IEEE Canadian Review

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Navigation system

Starting of a TIME SLOT indicator

To guide you through this tour of the *IEEE Canadian Review*'s last 25 years, we've developed a "navigation" system repeated throughout. Content is grouped into time periods, mostly of two years.

A blue time-line extends across the top of each page. A red rectangle is superimposed above the portion of the time-line being profiled on the pages below.

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IEEE Canadian Review

GENERAL INFORMATION

The *IEEE Canadian Review* is published three times per year: mid March, end of June and mid October. Its principal objective is to project an image of the Canadian electrical, electronics, communications and computer engineering professions and their associated academic and business communities.

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Looking back, moving forward
Retour sur le passé, regard vers l'avenir

Wahab Hamou-Lhadj
Editor-in-Chief
Rédacteur en chef

It's hard to believe that 25 years have already passed since the first issue of the *IEEE Canadian Review* was published. To celebrate this achievement, we have put together for you a commemorative issue. It contains a selection of articles from the last 25 years, structured mostly in two-year blocks.

Since its beginning, the *IEEE Canadian Review* has been home to a variety of articles covering a wide range of engineering disciplines. It's also reported on the numerous ongoing events and activities engaging our members. I hope the "snapshots" we present in this issue can be inspirational, while reminding us all of just how lucky we are to be part of this great organization, that is IEEE Canada. Where possible, we've included articles in their entirety. Where space didn't permit, we've included the URL where the entire item can be downloaded.

More than anything else, I would like to thank all *IEEE Canadian Review* contributors including authors, reviewers, members of the editorial board, and the publication team, who year-after-year have provided the support needed to sustain and shape it. On the page following, we pay special tribute to Bob Alden and Richard Marceau, the founders of the *Review*. We wouldn't be here without them!

This issue also celebrates the technical and volunteer achievements of our membership, as recognized at IEEE Canada's Annual Awards Banquet. This event is held every year in conjunction with the annual Canadian Conference on Electrical and Computer Engineering. Bound into the centre of this issue is the Programme from last May 6ths event, with profiles of the 11 medalists honoured that evening.

Looking to the future of the *IEEE Canadian Review*, we must extend the great work carried forward. The *Review* must continue its critical role in supporting IEEE Canada's mission and vision. The strategies to achieve this goal are: (a) Keep promoting the engineering profession by reaching out to a broader audience, (b) Extend the editorial content to include policy-oriented, thought-provoking, and visionary articles that are of interest to a larger readership base, (c) Recognize member achievements across the country, and (d) promote IEEE events, conferences, and member gatherings.

As we approach the holiday season, I would like to take this opportunity to wish you a magical holiday season and all the best in 2014 for you and your loved ones.

Happy Anniversary *ICR!*

Il est à peine croyable que vingt-cinq ans se soient écoulés depuis la publication du premier numéro de la revue canadienne de l'IEEE. Pour célébrer cet anniversaire, nous vous avons préparé un numéro commémoratif. Il contient une sélection d'articles parus au fil de cette période à des intervalles d'environ deux ans.

Depuis ses débuts, *la revue canadienne de l'IEEE* a publié une variété d'articles se rattachant à un vaste éventail de disciplines du génie. Elle a aussi fait connaître les nombreuses activités menées par nos membres. J'espère que les instantanés réunis dans ce numéro sauront vous inspirer tout en vous rappelant la chance que nous avons tous de faire partie de cette grande organisation qu'est l'IEEE Canada. Lorsque l'espace le permettait, les articles ont été reproduits dans leur intégralité. Dans le cas contraire, un lien URL vous permettra de les télécharger en entier.

Par-dessus tout, j'aimerais remercier l'ensemble des collaborateurs de *la revue canadienne de l'IEEE*, soit les auteurs, les lecteurs critiques, les membres du comité de rédaction et l'équipe des publications qui, année après année, ont fourni le soutien nécessaire à son maintien et à son développement. À la page suivante, nous rendons hommage à Bob Alden et à Richard Marceau, les fondateurs de la Revue. Sans eux, nous ne serions pas là!

Ce numéro souligne également les réalisations techniques de nos membres et les exploits de nos bénévoles tels qu'ils ont été reconnus à la dernière cérémonie annuelle de remise des prix de l'IEEE Canada. Cette cérémonie a lieu chaque année durant le Congrès canadien en génie électrique et informatique. Nous avons cru bon d'encarter dans ce numéro spécial le programme de la cérémonie du 6 mai dernier qui contient les profils des onze médaillés célébrés durant cette soirée.

Quant à l'avenir de *la revue canadienne de l'IEEE*, il reflétera obligatoirement l'immense travail entrepris depuis sa fondation. La Revue doit poursuivre son rôle critique consistant à soutenir la mission et la vision de l'IEEE Canada. Pour ce faire, elle appliquera diverses stratégies : (a) Continuer de promouvoir la profession d'ingénieur en rejoignant un nombre croissant d'entre eux; (b) Étendre le contenu éditorial en visant la publication d'articles inspirants, visionnaires et pertinents pour la prise de décision, capables d'intéresser des lecteurs de plus en plus nombreux; (c) Reconnaître les accomplissements de nos membres à travers le pays; et (d) Promouvoir leurs activités, congrès et autres réunions. À l'approche des Fêtes, j'aimerais profiter de cette occasion pour vous souhaiter, à vous et à vos proches, des vacances empreintes de magie et mes meilleurs vœux pour la nouvelle année.

Bon anniversaire
La revue canadienne de l'IEEE

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Tony Eastham


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Paul Freedman


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FOUNDER / FONDATEUR >

Robert T.H. (Bob) Alden

Bob Alden
IEEE Canada President
1988-89

When the first *IEEE Canadian Review* (*ICR*) rolled off the presses in September 1988, the electrical engineering society landscape in Canada was a much different view than the present. There was no formal IEEE Canada as we know today. Rather, Region 7 of IEEE competed for members with what was then called the Canadian Society for Electrical Engineering.

For then-Region 7 Director Bob Alden, the inaugural issue was more than just the launch of a publication. The aroma of printer's ink was akin to the scent of pine that greets the nostrils of the architect, peering through the roughly framed walls of a custom home, taking satisfaction at every bit of progress.

"The magazine was a key building block in the formal creation of IEEE Canada," says Alden. "It was – and still is – a way of helping to reinforce the uniqueness of IEEE membership in Canada."

Alden's vision of a single Canadian electrical engineering society dated back to the early '70s. Upon taking office as IEEE Region 7 Director, Alden promoted the name IEEE Canada on letterhead and business cards, even as he and the *ICR*'s first editor, Richard Marceau, established its mandate and recruited associate editors.

Receiving a positive response at IEEE Head quarters to both initiatives, Alden began advocating to the IEEE Board official use of the name alongside IEEE Region7.

Following his term as IEEE Region 7 Director, Alden continued to support the goal of a strong, distinctly Canadian entity for IEEE members living in this country, which was fully realized at the end of 1994 with the merger of the Canadian Society for Electrical and Computer Engineering and Region 7 of IEEE. Working with Miro Forest, he later also saw completion of another initiative begun during his term as Region7 Director – the evolution of the reserve funds committee of the then-inactive International Electrical and Electronics Conference into the IEEE Canadian Foundation.

Bob Alden's distinguished academic career in power research at McMaster University saw him receive many accolades as an engineer. "But in many ways, we can call him the architect of IEEE Canada," says IEEE Canada's first President, Ray Findlay.

Lorsqu'est arrivé le premier numéro de *la Revue canadienne de l'IEEE* en septembre 1988, la communauté d'ingénieurs électriques du Canada ne se présentait pas comme aujourd'hui. L'IEEE Canada n'existait pas encore officiellement et la Région 7 de l'IEEE recrutait ses membres en rivalisant avec l'ancienne Société canadienne de génie électrique.

Pour Bob Alden, alors directeur de la Région 7, ce premier numéro signifiait bien plus que le lancement d'une nouvelle publication. L'arôme de l'encre d'imprimerie s'apparentait alors au parfum du bois fraîchement charpenté savouré par l'architecte d'une maison en construction venu à son chantier constater la bonne marche des travaux.

« La revue a joué un rôle capital dans la création officielle de l'IEEE Canada, en contribuant – comme elle le fait encore aujourd'hui – à singulariser les membres de l'IEEE au Canada », rappelle M. Alden.

L'idée de M. Alden de disposer d'une seule société de génie électrique au Canada remonte au début des années 1970. À son entrée en fonction comme directeur de la Région 7 de l'IEEE, il s'est mis à promouvoir le nom « IEEE Canada » sur son papier à correspondance officielle et ses cartes professionnelles. En même temps, lui et le premier éditeur de la RCI, Richard Marceau, établissaient son mandat et recrutaient des éditeurs adjoints.

Voyant ses deux initiatives saluées par le bureau central de l'IEEE, M. Alden se mit à encourager les dirigeants de l'IEEE à utiliser officiellement le nom « IEEE Canada » pour désigner la Région 7 de l'IEEE.

Au terme de son mandat de directeur de la Région 7 de l'IEEE, il continua à poursuivre l'objectif de donner aux membres canadiens de l'IEEE une organisation forte et purement canadienne, objectif qui a été atteint à la fin de l'année 1994 lorsque la Canadian Society for Electrical and Computer Engineering fusionna avec la Région 7 de l'IEEE. En collaboration avec Miro Forest, il concrétisa plus tard un autre projet entrepris lorsqu'il dirigeait la Région 7, soit le transfert des fonds de réserve de l'International Electrical and Electronics Conference, alors inactive, à la Fondation canadienne de l'IEEE.

Grâce à ses recherches dans le domaine de l'énergie, la brillante carrière universitaire menée par Bob Alden à l'Université McMaster lui a valu de nombreuses félicitations de la part de ses collègues ingénieurs. « Mais on peut dire qu'il a été l'architecte de l'IEEE Canada », conclut son premier président, Ray Findlay.

FOUNDING EDITOR / ÉDITEUR FONDATEUR >

Richard Marceau

Richard Marceau
Founding Editor
1988-1990

The year 1987 had been a busy one for Richard Marceau. At Hydro-Québec Research Institute, he had just been promoted as a special advisor to the Director of Technology Planning. As a volunteer, working closely with Wally Read, former Region 7 Director, Marceau had planned and directed IEEE participation in the Canadian Engineering Centennial Convention, an event bringing together 44 engineering associations and societies, which also led to the creation of the Canadian Academy of Engineering. He received an MGA (then called RAB) Innovation Award for this. He also received a very special invitation from Bob Alden. Next year would become even busier.

"I'd come to know Richard, and admired the quality of his work," says Alden.

Twenty-five years on, we salute Marceau's adept editorship of the early issues (1-8). His original vision of its presentation, content and formatting is reflected in the magazine to this day.

After the first eight issues, he left the *Canadian Review* to pursue doctoral studies at McGill University. Earning his Ph.D. in electric energy transmission, Marceau embarked on a notable academic career, last June becoming V.P. Research at Memorial University of Newfoundland, and before that Provost and V.P. Academic of the University of Ontario Institute of Technology, Dean of the Faculty of Engineering at the Université de Sherbrooke, and Chair of the Department of Electrical and Computer Engineering, École-Polytechnique de Montréal. He is President 2012-2014 of the Canadian Academy of Engineering.

