canadian Review

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Fall 2020 – No. 85



IEEE Canada Awards 2020

A Tale of Two Electrical Engineers

ICF Honor Roll 2019

Lift-Off: Mission Mars

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The Institute of Electrical and Electronic Engineers Inc.

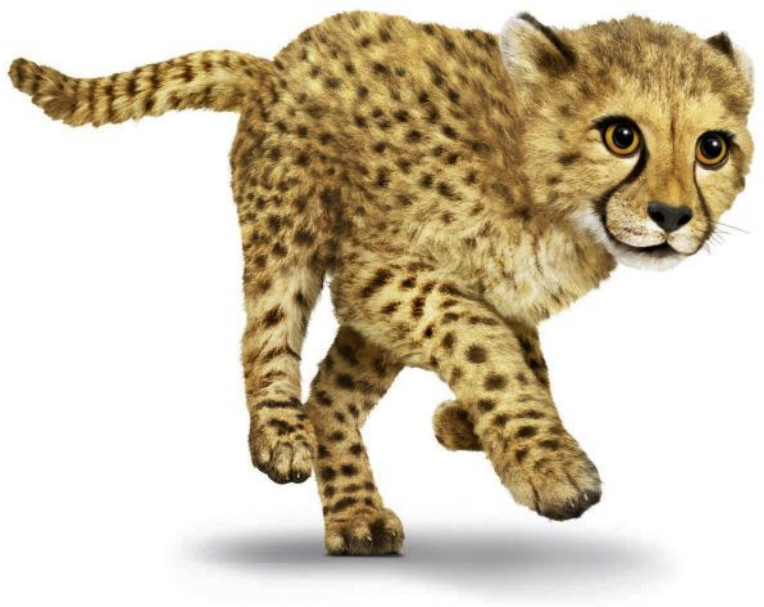
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Jason Gu
Ph.D., P.Eng., FEIC, FCAE

2020–2021 IEEE Canada President and Region 7 Director
Président de l'IEEE Canada et directeur de la région 7, 2020–2021

ICR 2020 Fall Issue

Warm greetings to all IEEE Canada members and volunteers. Summer is gone, and fall is upon us. This September, the Executive Committee had virtual meetings to discuss plans and objectives as well as Region 7's (R7's) budget for 2021. We have achieved a lot this year despite the COVID-19 pandemic and will plan more to work on in the future.

The R7/IEEE Canada revised bylaw was approved at the IEEE Board Meeting, and the restructuring committee has been hard at work. They have completed the operational manual to ensure the effectiveness of the committees and serve members better. There are some new open volunteer positions that the Nominations and Appointments Committee (NAC) will work hard to fill. The NAC will also look for potential candidates to be the R7 director-elect for 2022–2023.

Student Congress 2020 was successfully held online on 26 August 2020. Students from many different Sections and time zones across Canada participated in the well-attended meeting. We had presenters from R10 and R7 cover IEEE student awards, IEEE SPAx, regional student activities, Student Branch

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Numéro d'automne de la RCI 2020

Salutations à tous les membres et bénévoles de l'IEEE Canada. L'été est parti et l'automne est sur nous. En septembre, le Comité exécutif a tenu des réunions virtuelles pour discuter des plans et des objectifs ainsi que du budget de la Région 7 (R7) pour 2021. Nous avons accompli beaucoup de choses cette année malgré la pandémie de COVID-19 et nous prévoyons de travailler davantage à l'avenir.

Le règlement révisé de la Région 7 (R7) de l'IEEE Canada a été approuvé à la réunion du conseil d'administration de l'IEEE, et le comité de restructuration a travaillé d'arrache-pied. Ils ont rempli le manuel opérationnel pour assurer l'efficacité des comités et mieux servir les membres. Il y a de nouveaux postes de bénévoles ouverts que le Comité des mises en candidature et des nominations (CNA) s'efforcera pour combler. Le CNA cherchera également des candidats potentiels pour être le directeur élu de R7 pour 2022–2023.

Le Congrès des étudiants 2020 s'est tenu en ligne avec succès le 26 août 2020. Des étudiants de nombreuses sections et fuseaux horaires à travers le Canada ont participé à la réunion bien suivie. Nous avons eu des présentateurs de R10 et R7 couvrir les prix

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operations, membership benefits, and an introduction to the IEEE Canadian Foundation.

I am happy to report that the 2020 IEEE Canada Conference on Electrical and Computer Engineering (CCECE'2020) was successfully held from 30 August to 2 September. Due to the pandemic, this IEEE Canada 33rd flagship conference had to be entirely virtual. The organization committee faced the challenges of converting CCECE'2020 from a face-to-face conference to online conferences with a tremendous amount of work. CCECE'2020 has been a great success and will provide a perfect example for the future IEEE Canada Conference during this new normal. CCECE'2020 also hosted the IEEE Canada Awards Gala that was held online. The acceptance speeches from the gala have been posted on the Awards section of the IEEE Canada website. Please congratulate the winners of these very prestigious awards. IEEE Canada gratefully thanks all those who submitted and endorsed this year's nominations and encourages all members to nominate again next year.

I would like to add that the triennial IEEE Section Congress 2020 was converted to virtual meetings on a much smaller scale. Two online sessions were held on 1 and 15 September. The main online meeting held training sessions for Section delegates, and voting for the recommendations from all the IEEE Regions.

IEEE Canada gratefully thanks all those who submitted and endorsed this year's nominations and encourages all members to nominate again next year.

IEEE Day planning went well. This year, it was held on 6 October with the theme "Leveraging Technology for a Better Tomorrow." IEEE President-Elect Kathy S. Land gave a keynote speech at the IEEE Day opening ceremony. IEEE Canada also held many events together with students, Young Professionals groups, Women in Engineering, Life Members, Chapters, and Sections. Furthermore, panelists presented to celebrate the 25th anniversary of IEEE Canada.

The Ottawa Section was recently approved for an IEEE Milestone on the first demonstration of Fiber Bragg Grating at the CRC in Ottawa, Canada. Due to COVID-19, the Milestone dedication ceremony could not be held in person and is rescheduled for the future. Just to add some history about IEEE Milestones, IEEE began the Milestones program in 1983 to honour technological innovation and excellence in electrical, electronic, and computer engineering. To be approved for this award, a project must be at least 25 years old, must have involved a unique solution to an engineering problem, and must have had a regional impact. Fiber Bragg Grating at CRC in Ottawa will be the 17th Milestone in Canada. IEEE Canada encourages all Sections to put forward proposals for an IEEE Milestone to showcase technological growth in Canada.

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étudiants de l'IEEE, l'IEEE SPAx, les activités régionales des étudiants, les opérations de la Direction des étudiants, les avantages d'adhésion, et une introduction à la Fondation canadienne de l'IEEE.

Je suis heureux d'annoncer que la Conférence 2020 de l'IEEE Canada sur le génie électrique et informatique (CCECE'2020) s'est déroulée avec succès du 30 août au 2 septembre. En raison de la pandémie, cette 33e conférence phare de l'IEEE Canada devait être entièrement virtuelle. Le comité d'organisation a dû faire face aux défis de la conversion du CCECE'2020 d'une conférence en personne à une conférence en ligne avec un travail considérable. CCECE'2020 a été un grand succès et fournira un exemple parfait pour la future conférence de l'IEEE Canada au cours de cette nouvelle normalité. Le CCECE'2020 a également accueilli le gala des prix de l'IEEE Canada qui a eu lieu en ligne.

Les discours d'acceptation du gala ont été affichés sur la section des Prix du site Web de l'IEEE Canada. Veuillez féliciter les lauréats de ces prix très prestigieux. L'IEEE Canada remercie tous ceux qui ont soumis et approuvé les candidatures de cette année et encourage tous les membres à présenter une nouvelle candidature l'an prochain.

Je voudrais ajouter que le Congrès triennal de la section de l'IEEE 2020 a été converti en réunions virtuelles à une échelle beaucoup plus petite. Deux sessions en ligne ont eu lieu les 1er et 15 septembre. La principale réunion en ligne a organisé des sessions de formation pour les délégués de section et a voté pour les recommandations de toutes les régions de l'IEEE.

La planification de la journée de l'IEEE s'est bien déroulée. Cette année, elle s'est tenue le 6 octobre sur le thème «Tirer parti de la technologie pour un avenir meilleur». Kathy S. Land, présidente élue de l'IEEE, a prononcé un discours lors de la cérémonie d'ouverture de la journée de l'IEEE. l'IEEE Canada a également organisé de nombreux événements avec des étudiants, des groupes de jeunes professionnels, des femmes en génie, des membres à vie, des branches et des sections. De plus, des panélistes se sont présentés pour célébrer le 25e anniversaire de l'IEEE Canada.

La section d'Ottawa a récemment été approuvée pour une étape importante de l'IEEE sur la première démonstration du réseau de fibres Bragg au CRC à Ottawa, Canada. En raison du COVID-19, la cérémonie d'inauguration de cette étape n'a pas pu avoir lieu en personne et est reportée à l'avenir. Juste pour ajouter un peu d'histoire sur les jalons de l'IEEE, l'IEEE a lancé le programme Milestones en 1983 pour honorer l'innovation technologique et l'excellence en génie électrique, électronique et informatique. Pour être approuvé pour ce prix, un projet doit avoir au moins 25 ans, doit avoir impliqué une solution unique à un problème d'ingénierie et doit avoir eu un impact régional. Le réseau Fibre Bragg au CRC à Ottawa sera le 17e étape importante au Canada. L'IEEE Canada encourage toutes les sections à présenter des propositions pour une étape importante de l'IEEE afin de mettre en valeur la croissance technologique au Canada.

Enfin, je voudrais mentionner que la Conférence 2020 sur l'énergie et l'électricité de l'IEEE Canada (EPEC'2020) a maintenant été déplacée vers une plate-forme virtuelle, prévue du 9 au 10 novembre. L'IEEE EPEC est la plus importante conférence sur l'énergie et l'électricité de l'IEEE Canada, axée sur les innovations

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(President's Message cont'd from p. 2)

Lastly, I would like to mention that the 2020 IEEE Canada Electric Power and Energy Conference (EPEC'2020) has now been moved to a virtual platform, scheduled for 9–10 November. IEEE EPEC is IEEE Canada's premier power and energy conference, focusing on innovations in the electric power sector. There are cutting-edge paper presentations, special sessions, panels, tutorials, and exhibitors. Please visit the conference website (https://epec2020.ieee.ca/) for the latest updates.

One of the major changes resulting from the pandemic is that professional Societies' meetings and events will be held virtually for the foreseeable future. With many researchers and engineers practicing social distancing and isolation, we want to emphasize our continued support for the professional community, as IEEE Canada is fully operational despite the current challenges.

During this new-normal situation, I would like to take this opportunity to wish all the best to our readers and their families. Finally, please feel free to contact me at jason.gu@ieee.org. ■

Jason Gu, Ph.D., FEIC, FCAE
2020–2021 IEEE Canada President
2020–2021 IEEE Region 7 Director

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dans le secteur de l'énergie électrique. Il y a des présentations de papier de pointe, des sessions spéciales, des panneaux, des tutoriels et des exposants. Veuillez visiter le site Web de la conférence (https://epec2020.ieee.ca/) pour les dernières mises à jour.

L'un des changements majeurs résultant de la pandémie est que les réunions et les événements des sociétés professionnelles auront lieu pratiquement dans un avenir prévisible. Étant donné que de nombreux chercheurs et ingénieurs pratiquent la distanciation sociale et l'isolement, nous voulons mettre l'accent sur notre soutien continu à la communauté professionnelle, car l'IEEE Canada est pleinement opérationnel malgré les défis actuels.

Dans cette situation nouvelle et normale, je voudrais profiter de cette occasion pour souhaiter le meilleur à nos lecteurs et à leurs familles. Enfin, n'hésitez pas à me contacter à jason.gu@ieee.org. ■

Jason Gu, Ph.D., FEIC, FCAE
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Directeur de la Région 7 de l'IEEE 2020–2021

IEEE Canadian Review
La revue canadienne de l'IEEE

IEEE Canadian Review is published three times per year: Spring, Summer, and Fall.

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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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2020 has been anything but typical. Starting with the Iran Air Disaster and the beating of war drums in the Middle East, the novel coronavirus pandemic followed and swept over the whole world at an unprecedented pace. From toilet paper panic to face mask fiascos, this pandemic has exposed the good, the bad, and the ugly. As we brace for the second wave, our hope for returning to some form of normalcy hangs on the success of the vaccines that are in the trial stage.

What felt like doomsday in mid-March slowly turned into a collective awareness to "bend the curve." After months of lock-downs and social-distancing measures, many businesses have

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L'année 2020 a été tout sauf typique. À commencer par la catastrophe aérienne de l'Iran et le passage à tabac des tambours de guerre au Moyen-Orient, la nouvelle pandémie de coronavirus a suivi et balayé le monde entier à un rythme sans précédent. De la panique du papier hygiénique aux fiascos du masque facial, cette pandémie a exposé le bon, le mauvais et le laid. Alors que nous nous préparons pour la deuxième vague, notre espoir de revenir à une certaine forme de normalité dépend du succès des vaccins qui en sont à l'étape d'essai.

Ce qui ressemblait à un jugement dernier à la mi-mars s'est lentement transformé en une prise de conscience collective pour

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(A Few Words From the Editor-in-Chief cont'd from p. 4)

restarted—so has the second wave of the pandemic. It is almost certain that we will have to live with this reality for the foreseeable future. We must embrace the notion of social distancing, good hygiene, and telecommuting.

The Black Lives Matter movement has breathed new life into the issue of racial equality, inclusivity, and diversity. IEEE Canada stands in solidarity with this movement.

Many of our members were personally affected by the port explosion that devastated Lebanon's capital city of Beirut in early August. Our thoughts and prayers are with everyone.

While writing this editorial, a large part of the U.S. West Coast is dealing with the wrath of wildfires. Smoke and haze have also engulfed much of the Canadian West Coast. We hope everybody is keeping safe and staying out of harm's way.

Although it seems there is no respite from bad news this year, there are indeed many silver linings that we can celebrate. Clinical trials of vaccines are advancing at a speed the likes of which have never been seen before. Most of the professional communities, including IEEE Canada members, have embraced remote working. Segments of our economy are showing a comeback. We also are looking forward to seeing positive changes in the global geopolitical arena in the coming months.

IEEE Canadian Review (*ICR*) has been revived in 2020. Our editorial team is now fully engaged. We are seeing a steady stream of cutting-edge contributions. In the coming months, we aim to modernize our website, index selected articles through IEEE *Xplore*, strengthen diversity within our editorial team, and find ways to make this publication more sustainable in the long run. A robust opt-in mechanism for print and/or digital copies of this magazine is now active through the IEEE Membership Renewal portal.

As we brace for the second wave, our hope for returning to some form of normalcy hangs on the success of the vaccines that are in the trial stage.

This edition of *ICR* celebrates the contributions and successes of many distinguished members of our community who have received this year's IEEE Canada Awards. We also celebrate IEEE Canada's 25-year anniversary. Contributions to the IEEE Canadian Foundation is acknowledged through the Honour Roll. The column by Terrance Malkinson and Jacqueline Terlaan continues to looks at the postpandemic world. Dario Schor, Dave Michelson, and Daryoush Shiri continue to provoke our thoughts from multiple angles of science and technology. A number of success stories in our community will certainly make our survival through 2020 a bittersweet journey.

IEEE Canada's two signature events (CCECE'20 and EPEC'20) have gone virtual, with good participation and engagement. Kudos to those who worked tirelessly to convert the in-person conferences into virtual events.

With this edition of *ICR*, we bid farewell to 2020, a year that will be remembered for many years to come. Merry Christmas, Happy New Year, and all the best for 2021 and beyond. Be safe. Be healthy. ■

(Quelques mots du rédacteur en chef suite de p. 4)

«plier la courbe». Après des mois de blocages et de mesures de distanciation sociale, de nombreuses entreprises ont redémarré, tout comme la deuxième vague de la pandémie. Il est presque certain que nous devrons vivre avec cette réalité dans un avenir prévisible. Nous devons adopter la notion de distanciation sociale, de bonne hygiène et de télétravail.

Le mouvement Black Lives Matter a insufflé une nouvelle vie à la question de l'égalité raciale, de l'inclusion et de la diversité. IEEE Canada est solidaire de ce mouvement.

Beaucoup de nos membres ont été personnellement touchés par l'explosion du port qui a dévasté la capitale libanaise Beyrouth au début du mois d'août. Nos pensées et nos prières sont avec tout le monde.

En écrivant cet éditorial, une grande partie de la côte ouest des États-Unis est aux prises avec la colère des feux de forêt. La fumée et la brume ont également englouti une grande partie de la côte ouest canadienne. Nous espérons que tout le monde se garde en sécurité et reste hors de danger.

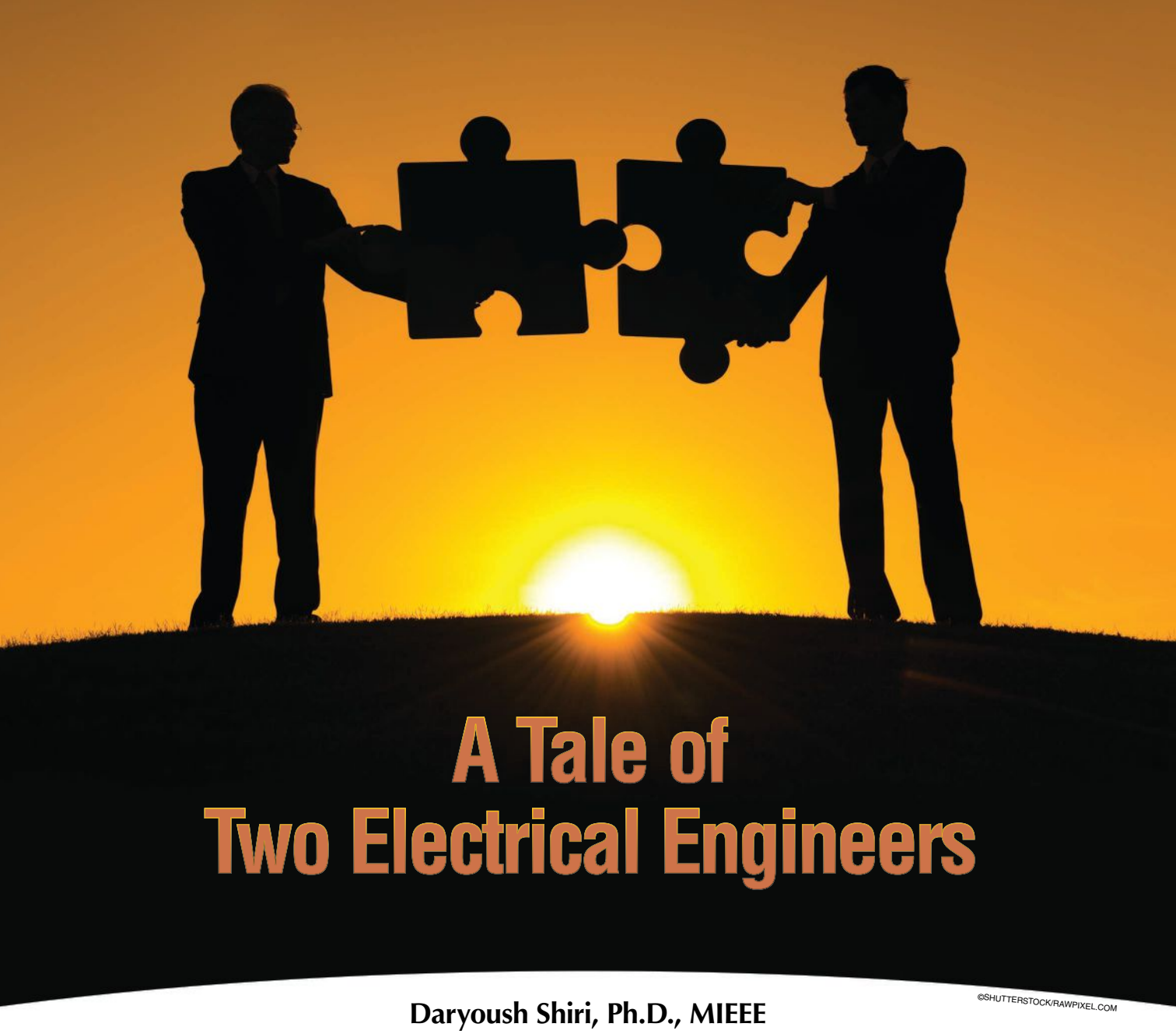
Bien qu'il semble qu'il n'y ait pas de répit face aux mauvaises nouvelles cette année, il existe en effet de nombreuses doublures argentées que nous pouvons célébrer. Les essais cliniques de vaccins progressent à une vitesse jamais vue auparavant. La plupart des communautés professionnelles, y compris les membres de l'IEEE Canada, ont adopté le travail à distance. Des segments de notre économie font un retour. Nous sommes également impatients de voir des changements positifs dans l'arène géopolitique mondiale dans les mois à venir.