L'année 1987 a été très occupée pour Richard Marceau. Il a été promu cette année-là conseiller spécial du directeur de la planification stratégique de l Institut de recherche d Hydro-Québec. À titre bénévole et en travaillant de près avec Wally Read, ancien directeur de la Région 7, il a aussi planifié et dirigé la participation de l IEEE au Congrès du centenaire du génie canadien, un événement qui rassembla 44 associations et sociétés de génie et qui conduisit à la création de l Académie canadienne du génie. Cet exploit lui valut un prix de l'innovation de l'IEEE (RAB Award). De plus, Bob Alden lui a fait cette année-là une offre très spéciale qui allait l occuper encore davantage l année suivante.

« Lorsque j'ai connu Richard, j'ai admiré la qualité de son travail », relate M. Alden.

Vingt-cinq ans plus tard, nous saluons la façon experte dont il a dirigé les premiers numéros de la Revue (1 à 8). Sa vision originale de la présentation, du contenu et de la mise en page de la revue est toujours d actualité.

Après les huit premiers numéros, Richard a laissé *la revue canadienne de l'IEEE* pour entreprendre des études doctorales à l Université McGill. Son Ph.D. en transmission de l énergie électrique lui a ouvert une brillante carrière universitaire qui allait le conduire en juin dernier au poste de vice-président à la recherche à la Memorial University of Newfound Land. Il a occupé auparavant les postes de vice-recteur à l enseignement et à la recherche et de vice-recteur à l enseignement à l Institut universitaire de technologie de l Ontario, de doyen de la Faculté de génie de l Université de Sherbrooke et de directeur du Département de génie électrique et informatique de l École Polytechnique de Montréal. Richard Marceau préside actuellement (2012-2014) l Académie canadienne du génie.

Laying out the vision

Like the first few words of a speaker at a podium, the earliest issues of a magazine must capture the audience's interest. *Check*. And followup with substance. *Check again*. But the *IEEE Canadian Review* was also launched with a vision. This is nowhere better articulated than by Bob Alden in the first article of the first issue (please see the following page).

The other articles chosen for our sampling of the publication's launch phase give full expresssion to that vision. Founding editor Richard Marceau's essay contends that government must make technology an instrument of national policy, and sketches out a blue print to achieve this.

With Canada one of the few industrialized countries still without a high-speed passenger rail system, the arguments concerning this investment are worth revisiting.

Does the mere mention of organizational structure make your eyelids heavy? The late Wally Read's discussion of the place of the Chapter in the IEEE family constellation brings "home" his message with wit and his inimitable style.

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Perspective

IEEE Canada and the *Canadian Review*

by Dr. Robert T.H. Alden
Director, IEEE Canada

Since this is the first issue of this new publication, and my first opportunity to write to all Canadian IEEE members as your Regional Director, I would like to share some observations about our Region with you, and introduce our new Region publication.

I am pleased to report to you that our Region is alive and well. Our Region membership passed the 15 thousand mark at the end of last year, while the Institute total is now approaching 300 thousand. You have an enthusiastic Region Committee, 20 active Sections, over 40 dynamic Student Branches, and a highly effective Region office.

Many of you will remember receiving NEWS7 three or four times per year as a Region-wide newsletter. With the increasing quality and number of Section newsletters, we decided to build on this strength, feed information to local groups more rapidly, and create a new Region magazine that would complement the other publications that you receive.

NEWS7 is now a one page newsletter sent monthly to Sections, Student Branches, and Committees of the Canadian Region. This is an efficient way to get information out quickly to about 150 IEEE volunteers for their immediate use, and allows for incorporation in Section newsletters. Please don't hesitate to send any items you would like published to our IEEE Canada office.

The *Canadian Review* replaces NEWS7 as the quarterly publication mailed to all IEEE members in Canada. I hope that you will find it informative and a pleasant reminder of your membership in IEEE and our Region, and also that you will enjoy this and future issues.

This year is being marked as the twenty-fifth anniversary of the IEEE and the Region structure as we know it today. IEEE was formed in 1963 by the merger of the two predecessor Institutes, AIEE (American Institute of Electrical Engineers) and IRE (Institute of Radio Engineers). Each Region has been given a commemorative Region banner to display at meetings and conferences. Region 8 (Europe, the Middle East and Africa) is celebrating its anniversary this October in Munich, West Germany with a special Region 8 committee meeting with the IEEE Executive Committee (and, I am told, suitable amounts of "Octoberfest" rituals).

The launching of the *Canadian Review* is, in one sense, a culmination of "25 plus" years of development within this Region. It seems appropriate that a brief review of our history should appear in this first issue.

IEEE Canada was born with the creation of the Toronto Section of the AIEE in 1903. In 1926, the Canadian Section of the IRE was formed. Both of these related but separate groups flourished, expanded their activities, and resulted in the creation of Region 7 of the IEEE when the 1963 merger of the two Institutes occurred. The creation of the Region office in 1972, located just north of metro Toronto in Thornhill, and the development of the three Canadian Councils (West, Central, and East) resulted from increased activities and the need for local coordination of Canadian efforts.

Due to the vision and energy of George Armitage, the first Region office manager, Student Branches and Section-based educational and technical activities flourished and enhanced the awareness of the Canadian aspects of our Region, which has become known as the Canadian Region of the Institute of Electrical and Electronics Engineers Inc., or IEEE Canada for short. Those of you who know George will be pleased to learn that IEEE is acknowledging his signal contributions in the form of a new award to recognize outstanding student branches.

We in our Region have already helped to celebrate the IEEE centennial in 1984 with our centennial book "Electricity the Magic Medium", edited by Harry Prevey of the Toronto Section (some copies are still available from our IEEE Canada office). We also organized, at the request of the Engineering Institute of Canada, the electrical portion of the Canadian Engineering Centennial celebrations in Montreal in 1987. We have just completed a 20 minute video on "Technology Transfer through Licensing". This was a joint venture with the Licensing Executives Society that involved Guy Houle, a senior volunteer officer with that Society and also a long standing member of the Montreal Section of IEEE.

We have a long heritage in the IEEE family, and there is a strong sense of loyalty to IEEE and an appreciation of the technical quality of its activities. It is with this background that we approach our new Region flagship publication.

The *Canadian Review*, as currently envisaged, will generally contain about three articles per issue, designed to be of interest to a broad range of Canadian IEEE members and others of like mind. The objective is to complement the "explanation of technology" articles that are the mainstay of "Spectrum" with articles that describe engineering projects and challenges, or that explore related fields of interest in a Canadian perspective. The Managing Editor, Richard J. Marceau, is in the process of developing a network of volunteer Associate Editors, who will seek and review articles on a wide range of topics such as national and international affairs, the industry scene, technology, education, etc.

I invite your contributions and participation, and urge any interested potential authors to contact our Associate Editors.

In addition to these major articles, the *Canadian Review* will contain information about activities and people in the IEEE Canadian Region. We expect that this type of content will evolve in response to you the reader. Please let us know your needs, interests, and comments, by contacting our IEEE Canada office.

I close by extending my personal thanks to all of the dedicated volunteers and staff who contribute so much time and talent to our Region. I would also like to recognize the friendship, good will, and assistance that is ever present from the IEEE Headquarters and Service Centre, and from the numerous volunteers from other Regions as well.

Technology, R&D and Government

If technology is strategic to the future of our nation, perhaps we need to pay more attention to how it comes into being.

by Richard J. Marceau
Secretary, IEEE Canada

In our world today, few nations will deny the strategic importance of technical expertise and advanced technological means coupled to an abundant supply of natural resources and a powerful financial infrastructure. The lack of free access to any one of these elements not only signifies dependence in the short term but vulnerability in the long term, whether seen from a political, economic, social or any other perspective.

Canada is a nation blessed by the relatively easy access to all of these elements. Nevertheless, when considering technology, it may not be so obvious that this should be taken for granted. Indeed, examples abound from recent times, primarily in relation to East-West or North-South relations, where various types of technology have not been made freely available, usually for reasons of national security. Nuclear or nuclear-propelled weapons systems immediately come to mind, but many other technologies such as more conventional weapons systems, high-precision numerical machine-tools, supercomputers and even some personal computers have seen their access severely restricted.

As other nations strive towards a higher technological base and attempt to protect whatever competitive edge they have, the access to new technology may change. In the same way that the controlled access to a national economy is one of many tools used by many nations to achieve strategic aims, the pressure to control access to technology as a lever of national economic policy may increase, not diminish.

In the past two centuries, technology has rapidly evolved to become a powerful economic vector for private enterprise, fueling social change, transforming the world we live in. Technology now stands at the very base of a nation's present and future wealth and influence, not only because an advanced technological base represents its potential to multiply the productivity of individuals, but also because it represents its capacity to continue this multiplying effect through future generations of technology.

Due to the strategic importance of technology, it is incumbent upon a nation's government to provide the leadership, nurture, stimuli, and environment whereby technology progresses and stimulates scientific breakthroughs into new areas. Notwithstanding the accelerated pace of technological evolution of the past three or four human generations, many are tempted to believe that the great scientific breakthroughs are a thing of the past. In fact, we have barely begun to understand the universe about us.

For Canada to maintain, if not increase, its relative economic weight in the rapidly changing world arena, limited as it is by its small population, it must actively search for ways to continue to amplify the efforts of its people. Technology, in this regard, must be seen as an instrument of national policy, wherein the necessity to reinforce the existing high technology infrastructure and governement technological policies.

Beyond the practical limitations of governmental financial restraint, how does one translate the concepts of nurture, stimuli, environment into a practical approach? What specific objective should be pursued? And is research and development the *only* cornerstone of a national policy on technology?

Technology and R&D

R&D is a familiar catchword that means different things to different people. Though one can easily associate the term "research" to a quest for understanding or new knowledge, "development" has been seen to describe anything from building a laboratory prototype to establishing the groundwork for new markets. In order to fill this gap, other terms, such as "demonstration", "innovation" and "qualification", have arisen. But regardless of how one defines the exact meaning behind the words, development is linked in some way to the application of knowledge. One intuitively senses that R&D represents the first few stages of a larger process involving the successful introduction and commercial exploitation of successive generations of technologies.

To make this process effective requires an understanding of how knowledge and technology interact, resulting in the advancement of both. Inventors, engineers, innovators or researchers will happily point out this iterative process as its relates to specific projects. And as one examines the macroscopic interaction between technology and knowledge on a longer time scale, they seem to combine, from seemingly unrelated fields, through apparently improbable scenarios, to advance the technological base of a nation to new generations of technology and new knowledge. In other words, the macroscopic process of technological evolution is a closed-loop process.

As every engineer has learned at one time or another, open-loop systems are inherently unstable. A national technology policy hinged solely on R&D, ignoring how it interacts with the remainder of the process, is like inputting a process whose output and feedback are not being monitored or controlled downstream. There is a very real danger that no output emerges: critical paths

Technology and national strategy

Thanks to its own efforts and those of its principal economic partners, Canada has long had ready and economical access to almost any technology necessary for its development. However, as many nations enter into a process of rapid technological evolution, Canada finds itself in a world of increasingly fierce competition in every sphere of activity including technology. In view of the importance of technology to a nation's present and future wealth and influence, how can we, as a nation, react to this changing environment?

Technologie et stratégie nationale

Grâce à ses propres efforts ainsi qu'à ceux de ses principaux partenaires économiques, le Canada a depuis longtemps accès aux technologies réquises pour assurer son développement. Toutefois, plusieurs pays amorcent un processus d'évolution technologique rapide: le Canada se retrouve dans un monde de compétition féroce où toutes les sphères d'activités sont touchées, en incluant la technologie. Étant donné l'impact de la technologie envers la richesse et l'influence d'une nation moderne, comment devons-nous réagir, en tant que nation, à cet environnement évolutif?