L'Examen canadien de l'IEEE (IC) a été relancé en 2020. Notre équipe éditoriale est maintenant pleinement engagée. Nous assistons à un flot constant de contributions de pointe. Au cours des prochains mois, nous visons à moderniser notre site Web, à indexer les articles sélectionnés par l'intermédiaire de l'IEEE *Xplore*, à renforcer la diversité au sein de notre équipe éditoriale et à trouver des moyens de rendre cette publication plus durable à long terme. Un mécanisme d'opt-in robuste pour les copies imprimées et/ou numériques de ce magazine est maintenant actif par l'intermédiaire du portail de renouvellement des membres de l'IEEE.

Cette édition de la RCI célèbre les contributions et les succès de nombreux membres éminents de notre communauté qui ont reçu les prix IEEE Canada de cette année. Nous célébrons également le 25e anniversaire d'IEEE Canada. Les contributions à la Fondation canadienne de l'IEEE sont reconnues par le biais du tableau d'honneur. La chronique de Terrance Malkinson et Jacqueline Terlaan continue de se pencher sur le monde post pandémique. Dario Schor, Dave Michelson et Daryoush Shiri continuent de provoquer nos pensées sous de multiples angles de la science et de la technologie. Un certain nombre d'histoires de réussite dans notre communauté feront certainement de notre survie jusqu'en 2020 un voyage doux-amer.

Les deux événements phares de l'IEEE Canada (CCECE'20 et EPEC'20) sont devenus virtuels, avec une bonne participation et un bon engagement. Félicitations à ceux qui ont travaillé sans relâche pour convertir les conférences en personne en événements virtuels.

Avec cette édition de la RCI, nous faisons nos adieux à 2020, une année dont on se souviendra pour de nombreuses années à venir. Joyeux Noël, bonne année, et tout le meilleur pour 2021 et au-delà. Soyez en sécurité. Sois en bonne santé. ■



A Tale of Two Electrical Engineers

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Two young electrical engineers joined Cavendish Laboratory at Cambridge University and worked under Sir Ernest Rutherford's supervision toward their Ph.D. degree. One of them became the master of high-electric fields and the other the authority on strong magnetic fields. They both won the Nobel Prize in Physics.

Legend has it that when Sir Ernest Rutherford won the 1908 Nobel Prize in Chemistry for his pioneering works at McGill University from 1898 to 1907, he was unhappy, as he considered himself a hardcore physicist rather than a chemist [1]. However, his research, as much as we can recall from high school chemistry, was indeed nuclear alchemy, which involved targeting the nuclei of elements by alpha, beta, and gamma rays that emanated from natural radioactive sources like radium or polonium. In 1919, Rutherford disintegrated nitrogen using alpha particles. Because an alpha particle is the nucleus of helium sans two electrons, the possibility of penetrating into the target nucleus and transforming or disintegrating it was very low.

Instead, in 1929, George Gamow theoretically predicted that a lighter particle shot toward the target has a higher chance of penetration [2]. So, the key to transforming an element into another one was a beam of protons accelerated by a million volts. The source used to generate this voltage during the 1930s was of no avail and the task fell on the shoulders of John Douglas Cockcroft and another student, E.T.S. Walton, at Cavendish Laboratory.

John Douglas Cockcroft was born in 1897 in Todmorden, England. After

finishing his military service in the First World War, he went back home and started his studies in electrical engineering at Manchester Municipal College of Technology. Thereafter, he worked in Vickers Electrical Company as an electrical engineer. As he progressed in his job, he won a scholarship to attend Cambridge University, in the hopes of pursuing his passion for mathematics and enjoying its excellent mathematical tripos. At the same time, Rutherford was the head of Cavendish Laboratory, and he was looking for a new member with hands-on experience in electrical engineering and good mathematical knowledge [3], [4]. John Cockcroft was who he was looking for.

Together with Walton, Rutherford and Cockcroft came across Gamow's paper and realized that quantum mechanical tunneling allows protons and neutrons to sneak out of the deep potential trap of the nucleus. Hence, instead of 700 kV or above, 300 kV was enough to bombard lithium and beryllium targets with protons to disintegrate them. The core of their success was their designed voltage multiplier made of capacitors (which used to be called *condensers*) and thermionic lamps working as rectifiers. Although the idea of voltage doubling did already exist [5], [6], it had not been explored in kilo- and megavolt regimes. Mechanical and thermal issues related to high voltage, corona discharge, and melting the glass tubes of the thermionic rectifiers were among the hurdles they had to overcome before an operating proton accelerator could see the light of the day. Note that silicon or selenium high-voltage rectifiers were not commercially available before 1950. You may have seen the Cockcroft–Walton generator or its toy model in your undergraduate electric circuit course. Figure 1 details the operation of the original Cockcroft–Walton's circuit with its original circuit diagram alongside a new version with diodes.

In a sequel of six papers published in *Proceedings of the Royal Society* [7], Cockcroft and Walton report the very original thought process of the design, operation, building, failures, repairs, and amendments of their voltage multiplier and results of the atom-splitting experiments in great and lucid detail (a quality that is becoming a rare commodity in the scientific and technical publications these days!). In 1932, they observed how the proton beam splits lithium into two alpha particles (helium nuclei) and, from the bill of energy, they proved that the missing mass is indeed converted to energy according to $E = mc^2$. This reconfirmed Einstein's most famous formula, i.e., the equivalence of mass and energy [3].

Cockcroft and Walton won the Nobel Prize in Physics in 1951 for this contribution, which opened up new ways of looking into atoms and also helped in tackling issues in high-voltage engineering (see Figure 2) [8].

Cockcroft spent the rest of his career as a professor at Cambridge University and helped radar research activities in the United Kingdom from 1942 to 1944. In 1944, he travelled to Canada to assume the directorship of the new atomic energy division of the National Research Council of Canada. He reinvigorated the Canadian research program and helped with establishing the facilities of Chalk River Laboratories in Ontario until 1946. Then he returned to Cambridge University and later became the master of Churchill College there. He won more than 20 honorary awards and titles during his career, including the Atoms for Peace prize in 1961.

Another parallel avenue toward the acceleration of particles was that of generating a very intense magnetic field. Rutherford gave this task to another member of his laboratory—Pyotr Leonidovich Kapitza.

Kapitza was born in Kronstadt, Russia, in 1894. Influenced by his father who was an army engineer in St. Petersburg, he studied electrical engineering at the A.F. Ioffe Physico-Technical Institute.

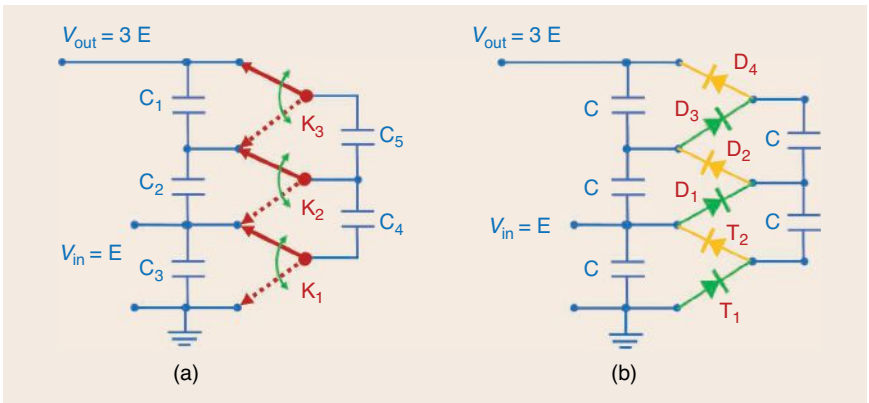


Figure 1: (a) A simplified sketch of Figure 1 in the original Cockcroft and Walton paper [7]. The red switches work in unison and alternate between top (solid arrow) and bottom (dotted arrow) positions by some means like a mechanical motor. When K_1 and K_2 are at the bottom position, they connect C_4 in parallel with C_3 to the dc source (V_{in}). C_4 is therefore charged to E. In the next phase, C_4 is parallel with C_2 as K_1 and K_2 switches are connected to their corresponding top positions. If all of the capacitors are equal, then C_2 is charged to E/2. In the next phase, C_2 and C_5 are in parallel and they charge up to E/4 while C_4 is being charged to E again. With this mechanism, charge is transferred gradually to all of the capacitors until the total charge of the three series capacitors, C_1, C_2, and C_3, adds up and triples the potential at the output node, i.e., V_{out} = 3E. In Cockcroft's design, the mechanical switches were replaced by thermionic rectifier lamps, except for the first two switches, which were triodes or thyratrons [T_1 and T_2 in Fig. 1(b)]. The third electrode in T_1 and T_2, which are not shown here, are grid potentials of triodes and they are connected to two out-of-phase signals to let T_1 and T_2 switch alternatively. With the same mechanism explained for Fig. 1(a), charge is transferred up to the last capacitor and leads to V_{out} = 3E. Note that if the input voltage V_{in} is already an ac one, there is no need for triodes and they can be replaced by diodes.

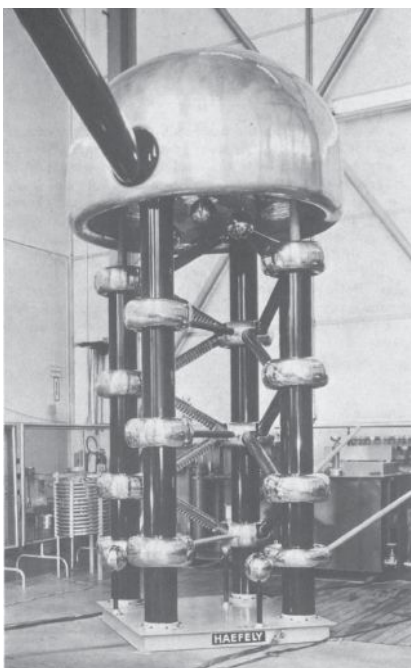


Figure 2: A 700-KV 180-mA dc Cockcroft–Walton power generator in the Chalk River Laboratory, Ontario [8].

After completing his studies and serving as an ambulance driver in the First World War, he returned to St. Petersburg to assume his new job as a lecturer at the same institute under the supervision of Russian physicist Abram Fedorovich Ioffe. Writing about A.F. Ioffe and his groundbreaking achievements in the field of semiconductor device physics requires a separate, lengthy article of its own [9].

Kapitza was advised by Ioffe to go abroad and join a high-caliber lab to broaden his experience and network. His first suggestion was to go to Leiden University, as it had garnered fame due to the discovery of superconductivity in mercury by Heike Kamerlingh Onnes in 1911—a serendipitous discovery in lieu of working on the liquification of helium under 4 K. But the Dutch officials were concerned about the spread of communism. Instead, Ioffe wrote to Rutherford and recommended that Kapitza join the Cavendish Laboratory as a Ph.D. student in 1921 [10].

In 1923, Kapitza earned his Ph.D. and won the James Clerk Maxwell scholarship. Later, he became the assistant director of the Magnetic Research Laboratory and a fellow of Trinity College in Cambridge. In 1929, he became a fellow of the Royal Society of London. He also served as the director of the Royal Society Mond Laboratory between 1930 and 1934.

Kapitza digressed from nuclear research and put his efforts into investigating the effect of high-magnetic fields on the electronic and thermal properties of solids. He was helped by Cockcroft with calculating the mechanical stress and thermal issues that a high-magnetic field exerts on the coil wires that carry high current and with issues related to the core of the magnet [11]. The mechanical stress was so high that it could shatter the coils into pieces, and explosions were often observed. Kapitza and Cockcroft designed and tested different methods to reinforce copper with steel to tweak its mechanical strength and heat capacity.

At this time, a French physicist, Aimé Auguste Cotton, spent millions of francs to build a 100-tonnes magnet that hardly reached 10 tesla. Jean Perrin, another French physicist, suggested that to avoid overheating of the coil at 10 tesla, the magnet should be cooled by liquid air (–190 °C) and that the flow should be 90 tonnes per hour. Very impractical, thought Kapitza, who instead decided to use pulsed magnetic fields, i.e., shorting the energy of a 3,500-r/min ac rotor into the coil for 0.01 s, which heats the coil up to 100 °C instead of 10,000 °C [12].

You can imagine how difficult it must have been to design such elements in those days, when no CAD tools or simulation software were available. All the calculations and predictions were based on pencil-and-paper calculations, experiments, smart judgements, recalculations, and experiments.

His colleagues recall miniearthquakes in Kapitza's magnetic laboratory when a control switch cut the current after a half alternance and 168 MVA of power was poured into a coil. Although a field of 10 tesla during 0.01 s was not enough for some steady experiments, it was enough to study the Zeeman effect and determine the magnetic moment of some particles, e.g., alpha rays [13]. Later he developed techniques to reach 50 tesla. The current technologies of achieving a high-magnetic field indeed rest on the shoulders of Kapitza's works, although some of his proposals seemed futuristic at the time [14], [15].

After 1935, Kapitza moved his laboratory from England to Moscow to become the head of the Institute for Physical Problems, where he worked on low-temperature physics, cryogenics, and the liquification of oxygen and helium. At the beginning of the Second World War, his laboratory was moved again, this time from Moscow to Kazan to save the laboratory from the war and to focus on the liquification of oxygen, which was in high demand by Soviet industries to supply their metal-devouring war machine [12].

Kapitza envisaged a system for the generation and transmission of energy using a high-power microwave. He designed and built magnetrons and planar magnetrons (planotrons) by which dc power could be transformed to microwave oscillation. Microwave power is then transmitted using underground waveguides instead of traditional ac transmission wires. He proved that the process of dc to microwave conversion is reversible and, by using a planotron on the other end of the waveguide, could revert the wave to dc power. The main components of his dream system, *high-power electronics*, as he referred to them [16], was built in his laboratory, but a fully functional system remained as a proposal (see Figure 3).

Kapitza won many international and national prizes and honors, including the Order of Lenin (five times) and the USSR State medal, among others, despite his disagreements with Stalin on several matters. His groundbreaking contributions to the liquification of hydrogen, helium, and oxygen and understanding the superfluidity phenomenon won him the Nobel Prize in Physics in 1978. Superfluidity is a state of matter that was observed in liquid helium under 2 K in which the viscosity of the fluid drops to zero and the liquid can creep up and escape its container; a macroscopic phenomenon defying any classical description that is only understandable using quantum mechanics.

Kapitza was an avid supporter of the idea of using controlled thermonuclear fusion in producing clean energy, i.e., building an artificial sun on Earth, and he also left a legacy in this field. In his first attempts during the 1950s to confine a plasma in a magnetic field, he created a hot filament of plasma reaching 1 million K [12].

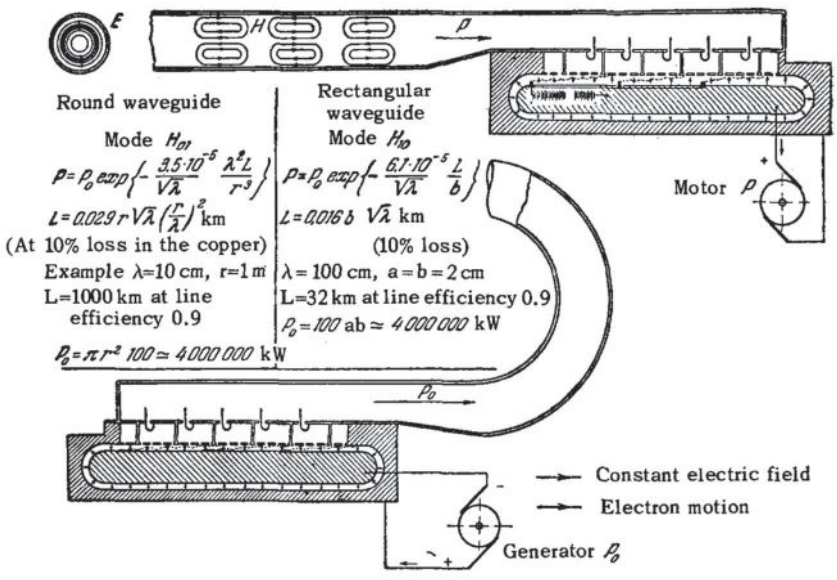


Figure 3: A high-power microwave generation and transmission system proposed by Kapitza. The hatched boxes on the top right and bottom left are planotrons. (Source: [16]; reprinted with permission from Uspekhi Fizicheskikh Nauk.)

Both Kapitza and Cockcroft spent the last decades of their careers promoting the idea of atomic energy for peaceful applications and conducting research in finding new clean energy alternatives. They both were Pugwash activists. Cockcroft attended the Pugwash Conference in Sweden in 1967 and a month later, he died. Pugwash is the name of a series of conferences devoted to peace and the dangers of weapons of mass destruction. The first event was funded by a Canadian industrialist and philanthropist, Cyrus Stephen Eaton, and held in his hometown, Pugwash, Nova Scotia, Canada, in 1955 [17].

Kapitza was awarded the Niels Bohr Medal by the Danish Engineering Society in 1966. In September 1970, Pyotr Kapitza and his fellow scientists at the USSR Academy of Sciences traveled to Canada and the United States aboard the ocean liner *Alexandr Pushkin*. After enjoying the scenery of Newfoundland, the St. Lawrence River, and Québec City, they landed in the city of Rutherford, Montreal. Kapitza visited Rutherford Museum under the custody of the Department of Physics at McGill University [18]. Seeing the instruments made by his master's hand was quite an emotional scene and brought back Cambridge memories for him. In Montreal, he gave a lecture before the Montreal Physical Society and signed the Rutherford Museum notebook.

Kapitza showed his interest and admired the results that Prof. Richard Stevenson at McGill University obtained in high-pulsed magnetic fields [19]. Stevenson used aluminum coils pressed under 10 K to obtain 300,000 Oersted (30 tesla) to resolve melting and snapping issues. He used this field to measure the magnetic susceptibility of materials as well as to study the Zeeman effect, in which the degenerate eigenenergy of an atom splits into two levels as a result of the applied magnetic field.

After a pleasant journey to Edmonton and the Rocky Mountains, Kapitza went back to Ottawa, visited the Parliament Hill and Chalk River nuclear facilities, where his friend Cockcroft was once the director. Kapitza died in 1984 after a fruitful life, more than 25 awards and honors, and a wide range of contributions to science and technology.