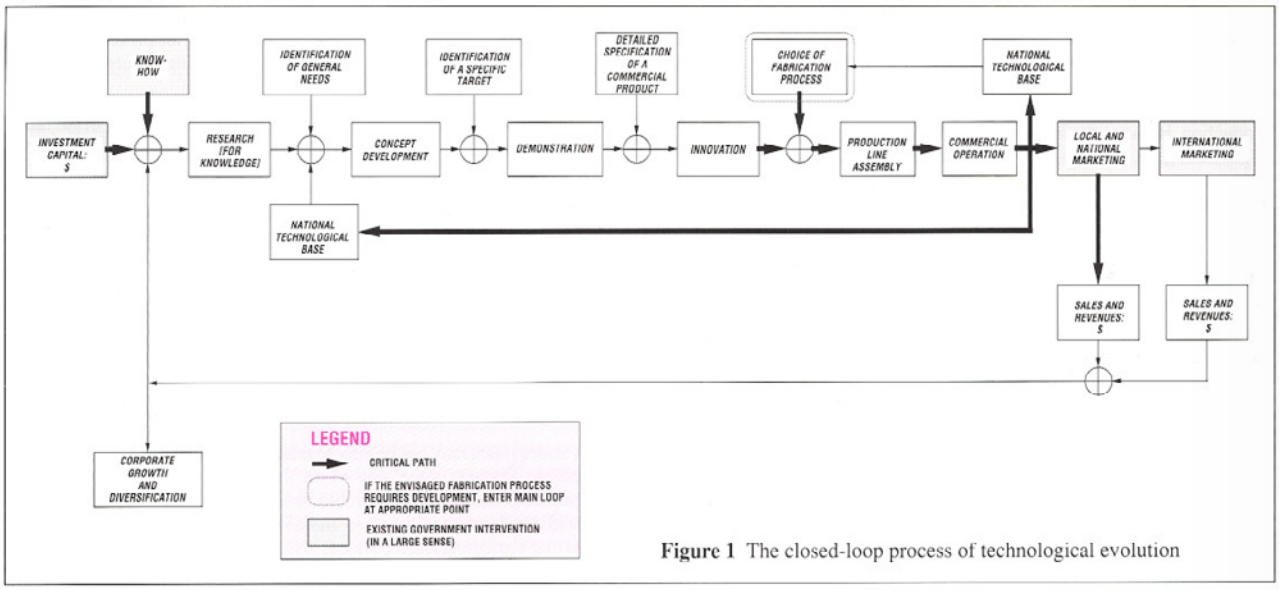


Figure 1 The closed-loop process of technological evolution

exist at several points in a loop, not just at the input stages where we find R&D. Let us examine this closed-loop process more closely, as illustrated in Figure 1.

The Process of Technological Evolution

As a working hypothesis, let us define R&D as having, at any one time, one or several of the following objectives:

a) The quest for knowledge;

b) The training of researchers, engineers, innovators or scientists;

c) The active prospecting of new technologies;

Establishing the basic concepts for:

d) the improvement of existing products or processes;

e) the introduction of new products or processes.

In Figure 1, one can directly relate the stages of *Research (For Knowledge)* and acquiring *Know-How* to a) and b) respectively, while d) and e) correspond to the *Concept Development* stage. Item c) can belong to either one of the three, according to how loosely it is coupled to specific needs.

Let us momentarily examine the impact of the availability of different types of technology to the initial R&D stages. The particular path of development taken in specific instances is heavily influenced by a society's present technological base. The higher the level of this base, the more ambitious the concepts which can, in one form or another, find their way to the marketplace. These in turn contribute to incrementing the base, which facilitates the emergence of new knowledge, from which springs further development. A mutual feedback consequently develops between knowledge and technology, resulting in a closed-loop system. And the enrichment of the technological base is the key to understanding the closed-loop nature of the process.

Downstream of the process, beyond the *Concept Development* stage, one targets a specific application which leads to the *Demonstration* of a scale- or life-sized prototype under real-life conditions. Much detailed design and fine-tuning follows even with highly successful demonstrations. If the technology is a specific product (hardware or software), a detailed commercial specification relating to the optimization of unit cost, quality and efficient manufacture represent the main challenges of the *Innovation* stage. If the technology is a process, the challenge is to implement the process in such a way that unit cost and quality are once again optimal. What then follows is the actual *Construction* of the production line and its subsequent *Commercial Operation*.

For an incremental advancement of the technological base to be permanent, the economic self-sufficiency of the means of production is essential until the product or process is no longer competitive, can be replaced by something better or is no longer socially or environmentally acceptable. Of course, economic self-sufficiency generates profits which are the sinew of further activity.

When applied to specific cases, some of the stages illustrated in Figure 1 take on more importance than others. In fact, in an effort to reduce lead time to product introduction, much effort has been directed to reducing the time required at each step. Powerful and reliable simulation can even permit the short-circuiting of certain stages altogether. However, each stage represents a specific need in the process, whether it exists implicitly or explicitly.

Critical Paths

The various government levels bring considerable support to different points in the process. For instance, many existing measures:

a) ensure the existence of a comprehensive education system, which supplies expertise and know-how;

b) provide partial or complete funding for many pure and applied R&D programs and projects;

c) stimulate partnership between industry, university and government;

d) facilitate the availability of investment or venture capital for job-creating projects of varying degrees of risk;

e) encourage the purchase of products from companies based locally or nationally;

f) promote the availability of Canadian products in foreign markets.

At first glance, one may be tempted to ask if there is anything left to be done. However, there is a weakness: these individual measures are not orchestrated as a coherent whole in tune with the technological process. The access to one set of measures and the consequent success of a particular stage in the process by no means translate into eligibility to another set of measures, or that appropriate measures even exist to exploit or weather the next stage. And need it be said that many obstacles must be overcome before a new technology is economically self-sustaining?

But when do obstacles become critical paths? One can suppose that obstacles which are not under direct organizational control can become critical paths. Of course, technology itself may present insurmountable obstacles. However, once a specific project is considered feasible and given the green light, one must assume that all technological task forces, pitted face to face against unforgiving matter, are on an equal footing.

According to this definition, there are three critical paths to the process, two

being at the point of entry: Availability of personnel having the necessary knowledge and expertise, and Accessibility of financing. The third critical path lies closer to the process output: inasmuch as R&D requires funding, the greatest financial risk lies in the generally far more considerable capital investment required to construct, commission and start-up new means of production. Between the initial go-ahead and the time a new production unit is generating a cash flow in line with its financial obligations, the fear of uncertainty and exposure may stifle the initiative to go with an otherwise promising technology, unless one can convince everyone concerned in the process that the risk is worth their while.

Incentives to the Process

Of course, this is far more simple to say than to do. On the one hand, motivation, though a necessary condition, may not always suffice to carry the day. On the other hand, nor are unlimited financial means a guarantee of success. However, one must recognize that motivation has the intangible attribute to provide far more margin than can be quantified *a priori*, if the proper incentives exist.

A national commitment to incrementing the technological base is precisely the type of objective that is best addressed by a global policy on technology. By means of a comprehensive set of incentives that reinforce the critical paths of the technological process, an appropriate policy can galvanize the physical and psychological energies of all those contributing to the process; the researchers, engineers, inventors, innovators, who will champion a project; the middle-managers who believe that the return is worth the investment; the high-level decision-makers who see new technology fueling growth and generating higher profits; the corporations that wish to increase their competitiveness or diversify into new areas; and, lest we forget, the production workers whose toil will permit a new technology to see the day.

One way to generate motivation is to provide contributor-specific incentives at every stage of the process. To ensure the eligibility to these incentives, one need only enter the process by investing in research, concept development, prototype demonstration, or any combination thereof. Four potential types of incentives, driven by self-interest, can thus be identified:

1. a corporate incentive;
2. an incentive at the individual level, for each employee involved in an individual project;
3. an incentive that will stimulate the *purchase* of products emerging from the incentives' program by those themselves engaged in the process: for instance, using products having emerged from the program as building blocks of new technology in the upstream stages (i.e. R&D, Demonstration, Innovation) or purchasing and exploiting such products when constructing new factories;
4. an incentive that will stimulate the *sale* – at large – of products emerging from this program.

Measures 1 and 2 directly target the motivation of those with a vested interest in the success of a new technology (i.e. a company and its employees) while attempting to reduce obstacles at the point of entry. At the output end, measures 3 and 4 will accelerate the purchase, acceptability and credibility of new products and help reinforce the competitive position of more traditional products emerging from a new process. In addition, the latter measures will encourage those having invested most heavily in time, effort and financial resources: a psychological intangible which may help smooth over some difficulties. Finally, corporate incentives provide margin for an enlightened company to reward its employees even further when the payoff appears.

A concrete example of each of these could be as follows:

1. in addition to all other incentives presently available at the point of entry, a reduction or absence of corporate income tax on all revenues associated with a new production unit for the first few years of commercial operation; for example two years.
2. a reduction or absence of personal income tax for the first few years of production (again, for example, two years) for all employees involved in the risk of realizing a new production unit, from R&D all the way to commercial operation;
3. a reduction or absence of sales taxes for 2 years associated with the *purchase*, by those who are themselves engaged in the process of building means of production, of earlier products having emerged from the process;
4. a reduction or absence of sales taxes for 2 years associated with the *sale* of products from new means of production emerging from the process.

As a whole, by encouraging the rapid utilization of locally emerging technologies and the reinsertion of new "technological building blocks" in downstream developments, one generates interest to enter the process and a technological momentum arises as a result of the closed-loop process. This momentum drives the rise of the technological base, which, in the long run, increases the overall productivity and competitivity of industry.

At first glance, one may suppose that such measures are unthinkable in this age of increasing national deficits. However, one can also suppose that much of the additional economic activity generated by virtue of the implementation of such measures would not have existed otherwise.

Such an approach may not be easy to manage, but this must not appear as an impossible obstacle. One way to do this would be to create exclusive, geographic zones where they would be in effect in such a way as to favour regional development. Of course, there may be other ways. But the bottom line is that something must be done.

Conclusion

Technology is of strategic importance to the future of our nation. Though support of R&D is essential, the emergence of new technology is a closed-loop process: to drive this process effectively and advance the national technological base, a national technology policy must not only provide incentives at the input (R&D) end but at all critical paths throughout the process.

The basic principle behind such a policy must be motivation. Everyone in the process, at every level, must find some incentive to deliver his or her best, at all times. And when government provides leadership, industry plays its part. Otherwise, individual, heroic efforts aren't enough to maintain our competitive edge in the world economic arena. It's a question of national strategy.

About the IEEE

The Institute of Electrical and Electronics Engineers, Inc. (IEEE), with headquarters in New York, is a transnational organization with 300,000 members in 137 countries. The world's largest engineering society, its objectives are technical, professional and societal.

The IEEE's technical objectives center on advancing the theory and practice of electrical, electronics, communications and computer engineering and computer science. To meet these objectives, it sponsors conferences and meetings, publishes a wide range of professional papers and provides educational programs. In addition, the Institute works to advance the professional standing of its members. It also has a mandate to enhance the quality of life for all people through the application of its technologies, and to promote a better understanding of the influence of these technologies on the public welfare.

Today, the IEEE is a leading authority in areas ranging from aerospace, computers and communications to biomedical technology, electric power and consumer electronics. When it began its second century in 1984, it rededicated itself to Innovation, Excellence, the Exchange of information and the quest for improved Education. In so doing, it underscores the initials IEEE.

IEEE Canada is the Canadian entity of this transnational organization, with approximately sixteen thousand members. The Canadian Region is divided into twenty Sections, each centered in a Canadian city, from Victoria, B.C., in the west, to St. John's, Newfoundland, in the east. For information on whom to contact in your area, the many IEEE products and services available, or how to join IEEE, write, phone, or fax our IEEE Canada office (page 3).