In remembering Rutherford's influence on his career, Kapitza noted that "A scientist should be evaluated not only by his/her scientific achievements but also by the legacy and school of thought that he/she leaves behind for students" [12].

Rutherford was always proud of Cockcroft's and Kapitza's results. He always delighted in showing visitors of the Cavendish Laboratory the high-voltage generator and his pupils' voluminous magnet.

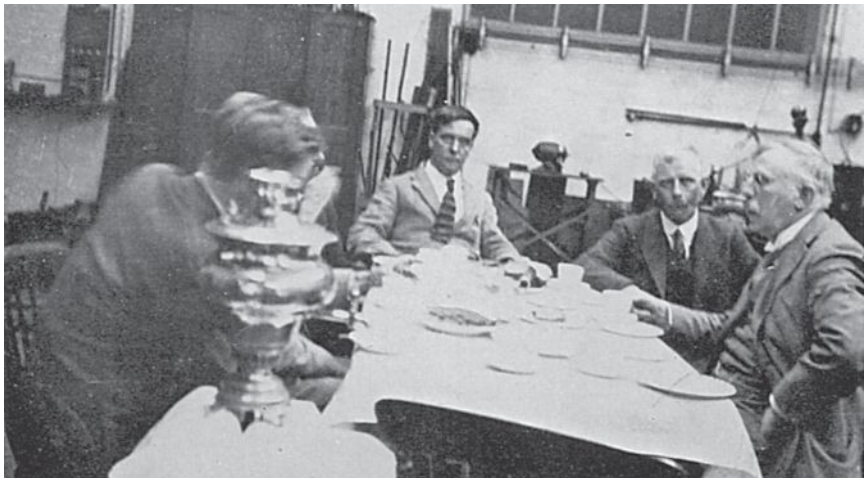


Figure 4: A tea (chai) break with Russian Samovar in the Cavendish Laboratory. Rutherford (right), Kapitza (center), and Cockcroft (behind Samovar). (Source: *Proceedings of the Royal Society of London*; used with permission from Harrison and Son.)

Independence, originality of thought, and clarity in presentation are what Rutherford insisted on, Kapitza recalled of his student life in Cavendish Laboratory. Students were not allowed to stay in the laboratory after 6:00 p.m. and during holidays. Rutherford would ask them to leave, and he used to say "Go home and spend the rest of the time thinking. Those who work too much and think little are not much good" [12].

The tradition of having weekly seminars, which Kapitza brought from his Russia days in A.F. Ioffe's group to Cambridge, had a very important role in helping his colleagues share their ideas and thoughts. This was also vital in understanding each other's problems and helping one another, which assisted their supervisor with identifying where the hurdles were.

Rutherford emphasized reusing and refurbishing every piece of material; nothing could go to waste, even a seemingly useless piece of wire. This is what made his pupils craftsmen, makers of instruments, and masters of 0 K to million Kelvin, millivolt to megavolt.

Rutherford was genuinely concerned about his students' success, and he was always trying to help them the way a father would (see Figure 4). He gave freedom and support to young scientists to ascend toward the highest echelons of academic achievement in the United Kingdom. The door of his laboratory was open to hire and host the best brains from every corner of the world. Bright minds were irreplaceable assets that many countries were losing as a result of two world wars, real and imaginary concrete walls between nations, and people being divided into "us" and "them." Despite all these, the Cavendish Laboratory was a borderless welcoming home for seekers of truth and knowledge. This approach earned 30 Nobel Prizes for the laboratory during its history [20]. ■

Acknowledgment

The author sincerely thanks Dr. Anita Fadavi Roudsari for her critical reading and useful suggestions.

References

[1] J. Hansson, *Moderna Fysiken på 15 Minuter, (Modern Physics in 15 Minutes)*. Stockholm: Axplock, 2016.

[2] G. Gamow, "Zur Quantentheorie der Atomzertrümmerung," *Z. Physik*, vol. 52, nos. 7–8, pp. 510–515, 1929. doi: 10.1007/BF01339451.

[3] "April 14, 1932: Cockcroft and Walton split the atom," *APS News*, vol. 28, no. 4, Apr. 2019.

[4] N. Mott, "Sir John Cockcroft – Cambridge physicist and nobel laureate," *Phys. Today*, vol. 20, no. 11, pp. 129–131, Nov. 1967. doi: 10.1063/1.3034012.

[5] P. Villard, "Transformateur à haut voltage. A survolteur cathodique," *J. Phys. Theor. Appl.*, vol. 10, no. 1, pp. 28–32, 1901. doi: 10.1051/jphystap:019010010002801.

[6] H. Greinacher, "Über eine Methode, Wechselstrom mittels elektrischer Ventile und Kondensatoren in hochgespannten Gleichstrom umzuwandeln," *Z. Physik*, vol. 4, no. 2, pp. 195–205, 1921. doi: 10.1007/BF01328615.

[7] J. D. Cockcroft and E. T. S. Walton, "Experiments with high velocity positive ions. Further developments of obtaining high velocity positive ions," *Proc. Roy. Soc., A*, vol. 136, no. 830, p. 477, 1932. doi: 10.1098/rspa.1932.0107.

[8] G. Reinhold, K. Trümpy, and R. Gleyvod, "High power Cockcroft-Walton generators," *IEEE Trans. Nucl. Sci.*, vol. 18, no. 3, pp. 92–93, June 1971. doi: 10.1109/TNS.1971.4325969.
[9] IOFFE. http://www.ioffe.ru/index_en.html
[10] D. Shoenberg et al., "Kapitza centenary symposium at the Cavendish laboratory (Cambridge, 8 July 1994)," *Uspekhi Fizicheskikh Nauk*, vol. 164, no. 12, pp. 1303–1318, 1994. doi: 10.3367/UFNr.0164.199412o.1303.
[11] J. D. Cockcroft, "The design of coils for the production of strong magnetic fields," *Trans. Roy. Soc. London. Ser. A*, vol. 227, pp. 317–343, 1928.
[12] F. B. Kedrov, *Kapitza: Life and Discoveries*. Moscow: Mir Publishers, 1984.
[13] P. L. Kapitza, "Experimental research in strong magnetic fields," *Uspekhi Fizicheskikh Nauk*, vol. 163, no. 4, pp. 77–85, Apr. 1993. doi: 10.3367/UFNr.0163.199304g.0077.
[14] G. Aubert et al., "Quasi-stationary magnetic fields of 60 T using inductive energy storage," *IEEE Trans. Appl. Supercond.*, vol. 12, no. 1, pp. 703–706, Mar. 2002. doi: 10.1109/TASC.2002.1018498.
[15] F. Herlach, "The generation and use of pulsed magnetic fields," in *Proc. 2006 IEEE Int. Conf. Megagauss Magn. Field Gener. Related Topics*, Herlany, pp. 1–12. doi: 10.1109/MEGAGUSS.2006.4530656.
[16] P. L. Kapitza, "High power electronics," *Uspekhi Fizicheskikh Nauk*, vol. 78, no. 10, pp. 181–265, Oct. 1962. doi: 10.3367/UFNr.0078.196210a.0181.
[17] The Canadian Encyclopedia. https://www.thecanadianencyclopedia.ca/en
[18] "Ernest Rutherford collection heritage." McGill. https://www.mcgill.ca/historicalcollections/departmental/ernest-rutherford
[19] R. Stevenson, "Measurement of magnetic susceptibility in very high pulsed fields," *Rev. Sci. Instrum.*, vol. 32, no. 1, pp. 28, 1961. doi: 10.1063/1.1717138.
[20] "June 21, 1874: Opening of the Cavendish laboratory," *APS News*, vol. 29, no. 6, June 2020.

About the Author



Daryoush Shiri received his Ph.D. degree in electrical and computer engineering in 2013 from the University of Waterloo, Canada. Prior to this, he worked in a few start-up companies as a radio-frequency/analog CMOS design engineer and team leader. His thesis was devoted to the computational study of electron transport in silicon nanowires. As a postdoctoral fellow at the Institute for Quantum Computing, Waterloo (2013–2015), he collaborated in developing a scalable package for quantum-computing circuits. He came to Sweden in 2016 as a postdoctoral fellow at the Department of Physics, Chalmers University of Technology, to work on heat transport in 2D materials. Currently, he is a researcher at Quantum Technology Laboratory in the same university, working on the simulation of superconducting microwave circuits for quantum computing. He co-supervised several Ph.D. and master's degree students during these years. He loves teaching and always quotes John Archibald Wheeler: "If you would learn, teach." In his free time, he enjoys cycling, cooking, translating, and reading historical/comparative linguistics. He is a Member of the IEEE, APS, and German Physical Society.

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IEEE has a long history in Canada, going back to the founding of the IEEE Toronto Section in 1903 and the IEEE Vancouver Section in 1911. There are now 21 IEEE Sections in Canada, and the most recent one was formed in Windsor in 2015. IEEE is organizationally divided into 10 Regions, and Canada represents IEEE Region 7. It is the only IEEE Region that consists of one country alone.

However, the name *IEEE Canada* for IEEE Region 7 is of a newer date. It appeared as a result of the merger of the Canadian Society for Electrical and Computer Engineering and IEEE Region 7 into a single organization under the name *IEEE Canada*, which took place in 1995. Since then, the IEEE Region 7 director/delegate also carries the title of IEEE Canada president. This year, IEEE Canada celebrates its 25th anniversary, which was marked in a virtual/video workshop on 6 October 2020 in the presence of a number of IEEE dignitaries, volunteers, and guests.

Here are a few historical facts. Three distinguished IEEE Members from Canada were elected as the presidents of IEEE:

- Robert H. Tanner in 1972
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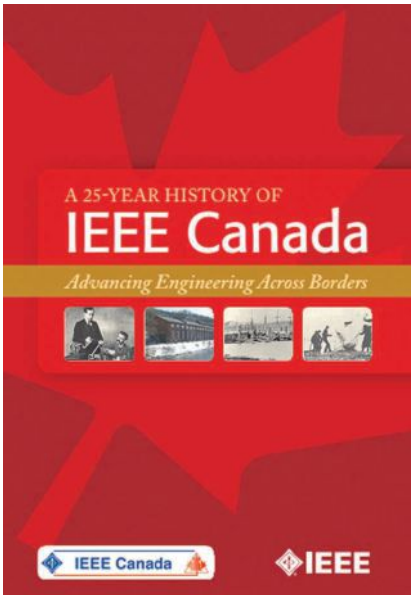


Figure 1: A history of IEEE Canada is provided on the Region's website.



Figure 2: The previous version of the IEEE Canada website provides additional historical details.

More about IEEE Canada's History.

- A brief history of IEEE Canada with more details can be found on the IEEE Canada website: https://www.ieee.ca/en/about/history/ (Figure 1).
- The previous version of the IEEE Canada website, available at https://ewh.ieee.org/reg/7/index.html, contains additional historical information (Figure 2).
- You may find more about IEEE Canada in the *IEEE Canadian Review* Fall 2013 issue, which celebrated the publication's own silver anniversary (Figure 3). For further reading, please visit http://canrev.ieee.ca/cr71/index.htm.

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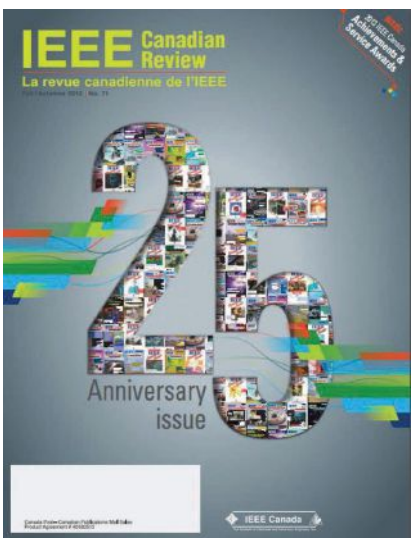


Figure 3: The Fall 2013 issue of *IEEE Canadian Review* highlighted IEEE Canada.

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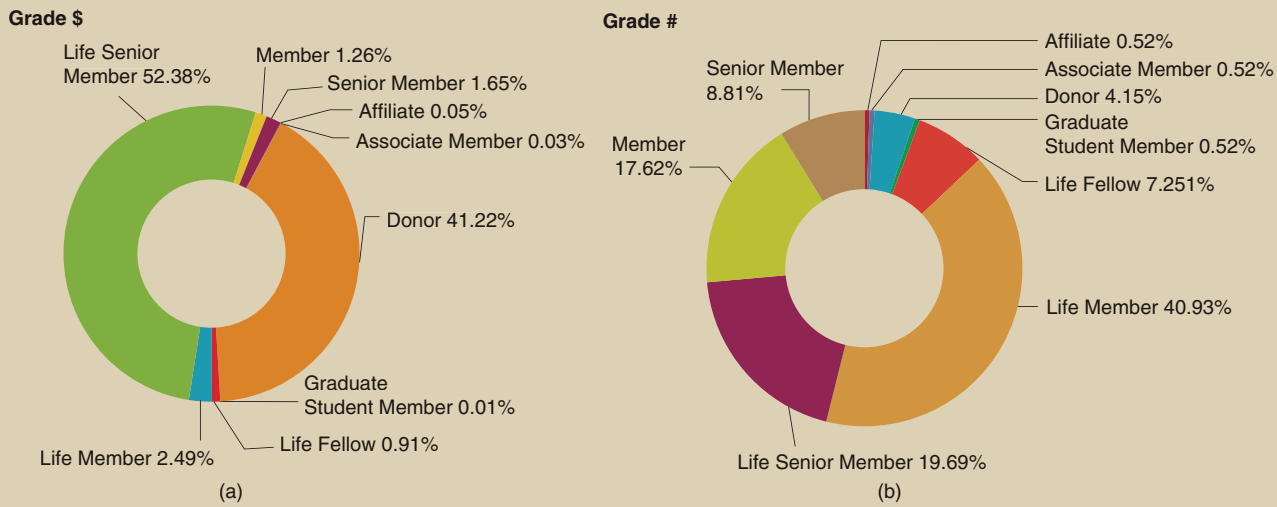
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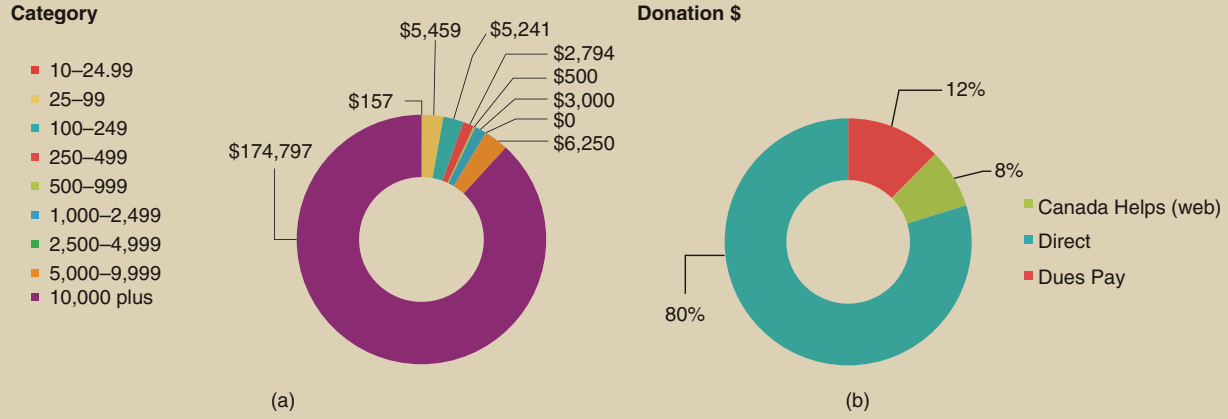
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- **Le Fonds général**—soutient les centres de ressources d'apprentissage McNaughton de l'IEEE partout au Canada, les bourses connexes et les subventions spéciales
- **Le Fonds des Membres à vie du Canada**—soutient les activités intéressant les membres à vie, les ingénieurs potentiels et les étudiants en genie Technologie pour
- **Le fonds pour l'humanité**—soutient des nouveaux projets et innovants qui cherchent à appliquer la technologie au profit de l'humanité.
- **Le fonds de bourses d'études de la section de Vancouver**—Ce fonds soutient les bourses accordées par la Section de l'IEEE de Vancouver
- **Le fonds de bourses d'études plus de la Société canadienne d'énergie et d'électricité de l'IEEE**—soutient des bourses d'études dans le cadre de programmes d'électricité de premier cycle au Canada
- **Le fonds de bourse d'études supérieures Nick Cercone de la Fondation canadienne de l'IEEE en informatique**—soutient une bourse d'études en informatique, un domaine d'études intéressant de l'IEEE.
- **Le fonds de bourses d'études de la section Kingston**— soutient les bourses accordées par la Section kingston de l'IEEE
- **La Bourse annuelle de premier cycle Raymond D. Findlay**—soutient une bourse nationale qui reconnaît le leadership et le professionnalisme.

Nous apprécions votre soutien passé et vous exhortons à continuer à donner et à augmenter vos contributions dans la mesure du possible. Si vous n'avez pas encore fait de don, joignez-vous à vos pairs , c'est votre occasion de vous tenir aux côtés d'autres personnes qui choisissent de faire une différence. Nous pourrions



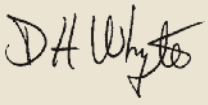
The 2019 donations by (a) category and (b) payment channel.

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the different ways to give and donor recognition programs are fully described on our website.

The IEEE Canadian Foundation wants to hear from you—if we can better engage and support our community, please let us know. You can contact me at president.ieeecanadianfoundation@ieee.ca or president.ieeefondationcanadienne@ieee.ca).

Many IEEE members in Canada contribute to the all-volunteer effort that is the IEEE Canadian Foundation, including the invaluable assistance of Luc Matteau, John Mowbray, and many others in the preparation of this 2019 Honour Roll of Donors.



David H. Whyte
President,
IEEE Canadian Foundation

2019 Year in Review

Donations from individuals and organizations in 2019 were $13,711 to General Fund programs, $184,487 to designated programs.

Every gift makes a difference. The honour roll formally recognizes all donors contributing $25 or more. The foundation extends our thanks also to those donors who are not listed.

In 2019, donor gifts helped support

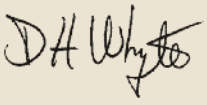
- six IEEE McNaughton Learning Resource Centre grants
- five IEEE Canadian Foundation scholarships
- 24 IEEE Canadian Foundation Special Grants (including humanitarian grants)
- one IEEE Canada Women in Engineering Prize
- six IEEE Canada Medals (W.S. Read Outstanding Service Award, Fessenden Award, R.H. Tanner Industry Leadership Award, J.M. Ham Outstanding Engineering Educator Award, P. Ziogas Electric Power Award, and J.J. Archambault Award)
- two IEEE Canadian Foundation Québec Science Fair Prizes
- one Findlay Scholarship
- four other endowed awards and scholarships.

La Fondation canadienne de l'IEEE veut vous entendre—si nous pouvons mieux nous impliquer et soutenir notre communauté, veuillez nous en informer.

faire beaucoup plus avec votre soutien financier. Toutes les différentes façons de donner et de reconnaître les donateurs sont décrites en détail sur notre site Web.

La Fondation canadienne de l'IEEE veut vous entendre - si nous pouvons mieux nous impliquer et soutenir notre communauté, veuillez nous en informer. Vous pouvez me contacter au president.ieeecanadianfoundation@ieee.ca ou president.ieeefondationcanadienne@ieee.ca).

De nombreux membres de l'IEEE au Canada contribuent à l'effort entièrement bénévole de la Fondation canadienne de l'IEEE, y compris l'aide inestimable de Luc Matteau, John Mowbray et de nombreux autres dans la préparation de ce tableau d'honneur des donateurs 2019.



David H. Whyte
Président de la Fondation
Canadienne IEEE

La Revue de l'année 2019

Les dons de particuliers et d'organismes en 2019 ont été 13 711 $ aux programmes du Fonds général, 184 487 $ aux programmes désignés.

Chaque cadeau fait une différence. La liste d'honneur reconnaît officiellement tous les donateurs qui versent 25$ ou plus. La fondation remercie également les donateurs qui ne sont pas inscrits sur la liste.

En 2019, les dons des donateurs ont aidé à soutenir

- Six subventions du Centre de ressources d'apprentissage McNaughton de l'IEEE
- Cinq bourses d'études de la Fondation canadienne de l'IEEE
- 24 Subventions spéciales de la Fondation canadienne de l'IEEE (y compris des subventions humanitaires)
- Un prix de l'IEEE Canada pour les femmes en génie
- Six médailles de l'IEEE Canada (W.S. Read Outstanding Service Award, Fessenden Award, R.H. Tanner Industry Leadership Award, J.M. Ham Outstanding Engineering Educator Award, P. Ziogas Electric Power Award et J.J. Archambault Award)
- deux prix de l'Expo-sciences du Québec de la Fondation canadienne de l'IEEE
- Une bourse Findlay
- Quatre autres prix et bourses dotés.

IEEE Canadian Foundation
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2019 Honour Roll of Donors

Tableau d'honneur des donateurs 2019

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Leonard P. Casciato

Leonard P. Casciato, B.A. (Hons), M.A., P.Eng., Life Member of IEEE, passed away on 3 June 2020. Born near Christie Pits, Ontario, in 1925, he was an engineering whiz kid whose technological innovations created computer-controlled traffic systems and revolutionised public transport in Canada and across the world.

Mr. Casciato helped design and build Canada's first computer between 1948 and 1950 while he was a student at the University of Toronto. A decade later, he designed and installed the first electronically controlled traffic system in the world in Toronto in 1962, and in the 1970s, he began the electronic revolution at the Toronto Transit Commission that now allows it to safely whisk millions of commuters to work every day. His string of patents and work impacted everything from the use of early cellular communications to track vehicles to the free-flowing movement of traffic in cities, automated reservations for airlines, as well as inventory, accounting systems, and automated production lines.



Leonard P. Casciato

Mr. Casciato helped design and build Canada's first computer between 1948 and 1950 while he was a student at the University of Toronto.

He was predeceased by his wife Loretta (née Carey) and leaves behind four children: John, Paul, Mary-Ellen, and Anne Marie; seven grandchildren: Adam, Christopher, Lauren, Jack, Max, Michael and Colleen; three step-grandchildren: Chris, Devin, and Kelton; and three of his four siblings: Evelyn Fontana (née Casciato), Joe Blondin, and Anthony Casciato. ■

Leonard P. Casciato

Leonard P. Casciato, B.A. (Hons), MA, P. Eng., Membre à vie de l'IEEE, est décédé le 3 juin 2020. Né près de Christie Pits, Ontario, en 1925, il était un enfant doué en ingénierie dont les innovations technologiques ont créé des systèmes de circulation contrôlés par ordinateur et révolutionné le transport en commun au Canada et dans le monde.

M. Casciato a aidé à concevoir et à construire le premier ordinateur du Canada entre 1948 et 1950 alors qu'il était étudiant à l'Université de Toronto. Une décennie plus tard, il a conçu et installé le premier système de circulation électronique au monde à Toronto en 1962, et dans les années 1970, il a commencé la révolution électronique à la Commission du transport en commun de Toronto qui lui permet maintenant de faire circuler en toute sécurité des millions de journaliers au travail. Sa série de brevets et son travail ont eu un impact sur l'utilisation des premières communications cellulaires pour suivre les véhicules à la libre circulation du trafic dans les villes, en passant par les réservations automatisées pour les compagnies aériennes, ainsi que les stocks, les systèmes comptables et les lignes de production automatisées.

M. Casciato a aidé à concevoir et à construire le premier ordinateur du Canada entre 1948 et 1950 alors qu'il était étudiant à l'Université de Toronto.

Il a été précédé par sa femme Loretta (née Carey) et laisse quatre enfants dont John, Paul, Mary-Ellen et Anne Marie; sept petits-enfants dont Adam, Christopher, Lauren, Jack, Max, Michael et Colleen; trois beaux-petits-enfants: Chris, Devin et Kelton; et trois de ses quatre frères et sœurs dont Evelyn Fontana (née Casciato), Joe Blondin et Anthony Casciato. ■

IEEE Young Professionals Ottawa Awarded the 2020 IEEE Young Professionals Hall of Fame Award



IEEE Ottawa Young Professionals Affinity Group (YPAG) has been awarded the 2020 IEEE Young Professionals Hall of Fame Award. This award is a certification that IEEE Ottawa YPAG has been classified at the top of all YPAGs worldwide based on their 2019 activities. For the same year, IEEE Ottawa YPAG has been awarded the 2019 Outstanding affinity group by IEEE Ottawa Section and the 2019 IEEE Canada YPAG of the Year Award by IEEE R7.

With over 50 volunteers under the leadership of Dr. Zied Bouida (2018–September 2019) and Mohamed Emara (October 2019–present), IEEE Ottawa YPAG has established itself as a leading affinity group within the IEEE Ottawa Section. They have organized numerous impactful technical and social events, as well as the Wireless in Space and Extreme Environments (WiSEE) International Conference. They are also known for their successful collaborations with other affinity groups including Women in Engineering (WiE), student branches, university departments, and industry. Their events have reached a diverse group of young professionals in academia and industry, and senior undergraduate students who are soon to be young professionals.









Awards Program

IEEE Canada Awards

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for exemplary contributions to the engineering profession

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

P.D. ZIOGAS ELECTRIC POWER MEDAL
for important contributions to the field of electric power engineering

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for important contributions to the field of computer engineering and science

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for outstanding contributions to engineering education

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for important contributions to electrical and electronics engineering

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

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for outstanding and sustained service to IEEE Canada and the Institute

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for meritorious service in western Canada at the local IEEE Section and area level

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

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for meritorious service in eastern Canada at the local IEEE Section and area level

PRIX 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 P.D. ZIOGAS DE L'ÉLECTRICITÉ
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pour ses contributions exceptionnelles à l'éducation en genie

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pour contributions exceptionnelles augénie électrique et électronique

MÉDAILLE D'EXCELLENCE EN LEADERSHIP INDUSTRIEL R.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

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

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

2020 IEEE CANADA A.G.L. MCNAUGHTON GOLD MEDAL
MÉDAILLE D'OR A.G.L. MCNAUGHTON DE L'IEEE CANADA 2020

For contributions to industry at large and the electrical engineering profession
Pour contributions à l'industrie en général et à la profession du génie électrique

Dr. Robert Hanna, Toronto, ON

Robert Hanna (LFIEEE) is president of RPM Engineering Ltd., founded in 1995. He obtained his Ph.D. degree in 1978 from Imperial College of Science and Technology, University of London, England. He was elevated to IEEE Fellow in 2004.

Dr. Hanna is internationally recognized in industry and the engineering community. He has completed complex assignments on five continents, resulting in more than 100 technical company reports and 45 technical papers, mostly published in IEEE Industry Applications Society transactions. He is frequently retained as a senior consultant to provide unique technical expertise on complex, nonconventional projects for large industrial customers and consulting firms. In many cases, he has been retained as a single source to conduct plantwide investigations into complex problems. The industrial sector includes petrochemical, gas plants, pipelines, mining, pulp and paper, and nuclear and renewable energy. He has completed many "first of its kind" projects in the industry, including designing an electrical storage facility using a compressed air concept, a comprehensive study of users' and manufacturers' experiences of medium-voltage adjustable-speed drives (ASDs) in North America, leading an international delegation to India on renewable energy, serving as an expert witness on several complex cases related to large electrical equipment malfunction, and surveying manufacturers' experiences with isolating transformers for ASD applications.



Dr. Hanna is a registered professional engineer in the provinces of Ontario and Alberta and a designated consulting engineer. He is a Life Fellow of IEEE; a Fellow of the Institution of Engineering and Technology, United Kingdom; and a Fellow of the Engineering Institute of Canada. He was president of IEEE Canada and director of IEEE Region 7 in 2006–2007 as well as president of the IEEE Toronto Chapter during 2002–2003. ■

Robert Hanna (LFIEEE) est président de RPM Engineering Ltd fondée en 1995. Il a obtenu son doctorat. en 1978 du Collège Impérial des Sciences et de la Technologie, Université de Londres, Angleterre. Il a été élevé au rang de Compagnon de l'IEEE en 2004.

Monsieur Hanna est reconnu internationalement dans l'industrie et la communauté d'ingénierie. Il a réalisé des missions complexes sur cinq continents, qui ont abouti à plus de 100 rapports de sociétés techniques et 45 • articles techniques, principalement publiés dans les transactions de la Société des Applications de l'Industrie IEEE. Il est fréquemment retenu comme consultant sénior pour fournir une expertise technique unique sur des projets complexes et non conventionnels pour de grands clients industriels et des cabinets de conseil. Dans de nombreux cas, il a été retenu comme source unique pour mener une enquête à l'échelle de l'usine sur des problèmes complexes. Le secteur industriel comprend la pétrochimie, les usines à gaz, l'oléoduc, les mines, les pâtes et papiers, l'énergie nucléaire et renouvelable. Il a réalisé plusieurs des «premiers projets du genre» dans l'industrie, notamment: La conception d'une installation de stockage électrique utilisant le concept d'air comprimé; L'étude approfondie des expériences des utilisateurs et des fabricants de Variateurs de Vitesse moyenne Tension (VVT) en Amérique du Nord; Le Chef d'une délégation internationale en Inde sur les énergies renouvelables; Le témoin expert sur plusieurs cas complexes liés à un dysfonctionnement de gros équipements électriques; l'enquête sur les expériences des fabricants en matière de transformateur d'isolement pour les applications (VVT).

Monsieur Hanna est un ingénieur professionnel agréé dans les provinces de l'Ontario et de l'Alberta et un ingénieur-conseil désigné. Il est membre à vie de l'IEEE, membre de l' Institution d'Ingénierie et de Technologie (FIET), Royaume-Uni, et membre de l'Institut d'ingénierie du Canada (FEIC). Il a été président de l'IEEE Canada et directeur de l'IEEE (région 7) en 2006–2007 et président de la Branche de l'IEEE de Toronto en 2002–2003. ■

2020 IEEE CANADA R.A. FESSENDEN MEDAL
MÉDAILLE R.A. FESSENDEN DE L'IEEE CANADA 2020

For industrial leadership in and pioneering contributions to mobile wireless communications
Pour leadership industriel et contributions pionnières dans les communications sans fil mobiles

Dr. Wen Tong, Ottawa, ON

Dr. Wen Tong is an IEEE Fellow. He is a Huawei Fellow and CTO of Huawei Wireless. In 2011, he was appointed head of Huawei's Communications Technologies Labs. Currently, he is the chief scientist leading Huawei's 5G wireless technologies research and development. Prior to joining Huawei in 2009, Dr. Tong was a Nortel Fellow and head of Network Technology Labs at Nortel. In 1995, he joined the Wireless Technology Labs at Bell Northern Research in Canada.

Dr. Tong is an internationally recognized leader driving the industry in the development of global mobile wireless communications systems. For the past three decades, he had led many technical breakthroughs and laid the foundation for 3G, 4G, and 5G mobile communication systems. Dr. Tong pioneered fundamental technologies from 1G to 5G wireless with 440 granted U.S. patents. His leadership in Canadian wireless technology innovation had a global impact.



In particular, the creation of 5G wireless will change our daily life and transform society.

Dr. Tong was the recipient of the IEEE Communications Society's Industry Innovation Award in 2014 and Distinguished Industry Leader Award in 2018 for "pioneering technical contributions and leadership in the mobile communications industry and innovation in 5G mobile communications technology." Dr. Tong is a Fellow of the Canadian Academy of Engineering, and he also serves on the board of directors of Wi-Fi Alliance. ■

Monsieur Wen Tong est membre de l'IEEE. Il est Compagnon huawei et Directeur Technique de Huawei Sans fil. En 2011, il a été nommé directeur des laboratoires de technologies de communication de Huawei. Il est actuellement scientifique en chef à la tête de la recherche et du développement des technologies sans fil 5G de Huawei. Avant de se joindre à Huawei en 2009, M. Tong était boursier Nortel et chef des laboratoires de technologie réseau chez Nortel. En 1995, il s'est joint aux laboratoires de technologie sans fil de Bell Northern Research au Canada.

Monsieur Tong est un chef de file reconnu à l'échelle internationale dans le développement de systèmes de communications sans fil mobiles à l'échelle mondiale. Au cours des trois dernières décennies, il a mené de nombreuses percées techniques et jeté les bases des systèmes de communication mobile 3G, 4G et 5G. M. Tong a été le pionnier des technologies fondamentales de la 1G au sans fil 5G avec 440 brevets américains. Son leadership dans le cadre de l'innovation canadienne en technologie sans fil a eu un impact mondial. En particulier, la création de 5G sans fil qui va changer notre vie quotidienne et transformer la société.

Monsieur Tong a reçu en 2014 le «Prix de l'innovation de l'industrie» de l'IEEE Communications Society et le «Prix de Leader de l'Industrie Distingué» en 2018 pour «ses contributions techniques pionnières et son leadership dans l'industrie des communications mobiles et l'innovation dans les technologies de communication mobile 5G». M. Tong est membre de l'Académie canadienne de génie et siège également au conseil d'administration de l'Alliance Wi-Fi. ■

Monsieur Tong est un chef de file reconnu à l'échelle internationale dans le développement de systèmes de communications sans fil mobiles à l'échelle mondiale.

2020 IEEE CANADA P.D. ZIOGAS ELECTRIC POWER MEDAL
MÉDAILLE P.D. ZIOGAS D'ÉNERGIE ÉLECTRIQUE DE L'IEEE CANADA 2020

For contributions to electrical power systems from generation (nuclear power plants) to distribution (microgrids) through the research and development of advanced control and energy management systems
Pour contributions aux systèmes d'alimentation électrique de la génération (centrales nucléaires) à la distribution (microréseaux) par la recherche et le développement de systèmes avancés de contrôle et de gestion de l'énergie

Dr. Jing Jiang, London, ON

Dr. Jing Jiang (IEEE Fellow, 2017) has been with the Department of Electrical and Computer Engineering, Western University, since 1991, where he is a distinguished university professor and a Natural Sciences and Engineering Research Council of Canada (NSERC)/UNENE Senior Industrial Research Chair (IRC). Dr. Jiang received his Ph.D. degree in electrical engineering from the University of New Brunswick in 1989. He is a Fellow of the Engineering Institute of Canada and Canadian Academy of Engineering and a registered professional engineer in Ontario.

Dr. Jiang has made contributions in power engineering from generation to distribution. At the generation end, he has been working with nuclear power industries in Canada (mainly in Ontario) through the IRC program and also internationally with the International Atomic Energy Agency to improve the safety and operational effectiveness of existing nuclear power plants through the research and development of advanced control and monitoring technologies. At the distribution end, he has made various contributions in control and energy management for microgrids at distribution networks involving renewable energy resources. His research has resulted in several technological innovations. Two developed technologies have been licensed by industry partners for commercialization, resulting in social and economic benefits.



Dr. Jiang is also a passionate teacher and a trusted mentor for his students and colleagues. He has successfully supervised more than 30 Ph.D., 40 M.E.Sc., and more than 100 B.E.Sc. students throughout his career. At the IEEE Society level, he served as chair of the IEEE Power & Energy Society (PES) London Chapter from 2016 to 2019. He has also been a warden of Engineering Camp 11 since 2004. ■

Monsieur Jing Jiang (Compagnon de l'IEEE, 2017) travaille depuis 1991 au Département de génie électrique et informatique de l'Université Western, où il est professeur distingué à l'Université et titulaire de la Chaire de Recherche Industrielle (CRI) du CRSNG/UNENE. Monsieur Jiang a obtenu son doctorat en génie électrique de l'Université du Nouveau-Brunswick en 1989. Il est membre de l'Institut de génie du Canada, de l'Académie canadienne de génie et ingénieur professionnel agréé en Ontario.

Monsieur Jiang a contribué à l'ingénierie de l'énergie, de la génération à la distribution. À la fin de la production, il a travaillé avec les industries de l'énergie nucléaire au Canada (principalement en Ontario) dans le cadre du program CRI, ainsi qu'à l'échelle internationale avec l'Agence internationale de l'énergie atomique (AIEA) afin d'améliorer la sûreté et l'efficacité opérationnelle des centrales nucléaires existantes grâce à la recherche et au développement de technologies avancées de contrôle et de surveillance. À la fin de la distribution, il a apporté diverses contributions dans le contrôle et la gestion de l'énergie pour les microréseaux dans les réseaux de distribution impliquant des ressources d'énergie renouvelable. Ses recherches ont donné lieu à plusieurs innovations technologiques. Deux technologies développées ont été autorisées par des partenaires de l'industrie pour la commercialisation, ce qui a donné lieu à des avantages sociaux et économiques.

Monsieur Jiang est également un enseignant passionné et un mentor de confiance pour ses étudiants et collègues. Il a supervisé avec succès plus de 30 doctorats, 40 MESc et plus de 100 étudiants du BESc tout au long de sa carrière. Au niveau de la société IEEE, il a été président de la Branche de london en Ontario de l'IEEE PES de 2016 à 2019. Il est également directeur du camp d'ingénierie 11 depuis 2004. ■

Monsieur Jiang est également un enseignant passionné et un mentor de confiance pour ses étudiants et collègues.

2020 IEEE CANADA C.C. GOTLIEB MEDAL
MÉDAILLE C.C. GOTLIEB DE L'IEEE CANADA 2020

For contributions on cyberphysical–social system design and data analytics
Pour contributions à la conception de systèmes cyberphysiques-sociaux et l'analyse de données

Dr. Laurence T. Yang, Antigonish, NS

Laurence T. Yang (IEEE Fellow) got his B.E. degree in computer science and technology and his B.Sc. degree in applied physics, both from Tsinghua University, China, and his Ph.D. degree in computer science from University of Victoria, Canada. He is a professor and the W.F. James Research Chair in computer science at St. Francis Xavier University, Canada. His research includes parallel, distributed, and cloud computing; embedded systems and the Internet of Things; ubiquitous and pervasive computing; and big data. He has published 200+ papers in these areas in top IEEE/Association for Computing Machinery (ACM) transactions/journals, including five and 25 papers as the top 0.1% and top 1% highly cited ESI papers, respectively.

He has been involved as a steering chair for many IEEE international conferences. He is the chair of the IEEE Computer Society Technical Committee of Scalable Computing (2008–2011, 2018–present), IEEE Computational Intelligence Society (CIS) Task Force on Cyberphysical Systems (2020–present), and IEEE Systems, Man, and Cybernetics Society Technical Committee on Cybermatics (2016–present) as well as vice chair of the IEEE CIS Technical Committee on Smart World (2016–2019). In addition, he serves as an editor for many international journals, is the author/editor of 25 books from



well-known publishers, and has been invited to give 50 keynote talks at various international conferences and symposia.