High Speed Rail in Canada: An Impossible Dream?

Does high speed rail transportation make financial and economic sense in Canada?

by W. J. Hurley, J. Jones and A. R. Eastham
Kingston, Ontario

An idea whose time has come?

The concept of high-speed rail (HSR) in Canada has attracted considerable media attention. Given the success of high speed rail in Japan, France and elsewhere, the technical feasibility of such a project is not seriously in question. But is such a project economically viable in Canada?

Le temps est-il mûr?

L'idée d'un train à grande vitesse au Canada a attiré beaucoup d'attention ces derniers temps dans les grands médias. Étant donné le succès de différents types de trains à grande vitesse au Japon, en France et ailleurs, on ne met plus en doute sa faisabilité technique. Toutefois, un tel projet est-il économiquement viable au Canada?

Much media attention has recently been given to the possibility of an electrified high speed rail system (HSR) between Montréal, Ottawa and Toronto. This discussion occurs against a backdrop of cutbacks and uncertainty regarding the future of VIA, the Crown corporation responsible for rail passenger transport in Canada. The Canadian government is planning to reduce the subsidy to VIA to $350 million, a cut of 45%, by 1993. In this climate of budgetary restraint, it seems unlikely that the federal government would make a major investment in HSR. Yet, our estimates suggest that it may be possible to move people in the Montréal-Ottawa-Toronto corridor more cheaply by HSR than by air transportation (Air).

The Relative Cost of HSR and Air

Let us first consider the basis on which costs are to be compared. Currently, there is no high speed rail; there is only an air system. It is appropriate, then, to compute the savings in discounted cost that would result if a given level of traffic is moved by HSR rather than by air. Costs are discounted over the life of the HSR infrastructure, which is assumed to be 40 years.

The total cost for each system comprises three categories: direct fixed costs; direct variable costs; and indirect costs.

- Direct fixed costs for HSR are the costs of providing the right-of-way and track. For Air, they consist of two major elements: the cost of airports, terminals and related fixed plant; and the cost of the air navigation system.
- Direct variable costs include all other direct costs exclusive of infrastructure costs. For HSR, direct variable costs would include: operations; rolling stock maintenance; maintenance of way; overhead; and an amortized capital charge associated with the rolling stock investment.
- For Air, direct variable costs would consist of comparable items.
- Indirect costs include the cost of travel time, pollution and other such items which are not borne directly by the providers of the transportation service.

Indirect Costs

On indirect costs, HSR compares favourably with Air. For instance, consider the cost of travel time. Table 1 compares the total time of travel - including time spent traveling to and from the terminal and waiting at the terminal - for the three major corridor trips. Between Ottawa and Montréal, HSR is faster; for the other two, HSR times are competitive.

Table 1 - Air and HSR Trip Times for Selected City Pairs

City Pair	HSR	Air
Toronto-Ottawa	3 hours 20 minutes	3 hours
Toronto-Montréal	4 hours	3 hours 20 minutes
Montréal-Ottawa	2 hours 10 minutes	2 hours 20 minutes

Other aspects of indirect costs are convenience and comfort. HSR and Air come out roughly equal. A TGV-type HSR service would be more comfortable than Air. On the other hand, Air would generally offer more departures.

A final category of indirect costs are "externalities" like noise, air pollution and congestion. Since TGV-type service is electric, it is both quieter and cleaner than Air. With the existing congestion at Pearson International Airport in Toronto and the prospect that it will get worse, HSR is an alternative to airport capacity expansion.

Direct Costs of High Speed Rail

To get a high speed rail system operational between Toronto and Montréal will require approximately $2.6 billion, consisting of $2.3 billion for infrastructure (see Figure 1 for breakdown) and $300 million for rolling stock.

We take $2.3 billion, the total infrastructure cost, to be the direct fixed cost of the high speed system. We estimate that it will take 6 years to put the infrastructure in place and, once in place, it will last for 40 years with normal maintenance. Rolling stock is not included as a fixed cost for reasons to be discussed below.

There are two items of direct variable cost. One is a period charge which includes operation, overhead, maintenance of rolling stock and maintenance of way. The other is rolling stock. We estimate the period charge to be $.052 per passenger-kilometer, calculated as shown in Table 2.

Table 2 - Annual Operating and Maintenance Costs for High Speed Rail ($ millions)

Crew and On Board Services	24.4
Equipment Maintenance	22.8
Stations and Sales	18.0
Train Control	1.5
Track and Facilities Maintenance	12.5
Insurance	3.0
Corporate Offices	5.5
Total	87.7
Total passenger-kilometers (millions)	1 679
Cost per passenger-kilometer (cents)	5.2

These costs have been developed under the assumption that the operator of a Canadian high speed system would not be constrained by traditional railway industry workrules. In particular, it assumes that the crewing levels practised on the French TGV could be implemented here. Also, the cost per passenger-kilometer is for the forecast level of demand. For higher levels of demand, this cost would fall.

To check that 5.2 cents per passenger-kilometer is reasonable, we examined the TGV Southeast accounts over the years 1981-1985. These indicated that the average costs decreased from 5.4 cents in 1981 to 3.9 cents in 1985, therefore supporting our cost analysis.

The other variable cost is the capital cost of the rolling stock. We have chosen to amortize the capital cost over a 15 year period. An equipment analysis based on 65% occupancy factors and an annual workload of 350,000 km per trainset indicated that 15 trainsets will be required, at a cost of $300 million in 1988 dollars. This translates into 1.5 cents per passenger-kilometer over the useful life of the equipment. Thus, we calculate the total direct variable cost to be 5.2 + 1.5 = 6.7 cents per passenger-kilometer.

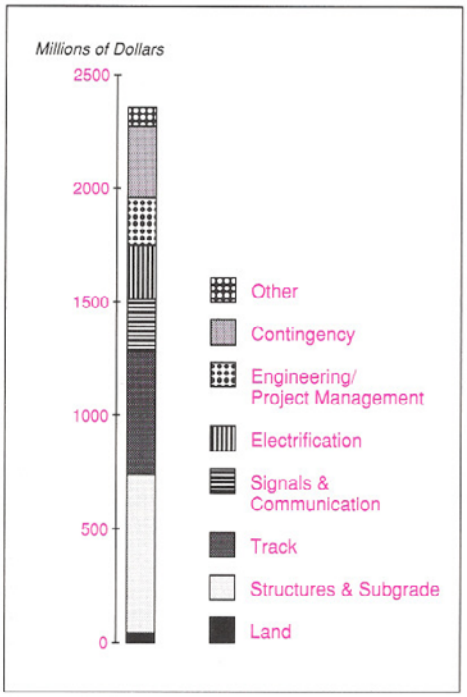


Figure 1 Breakdown of infrastructure costs for High Speed Rail.

There is one additional cost, and that is the cost of capital. We have assumed a required real rate of return of 5%.

To get a total direct cost, we discount the annual variable cost over the 40 year life of the high speed infrastructure and add to it the cost of the infrastructure. The total net present cost of the HSR then becomes $3.8 billion.

Direct Costs of Air

We take a different approach to estimate the variable direct costs of the Air mode. Airline fare data for major origins and destinations across Canada was obtained as well as the distance in kilometers between each. With this data set, we regressed price on distance. The resulting regression equation is as follows:

$$P(d) = 89.3 + 0.135\,d, \quad R\text{-squared} = 0.997 \qquad [1]$$

where P(d) is price (i.e. in dollars per passenger) and d is distance. The high R-squared indicates that the data fit the linear relationship quite well.

We take this as the airline cost function for several reasons. First, North American airline companies have not been exceptionally profitable since deregulation, even with substantial increases in traffic. Table 3 presents the breakdown of operating profits for US airlines on domestic services between 1970 and 1985 for selected years. With the exception of 1985, revenues are just enough to cover operating expenses. Even in 1985, the margin is only about 2%. Second, the theory of contestable markets applied to air passenger transport suggests that, given the mobility of capital in the industry, airline prices may be close to competitive prices. Table 3 provides evidence in support of this contention.

But there are obvious objections to this approach. First, it may be that there is a cross-subsidy between long and short-haul flights. If short-haul subsidizes long-haul, the true airline cost function may be flatter that [1]. Hence, if [1] is used to estimate the cost of short-haul flights, the resulting cost will overestimate the true cost. Second, if [1] is the true cost function, it will also include a provision for capital payments to airline shareholders and bondholders. If yearly unit costs are developed from [1] and then discounted for comparison purposes with HSR, capital costs will be double counted, thus biasing the comparison towards HSR. Airline costs would also include landing fees. We do not net these from Air costs for two reasons: they are a small fraction of airline costs; in our analysis, we are not going to charge any of the capital and operating charges of the airport and air navigation system against the Air alternative.

With these qualifications noted, we proceed as follows. For a trip length of 539 kilometers, the distance between Montréal and Toronto, the cost from [1] is $162 or 30.1 cents per passenger-kilometer. However, as noted above, this cost includes all airline costs as well as capital charges to the various stakeholders. To take out these capital charges, the data in Table 3 are used to estimate the percentage of total expenses which are made up by capital charges. We take the expense item "depreciation and amortization" to be a suitable proxy for capital charges. In 1970, the depreciation and amortization constituted 10% of total expenses. For 1975, 1980 and 1985, it averaged 6%. To be conservative, we use 10%. Therefore, the direct variable cost adjusted for capital charges is:

$$30.1 - 10\%(30.1) = 27 \text{ cents.}$$

To this point, the analysis indicates that HSR has a significantly lower variable cost. Now to the problem of direct fixed cost for Air. As mentioned above, this cost has two components: airports, terminal and other fixed plant; and the air navigation system. Adoption of the new microwave landing system and maintaining the existing infrastructure will require approximately 6 to7 billion dollars over the next 20 years for the country as a whole. This expenditure does not include any provision for expansion at Toronto. Whatever these planned expenditures, the key number is the savings in Air capacity cost which would result if a high speed rail system were implemented.

For our purposes, it is enough to assume that the savings in Air capacity cost as a result of HSR are zero.

Based on the variable direct cost of 27 cents and zero fixed direct cost, the net present cost of Air is $5.8 billion. To arrive at this number, we have made the same traffic assumptions that we used for HSR: there is no traffic for 6 years; after 6 years, the traffic is a constant 1.7 billion passenger-kilometers per year.

In summary then, HSR is some $2 billion cheaper that Air over the 40 year period.

The Investment Value of HSR

We have shown that it is more efficient to move people by HSR than by Air. However, this does not mean that the returns will be sufficient to justify private sector investment. For this assessment, we need to test the profitability of HSR at various revenue levels.

Table 4 presents the Net Present Value of the high speed rail investment at levels of revenue ranging from 15 to 25 cents per passenger-kilometer.

Table 3 - Operating Income of U.S. Airlines on Domestic Operations (1970-1985, $ millions)

	1970	1975	1980	1985
Total Revenues[1]	7 131	11 911	26 404	37 629
Expenses:				
Flying Operations	2 098	3 869	11 029	12 684
Maintenance	1 127	1 595	2 758	3 604
General Administration	3 157	5 050	10 545	17 324
Depreciation and Amortization	745	883	1 560	2 318
Transport Related	n/a	383	517	681
Total Expenses	7 127	11 780	26 409	36 611
Passenger-miles (billions)	104.1	131.7	200.8	270.6

[1] Revenues include freight and other revenues which range between 12% and 15% of total revenues.

Source: Statistical Abstract of the United States, 1988, 108th edition.