His recent honors and awards include Fellow of the IEEE (2020), IEEE SCSTC Most Influential Paper Award on Smart Computing (2019), IEEE TCBD Best Journal Paper Award on Big Data (2019), Clarivate Analytics (Web of Science Group) Highly Cited Researcher (2019), Fellow of Engineering Institute of Canada (2019), AMiner Most Influential Scholar Award for Internet of Things (2018), IEEE TCCPS Distinguished Leadership Award on Cyberphysical Systems (2018), IEEE SCSTC Life Career Achievement Award on Smart Computing (2018), Fellow of the Canadian Academy of Engineering (2017), IEEE System Journal Best Paper Award (2017), IEEE TCSC Achievement Award for Excellence in Scalable Computing (2017), and Elsevier JCSS Journal Most Cited Paper Award (2017). ■

Laurence T. Yang (IEEE Fellow) a obtenu son BE en informatique et technologie et son BSc en physique appliquée, tous deux de l'Université Tsinghua, en Chine, et son doctorat en informatique de l'Université de Victoria, au Canada. Il est professeur et titulaire de la Chaire de recherche W.F. James en informatique à l'Université St. Francis Xavier, Canada. Ses recherches comprennent l'informatique parallèle, distribuée et en nuage, les systèmes embarqués et l'IdN, l'informatique omniprésente et, et le Big Data. Il a publié plus de 200 articles dans les domaines ci-dessus sur les principales transactions/revues de l'IEEE/ACM, y compris 5 et 25 articles comme les meilleurs 0,1% et les meilleurs 1% d'articles ESI très cités, respectivement.

Il a été impliqué en tant que président directeur de nombreuses conférences internationales de l'IEEE. Il est président du comité technique CS de l'IEEE du calcul évolutif (2008–2011, 2018–), du groupe de travail CIS de l'IEEE sur les systèmes cyberphysiques (2020–), du comité technique de SMC de l'IEEE sur les cybermatiques (2016–) et vice - président du comité technique de CIS de l'IEEE sur le monde intelligent (2016–2019). En outre, il est rédacteur en chef de nombreuses revues internationales et il est l'auteur/éditeur de 25 livres d'éditeurs renommés, • invité à donner 50 discours lors de diverses conférences et colloques internationaux.

Ses récents honneurs et récompenses associés Compagnon de l'Institut des ingénieurs en électricité et en électronique (2020), le prix IEEE CSTC du document le plus influent sur l'informatique intelligente (2019), le prix IEEE TCBD du meilleur document de journal sur les Données Massives (2019) 2019), Clarivate Analytics (site web du groupe scientifique) Chercheur très cité (2019), Compagnon de l'Institut d'ingénierie du Canada (2019). Chercheur hautement cité (2019), membre de l'Institut d'ingénierie du Canada (2019), prix AMiner du chercheur le plus influent pour l'Internet des objets (2018), prix de leadership distingué TCCPS de l'IEEE sur les systèmes cyberphysiques (2018), réalisation de carrière à vie SCSTC de l'IEEE du prix sur l'informatique intelligent (2018), Compagnon de l'académie canadienne de l'ingénierie (2017), le Prix du meilleur article de la revue système de l' IEEE (2017), prix de la réussite TCSC de l'IEEE pour l'excellence en informatique évolutive (2017), Elsevier du journal JCSS, le prix de l'article le plus cité (2017). ■

2020 IEEE CANADA J.M. HAM OUTSTANDING ENGINEERING EDUCATOR MEDAL
PRIX J.M. HAM D'ÉDUCATEUR EXCEPTIONNEL EN GENIE DE L'IEEE CANADA 2020

For successfully training world-class engineers and researchers for today's industry and academia
Pour la formation réussie d'ingénieurs et de chercheurs de classe mondiale pour l'industrie et le monde universitaire d'aujourd'hui

Dr. Amir Aghdam, Montréal, QC

Amir Aghdam received the Ph.D. degree in electrical and computer engineering from the University of Toronto, Ontario, Canada, in 2000. He is currently a professor with the Department of Electrical and Computer Engineering at Concordia University, Montréal, Quebec, and the academic code administrator at the School of Graduate Studies. He is a Fellow of the Engineering Institute of Canada, member of Professional Engineers Ontario, chair of the Conference Editorial Board of the IEEE Control Systems Society, and editor-in-chief of *IEEE Systems Journal*. He has served as an associate editor for *IEEE Transactions on Control Systems Technology*, *IEEE Access*, *IET Control Theory and Applications*, and *Canadian Journal of Electrical and Computer Engineering*. He has been a member of the technical program committees of a number of conferences, including the IEEE Conference on Systems, Man, and Cybernetics and IEEE Multiconference on Systems and Control. He has served as a member of the review committee for the Italian Research and University Evaluation Agency, the NSERC ECE Evaluation Group, Eurostars Expert Group for the Innovation Fund Denmark Projects (Eureka Network), and a National Science Foundation panel. He is a recipient of the 2009 IEEE MGA Achievement Award, 2011 IEEE Canada J.J. Archambault Eastern Canada Merit Award, and 2013



Faculty of Engineering and Computer Science Teaching Excellence Award at Concordia University. He was the 2014–2015 president of IEEE Canada and director (Region 7), IEEE, and was also a member of the IEEE Awards Board for this period. Dr. Aghdam has served as a member of the IEEE Medal of Honour Committee and IEEE MGA Awards and Recognition Committee, and he is currently the vice chair of the IEEE Medals Council. He was a visiting scholar at Harvard University in fall 2015 and was an associate at the Harvard John A. Paulson School of Engineering and Applied Sciences for 2015–2016. Dr. Aghdam's graduate students have received several national and international awards, including three Governor General's Gold Medals at Concordia University, and many of them hold key positions in industry and academia. His research interests include multiagent networks, distributed control, optimization, and sampled-data systems. ■

Amir Aghdam • a reçu le diplôme de doctorat en génie électrique et informatique de l'Université de Toronto, ON, Canada, en 2000. Il est actuellement professeur au Département de génie électrique et informatique de l'Université Concordia, Montréal, QC, Canada, et administrateur du code académique à l'École des études supérieures. Il est Compagnon de l'Institut d'ingénierie du Canada, membre des Ingénieurs Professionnels de l' Ontario, président du comité de rédaction de la conférence de Société des systèmes de contrôle de l'IEEE et rédacteur en chef du Journal des systèmes de l'IEEE . Il a été rédacteur associé pour les transactions de l'IEEE sur la technologie des systèmes de contrôle, l'accès à l'IEEE, la théorie et les applications de contrôle IET et le Journal Canadienne de Génie Électrique et Informatique. Il a été membre du comité du program technique de plusieurs conférences, dont la Conférence de l'IEEE sur les systèmes, l'homme et la cybernétique (IEEE SMC) • et la Multi Conférence de l'IEEE sur les systèmes et le contrôle (IEEE MSC). Il a été membre du comité d'examen de l'Agence italienne d'évaluation de la recherche et des universités (ANVUR), du groupe d'évaluation de la CEE du Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG), du groupe d'experts Eurostars pour les projets du Fonds d'innovation au Danemark (réseau Eureka)) et un panneau NSF. Il est récipiendaire du prix d'excellence MGA 2009 de l'IEEE, le prix du mérite J.J. Archambault de l'IEEE Canada 2011 de l'Est du Canada et le Prix d'excellence en enseignement de la Faculté de génie et d'informatique 2013 à l'Université Concordia. Il a été président 2014–2015 de l'IEEE Canada et directeur (région 7), IEEE Inc., et a également été membre du conseil des prix de l'IEEE pour cette période. Monsieur Aghdam a été membre du comité des médailles d'honneur de l'IEEE, du comité des prix et de la reconnaissance de MGA de l'IEEE et il est actuellement vice-président du conseil des médailles de l'IEEE. Il était chercheur invité à l'Université Harvard à l'automne 2015 et il était associé à la Harvard John A. Paulson School of Engineering and Applied Sciences pour 2015–2016. Les étudiants diplômés du Dr Aghdam ont reçu plusieurs prix nationaux et internationaux, dont trois médailles d'or du gouverneur général à l'Université Concordia, et bon nombre d'entre eux occupent des postes clés dans l'industrie et le milieu universitaire. Ses intérêts de recherche incluent les réseaux multiagents, le contrôle distribué, l'optimisation, et les systèmes de données échantillonnées. ■

2020 IEEE CANADA OUTSTANDING ENGINEER MEDAL
MÉDAILLE D'EXCELLENCE EN INGÉNIERIE DE L'IEEE CANADA 2020

To recognize his significant contributions to the research and development and commercialization of micro-/nanodevices for medical and industrial applications

Reconnaître ses contributions importantes à la recherche et développement et à la commercialisation de micro/nanodispositifs pour des applications médicales et industrielles

Dr. John Yeow, Waterloo, ON

John T.W. Yeow (Senior Member) received the B.A.Sc. degree in electrical and computer engineering and the M.A.Sc. and Ph.D. degrees in mechanical and industrial engineering from the University of Toronto, Ontario. He is currently a professor in the Department of Systems Design Engineering at University of Waterloo, Ontario.

John Yeow is widely recognized for his pioneering contributions to the fields of microsystems and nanodevices research, particularly as they apply to micro- and nanodevices. His work has had a broad and seminal impact—from the advancement of scientific knowledge to industrial innovation. He is an international leader and educator in the development of nanotechnology-based multimodality imaging systems involving X-ray, optical and ultrasound imaging technologies.

He is a recipient of the Professional Engineering Ontario Young Engineer Medal, Professional Engineering Ontario Engineering Excellence Award,Natural Science and Engineering Research Canada Innovation Challenge Award, Douglas R. Colton's Medal of Research Excellence, Micralyne Microsystems Design Award, Ontario Ministry of Research and Innovation's Early Researcher Award,



IEEE NANO Excellence Paper Award, and University of Toronto Alumni Association 7T6 Early Career Award. He was a Canada Research Chair in Micro/Nanodevices (2009–2019) and a University Research Chair. He was the editor-in-chief of *IEEE Nanotechnology Magazine* (2014–2019), and an associate editor of *IEEE Transactions of Nanotechnology*. He is a Fellow of the Canadian Academy of Engineering, Engineering Institute of Canada and Engineers Canada and a member of the College of New Scholars, Artists, and Scientists of the Royal Society of Canada. He is also a 2017/2018 IEEE Nanotechnology Technical Council Distinguished Lecturer. He is the vice president of educational activities of the IEEE Nanotechnology Technical Council. ■

John T.W. Yeow (Membre Sénior) a reçu le diplôme de B.A.Sc. en génie électrique et informatique, et les diplômes de M.A.Sc. et Ph.D. en génie mécanique et industriel de l'Université de Toronto, ON, Canada. Il est actuellement professeur au Département de génie de la conception de systèmes de l'Université de Waterloo, Waterloo, ON, Canada.

John Yeow est largement reconnu pour ses contributions pionnières dans les domaines de la recherche sur les microsystèmes et les nano dispositifs, en particulier dans la mesure où ils s'appliquent aux micro et nano dispositifs. Son travail a eu un impact large et fondateur-sur l'avancement des connaissances scientifiques à l'innovation industrielle. Il est un chef de file international et un éducateur dans le développement de systèmes d'imagerie multimodalité basés sur la nanotechnologie impliquant des technologies d'imagerie par rayons X, optique et ultrasonore.

Il est récipiendaire de la Médaille du jeune ingénieur de génie professionnel de l'Ontario, du prix d'excellence en génie professionnel de l'Ontario, du prix du défi d'innovation de Recherche en Sciences Naturelles et en Génie du Canada, de la médaille d'excellence en recherche Douglas R. Colton, du prix de conception Micralyne Microsystems, du ministère de la Recherche et de l'Innovation de l'Ontario. Prix du premier chercheur, prix d'excellence NANO de l'IEEE, et Prix 7T6 de l'Association des anciens élèves de l'Université de Toronto en début de carrière. Il a été titulaire d'une chaire de recherche du Canada sur les micro/nanodispositifs (2009–2019) et d'une chaire de recherche universitaire. Il a été rédacteur en chef du Magazine de nanotechnologie de l'IEEE (2014–2019) et rédacteur associé de l'IEEE Transactions of Nanotechnology. Il est membre de l'Académie canadienne du génie, de l'Institut d'ingénierie du Canada, d'Ingénieurs du Canada et membre du Collège des nouveaux chercheurs, artistes et scientifiques de la Société royale du Canada. Il fut également conférencier émérite du Conseil technique de nanotechnologie de l'IEEE 2017/2018. Il est le vice-président des activités éducatives du Conseil technique de l'IEEE sur la nanotechnologie.l. ■

2020 IEEE CANADA R.H. TANNER INDUSTRY LEADERSHIP AWARD
MÈDAILLE D'EXCELLENCE EN LEADERSHIP INDUSTRIEL R.H. TANNER DE L'IEEE CANADA 2020

For contributions to improved safety of industrial power systems and for ongoing development of standards for power system protection and coordination

Pour des contributions à l'amélioration de la sécurité des réseaux électriques industriels et pour le développement continu de normes de protection et de coordination des réseaux électriques

Rasheek Rifaat, Calgary, AB



Rasheek Rifaat (LFIEEE) earned his B.Sc. degree from Cairo University and his M.Eng. degree from McGill University. Currently, he is an industry subject matter expert for industrial power distribution systems, generation, cogeneration, power system protection, and power system studies. His Canadian engineering work history spans more than 45 years in Calgary, Regina, and Montréal. During this time, he has been involved in a wide range of sizes and diversity of projects. His experience was published and presented in more than 40 technical papers and tutorials. Since 1976, he has been an active IEEE Member, and in 2014, he was elevated to Fellow grade for "contributions to the 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 the Standards Working Group on Protection and Coordination (Series 3004) and chair of the Industrial and Commercial Power Systems (I&CPS) Department of the IEEE Industry Applications Society (IAS).

Rasheek's dedication to supporting related IEEE technical conferences, tutorials, seminars, and events reflects his profound appreciation for the importance of these activities—critical for advancement of the electrical engineering profession and the intergeneration 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 the Electrical Power and Energy Conference (EPEC) 2014, all held in Calgary. He has been instrumental in devising the evening seminars and events shared by the Southern Alberta and Northern Canada Sections. From January 2016 until December 2018, he served as the regional treasurer for IEEE Canada (Region 7). Rasheek is registered as a P.Eng. in Alberta, Saskatchewan, and Ontario and is a member of the Energy Industry Electrical Engineering Association. ■

Rasheek Rifaat (LFIEEE) a obtenu son B.Sc. de l'Université du Caire et M.Eng. de l'Université McGill. Actuellement, il est un expert en la matière pour les systèmes de distribution d'énergie industrielle, la production, la cogénération, la protection des systèmes d'alimentation et les études de systèmes d'alimentation. Son histoire de travail en génie au Canada s'étend sur 45 ans à Calgary, Regina et Montréal. Pendant ce temps, il a été impliqué dans un large éventail de projets de tailles et diversifiés. Son expérience a été publiée et présentée dans plus de 40 articles techniques et tutoriels. Depuis 1976, il est membre actif de l'IEEE et en 2014, il a été élevé au grade de Compagnon pour «contributions à la protection des systèmes électriques industriels». Il est notamment engagé dans les normes de l'IEEE pour les pratiques recommandées sur les systèmes d'alimentation industriels et commerciaux. Il est actuellement président du groupe de travail pour les normes sur la protection et la coordination (série 3004) et président du département des systèmes électriques industriels et commerciaux (I & CPS) de l'IEEE/IAS.

Le dévouement de Rasheek à soutenir les conférences techniques, les tutoriels, les séminaires et les événements liés à l'IEEE reflète sa profonde appréciation de l'importance de ces activités - essentielles pour l'avancement de la profession d'électrotechnique et le transfert intergénérationnel des connaissances en génie. Ses contributions ont été particulièrement fortes dans l'Ouest canadien. Il a présidé deux conférences techniques I & CPS (2009/2015) et a été le trésorier de l'EPEC 2014, toutes tenues à Calgary. Il a joué un rôle déterminant dans la conception des séminaires et événements du soir partagés par les sections du sud de l'Alberta et du nord du Canada. De janvier 2016 à décembre 2018, il a occupé le poste de trésorier régional de l'IEEE Canada (région 7). Rasheek est enregistré comme P.Eng. en Alberta, en Saskatchewan et en Ontario et il est membre de l'Association de l'Industrie de l'Énergie de Génie Électrique ■

Son histoire de travail en génie au Canada s'étend sur 45 ans à Calgary, Regina et Montréal.

2020 IEEE CANADA W.S. READ OUTSTANDING SERVICE MEDAL
MÉDAILLE D'EXCELLENCE DE SERVICE W.S. READ DE L'IEEE CANADA 2020

For outstanding service and dedication to IEEE Canada (Region 7) and to the engineering profession at large
Pour un service exceptionnel et son dévouement envers IEEE Canada (région 7) et la profession d'ingénieur en general

Dr. Keith Brown, Toronto, ON

Dr. Keith B. Brown (SMIEEE) is an engineering lead with Ontario Power Generation's (OPG's) Nuclear Refurbishment Project overseeing the refurbishment of steam turbine-generator systems. He received a B.Sc. degree in mathematical sciences, B.Sc. degree in honours physics, and M.Sc. and Ph.D. degrees in electrical and computer engineering, all from the University of Alberta. While employed with OPG, from 2007 to 2013, Dr. Brown was also an adjunct professor in the Electrical and Computer Engineering Department at Ryerson University. Previous to joining OPG in 2006, he worked as a principal engineer in the energy sector and, prior, served 15 years with the Royal Canadian Navy in various technical and operational capacities.

Dr. Brown has been an active IEEE volunteer for more than 17 years and a long-standing member of multiple societies. He has held almost every leadership position at the Section, area, and national levels plus numerous roles at the global level, including the position of IEEE Canada president and Region 7 director in 2012–2013. He cofounded the Electrical Safety and Mega Projects Workshop in 2005, a workshop that continues today and has grown to more than 300 participants. He continues his active service as chair of a number of national and global committees and, for the past eight years, as a director with the IEEE Canadian Foundation. He has published or presented more than 71 articles, many on topics related to leadership, strategic planning, and improving the volunteer experience within the institute.



Dr. Brown has received various scholarships and awards for his graduate studies; service recognition from the Northern Canada, Toronto, and Montréal Sections; the Canadian Forces Decoration; and the Canada 125 medal. He has also received recognition within OPG for his technical and leadership contributions. In 2016, he was made a Fellow of the Engineering Institute of Canada. ■

Monsieur Keith B. Brown (SMIEEE) est chef de file de l'ingénierie du projet de rénovation nucléaire de l'Ontario Power Generation (OPG) qui supervise la remise à neuf des systèmes de turbine à vapeur-générateurs. Il a reçu un B.Sc en sciences mathématiques, B.Sc. en physique des honneurs, un M.Sc et un doctorat en génie électrique et informatique, tous de l'Université de l'Alberta. De 2007 à 2013, M. Brown a également été professeur adjoint au département de génie électrique et informatique de l'Université Ryerson. Avant de se joindre à OPG en 2006, il a travaillé comme ingénieur principal dans le secteur de l'énergie et a occupé 15 ans au service de la Marine royale canadienne dans diverses fonctions techniques et opérationnelles.

Keith est un bénévole actif de l'IEEE depuis plus de 17 ans et un membre de longue date de plusieurs sociétés. Il a occupé presque tous les postes de direction aux niveaux de la Section, de la région et du Canada, ainsi que de nombreux postes à l'échelle mondiale, y compris celui de président et directeur de la région 7 day'IEEE Canada de 2012 à 2013. Il a cofondé l'Atelier sur la sécurité électrique et les mégaprojets en 2005; un atelier qui se poursuit aujourd'hui et qui compte plus de 300 participants. Keith poursuit son service actif à titer de président d'un certain nombre de comités nationaux et mondiaux et, au cours des huit dernières années,

Keith est un bénévole actif de l'IEEE depuis plus de 17 ans et un membre de longue date de plusieurs sociétés.

de directeur de la Fondation canadienne de l'IEEE. Keith a publié ou présenté plus de 71 articles, dont plusieurs portent sur des sujets liés au leadership, à la planification stratégique et à l'amélioration de l'expérience des bénévoles au sein de l'institut.