At a fare level of $0.20 per passenger-kilometer, which is about 70% of the current Air fare between Montréal and Toronto, the HSR investment has a positive Net Present Value using a discount rate of 5%. However, the net present value calculation is sensitive to the revenue assumption. If fares are raised 25% to $0.25 per passenger-kilometer, the net present value increases by about 350%. Thus, given the structure of our analysis, profitability is very sensitive to the revenue assumption made.

This sensitivity suggests a role for the public sector. High speed rail profitability turns on the level of fare that can be charged. Since the initial investment is quite large, it is doubtful whether a private company or consortium of private companies would be willing to take the risk. However, if a government (or a group of governments) undertook to supply a sufficiently large part of the initial investment, the private sector risk of the project could be reduced to the point where the project would be attractive.

Table 4 - Net Present Value of the HSR Investment ($ millions)

Revenue per passenger-kilometer	*Net Present Value*
0.150	-661
0.175	-153
0.200	354
0.225	861
0.250	1368

An interesting issue related to public sector involvement is the structure of this involvement. One alternative is to have the government supply a fraction of the infrastructure cost. This will have two effects on the private sector investment. It will increase profitability and reduce the payback period. For example, suppose the fare level is fixed at $0.20 per passenger-kilometer. With no public sector involvement, the payback period is 16 years; if the public sector were to contribute $1 billion, the payback period would be reduced to 6 years.

Conclusions

The main finding is that, for a given level of demand over the Montréal-Ottawa-Toronto Corridor distances, high speed rail is cheaper than air transportation. However, our profitability study suggests that HSR may be too risky for private sector investment alone. This suggests a role for public-private sector cooperation to reduce these risks to acceptable levels and enable the benefits of HSR to be reaped.

There are also other benefits which have not been included in the economic analysis:

1. Bombardier has the North American manufacturing rights for the TGV. If high speed rail is adopted by other North American jurisdictions, Canada is well positioned to supply this market.
2. There will be economies from CN and CP's increased capacity to move freight.
3. The high speed option has the potential to reduce the congestion which currently plagues the air mode, especially at Pearson International Airport.

A final benefit is related to our ability to predict the future. Our analysis does not include the modeling of shocks to the economy over the next 40 years. Yet, in the transportation industry, shocks such as the OPEC oil embargo can have substantial effects. By way of example, suppose the price of oil were to double at some time in the next forty years. Under the existing corridor transportation arrangements, this would cause significant difficulties because of our reliance on the automobile and airplane and the energy costs incurred thereby. In a sense, the HSR investment, which is much less energy intensive, is a form of insurance against such adverse movements.

IEEE Canada Newsflash

Dr Robert T. H. Alden, outgoing Director of IEEE Canada, has just been named Vice-president of the IEEE Regional Activities Board (RAB). Dr. Raymond Findlay, a long-time active member of IEEE Canada, has also just been named Student Activities Committee (SAC) Chairman for all of IEEE. Congratulations to Bob and Ray!

Special Guest Editorial

The Chapter Dilemma: "Where's my Mom?"

This paper is prepared and presented in the spirit of encouraging a dialogue about the responsibilities of Sections (Mama RAB) and Societies (Mama TAB) for the IEEE offspring we call the Chapter.

Wallace S. Read
Treasurer, IEEE

All is not well in the Chapter camp. This may not be accurate for all Regions or in all Societies, but given the IEEE financial and technical resources, I believe we can do better, even in those areas where Chapters seem to thrive.

Essential to the examination of parental responsibilities is a knowledge of the needs of the child. Obviously, these include a requirement for identity, shelter, nurture, guidance, discipline and reward. It is in this broad context that I would like to review the way in which Mama RAB (Regional Activities Board) and Mama TAB (Technical Activities Board) behave towards the child Chapter and whether there is any need to strengthen the parental structure or relationship to make things better.

The IEEE Family Unit

No one would dispute the IEEE operational complexity. So varied are the interests of our members that the responsibility for special services such as education, standards, publications, etc. have been assigned to separate units. And the two units which arose from the amalgamation of IRE and AIEE as the initial member contact, both with transnational interest, are RAB and TAB. The former is a geographically-organized unit and the latter is a centralized technically-organized unit.

Immediately a dilemma surfaced. How do you service the technical interests of our members everywhere? Who should be the parent? What should be her reponsibility and how should the "other" parent support this member activity?

Well, those who had the responsibility for addressing this concern did make a decision. They felt that the closeness of a geographical parent (Mama RAB) rather than the remoteness of a centralized technical parent (Mama TAB) was more likely to ensure that the Chapter structure would survive and meet the challenge of delivering technical services. It is also possible that, at that time, they saw a larger and stronger member interface developing at the geographical level in RAB rather than at the technical level in TAB. On the other hand, I am sure that they recognized the importance of Mama TAB's close supportive role and trusted to RAB and TAB to ensure a close working relationship in the administration and delivery of this member service.

Whatever the reasons, so it was decreed and so it was written. The Bylaws clearly state there shall be two mothers:

- Mama TAB, the Society, who will conceive and give birth to a Chapter, not unlike the role of a surrogate mother, and
- Mama RAB, the Section, who, following birth, will legally nurture and raise the Chapter as it would one of its own Committees.

What the Bylaws are silent on is how this entity, the Chapter, is supposed to survive and prosper given it now needs all those things which I mentioned earlier: identity, shelter, nurture, guidance, discipline and reward.

Raising the Chapter Child

While the Bylaws clearly set out the roles of the two mothers, I believe there was an implication there. Just as Mama RAB was to seek the strength of Mama TAB for the birth, she was also to expect that the surrogate mother go beyond that role and act as wet nurse. Indeed, the drama and excitement of birth often triggered in Mama TAB a greater interest in the child and she has welcomed this expanded role.

We only have to read the guidance document written by the legal mother entitled "Chapter Operations - A Guide for Sections" to understand how Mama RAB expects her child to behave. But that same document clearly identifies the need for the continued interest and support of Mama TAB.

The Introduction States:

"Chapters are units within IEEE Sections formed to serve the specialized technical interest of Society members and to coordinate these with the local activities of the Sections and the broader activities of the parent Society."

and

"The Chapter, operating in concert with its parent Society and the Section, plays a major role in fulfilling the objectives of the IEEE."

As a result, I believe that when you boil it all down, there are in fact two mothering roles. One is to be a Conscience, a facilitator, an overseer, a disciplinarian which ensures the proper operation of the Chapter. The second role is one of support, both financial and technical, to ensure that adequate and quality programming occurs.

It seems to me that the first role requires a close geographical relationship. The child needs to be physically close to its mother so that the watchful eye can detect problems very early and take steps to correct them. Enter Mama RAB. The second role of nurturing the child is best accomplished close at hand as well. It is difficult to breast feed at a distance but, on the other hand, you can't breast feed if you have no milk. Enter Mama TAB.

If either of these roles break down, you have a difficult parent/child relationship and an undisciplined or undernourished child. Neither will be a good performer. Mama TAB will have to address whether she is prepared to support a child conceived by her but growing up under someone else's guardianship. Mama RAB will have to consider whether legal guardianship requires the parent to bear the cost of feeding the child as well. But either way, grandparents RAB and TAB had better more clearly define the roles of the mothers, shake hands and get on with supporting the Chapters in their important work.

It's tough trying to serve two parents unless the parents agree on how, when, where and why they will exercise their authority. Give Chapters a break. Don't abandon them. Just lay down the rules of the game so that they can understand them.

Identifying a problem is halfway towards solving it. I've given you my views. What are yours?

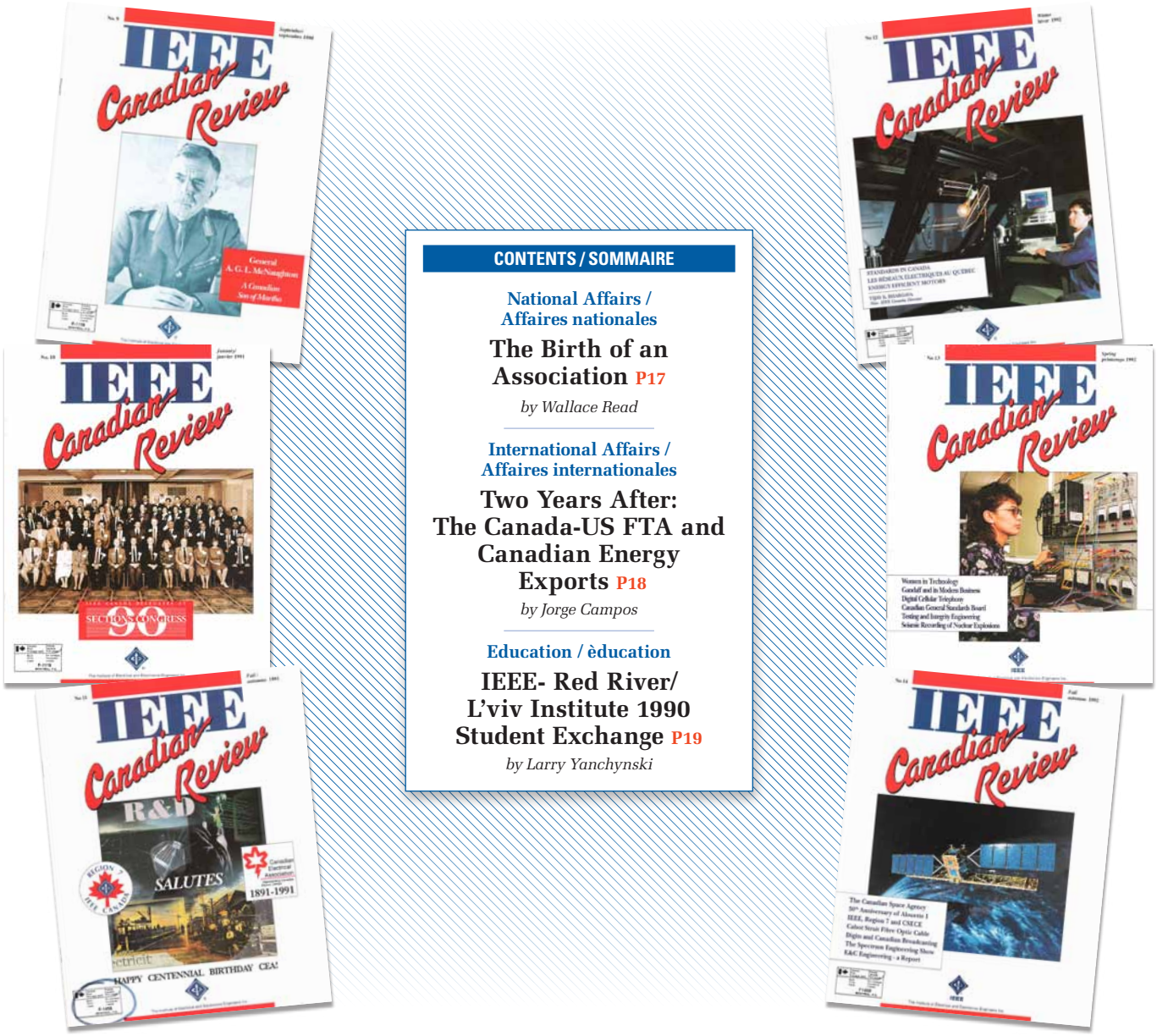
Power and Politics

The Canadian Electric Association celebrated its 100th anniversary in 1991. A piece by Wally Read (see page opposite) reminds readers that even though we have smarter grids, bringing power to people—a major issue in 1891—is still an essential part of the profession 115 years later.

SECURING ENERGY MARKETS was as compelling an issue in the early '90s as it is today. Whether or not the 1989 free trade agreement with the U. S. achieved this goal was the topic of much debate, with both sides explored in the January 1991 issue.

IT WAS BIG NEWS that an exchange could take place between students in the Western Ukraine and Alberta. With the recent end of the Cold War, such exchanges—now common place—were unique. Currency exchange was a major hurdle as were transportation logistics.

"'Toronto in grip of winter storm — traffic suspended, wires all down'" (The Birth of an Association)



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The Birth of an Association

by Wallace S. Read
President, Canadian Electrical Association

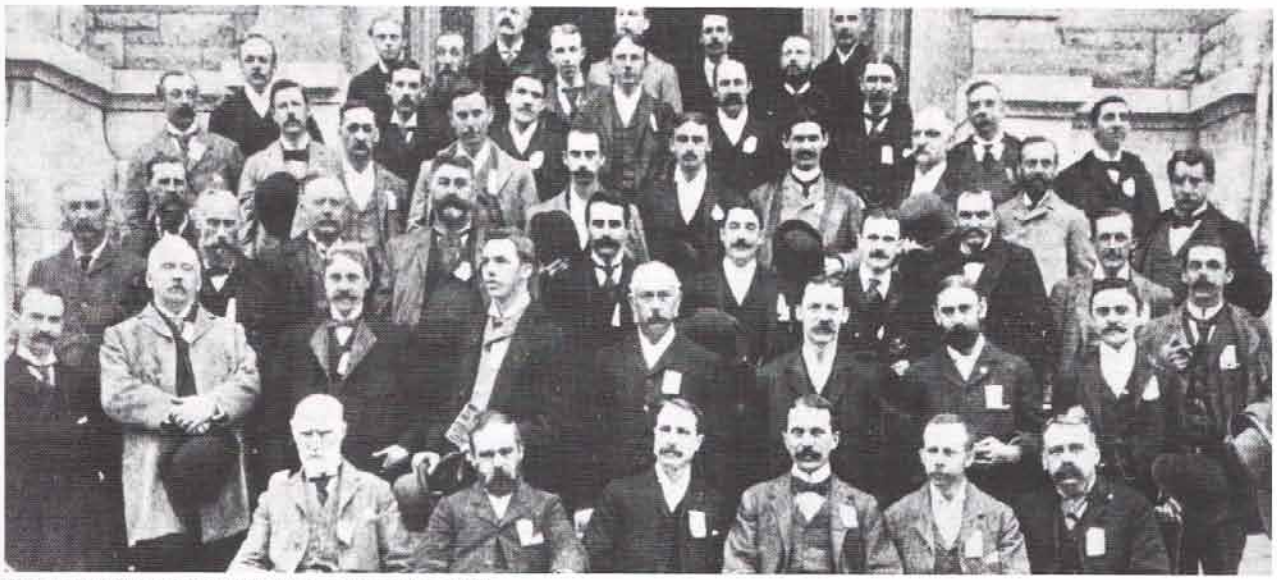
The sun had just retreated from the wintry skies and a quietness settled over the streets of downtown Toronto. A short, stocky, distinguished looking gentleman, muffled against the cold, made his way along King Street East to the offices of Toronto Electric Light Company. His ample moustache carried the weight of frozen condensation and his fingers were numb as they groped for the ring of keys from his waistcoat pocket. He let himself in to the empty offices of the utility. It was 7:30 p.m., Friday, February 20, 1891.

Climbing the wooden stairs to the executive offices on the second floor, he moved quickly to a glass panelled door with black letters enamelled on the frosted glass. Removing his gloves, he allowed his skilled fingers to trace fondly the words "J.J. Wright - Manager". To J.J. that said it all. He half smiled as the thought crossed his mind it would make a suitable epitaph as well. Doffing his overcoat, he crossed the room and slumped into an overstuffed leather chair, the one luxury he had allowed himself in this otherwise sparsely furnished office.

It had been a rough week. Apart from the usual problems at the generating station, Mother Nature dealt the distribution system a terrible blow. An ice storm accompanied by strong winds blew into the area from New York state and the crew had its hands full restoring service to an irate group of customers. Thank God it's Friday he whispered to himself.

J.J. always reserved the late hours of Friday to do some creative thinking about the industry he served and the impact it was having on society. It was a welcome respite from the purely technical problems that occupied his work week. As he sank deeper into his chair, the upholstery enveloped him as if to shield him from the worries of the day. The chair seemed to have a magical way of transforming his bone-tired frame and brain into a state of renewed strength and vigour.

The newspaper lay open on his desk and a furtive glance caught the headline "Toronto in Grips of Winter Storm - Traffic Suspended, Wires All Down" Another read "It Will Mean Ruination - Unrestricted Reciprocity with the United States Will Curtail Industry, Reduce Wages and Depress



Fifth annual CEA convention in Ottawa, September 1895
Front row, 3rd from left: F.J. Dunstan, President CEA and Manager Bell Telephone in Toronto. 5th from left: C.H. Mortimer, Secretary CEA and Publisher of Canadian Electrical News. Extreme right: J.J. Wright, first President CEA and Manager, Toronto Electric Light Company

Two Years After: The Canada–US FTA and Canadian Energy Exports

The agreement impact on the bilateral energy trade

When we now hear with insistence the possibility of a Canada-Mexico-U.S. Free Trade Agreement, many of us cannot avoid wondering about the real impact of the two years old Canada-U.S. Free Trade Agreement. The lessons of the past offer the most valuable way to identify the pitfalls and the opportunities in the future.

by Jorge Campos
Chief Electrical Engineer
Westmount Light and Power
Westmount, Quebec

Free trade and energy

In the midst of the heated controversy surrounding the announcement of the Canada-United States Free Trade Agreement, many experts voiced strong concern about the impact of its energy chapter. They feared that it would eliminate the ability of the Canadian Government to establish a future independent policy on energy. Some did not even hesitate in characterizing the provisions on energy as powerful constraints to Canadian sovereignty. After two years of free trade with the U.S., did these alarming predictions come true? Or rather, did free trade have a positive impact on the Canadian policy on energy exports?

Libre-échange et Énergie

Au cours du tumultueux débat accompagnant l'annonce de l'Accord de Libre-Échange Canada - États-Unis, de nombreux experts ont exprimé leur profonde inquiétude sur les impacts de son chapitre énergétique; ils craignaient l'impossibilité future pour le gouvernement canadien de pouvoir définir une politique énergétique indépendante. Plusieurs n'ont pas hésité à désigner les clauses sur l'énergie comme de dangereuses restrictions à la souveraineté canadienne. Après deux ans de libre-échange avec les É-U, ces prédictions inquiétantes se sont-elles réalisées? Ou, au contraire, est-ce que le libre-échange a eu un impact positif sur la politique canadienne d'exportation de l'énergie?

The Canada-United States Free Trade Agreement (FTA) came into effect on January 1, 1989. One of the highest priorities of the Canadian team in the negotiations leading to the agreement had been to secure market access for Canadian energy products. With Canadian energy exports to the U.S. exceeding $10 billion per year, Canada could not afford not to protect itself from the increasingly strong protectionist movement emerging in the United States.

The Americans never really put any objections to the Canadian aspirations in the energy sector, but they showed great determination in obtaining a commitment from Canada in assuring the continuity of future energy supplies. Their efforts were specially directed to restrain Canada's ability to impose restrictions on energy exports. The U.S. had opposed for years certain policies existing under the National Energy Program, such as restrictive export licensing and regulated dual-pricing. They had been used by the Canadian government in times of energy shortages to impose unilateral export restrictions and energy export prices higher than domestic prices.

In the energy chapter of the FTA, Canada and the U.S. basically agreed to adhere to the National Treatment Principle, as the basis to the bilateral trade of energy products such as coal, petroleum, natural gas, electricity, uranium, and heavy water. Previously, national treatment had already been advocated, and accepted in principle, by both countries under the General Agreement on Tariffs and Trade (GATT).

National treatment means that U.S. business in Canada, and Canadian business in the U.S., is to be treated no less favourably than domestic business in each country. The agreement established provisions prohibiting trade restrictive measures on energy goods, such as minimum export/import requirements, minimum price requirements, export/import taxes, licenses, fees or any other discriminatory charges or barriers to trade.

However, the agreement left untouched all import and export restrictions permitted under GATT. The allowed trade restrictions include measures undertaken to relieve or prevent shortages of a product, or to assure the conservation of exhaustible natural resources. Nevertheless, if export restrictions are imposed, exports can only be reduced in the same proportion as the reduction experienced in the total available supply.

Some saw the energy chapter of the FTA as being very favourable to Canada; others fell just short of comparing it to a national political and economic disaster. The controversy was heated and emotional. As a matter of fact, few points in the agreement motivated such tempestuous debates as the issue of how the energy chapter would affect Canadian sovereignty.

At the heart of the controversy were the provisions guaranteeing U.S. access to a stable proportion of Canadian energy supplies in the event of government imposed rationing, regardless of whether that rationing would be for reasons of a short-term supply crisis or longer term efforts to conserve exhaustible resources. Further, Canada's adherence to the National Treatment Principle was regarded as being equivalent to the acceptance of the imposition by the U.S. of a unique price structure on Canadian energy products. Of course, the obligations by both sides in respect to energy were equal, but because Canada is a net exporter of energy, the implications for each country were different.

Those opposing the FTA, pointed out that the true meaning of the agreement was to constrain Canada within a continental energy policy, which eliminated its ability to reserve resources for its own citizens even when such resources would be very scarce. They especially resented the "Extent of Obligation" clause, which unilaterally imposed the observance of the FTA by state, provincial and local governments, without their consent or agreement.

It was often mentioned that, in spite of the watchdog action of the National Energy Board (NEB), most past energy export programs had in fact been monitored and controlled by provincial governments. So, the opponents of the agreement felt that the provisions of the energy chapter significantly restricted the freedom of the Canadian Governments - federal and provincial - to screen the export of their energy resources and to follow many policies

IEEE Canadian Review - January / janvier 1991

To view this article in its entirety please visit www.ieee.ca/canrev/archive/cr10.pdf

IEEE - Red River / L'viv Institute 1990 Student Exchange

The end of the Cold War has brought new opportunities for contact between East and West

by Larry Yanchynski
Instructor, Technology Communication Dept.
Red River Community College
Winnipeg, Manitoba

On June 1, 1990, four students and two instructors from the Technology Division at Red River Community College departed from the Winnipeg International Airport for Ukraine. Their destination was L'viv, an ancient city with a population of over a million people in Western Ukraine, about sixty miles from the Polish border. They were to be met later in L'viv by Andrew Bereza, an Electronic Technology instructor from Assiniboine Community College in Brandon.

The Canadians would stay in Ukraine for two weeks and in October, the Ukrainians would stay in Winnipeg. The exchange was the brainchild of Lubomyr "Borys" Shulakewych, an instructor in the Electronics Technology department at Red River, who decided to act on Mayor Norrie's suggestion, after the mayor's visit to L'viv, to facilitate an exchange between our educational institutions and those in Winnipeg's "sister" city L'viv.

Working through the offices of Bill Norrie and Bohdan D. Kotyk, mayors of the two cities, Borys had proposed the idea in Fall, 1989. Because of its size and curriculum, the Trade and Economy Institute of L'viv (hereafter called simply "the institute") was selected as the host college in Ukraine.

Although the Institute of Electrical and Electronic Engineers (IEEE) was the chief sponsor, the students (Todd Atamanchuk, Darcy Hildebrand, Bill Nanowski, Larry Obelnicki) and instructors (Borys Shulakewych and Larry Yanchynski from the Technical Communications department) from Red River Community College spent several busy months soliciting local businesses and associations to raise money for the exchange. In addition, they held a "social" and also participated in a daylong car-wash. Thus, they raised over $5000 prior to their trip, with more financial support hopefully forthcoming.