Monsieur Brown a reçu diverses bourses et prix pour ses études supérieures; la reconnaissance du service des sections du nord du Canada, de Toronto et de Montréal; la décoration des Forces canadiennes; et la médaille Canada 125. Il a également été reconnu au sein d'OPG pour ses contributions techniques et de leadership. En 2016, il a été nommé Compagnon de l'Institut d'ingénierie du Canada. ■

2020 IEEE CANADA E.F. GLASS WESTERN CANADA MERIT MEDAL
MÉDAILLE D'EXCELLENCE E.F. GLASS DE L'OUEST DU CANADA DE L'IEEE CANADA 2020

For contributions to the Southern Alberta Section and the Southern Alberta IAS/PES Chapter
Pour les contributions à la section sud de l'Alberta et au chapitre sud de l'Alberta IAS/PES

Dale Tardiff, Calgary, AB

Dale Tardiff, SMIEEE, is the past chair of the Southern Alberta Section (SAS). He graduated from the University of Calgary in 1990 with an M.Sc. degree in electrical engineering, specializing in power electronics. He previously received a B.Sc. degree from the University of Calgary in 1986. In 2002, he started his own company, Innovative Power Solutions Inc., and has been a self-employed consultant in power electronics, working for a variety of clients in telecommunications, railway, and energy. Prior to this, he worked for Revolve Magnetic Bearings, now part of SKF, designing power supplies and power amplifiers for magnetic bearing applications.

He has held a number of roles for IEEE with the Southern Alberta Section. This includes chair of the IAS/PES Chapter, treasurer, and then chair for the SAS. In addition, he was the treasurer of 2015 IEEE I&CPS Conference in Calgary and conference chair of the I&CPS Conference when it returned to Calgary in 2019. During his



involvement with SAS, the Section received several awards for its activities, including the IEEE Canada Exemplary Section award for three consecutive years. In addition to being a Member of IEEE, he is also a member of the Association of Professional Engineers and Geoscientists of Alberta and is a registered professional engineer in Alberta. He is also a volunteer on two standards committees: Canadian Standards Association (CSA) 22.2 No. 107.1–Power Conversion Equipment and IEEE 1566–Standard for Performance of Adjustable-Speed AC Drives Rated 375 kW and Larger. ■

Dale Tardiff, SMIEEE, est l'ancien président de la section sud de l'Alberta. Il est diplômé de l'Université de Calgary, en 1990, avec une maîtrise en génie électrique, spécialisée dans l'électronique électrique. Il a déjà reçu un BSc de l'Université de Calgary en 1986. En 2002, il a fondé sa propre entreprise, Innovative Power Solutions Inc. et a été consultant indépendant en électronique électrique travaillant pour une variété de clients dans les télécommunications, le chemin de fer et l'énergie. Avant cela, il a travaillé pour Revolve Magnetic Bearings, qui fait maintenant partie de SKF, la conception d'alimentations et d'amplificateurs de puissance pour les applications de roulement magnétique.

Dale a occupé un certain nombre de rôles pour l'IEEE avec la section du sud de l'Alberta. Cela comprend le président de la Branche IAS/PSE, de trésorier, puis le président de la Section Sud de l'Alberta (SAS). En outre, il a été le trésorier de la Conférence IEEE I & CPS 2015 à Calgary et président de la Conférence I & CPS à son retour à Calgary en 2019. pendant 3 années consécutives. En plus d'être membre de l'IEEE, Dale est également membre de l'Association d'Ingénieurs Professionnels et de Géoscientifiques de l'Alberta (APEGA) et il est un ingénieur professionnel enregistré en Alberta. Il est également bénévole dans 2 comités de normalisation: CSA 22.2 No 107.1 - Power Conversion Equipment; et l'IEEE 1566 - Norme pour les performances des variateurs CA à vitesse réglable de 375 kW et plus. ■

Dale a occupé un certain nombre de rôles pour l'IEEE avec la section du sud de l'Alberta.

2020 IEEE CANADA M.B. BROUGHTON CENTRAL CANADA MERIT MEDAL
MÉDAILLE D'EXCELLENCE M.B. BROUGHTON DU CENTER DU CANADA DE L'IEEE CANADA 2020

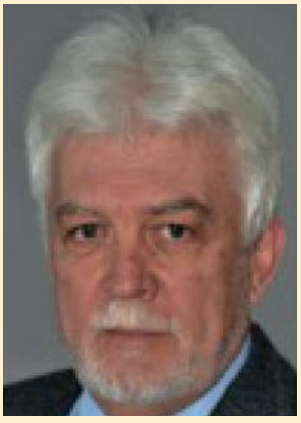
For his contributions to the vitality of the London Section and contributions to Region 7 through the central area chair and committee member roles

Pour sa contribution à la vitalité de la section de Londres et ses contributions à la région 7 par le biais du president de la région du Center et des rôles de membre du comité

Murray MacDonald, London, ON

Murray MacDonald (LSMIEEE) holds B.Sc. (EE) and M.Sc. (EE) degrees from Queens University in Kingston. He has been an IEEE Member since joining as an undergraduate. Murray spent his 40-year career in design and engineering management roles with several multinational telecommunication power equipment manufacturers. Most recently, he has been consulting as a project manager for telecom power projects. Besides developing numerous successful new products, he was involved in writing two CSA standards related to telecommunications power equipment.

Murray was active with the program committees of many IEEE International Telecommunication Energy Conferences since 1986 and with the organizing committees for the EPEC 2012 and 2015 in London. During his career, Murray also authored or coauthored eight papers on the topic of telecom power. Since quasi-retirement in 2009, Murray has been active in executive roles (secretary, vice chair, chair, and past chair) with the IEEE London Section. As past chair,



he has been a mentor for new executives, in particular the Young Professionals and Women in Engineering affinity groups. He has also been the Teacher In-Service Program (TISP) lead in London where, during the 2018–2019 school year, his programs reached more than 1,000 students and 40 teachers.

At the Region 7 level, Murray served as the central area chair in 2017–2018 and is currently the TISP Committee chair. He is also serving on the Nominations and Appointments Committee and the Education Activities Committee. He is currently on the Organizing Committee as Treasurer for the Canadian Conference on Electrical and Computer Engineering 2020 in London. ■

Murray MacDonald (LSMIEEE) est titulaire d'un B.Sc. (EE) et M.Sc. (EE) de l'Université Queen's à Kingston. Il est membre de l'IEEE depuis qu'il s'est joint à l'IEEE au premier cycle de sa carrière universitaire. Murray a passé sa carrière de 40 ans dans des rôles de conception et de gestion de l'ingénierie au sein de plusieurs fabricants multinationaux d'équipements d'alimentation en télécommunications. Plus récemment, il a été consultant en tant que chef de projet pour des projets d'énergie de télécommunications. En plus de développer de nombreux produits réussis, il a participé à la rédaction de deux normes de l'Association canadienne de normalisation (ASC) relatives à l'équipement d'alimentation en télécommunications.

Murray a été actif au sein des comités de program de nombreuses conférences internationales sur l'énergie des télécommunications de l'IEEE (INTELEC) depuis 1986 et avec les comités d'organisation de la conférence sur l'énergie et l'électricité (EPEC) 2012 et 2015 à London, ON. Au cours de sa carrière, Murray a également rédigé ou coécrit huit articles sur le thème de l'Énergie des télécommunications. Depuis la quasi-retraite en 2009, Murray a occupé des postes de direction (secrétaire, vice-président, président et ancien président) de la section de London, ON. de l'IEEE. En tant que président sortant, il a été le mentor de nouveaux cadres, en particulier les groupes d'affinité Jeunes professionnels et Femmes en génie. Il a également été responsable du program des enseignants en service (TISP) à London, ON où, pendant l'année scolaire 2018–2019, ses programs ont atteint plus de 1000 élèves et 40 enseignants.

Au niveau de la région 7, Monsieur Murray a été président de la région centrale en 2017–2018 et il est actuellement président du comité du TISP. Il siège également au Comité des nominations et au Comité des activités éducatives. Il siège actuellement au comité organisateur à titer de trésorier de la Conférence canadienne sur le génie électrique et informatique (CCECE) 2020 à London, Ontario. ■

2020 IEEE CANADA J.J. ARCHAMBAULT EASTERN CANADA MERIT MEDAL
MÉDAILLE D'EXCELLENCE J.J. ARCHAMBAULT DE L'EST DU CANADA DE L'IEEE CANADA 2020

"Be the change you wish to see in the world." —Gandhi
"Soyez le changement que vous souhaitez voir dans le monde."

Saida Maaroufi, Montréal, QC

Saida Maaroufi (MIEEE) is a postdoctoral research fellow at the Mobile Computing and Networking Research Laboratory, École Polytechnique de Montréal. She received the B.Sc. and M.Sc. degrees (with distinction) in electrical and computer engineering from Université Mohamed V in 2003 and 2007, respectively, and earned the Ph.D. degree in the area of mobile computing in 2016 from Polytechnique Montréal. She has taught courses on networking and computer engineering since 2008. Her research interests include interworking architecture design, machine learning, network softwarization, and network security. She serves as a chair and member of the technical program committee of several IEEE/ACM conferences.

Dr. Maaroufi is very passionate about promoting women in science, technology, engineering, and mathematics fields. She is the chair of IEEE Women In Engineering (WIE) Montréal and also serves as IEEE Canada WIE East Area chair. At an international level, she successfully co-chaired the organization of IEEE Women in Sensors events, internationally supported by the IEEE Sensors Council and held in conjunction with the IEEE SENSORS 2019 conference. At the Region level,



she greatly contributed to the success of the IEEE WIE ILS summit held in Toronto in 2018. Under her leadership, IEEE WIE Montréal won the 2017 IEEE Canada WIE Group of the Year Award, Large Section Runner-Up. She is currently working on the rejuvenation of the IEEE WIE Saint-Maurice Section at the East Area level. Since January 2019, she has served as chair of the IEEE Montréal Section.

Dr. Maaroufi was awarded the prestigious 2016 IEEE Canada WIE Prize, sponsored by the Judy Clift Fund, the NSERC-DIVA Best Poster Award and the 2017 IEEE Canada WIE Leadership Appreciation Award. She is engaged in many professional activities: she is a technical consultant of IEEE SIGHT and an active member of ACM N2 Women research community, IEEE TISP program, and GRAHN-Monde. ■

Saida Maaroufi (MIEEE) est chercheuse postdoctorale au Laboratoire de recherche sur l'informatique mobile et les réseaux (LARIM) de l' École Polytechnique de Montréal. Elle a reçu le BSc. et MSc. diplômés (avec distinction) en génie électrique et informatique de l'Université Mohamed V en 2003 et 2007, respectivement, et a obtenu le doctorat. diplôme dans le domaine de l'informatique mobile en 2016 de Polytechnique Montréal. Elle a enseigné des cours sur l'ingénierie des réseaux et de l'informatique depuis 2008. Ses intérêts de recherche incluent: la conception d'architecture d'interfonctionnement, l'apprentissage automatique, la mise en place de logiciels de réseaux et la sécurité des réseaux. Elle est présidente et membre du comité de program technique de plusieurs conférences de l'IEEE/ACM.

Madame **Maaroufi** est très passionné par la promotion des femmes dans les domaines STEM. Elle est présidente de l'IEEE Femmes en génie (FEG) de Montréal et elle est également présidente de la région Est de l'IEEE Canada FEI. Au niveau international, elle a coprésidé avec succès l'organisation d'événements femmes de l'IEEE dans les capteurs (WISE), soutenus à l'échelle internationale par le Conseil des capteurs de l'IEEE et organisés en collaboration avec la conférence CAPTEURS de l'IEEE 2019. Au niveau régional, elle a grandement contribué au succès du sommet FEG ILS de l'IEEE qui s'est tenu à Toronto en 2018. Sous sa direction, Le FEG de l'IEEE de Montréal a remporté le prix IEEE Canada Groupe de l'année 2017 de FEG de l'IEEE Canada, Finaliste de la Grande Section. Elle travaille actuellement au rajeunissement de la section FEG de Saint-Maurice de l'IEEE au niveau de la région Est. Depuis janvier 2019, elle est présidente de la section de l'IEEE de Montréal.

Madame Maaroufi a reçu le prestigieux prix de Femme En Genie de l' IEEE Canada 2016 parrainé par les fonds Judy Clift, le prix CRSNG-DIVA de la meilleure affiche et le prix d'appréciation du leadership de FEG de l'IEEE Canada 2017. Elle est engagée dans de nombreuses activités professionnelles: elle est consultante technique de l'IEEE SIGHT et membre active de la communauté de recherche ACM N2 des Femmes, du program TISP de l'IEEE et de GRAHN-Monde. ■

IMPORTANT UPDATES

IEEE Canadian Review (*ICR*) is now a "default-digital" publication.

What does this mean?

- All IEEE Canada members will receive *ICR* in digital formats, either through the website or through the IEEE app.
- Members who have explicitly requested not to receive electronic communication will not receive the digital copies. Default mail delivery of print copies will be discontinued to those members in the future. Members are encouraged to opt in for print copies, or modify their electronic communication preferences to receive digital copies.
- A print copy will be delivered only to those full-grade members who request it. This will be provided free of additional costs (included in the annual membership fee).
- Members can opt in for print or digital copies through IEEE membership renewal web page: https://www.ieee.org/membership/index.html

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On 23 June, 2020, IEEE Women in Engineering (WIE) Ottawa created a historical move by carving its name as the winner of the 2020 IEEE WIE Affinity Group of the Year Award. This award is given annually to one IEEE WIE Affinity Group that has shown outstanding leadership and initiative in organizing activities. For IEEE WIE Ottawa, this award consists of the appointment of the group's chair, Anastassia Gharib, as a voting member on the WIE Committee from 1 January 2021 until 31 December 2021, prize money in the amount of $US500 to be used for future WIE activities, and a certificate of recognition. This is a moment of pride for the WIE Ottawa team. Looking at another feather added on IEEE WIE Ottawa's hat gives the team motivation to keep going with the work done and thrive to be the best in what they do. The team's prime focus has been a belief to share the knowledge and thus, bring together events by analyzing topics that the Ottawa community needs the most. This achievement would not have been possible without the support of the speakers, mentors, and WIE Ottawa members. To all the volunteers who are and have been a part of the IEEE WIE Ottawa, kudos to all the hard work, and thanks for being a great team.


IEEE

Takes pleasure in presenting this certificate to the

IEEE Ottawa Women in Engineering Affinity Group

as the recipient of the

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In recognition of contributions on behalf of IEEE Women in Engineering

Lisa Lazarack-Ayuntа

IEEE Women in Engineering Committee Chair 2019-2020



From left to right – first row: Ragunath Anbarasu – Web Master, Fadwa Darwaish – Treasurer, Anastassia Gharib – Chair, Dana Haj Hussein – Secretary, Manar Helal – Vice Chair; From left to right – second row: Chowdhury Saleha Ferdowsy – Social Media Assistant, Astha Tiwari – Publications Director, Hilda Azimi – Social Media Coordinator, Kareem Farah – Logistics Officer, Naomi Solomon – Outreach Officer.

Radio Science in Canada



by David G. Michelson

The International Union of Radio Science (Union Radio-Scientifique Internationale, or URSI) is responsible for stimulating and coordinating, on an international basis, studies, research, applications, scientific exchange, and communication in the field of radio science. Forty-four countries are members of URSI through their National Academy of Sciences, National Research Council, or similar institution or association of institutions.

The National Research Council of Canada serves as the adhering member of URSI for Canada and appoints the Canadian National Committee (CNC-URSI) to represent the interests of Canada's community of researchers engaged in the study of all aspects of electromagnetic fields and waves. In addition to its roles in supporting URSI publications and conferences, CNC-URSI is also encouraged to contribute to science policy, and is occasionally called upon to provide expert advice to government.

URSI is one of 40 international scientific unions and associations and more than 140 national and regional scientific organizations that make up the International Science Council (ISC). Created as a result of a merger in 2018 between the International Council for Science and the International Social Science Council, the ISC is the only international nongovernmental organization that brings together the natural and social sciences. It is the largest global science organization of its kind.

One of CNC-URSI's goals during the next few years, as reflected in the latest revision to its strategic plan, is to increase its participation in ISC activities. In this column, I introduce the mission and activities of the ISC and explain how Canada can benefit from increased participation and representation in the ISC.

David G. Michelson;
dmichelson@ieee.org;
chair@ursi.ca

THE MISSION AND ACTIVITIES OF THE ISC

The mission of the ISC is to act as the global voice for science. As part of that mission, the ISC

- speaks for the value of all science and evidence-informed decision making
- stimulates and supports international scientific research and scholarship on major issues of global concern
- articulates scientific knowledge on such issues in the public domain
- promotes the continued and equal advancement of scientific rigour, creativity, and relevance in all parts of the world
- defends the free and responsible practice of science.

ISC's activities focus on three principal areas of work:

- science for policy, to stimulate and support international scientific research and scholarships and to communicate science that is relevant to international policy issues
- policy for science, to promote developments that enable science to contribute more effectively to major issues in the international public domain
- scientific freedom and responsibility, to defend the free and responsible practice of science.

Through a broad range of cosponsored international research programs, networks, and committees, ISC activities span a broad range of issues, from global sustainability, poverty, urban health and well-being, and disaster risk reduction to data, observing systems, and providing science advice to governments. The ISC's current activities are driven by its Action Plan, 2019–2021, which identifies four principal domains to which ISC intends to lend an impactful global voice.

1. THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

While Sustainability Development Goals have become a rallying point for scientists, science policy makers, and funders alike, the potential for duplication of efforts as well as competition for resources and policy influence among researchers is of great concern. With just more than a decade left to achieve the ambitious goals of the 2030 agenda, there is a pressing need—and a significant opportunity—to enhance the impact of international scientific efforts through strengthened collaboration and strategic coordination. The ISC is well placed to play an important role in such efforts and, importantly, help make it easier for the broader community to access, become familiar with, and gain confidence in the scientific knowledge relevant to these goals.