The planning did not always go smoothly; there were several problems with setting mutually convenient dates and with the non-exchangeability of Soviet currency. But after many letters, telephone calls and faxes, the problems were eventually resolved.

After almost two days of flying (Winnipeg-Toronto-Amsterdam-Paris-Kiev) the Winnipeg delegation touched Soviet soil at the Boryspil Airport on the outskirts of the golden-domed city of Kiev on June 2. After briskly competing with several dozen French tourists to pass through customs, the group was met at the airport by three persons from the Institute: Ihor Mytnyk, (an instructor), Andrei Muryn (a student) and Viktor (the driver of the Intourist bus). The bus ride surprised and delighted the Winnipeggers, who were expecting still another flight or a train.

This account of the Red River/L'viv exchange visit was written with the help of the students who took part—Todd Atamanchuk, Darcy Hildebrand, Bill Nanowski and Larry Obelnicki. Almost one-third of IEEE members in Canada are students. Although student members of IEEE worldwide have their own publication, Potentials, we warmly welcome reports from our student members concerning their IEEE-related activities, whether technical or, as in this case, social and cultural, for publication in the IEEE Canadian Review.

Échange d'étudiants du IEEE - Red River Community College (Winnipeg) et de l'Institut de Commerce et d'Économie de L'viv (Ukraine)

Ce compte rendu de l'échange étudiant Red River/Lviv a été écrit avec l'aide des étudiants de Red River qui y ont pris part - Todd Atemahchuk, Darcy Hildeband, Bill Nanowski et Larry Obelnicki. Près du tiers des membres du IEEE Canada sont des étudiants, malgré le fait que les membres étudiants du IEEE aient leur publication, Potentials, nous accueillons avec plaisir dans le IEEE Canadian Review les reportages de nos membres étudiants concernant leurs activités reliées au IEEE, qu'elles soient techniques ou, comme dans ce cas, sociales et culturelles.

From Kiev to L'viv

It was a beautiful summer evening as the Intourist bus left the airport and took a brief excursion through the ancient capital of Rus': through the Podol, past Babij Yar onto Khreshchatyk Boulevard. The Canadians were just starting to become accustomed to seeing the uniformed Soviet soldiers, who seemed to be everywhere. Within an hour, the bus was on the highway, enroute to Zhitomyr, where the jetlagged but excited group would spend their first night.

Zhytomyr

Although the Canadians had requested a visit to Chernobyl, the site of the infamous nuclear reactor, Zhitomyr would be the closest they would get. Health risks were given as the main reason that Chernobyl would not be on the itinerary. By the time the bus parked in front of the hotel, the Canadians were getting over one of several misconceptions: the vegetation was lush and the landscape more closely resembled that of the southern United States than the prairies of Manitoba.

The hotel was part of a chain of cooperative enterprises many of whose managers, Ihor proudly remarked, were graduates of the L'viv Institute of Trade & Economy. Although the rooms didn't quite meet Holiday Inn

Women in Engineering - progress continues

Twenty years ago, 14% of Canadian engineering students were female. In 2011 that number had risen to 18%. Progress has been made, but there is still a big gender inbalance not found in other traditional faculties, (e.g., law, medicine). Why is this? A 1990s' Labour Canada study contemporary to the chosen article showed a shift downward in girls' interest in science careers around age eleven. With few female engineering role models, lacking confidence in their math abilities and little support, girls often dropped maths and sciences, eliminating options early. Thanks to WIE and other initiatives, that is less the case in 2013. However, both then and now, a finding cited for both males and females, is ignorance of the wide variety of engineering careers. Addresing this, IEEE's TISP workshops equip teachers to better promote these career options.

"So by grade six, boys and girls are making career guesses ..." (Women in Technology — Where are They?)

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Women in Technology– Where are They?

by Win M. Torchia
Department Head, Women's Programs
Red River Community College

A look at why young women are not entering technology, and some suggested initiatives to overcome this trend.

Une constatation: les jeunes femmes n'embrassent toujours pas les carrières technologiques; on propose quelques remèdes pour contrer cette tendance.

Why do we need women in technology?

The Canadian Engineering Manpower Board predicts that by the year 2000, Canada will have an estimated shortfall of at least 10,000 engineers. Despite this shortfall, enrolment of women in engineering schools remains dismally low with a national average of 14% in 1988-89. Less than 5% of all students enrolled nationally in technology programs are women.

The urgency to diversify women's participation in the labour force grows out of the rapid pace at which changes are taking place in the technological realm. These employment projections indicate a rising need for technically competent workers at every level. Unless we reverse the current trend, there will not be enough engineers to meet the challenges of the future.

Why don't young women consider careers in technology?

Well, for one thing, many young girls drop Math 300 (which includes algebra, trigonometry, differential equations and calculus) before they realize it is required for university and college programs such as computer technology, and electrical, civil and mechanical engineering. They close the door to over 100 occupations by dropping math and science 300 courses, mainly because they lack self confidence in their own abilities to do well in subjects that require mathematical manipulations. They are not encouraged by parents, teachers and guidance counsellors to stick with these courses.

A study by Labour Canada shows that the most significant shift in girls' openness to scientific/engineering occupations occurs at age eleven or twelve. So by grade six, boys and girls are making career "guesses" based on what they have learned is appropriate for them. They don't necessarily select a specific occupation at this age, but rather they eliminate some options. This happens because they have internalized the cultural/social expectations for their gender.

Cheryl Van Nest (foreground) and **Angela Rinella**, both students in the Pre-Technology for Women class, learn the engineering applications of computers. *(photo by Jim Woroniuk, RRCC)*

Occupational sex stereotyping is still prevalent among Canadian children and adolescents, because children learn at a very young age that the world is polarized to male and female. In society's eyes, young boys are expected to be active, dominant and rational which translates into being oriented towards scientific, technical and management areas and are rewarded for these characteristics. Girls, on the other hand, are typified as passive, submissive, and emotional, which translates into an orientation to naturalistic and social areas, and are also rewarded for having these characteristics.

This polarization applies to all areas of society, not just to divisions in the labour force. Young people receive the message loud and clear that if you don't fall on the correct side of the line for your gender, your sexuality and identity are in question. It's no accident, then, that the workforce is similarly polarized into "male" and "female" jobs.

Donna Stewart, M.A., reported in The Manitoba Teachers' Society Equality News (Sept. 1991), that many adolescent girls still believe in the "Cinderella Syndrome" ("happily-ever-after" theory). The facts, however, are that men ("modern princes") have a tendency to:

- die young (1 in 10 before the age of 50),
- get sick or suffer an injury on the job,
- be laid off,
- earn too little to support the family,
- often leave the family.

"Modern Cinderellas" need to understand the realities of the modern workplace:

- They will need at least two years of post-secondary education to access stable, well-paying jobs - with a future.
- Most of them will be back in the paid workforce before their children are three years of age and they will remain in the workforce 28 to 48 years.
- In "good" jobs, those with responsibility and a living wage, they will be adding to their skills and knowledge on a regular basis, so the better their

The Canadian Space Agency

A brief history.

In December 14, 1990, the Canadian Space Agency was officially established by an Act of Parliament, with the following mandate:

- to promote the peaceful use and development of space;
- to advance the knowledge of space through science; and
- to ensure that space science and technology provide social and economic benefits for Canadians.

Dr. Larkin Kerwin, former President of the National Research Council of Canada, was the first president of the newly-established Canadian Space Agency. He was succeeded in May 1992 by **Dr. Roland Doré**, former Principal and Chairman of École Polytechnique de Montréal.

Canada's experience in space began in 1962, with the launch of **Alouette I, a** research satellite. Canada was the third country in the world, after Russia and the United States, to design and build its own satellite. With the launch of **Anik A1** in 1972, Canada became the first country in the world to have its own commercial, domestic, geostationary communications satellite. In 1976, a Canada-U.S. cooperative effort led to the launch of the **Hermes** communications satellite, which subsequently served as a prototype for direct broadcast satellites.

In 1981, Canada confirmed its position as a world leader in space robotics technology with the development of the **Canadarm** or **Shuttle Remote Manipulator System (SRMS)**, which is used to deploy and retrieve satellites in space from the Space Shuttle. The ***Canadarm*** was used for the first time aboard the U.S. Space Shuttle **Columbia** in 1981. A few years later, in October 1984, Dr. Marc Garneau became the first Canadian in space when he conducted the **CANEX-1** series of experiments.

More recently, in January 22, 1992, **Dr. Roberta Bondar** became Canada's second astronaut and first Canadian woman in space when she participated in the first **International Microgravity Laboratory** mission (**IML-1**) aboard the **Spacelab** on Space Shuttle **Discovery**. A few months earlier, in September 1991, Canada had provided the **WINDII** instrument, or **Wind Imaging Interferometer**, as part of NASA's **Upper Atmosphere Research Satellite** (**UARS**) program, designed to study global ozone change.

The Canadian Space Agency brings together the larger part of the existing space activities of the federal government. It coordinates all elements of Canada's Space Program and manages major space-related activities in Canada. Its headquarters are temporarily located in Montreal, pending completion of the new headquarters under construction in St-Hubert, a suburb of Montreal. The $72.2 million complex will be set on 40.7 hectares of land in St-Hubert. With occupancy scheduled for mid-1993, it is designed to provide work areas, laboratories and other facilities for Agency personnel and visitors from institutions, companies and other partners of the Canadian Space Agency.

The Canadian Space Agency is also maintaining and upgrading the ***David Florida Laboratory*** (***DFL***) in the Ottawa area, which is dedicated to the assembly and testing of space hardware, satellites and remote sensing equipment.

MSS Canada: Robotics for the Space Station

The **Mobile Servicing System** (**MSS**) is Canada's contribution to the international Space Station *Freedom*. This next generation of the **Canadarm** is a crucial component of Space Station. Designed to play the predominant role in the assembly and maintenance of the Space Station, the **MSS** will be used to help move equipment and supplies, release and capture satellites, service instruments and other payloads attached to the Station, and support astronauts working in space. It will also be used for berthing the shuttle to the Space Station and then loading and unloading materials from its cargo bay.

The **MSS** will be a roving space robot, able to travel the full length of the Space Station on its rail-mounted base. The first elements of the **MSS** are scheduled to be flown to Space Station orbit in the mid-1990s, aboard one of the first Space Shuttle missions dedicated to the Station's assembly. The rest of the equipment will be delivered on several shuttle flights throughout the four years it will take to make Space Station permanently habitable. Space Station *Freedom*, 450 km above Earth, along with the **MSS**, will have an expected working life of thirty years.