2. THE DIGITAL REVOLUTION

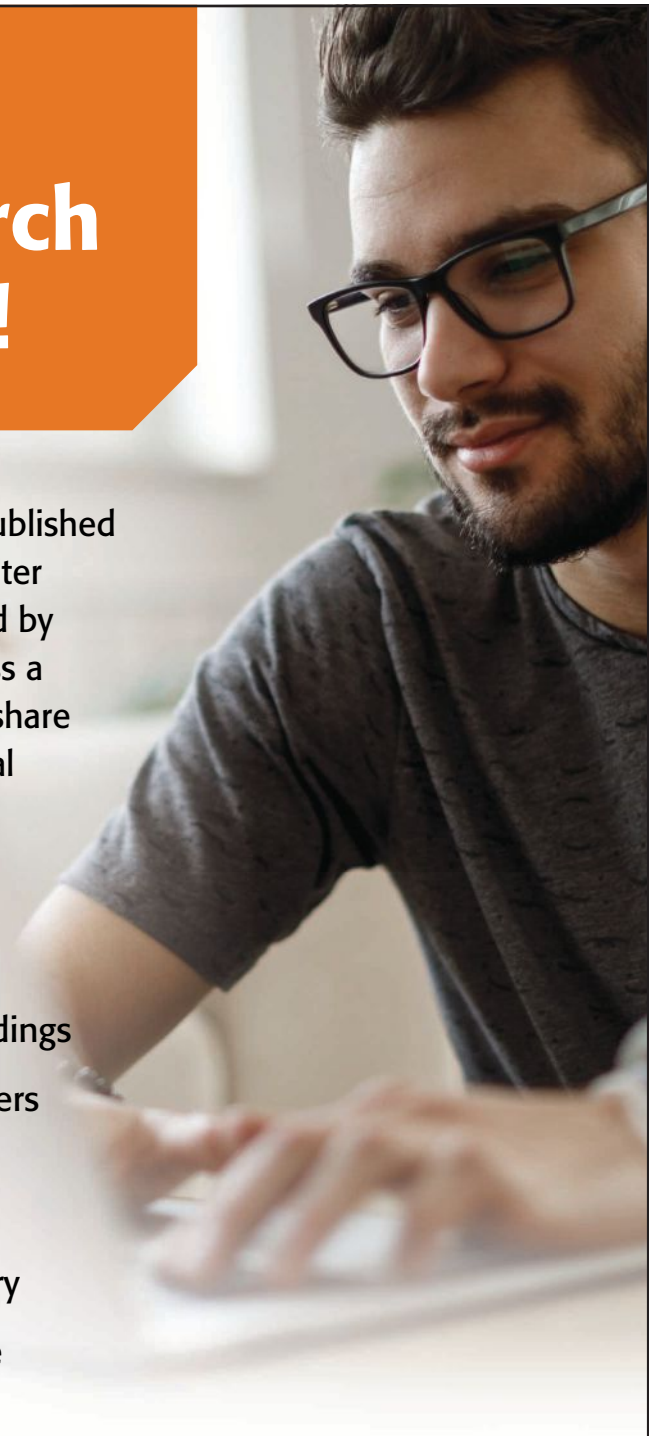
The adoption of new data-intensive techniques across scientific communities and practices is uneven, and the manual effort required to prepare and cleanse data before use is a considerable diversion of scientific resources. Ontologies and vocabularies are often incompatible and, sometimes, quite inadequate to the task. Addressing these problems is crucial if we are to use to best effect the increasing quantities of diverse data to understand the complex systems that are at the heart of global challenges. Doing so will require the widespread adoption of replicable, generic approaches to data integration and findable, accessible, interoperable, and reusable (referred to as *FAIR*) data standards in more science disciplines and interdisciplinary research areas.

3. SCIENCE IN POLICY AND PUBLIC DISCOURSE

Despite widespread agreement that governments should strive to ensure that policy decisions are informed by the best available scientific evidence, the potential contribution of science to policy making is much greater than has been realized to date. At the same time, the private sector's share of global science and

(Continued on p. 36)

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Updates on COVID-19

by Terrance Malkinson and Jacqueline Terlaan













The coronavirus pandemic continues to challenge humanity, disrupting everything. Although we are now more knowledgeable about the virus and scientists are working hard to develop an effective vaccine, predictions suggest that this will be a global battle for many years. The new normal as discussed by the authors in the previous issue of *IEEE Canadian Review* is rapidly evolving. After six months of shutdowns, governments and businesses are now faced with the challenges of getting people back to work, opening schools, resuming sports, managing unprecedented national debts, and reducing travel restrictions, to name but a few. This all needs to be accomplished safely to prevent the spread of the virus and precipitate a predicted massive second wave of infection. Complications also result from the uncertainty of the U.S. presidential election in November, the possibility of a Canadian election this fall, the anger that many are violently expressing, and disobedience with COVID-19 mitigation precautions.

- COVID-19 has changed the nature of unemployment and underemployment. Unprecedented numbers of individuals looking for work in an environment where there are few opportunities. As a strategy, some employees are adopting a multiple part-time contract job approach to ensure a continuing source of income should one job be discontinued. In Canada, employers are legally obliged to provide a safe workplace, ensuring the medical, physical, and psychological health of their workers. The decision to return to the worksite, work remotely, or choose a new career depends on factors such as your perceived personal risk for contracting COVID-19 complications. Considerations include risks of commuting, your caregiving responsibilities, how crowded your work environment is, and whether your home life is conductive to getting work done as well as your career aspirations. Discussions with building owners and maintenance staff about ventilation is important, as preventing COVID-19 from spreading in a building environment is reduced by increasing the rate of air exchanges. The risk is also lower in buildings where you can open windows. The ability to open windows may require changes to building codes, as most new structures are sealed airtight. Health and wellness professional counselling services are increasingly in demand by the general public and business owners to support their staff working in a stressful environment.

- The Organization for Economic Co-operation and Development has estimated that disruptions to schooling will cause a skill loss that could result in a 1.5% drop in global economic output for the rest of this century. As this article is being written in August, a most-important national discussion is underway on how to reopen schools while ensuring the safety of K–12 and postsecondary students. There is no easy solution to this. The reality is that formal education cannot be put on hold indefinitely until the pandemic is over. Most jurisdictions are reopening K–12 with smaller class sizes and distancing between student desks. Some parents are choosing the option of home schooling. Some providers are teaching classes outside. Most are requiring full or part-time masking. There is considerable discussion about whether the harms outweigh the benefits of requiring very young kindergarteners to wear masks. Some health professionals are of the opinion that the forced masking of children is psychologically harmful. Additionally, masks can be distracting and irritating and may even increase the risk of infection from increased touching of the face and eyes. There is considerable uncertainty as to the possibility of "silent" COVID-19 transmission in the community by children. The case is similar with postsecondary cases; however, this cohort group should be more responsive to COVID-19 prevention education, and the option of online learning, although not optimal, is increasingly being adopted by the postsecondary education sector.
- Some professional sports have resumed but are under strict isolation guidelines and with no spectators. Amateur sports and fitness/recreation centers are much different with severe restrictions and operating guidelines, such that many members are choosing home-based exercise or, regrettably, inactivity. The prohibition against organized sporting events is affecting charitable organizations, as many of them depend on funds raised through community participation in "fun races." Virtual sporting participation is not the same. It is important that citizens get back to physical activity as soon as possible. In the authors' opinion, policy makers should consider the return of mandatory physical and health education for all students, which will increase strength and resiliency and teach a holistic approach to the proven benefits of lifelong exercise and pursuing a healthy lifestyle. Multiple research investigations have reported on the beneficial anti-inflammatory response, the instantaneous mobilization of immune cells that, among other functions, recognize and kill virus-infected cells and promote the release of various proteins that help maintain immunity by exercise—particularly whole-body cardiorespiratory exercise. Exercise immunology research is a growth opportunity, along with developing specific immunity-enhancing exercise and nutritional recommendations to mitigate infection risk. A strong body is a disease-resistant body.
- It is no secret that this fight has been costly to all nations. In Canada, the debt has reached unprecedented levels and questions arise as to the effect of this on future government programs and taxpayers, particularly today's young adults. There is anxiety over the possibility of government legislating the creation of new taxation measures. A home equity tax is being examined. In August, the Fraser Institute released its investigate report "Average Canadian Family Spent 42.6% of Annual Income on Taxes—More Than Housing, Food and Clothing Combined." Additionally, should the pandemic be lengthy, employment and business support programs will not be sustainable. Health authorities are now working through a backlog of medical procedures cancelled in the spring to transition resources to manage COVID-19. Should a massive second wave emerge, it is likely that, as before, nonurgent surgeries, procedures, and diagnostics will again be cancelled.
- Restrictions on national and international travel continue, and any travel is accompanied by time-consuming health checks prior to boarding the vessel and the wearing of masks throughout the voyage. Likely, as has happened earlier in our history with smallpox, travelers may need certificates of immunization. Currently, Canada is keeping its international borders closed in spite of pressures to relax restrictions. Government believes (and correctly so) that travel restrictions are a most effective way to limit the spread and introduction of new cases.
- It is certain that the pandemic will have an influence on the U.S. presidential election and possibly a Canadian election should the current minority government be defeated in a nonconfidence vote. On the positive side, this allows for a national discussion of policy; however, it will cause a disruption in the ability of government to respond quickly to changing pandemic conditions during the election campaign.
- Vaccines are under development and at various stages of clinical testing in animals and humans. The Canadian government has entered into a number of advance agreements with developers to purchase vaccines that receive Health Canada approval. There will likely be many different types of the COVID-19 vaccine, some being more effective than others. Vaccine administration will be the most complicated and largest program in human history, requiring a level of effort that has never been done before; how would it be distributed globally, how much will it cost, who should have priority, will two doses be necessary, will there be side effects, and, most importantly, will it be effective? What is the best method of protection: masks, face shields, or social distancing? Research evidence suggests that hand hygiene and social distancing are the most effective strategies [1]. We are all responsible for taking action to prevent the spread of the virus and for showing empathy to others.

The Organization for Economic Co-operation and Development has estimated that disruptions to schooling will cause a skill loss that could result in a 1.5% drop in global economic output for the rest of this century.

Despite best efforts, we need to understand that it is inevitable that there is a strong possibility of a second wave as the seasons change to fall and winter. We are inside and therefore in closer proximity. In the case of schools reopening, medical officers of health across the country are predicting outbreaks and have created plans to effectively manage this. The reality is that our economy cannot be restricted indefinitely. People are scared, fatigued, and tired … they want it to go away. Everyone copes with stress differently. Some, because of their personality and lifestyle, are resilient and have effective coping mechanisms; others react with inappropriate anger against authority as well as with

extremism and intolerance for the diversity of our world. Historically, we have faced many challenges, including world wars, internation wars, pandemics, and injustices. We have learned from all of these historical events and we will learn from this COVID-19 experience. This is all a part of life. Career and personal success are not achieved by preoccupation with safety. A well-lived life is achieved by taking risks. Carpe diem. ■

Reference

[1] D. K. Chu, E. A. Akl, S. Duda, K. Solo, S. Yaacoub, and H. J. Schünemannal, "Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: A systemic review and meta-analysis," *Lancet*, vol. 395, pp. 1973–1987, June 2020. [Online]. Available: https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2931142-9

About the Authors



Terrance Malkinson is the author of more than 500 peer- and editorial-reviewed publications and is now retired. However, in retirement, he vigorously continues research and journalism, with an extensive portfolio of basic and applied research projects, journalism, philanthropy, and mentorship. His diverse career path includes 26 years in medical research as a founding member of the Faculty of Medicine at the University of Calgary as well as a three-year appointment as a manager with the General Electric Company followed by a one-year applied research appointment with SAIT Polytechnic. During his long career, he has advanced both basic and applied medical, health and wellness, scientific, and engineering knowledge. He has trained and mentored undergraduate, graduate, and postdoctoral students as well as staff in the business sector and government. He is a 45-year, long-term member of the IEEE and, over the years, has served in many IEEE governance and publication roles. His current research interest in health and wellness extends to being an accomplished multisport triathlete, including, among other events, the completion of 11 long-distance Ironman triathlons. He is a Senior Life Member of the IEEE.

Jacqueline Terlaan recently completed her bachelor of arts degree in philosophy (honors) from the University of Alberta. She is the recipient of several student achievement awards and competitive scholarships. She has contributed her expertise in writing to outreach at the University of Alberta as well as with industrial leaders in Alberta.

Radio Science Canada

(Continued on p. 32)

innovation is growing, and it is now estimated to represent approximately 70% of the global expenditure on science. Further, publicly funded researchers are increasingly encouraged to form partnerships with the private sector and to undertake research that will support private priorities. It is vital that a level playing field be established across these domains to preserve trust in science and its application to public policy.

4. THE EVOLUTION OF SCIENCE AND SCIENCE SYSTEMS

The ISC has been at the forefront of efforts to ensure that all groups are fairly represented in scientific activities and that neither gender nor geography represents a barrier to participation in science. At the same time, the ISC recognizes that the public good depends upon 1) the efficiency with which new knowledge is created, 2) the speed with which it diffuses through the public space, and 3) the extent to which the new knowledge is comprehensible to those who may be able to use it in innovative ways through all sectors of society. It is essential that all three aspects of science creation, delivery, and comprehension be addressed.

THE ROLE OF CNC-URSI

During the next few years, CNC-URSI will be taking a greater role in contributing Canadian perspectives to the issues and challenges that the ISC seeks to address. With its broad expertise across multiple application areas, including metrology, fields and waves, radiocommunication, electronics and photonics, the electromagnetic environment, wave propagation and remote sensing, the ionosphere, plasma physics, radio astronomy, and biomedical applications, we are well positioned to contribute to the effort and discussion. ■

About the Author



David G. Michelson is chair of the Canadian National Committee of the International Union of Radio Science (2018–2021). He has led the Radio Science Lab at the Department of Electrical and Computer Engineering, University of British Columbia (UBC), since 2003. His current research focuses on short-range/ low-power wireless networks for smart utility, smart transportation, and natural-resource applications; millimetre-wave channels and systems; and satellite networks for communications and remote sensing. Prof. Michelson serves as a member of the Board of Governors of the IEEE Vehicular Technology Society, as a member of the steering committee of the NIST-sponsored 5G mm-Wave Channel Model Alliance, and as director of the AURORA Connected Vehicle Technology Testbed at UBC.



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November 9-10, 2020, Virtual ~~Edmonton, Canada~~

The annual IEEE Canada Electrical Power and Energy Conference (EPEC 2020) will move to virtual platform ~~take place in Edmonton, Alberta, Canada from October 14-16, 2020~~. EPEC 2020 is a conference that provides an opportunity for experts from industry, academia, government sector and other interested organizations from Canada and abroad to present and discuss the latest developments in the electric power and energy systems: academic, industrial and government research and development, industrial and business trends and challenges, as well as regulatory and policy aspects. This includes debate on the potential impact of these developments on the society. The conference provides an international forum for the presentation of peer-reviewed papers and presentations on power and energy research and development, applications and their implementations.

Topics: The EPEC 2020 welcomes submission of papers related to the conference theme including, but not limited to, the following topics:

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Submission of full papers	**June 30th, 2020**
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Despite all the border closings, travel advisories, and health recommendations for COVID-19, Mars is still accepting visitors. Over the summer, three missions launched toward the red planet aiming to study the atmosphere and look for signs of life. In this issue, we answer the question of why launch in the middle of a pandemic, what each mission is hoping to accomplish, and what to look forward to in February when they reach their final destination.

Ad astra,
Dario Schor; schor@ieee.org

For centuries, humans have been fascinated by the red dot in the night sky. Reminded of blood, the Romans named the planet Mars after their god of war [1]. Centuries later, astronomers like Galileo Galilei, Christiaan Huygens, and Giovanni Cassini used their telescopes to observe patterns in the terrain, estimate the rotational period, and identify the polar caps [1]. However, not all observations were accurate. For instance, in 1877, Giovanni Schiaparelli mistakenly thought the streaks on the surface were canals and concluded that these were a sign of civilization [1]. Regardless, it was not until the 1960s that both the United States and the Soviet Union attempted the first flyby missions to Mars.

Finally, after six failed attempts, the U.S. *Mariner 4* became the first spacecraft to fly just 9,846 km above the surface of the Red Planet on 14 July 1965 [2]. During the approach, *Mariner 4* captured 21 grayscale images (totalling ~650 kB) [2]. Overall, there have been more than 50 missions to the Red Planet. With close to a 50% success rate, many believe there is a Mars curse, yet they still want to explore the red dot because of its similarity to Earth, the hope of learning about our solar system, and the likelihood that it shows past and/or present evidence of extraterrestrial life.

Despite the Red Planet's appeal, one has to wonder, why not reschedule the launch instead of attempting these complex engineering feats in the middle of a global pandemic? The answer is simple: fuel efficiency and celestial mechanics [3]. In 1925, long before *Sputnik*, Walter Hohmann theorized how to move between orbits efficiently by applying velocity changes to form an elliptical transfer orbit, as shown in Figure 1. In essence, once the rocket is orbiting around Earth, one can apply an initial impulse (ΔV1) towards Mars, shut off the engines, and coast for six to seven months, and then apply a second impulse (ΔV2) to enter a Martian orbit. Lining up the Hohmann transfer with the period and position for the two planets leaves us with a short launch window occurring every 26 months (see Figure 2) and, hence, why it was so important to launch in the summer 2020.

To make things more complicated, the two planets are not stationary. Earth takes 365 days to orbit around the sun, while Mars takes 687 days. Thus, one must also account for the position of the planets to ensure that both the spacecraft and Mars arrive to the same location in the solar system at the same time. Accounting for all of these parameters, it is possible to determine that the launch window for Mars occurs every 26 months.

One must also account for the position of the planets to ensure that both the spacecraft and Mars arrive to the same location in the solar system at the same time.

The first of the three launches this year was from the United Arab Emirates and constitutes the first interplanetary mission from the Arab world [4]. The Emirates Mars Mission took off from the Tanegashima Space Center in Japan on 19 July 2020. The objective is to place the *Hope* spacecraft into a highly elliptical Martian orbit to study weather patterns,

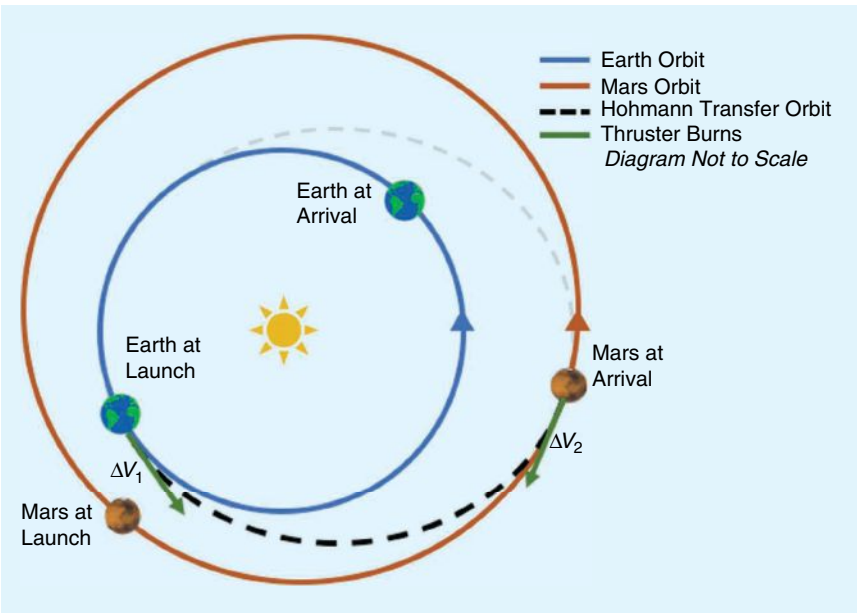


Figure 1: The Hohmann transfer orbit between Earth and Mars.

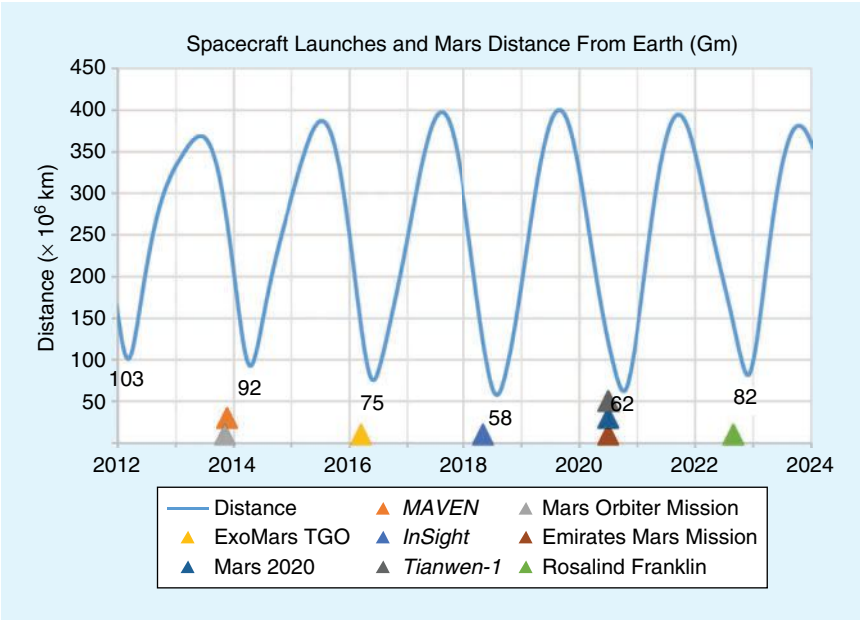


Figure 2: The distance between Mars and Earth, showing the 26-month cycle for launches. (Credit: https://commons.wikimedia.org/wiki/File:Mars_distance_from_Earth.svg.)

the atmosphere, and dust storms to better prepare us for future human missions. The spacecraft carries three scientific instruments. The Emirates eXploration Imager is a multiwavelength camera designed to measure water ice as well as use different filters to identify dust and clouds in the atmosphere. The Emirates Mars ultraviolet spectrometer will study the seasonal and solar changes of the hydrogen and oxygen corona of Mars to estimate the loss of water from the upper atmosphere. Finally, the Emirates Mars infrared spectrometer will be used to study the dynamical thermal properties of the atmosphere.

Not discouraged by the launch failure of *Yinghuo-1* in 2011, China has attempted a second Mars mission, *Tianwen-1* [5]. The mission launched from Wenchang Spacecraft Launch Site on 23 July 2020. The spacecraft is equipped with many instruments and cameras to study the Martian atmosphere. If that was not enough, China has a more ambitious goal where the orbiter will deploy a rover to the Utopia Planitia (the same region as NASA's *Viking 2* lander) with high-resolution cameras, subsurface detection radar, spectrometers, and other instruments to study both the climate and geology of the planet.

The last ride to Mars took off from Cape Canaveral on 30 July 2020 carrying NASA's *Perseverance* rover and the *Ingenuity* helicopter drone [6], [7]. The astrobiology rover aims to land on the Jezero crater to look for signs of past life on Mars. Along the way, the vehicle will collect soil and rock samples into specialized containers to be picked up by a future sample return mission. Moreover, NASA included a few experiments to gather information in advance of a human mission to the Red Planet. For instance, the Mars Oxygen In Situ Resource Utilization Experiment (MOXIE) will attempt to demonstrate how to produce oxygen for breathing from the Martian atmosphere. The *Ingenuity* helicopter is another exciting technology demonstration that will be the first attempt to fly a drone on another planet with a very thin atmosphere. Although the team would love to fly around to capture lots of information, the initial test will be limited to takeoff, hovering for 20–30 s at low altitudes, and landing safely.

Although the team would love to fly around to capture lots of information, the initial test will be limited to takeoff, hovering for 20–30 s at low altitudes, and landing safely.

All three missions will be buckling their seatbelts and preparing for landing in February 2021. Upon arrival, *Tianwen-1* and *Perseverance* will undergo what NASA has dubbed the "seven minutes of terror" as these spacecrafts enter the Martian atmosphere. The entry, descent, and landing are perhaps the most dangerous parts of the mission. Given the communication delays, engineers will be watching the events unfold knowing that they cannot send any commands to correct the trajectories. It is both exciting and nerve-racking. Fingers crossed! ■

References

[1] "All about Mars." NASA. https://mars.nasa.gov/allaboutmars/mystique/

[2] "Mariner 4." NASA. https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1964-077A

[3] "Let's go to Mars! Calculating launch windows." Jet Propulsion Laboratory. https://www.jpl.nasa.gov/edu/teach/activity/lets-go-to-mars-calculating-launch-windows/

[4] Emirates Mars Mission. https://www.emiratesmarsmission.ae/

[5] "Tianwen-1 launches for Mars, marking dawn of Chinese interplanetary exploration." SpaceNews. https://spacenews.com/tianwen-1-launches-for-mars-marking-dawn-of-chinese-interplanetary-exploration/

[6] "Mars 2020 mission." NASA. https://mars.nasa.gov/mars2020/

[7] "Ingenuity helicopter." NASA. https://mars.nasa.gov/technology/helicopter/

About the Author



Dario Schor is a software engineer at Magellan Aerospace and is currently in a two-year Interchange Canada position supporting satellite operations at the Canadian Space Agency. He is also pursuing a space studies Ph.D. at the University of North Dakota. He obtained his B.Sc. and M.Sc. degrees in computer engineering from the University of Manitoba in 2008 and 2013, respectively, before attending the 2013 Space Studies Program from the International Space University in Strasbourg, France. Dario has served in various roles within IEEE Canada and the Winnipeg Section. He can be reached by email at schor@ieee.org.

Mazana Armstrong



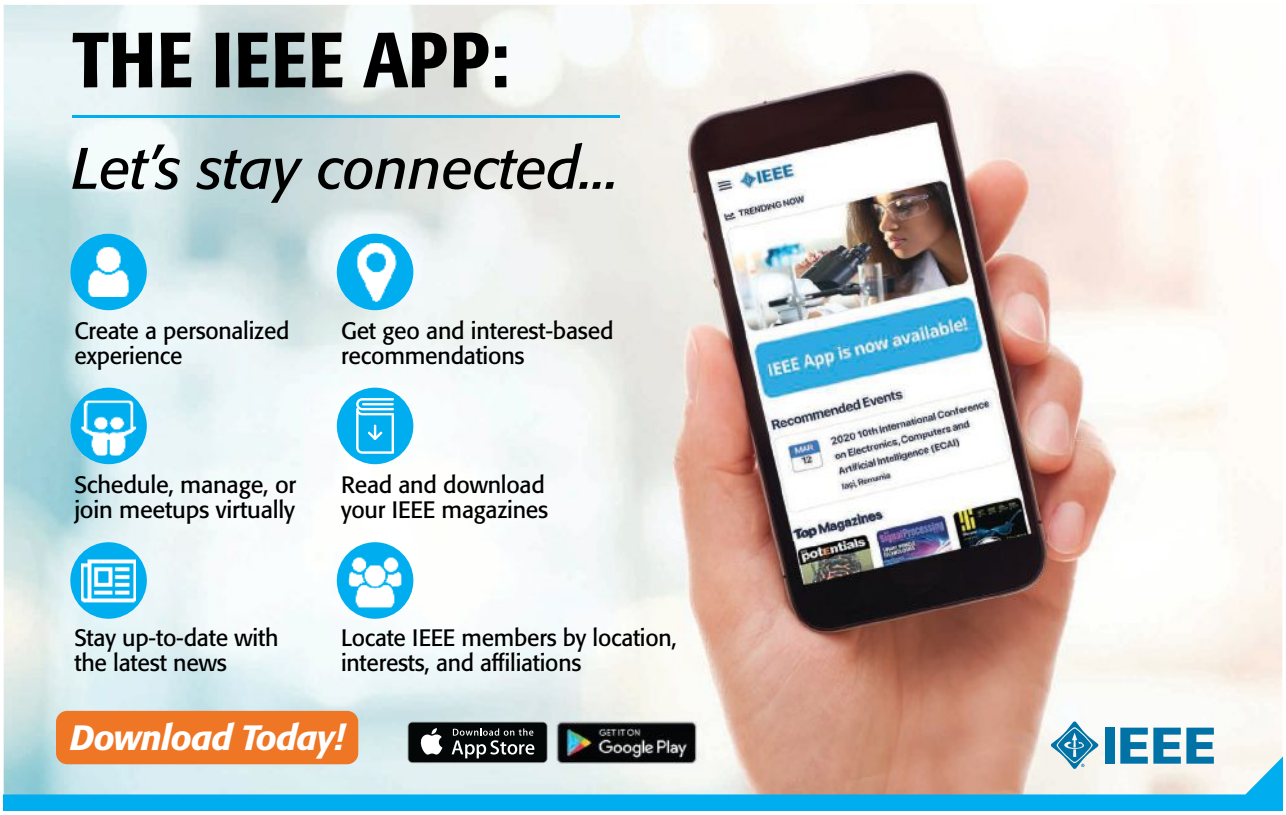
Mazana Armstrong
Vice President, Chapters
IEEE Power & Energy Society
mazana.armstrong@ieee.org

Greetings to all Region 7 members. My name is Mazana Armstrong, and I am the IEEE Power & Energy Society (PES) vice president for Chapters. My IEEE volunteering journey started more than 20 years ago while I was a graduate student at the University of British Columbia. At that time, for me, IEEE was a place to publish papers from conferences and publications.

After I started volunteering as a Chapter chair for the IEEE Vancouver Section, I realized the full value of being an IEEE Member: being able to not only support organizing local technical and social/networking events but initiating and spearheading many of them with the help of my colleagues and fellow volunteers. It is very different to meet colleagues at events, compared to working shoulder to shoulder with them on common goals. The relationships created through the process of volunteering can last a lifetime and also shape one's professional career.

Moving up through the ranks of both IEEE and the PES taught me some incredibly valuable lessons in leadership, which I apply every day in my professional life. I strongly believe that my volunteer experiences helped shape me into the successful leader I have become. I especially encourage younger colleagues who are just starting their professional careers to get involved in volunteering with their local IEEE Section, Chapter, or affinity group. There are so many roles with varying degrees of involvement and time commitment that would fit their availability and schedules. The rewards they will receive in terms of experiences and connections are well worth it.

Together, we are creating the future of IEEE. We truly need every member and volunteer on board for that future to be as bright and as meaningful as it has been since the start of the era of electricity. ■





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What's New in the Literature?



by Terrance Malkinson and Jacqueline Terlaan

Digitization is going to be the technology leader in business as we move forward to the new normal globally. Business, consumer products, services, and education are all transitioning to the Internet. This raises the important question of the right of all citizens to have access to the Internet at little or no cost and the expansion of connectivity throughout the country. The Canadian Radio-television and Telecommunications Commission's Broadband Fund will provide a total of $750 million over five years to improve Internet access in underserved regions. In August, the regulator announced that it will provide funding of $72 million to help bring faster Internet to more than 10,000 households in northern Manitoba, Yukon, and the Northwest Territories. Interesting and lucrative careers are opening up to those with vision, who think entrepreneurially, and currently possess or are willing to learn digital skills.

The teaching of advanced digital skills is crucial to our nation's economy and well-being. Retired investment manager and Calgary philanthropist David Bissett gave the largest-ever gift, $30 million, to the Southern Alberta Institute of Technology (SAIT) on 3 December 2019. With this donation, Bissett stated "the critical need for Canadians to be fully competitive in digital technology or become a nation falling behind." SAIT is responding by creating the School for Advanced Digital Technology and leveraging David Bissett's donation through a local and national fundraising campaign. This innovative school will enable SAIT to advance change through technology and set a new course that positions the institute as a leader in digital transformation and education. The school will be a catalyst for industry, technology, and education and will 1) identify and train skills for the workforce of today and tomorrow; 2) produce work-ready graduates who have a growth mindset, entrepreneurial skills, and resilience; and 3) retool existing workers for a diversified digital economy. It will continue the proud SAIT tradition of ensuring student success and educating job-ready employees.

This innovative school will enable SAIT to advance change through technology and set a new course that positions the institute as a leader in digital transformation and education.

GHGSat Inc. is the Montreal-based company behind *Iris*, a Canadian satellite that has begun its long-awaited mission to search for excess industrial emissions of methane gas, a contributor to climate change. This Canadian aerospace firm's goal is to become the world's leader in monitoring greenhouse gases from space. The microwave-oven-size probe, nicknamed *Iris*, lifted off from its launch site near Kourou, French Guiana, in September. *Iris* was one of 53 small satellites from 13 countries deployed by the European-built Vega launch vehicle.

The Alberta government says it plans to join three other provinces (New Brunswick, Saskatchewan, and Ontario) in exploring the development of small modular nuclear reactors that will supply nonemitting, low-cost energy. The units are smaller than traditional nuclear reactors with lower upfront capital costs and enhanced safety features. Alberta Premier Jason Kenney said in a statement: "We are building on our track record of responsible and innovative energy production by exploring the potential for small modular reactors, which have the ability to generate reliable and affordable energy while also strengthening our traditional resource sectors and reducing emissions."

A four-year-old Toronto start-up, Xanadu Quantum Technologies Inc., is attempting to build the world's most powerful computer by using quantum properties of light. Xanadu uses a process called *squeezing light*, firing lasers that enable light particles to generate quantum effects on a thumbnail-size chip. Xanadu has raised $41 million from Canadian venture capital firms, and it is aiming to raise roughly US$100 million next year, following the recent launch of online customer access to its technology. Xanadu is trying to build machines that can outperform existing supercomputers by harnessing the power of subatomic particles. Industry analysts suggest that these computers will be able to offer powerful new ways to help with drug discovery, materials science, financial risk modelling, and other applications.

Canadian Hyperloop company TransPod has signed a memorandum of understanding with the Alberta government that will see the province support the firm's early efforts to advance the development of an ultrahigh-speed transportation line between Calgary and Edmonton. The province will support the company in studying the feasibility of the technology in Alberta, share transportation data, and identify suitable land for a test track. There is no commitment to provide government money. The company's ultimate goal is to have passengers and cargo travelling between Calgary and Edmonton in train-like pods at speeds of up to 1,000 km/h through magnetic tubes by 2030. Hyperloop systems don't use rails; instead, they propel vehicles through a vacuum in sealed tubes at high speeds made possible by the extremely low friction inside the tube. The estimated cost to build the full line would be between $6 billion and $10 billion. The company's goal is to attract private investment by showing that it's economically viable. TransPod would like to begin building a $500 million test track in Alberta in 2022 with the construction of the full line beginning in 2025.

A massive European engineering project is approaching its final stages. The Ceneri Base Tunnel (CBT) is the final section of a new high-speed, high-capacity railway deep under the mountains of Europe, achieving the goal of a flat line through the Alps and reducing transport times across the continent through an uninterrupted rail route from the Dutch North Sea port of Rotterdam to the Italian city of Genoa on the Mediterranean. This $11.3 billion project is massive; at its deepest point, the CBT's twin tunnels are 8,000 ft below the Alpine peaks. The project employed more than 2,500 people, removing nearly 30 million tonnes of granite, laying approximately 250 mi of steel rails; and installing thousands of miles of cables for power, signaling, and communications systems. To protect the environment, Europe is transitioning freight from road to rail wherever possible.

French energy giant Total said in July that it is writing off $9.3 billion worth of oil sands assets in Alberta and cancelling its membership in the Calgary-based Canadian Association of Petroleum Producers. In its evaluation, Total considers oil reserves with high production costs that are to be produced more than 20 years in the future to be "stranded," given the company's carbon-reduction targets and because the resource may not be produced by 2050. As the world transitions away from fossil fuels, investors are re-examining their options. Earlier, Frankfurt-based Deutsche Bank said it would join a list of European lenders and insurance companies that say they won't back new oil sands projects. The German bank said its new fossil fuels policy will also prohibit investing in projects that use hydraulic fracturing or fracking in countries with scarce water supplies as well as all new oil and gas projects in the Arctic region. Two years ago, Europe's largest bank, HSBC Holdings announced it would no longer offer financial services for new oil sands projects or pipelines.

The Seventh Generation Principle is based on an ancient Iroquois philosophy that the decisions we make today should result in a sustainable world seven generations into the future. Most Native American and indigenous tribes throughout the world embrace this teaching. As taught by Native Americans for every decision made—personal, governmental, or corporate—we must consider how it will affect our descendants. It has considerable application to decisions being made about our energy, water, and natural resources. Some national governments have created a future generations advisory panel to provide advice for setting government policy and evaluating government decisions so that we will be remembered as good ancestors.

Terry Fox was diagnosed with bone cancer at the age of 18. He had his right leg amputated above the knee. The idea to run across Canada raising money for cancer research came to him while he was recovering in hospital. Forty years ago on a stretch of road near Thunder Bay, Ontario, Terry Fox felt an intense pain in his chest. He had run almost 42 km every day for more than four months in his ambitious cross-country mission to raise money. By kilometre 5,373, the cancer he'd been fighting spread to his lungs, and he was forced to stop running. 1 September 1980 marked the last day of his Marathon of Hope. Fox died in a hospital the following summer at the age of 22. Terry's original goal was to raise $1 for every Canadian, $24.17 million, which was achieved just four months before his death. Since then, more than $800 million has been raised to support cancer research in Terry's name. This inspiring young man hoped that his example of never giving up and the example of caring for other people would be continued by others. On this 40th anniversary, Prime Minister Justin Trudeau issued a statement calling Fox "a Canadian hero who taught us invaluable lessons about the importance of helping others. His extraordinary accomplishments captivated the country, instilled hope in Canadians, and helped shift their views of people with disabilities." Forty years later, people across Canada and around the world continue to be inspired by Terry's tenacity and enthusiastic message of hope, which is as timely as ever during the COVID-19 pandemic. ■

About the Authors



Terrance Malkinson is a long-term contributor to IEEE and the author of more than 500 peer- and editorial-reviewed publications and is now retired. However, in retirement, he vigorously continues research and journalism, with an extensive portfolio of basic and applied research projects, journalism, philanthropy, and mentorship. His diverse career path includes 26 years in medical research as a founding member of the Faculty of Medicine at the University of Calgary as well as a three-year appointment as a manager with the General Electric Company followed by a one-year applied research appointment with SAIT Polytechnic. During his long career, he has advanced both basic and applied medical, health and wellness, scientific, and engineering knowledge. He has trained and mentored undergraduate, graduate, and postdoctoral students as well as staff in the business sector and government. He is a 45-year, long-term Member of the IEEE and, over the years, served in many IEEE governance and publication roles. His current research interest in health and wellness extends to being an accomplished multisports triathlete including, among other events, the completion of 11 long-distance Ironman triathlons. He is a Senior Life Member of IEEE.

Jacqueline Terlaan recently completed her bachelor of arts degree in philosophy (honors) at the University of Alberta. She is the recipient of several student achievement awards and competitive scholarships. She has contributed her expertise in writing to outreach at the University of Alberta as well as with industrial leaders in Alberta.

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Call for Papers: ANTEM 2021

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Scope of the Conference

IEEE ANTEM 2021 will be held from 08-11 August 2021 in Winnipeg, MB, Canada. The symposium and meeting are co-sponsored by the IEEE Canada and the IEEE Winnipeg Section. The language of the conference will be English. ANTEM is a premier event in antennas and applied electromagnetics. It provides an ideal forum and venue for networking, exchanging ideas, and identifying future trends and developments. The technical sessions will be host to a well-balanced, comprehensive program with topics in antennas, propagation, and electromagnetics. Following tradition, the symposium will have both oral and poster sessions. Additionally, there will be distinguished lecturers and special sessions with contemporary topics at the leading edge of antenna and electromagnetics technology.

Venue Information

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Conference Theme: "Making Space"

The world has experienced major changes in the last year as a result of the COVID-19 pandemic. The theme, "Making Space," can be interpreted in many ways. The conference will be offered as an in-person event, as well as with a remote access option. Several specialized topical sessions will be introduced to the conference under this theme:
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- Antenna miniaturization to reduce antenna dimensions
- Antennas designed for space applications (e.g., satellites and CubeSats)

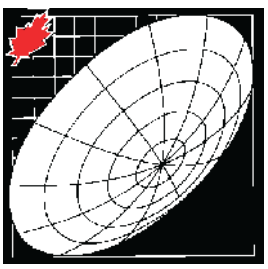
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- On-Chip/In-Package Antennas
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Field Theory and Computation
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