A major component of the **MSS** will be the **Space Station Remote Manipulator System** (**SSRMS**). About the same size as **Canadarm**, but over three times as strong, it is being designed to handle loads as big as the Shuttle as it approaches to resupply the Space Station. The **SSRMS** will also be able to detach itself from its movable base and crawl hand-over-hand to different points of the Station's structure to service hard-to-reach objects. When operated by astronauts, the **MSS** will be an extension of their own senses – able to see and touch. Artificial intelligence will even give it an I.Q.

by Dr. Roland Doré, P.Eng.
President, Canadian Space Agency

This article is an overview of the Canadian Space Agency's main programs and activities. The Canadian Space Agency brings together the larger part of the existing space activities of the federal government. It coordinates all elements of Canada's Space Program and manages major space-related activities in Canada. Thus, it administers projects such as RADARSAT – *a remote sensing satellite to be launched in 1995; the Mobile Servicing System (MSS) – Canada's contribution to Space Station Freedom; the David Florida Laboratory – A spacecraft testing facility; the Astronaut Program; the Space Science and Space Technology Programs; as well as Canada's cooperation with international partners such as NASA, the European Space Agency (ESA) and other foreign space agencies.*

Le présent article constitue un aperçu des principaux programmes et activités de l'Agence spatiale canadienne. L'Agence spatiale canadienne regroupe la plupart des activités spatiales du gouvernement fédéral. L'Agence coordonne l'ensemble des éléments du Programme spatial canadien et gère les principales activités liées au secteur spatial au Canada telles que : RADARSAT – *un satellite de télédétection qui sera lancé en 1995; le Système d'entretien mobile (SEM) – la contribution du Canada à la station spatiale Freedom; le Laboratoire David Florida – une installation de mise à l'essai d'engins spatiaux; le Programme des astronautes; les Programmes des Sciences et de la Technologie spatiales; ainsi que la coopération du Canada avec ses partenaires internationaux comme la NASA, l'Agence spatiale européenne (ESA) et les autres agences spatiales étrangères.*

HYDRO-QUÉBEC POWER SYSTEM SIMULATOR

by C. Gagnon, V. K. Sood, J. Bélanger. A. Vallée, M. Toupin, P. Mercier, and M. Tétreault

Over the past 20 years, IREQ (Institut de recherches d'Hydro-Québec) has built up a strategic simulation facility for the design and commissioning of power transmission systems. This real-time simulator has been extensively used by Hydro-Québec and other utilities for the verification and optimization of real controls and protection equipment.

Au cours des 20 dernières années, l'IREQ (Insititut de recherches d'Hydro-Québec) a developpé des moyens stratégiques de simulation pour évaluer la conception et pour mettre au point avant la mise en route, les équipements de réseaux électriques. Le simulateur de réseaux de l'IREQ a été largement utilisé par Hydro-Québec elle-même et plusieurs autres sociétés de gestion de systèmes électriques pour la vérification et l'optimisation des équipements de régularisation et de protection des réseaux, assurant ainsi une meilleure sécurité et fiabilité de ces équipements.

The complexity of power transmission systems has increased dramatically over the past 20 years as a result of economic and environmental constraints. Multiterminal HVDC (High Voltage Direct Current), SVCs (Static VAR Compensator), series capacitors, FACTs (Flexible AC Transmission Systems) as well as sophisticated protection and control schemes have ever greater impact on modern power system performances. Utilities that face these problems must therefore have access to real-time simulation facilities in order to cope with any problem not recognized at the design stage, but detected at the commissioning or operating stages.

During the sixties, Hydro-Quebec made extensive use of transient network analyzers (TNAs) for the design and commissioning of the world's first 735 kV transmission system interconnecting the 5000-MW Manicouagan hydro electric plants to the main power grid. Recognizing, on the one hand, the strategic importance of such tools for the development of its power transmission system, and, on the other hand the limited capability and excessive losses of commercially available TNAs, IREQ (Institut de Recherches d'Hydro-Québec) designed and built a real-time power system simulator capable of simulating large high voltage transmission systems.

First commissioned in 1973, the IREQ simulator (cover picture) has undergone continuous upgrading and evolution over the past 20 years to keep pace with technological advances. The simulator was used extensively for the design and commissioning of Hydro-Quebec's James Bay transmission system as well as by several other utilities around the world for the simulation of their own systems.

Simulation Technology

The simulator uses well proven and reliable analog, electronic and digital technologies for the simulation of power system elements by lumped reactors, resistors and capacitors, saturable cores, etc. Its rated operating voltage of 100 V phase-to-phase and maximum short-circuit current of 5 A were selected to minimize the losses and increase the precision of EHV (extra high voltage up to 400kv) and UHV (ultra high voltage, above 735kv) system simulation.

The simulator operates in real-time at the nominal system frequency (60 Hz or 50 Hz). Real-time behavior permits the verification and optimization of real controls and protection equipment which can be connected to the simulator, much as in the field, by special interfaces and models. The performance of the controls can thus be evaluated under realistic operating conditions, including very severe but probable contingencies that are difficult and often impossible to duplicate in the field.

Another advantage of the real-time capability is the speed of test execution. The simulation of a phenomena lasting 1 second takes 1 second instead of several minutes or hours as with conventional simulation software operating in deferred (non real) time. This makes it possible to perform detailed optimization studies that may include random variation of parameters such as circuit-breaker switching instants. Rapid interaction with the user is vital in investigations of complex phenomena and controller trouble shooting. Such studies involve a "what if" type of analysis for which it is very important to minimize the simulation time, since the next test or actions depend upon the conclusions of the previous test.

The key features of the Hydro-Québec Power System Simulator are:

- Real-time simulation capability;
- Hybrid technology that includes passive and electronic analog models and also real-time digital models;
- Large numbers of low-loss analog models for the simulation of complex EHV networks;
- Large numbers of SVC and HVDC system models (Figure 1);
- Interconnection with commercial protection and control systems;
- Sophisticated software and computer system for test automation, data recording, on-line analysis, post-processing and report editing;
- Central-computer-controlled interconnection panels for control of network configuration from computer terminals;
- An integrated database for results and input data used for the real-time simulation and conventional off-line simulation software packages;
- A unique layout allowing system studies, control and protection validation tests, research projects and training sessions to be conducted simultaneously.

Passive analog components such as reactors, capacitors and resistors are used to model transmission lines, transformers (with saturation), shunt

Engineers reach out to First Nations

There has been longstanding under representation of First Nations members in the engineering profession. Currently less than 1% of engineers have First Nations heritage. Youth miss out on career opportunities and communities lack needed skills among people in their own culture. In 2010, to try to remedy this situation Engineers Canada entered a partnership with the Assembly of First Nations to promote awareness of and increase access to careers in engineering. In 1996, we profiled two programs tackling a multifaceted problem in different ways. UBC initiated and continues to offer "First Nations Professional Science Access." The focus is on providing a bridging year of personalized academic study coupled with the unique cultural support of their campus Longhouse activities. At Concordia University, a joint program was developed with the Québec Order of Engineers called "Engineering Exploration Summer Camp for Aboriginal Students." It was held annually in Montreal from 1994 until 2006 with a mission to inspire budding engineers. Experience has shown that successful programs require much more than simple academic support to bridge the cultural gaps and enable success for First Nations students in what seems to many a foreign environment.

> "We as students, are here not only to brighten the future for ourselves, but also for the whole Native community"

Education / *Éducation*

AT THE DAWN OF FIRST NATIONS ENGINEERING

Order of Engineers of Québec and Concordia University combine efforts to assist First Nations breaking into engineering

by Jorge Campos
Chief Electrical Engineer, City of Westmount

As First Nations communities struggle to improve the quality of life in the reserves, the need for science and technical oriented people increases. Native engineers will have a prominent, if not fundamental, role in the development of their communities. Yet, due to social and historical factors, an effective First Nations engineering work force is mostly a dream which is overdue to bloom into reality. Sensitive to a new spirit amongst native leaders, the Order of Engineers of Québec and Concordia University initiated serious efforts to promote native access to engineering.

À l'heure où les autochtones se démènent pour améliorer la qualité de vie dans les réserves, leurs besoins, en ce qui concerne la science et la technologie, s'accroient. Les ingénieurs autochtones auront un rôle déterminant, voire même fondamental, dans le développement de leurs communautés. Jusqu'à présent, à cause de facteurs sociaux et historiques, former un groupe de travail d'ingénieurs compétents à l'intérieur des communautés autochtones était un rêve, mais qui est en voie de devenir réalité. Sensible à ce nouvel état d'esprit parmi les leaders autochtones, l'Ordre des Ingénieurs du Québec en collaboration avec l'Université Concordia ont initié un effort sérieux afin de promouvoir l'accès à l'ingénierie pour les communautés.

The predisposition to move towards brighter horizons is nowhere so evident as in the First Nations leaders' determination to direct their youth to higher studies in science and engineering. With lawyers successfully settling more and more land claims, the need for technical people to develop the native administrated territories becomes a pressing priority. Municipal infrastructures, bridges and roads, health services, natural resources optimization and geographic management are just some of the fields requiring immediate attention.

The new commitment has not gone unnoticed. It has enjoyed substantial coverage in the Canadian press, even occasionally making front page headlines. Many universities and the provincial engineering associations did not ignore it either. Recent articles in Plan and in Engineering Dimensions, respectively the publications of the Order of Engineers of Québec (OEQ) and of the Association of Professional Engineers of Ontario, have shed light into the difficulties experienced by natives in their struggle for technical emancipation.

Faced with a promising situation which seems to linger, the OEQ and Concordia University took in late 1993 a rather bold step. They combined efforts to create the Joint Working Force on Native Access to Engineering. The OEQ counted with a strong knowledge on minority issues, accumulated from such programs as Women in Engineering. On the other hand, Concordia University has for years welcomed native students. With an estimated two hundred North American aboriginal students in a population of 25,000, the university had the concern to assure the services of some native teachers. Since 1992, it also runs a Native Student Center. The center acts as a relay for information and experience exchange, counselling and in-house tutorial clinics.

Joining the working group, the Canadian Aboriginal Science and Engineering Association (CASEA) brought a valid native perspective to the proceedings. CASEA is an association of engineers and science oriented aboriginals dedicated to leadership training, promotion and diffusion of applied science programs among native communities. It follows on the footsteps of its powerful american counterpart, the American Indian Science and Engineering Society from Boulder, Colorado.

The mandate of the OEQ-Concordia University working group is to promote the integration of First Nations students in engineering. In a more specific way, it aims at helping create the conditions which would channel native students to engineering faculties and provide the necessary support to keep them there until they finish a degree.

The hurdles are many and not easy to overcome. They start with a lack of motivation due to the absence of role models. Just a few decades ago, Indians could not go to university. They had to give up their status and leave their communities if they wanted an university education. In Québec, in 1987, only 2.2 per cent of registered Indians held university diplomas, versus a 7.1 per cent for non-natives (more recent statistics are difficult to obtain, due to non-discriminatory laws governing surveys). From those, only a handful are engineers. It is a factor that has had a devastating effect in career choices. A study made in Kahnawake, an indian community in the outskirts of Montréal, showed that roughly 70 per cent of students coming out of a native school will go to Cegep (pre-university institutions); only 10 per cent of those graduating will move on to university.

Then, there is a certain pernicious conformism. The old ways of living and thinking are deeply entrenched. The advantages of breaking way from them are not always obvious. Many times the reward at the end of the trail does not seem worth the effort. It is not uncommon that the students are discouraged by family and friends to leave their communities. Those who persist in the ideal of higher education can find themselves labelled as giving in to the white man's pressure.

Not less devastating are the difficulties students experience once they enter university. They clash with different traditions, different perspectives on life, different needs. They find the university life intimidating, the complex bureaucracy oppressing. They have to adapt to culturally alien ways of learning and interacting. Many will be studying in a second language, and the advanced technical jargon of the classroom challenges their writing and reading skills. Frustration and despair settle in. A great number will not even complete the first year.

IEEE Canadian Review - Winter / *hiver* 1995

Education / *Éducation*

UBC'S FIRST NATIONS PROFESSIONAL SCIENCES ACCESS PROGRAM

University of British Columbia works to encourage students of aboriginal descent to pursue careers in forestry, agriculture and engineering

by Paul Freedman (Associate Editor)
Centre de recherche informatique de Montréal

The University of British Columbia has recently created a new program to encourage students of aboriginal descent to pursue careers in forestry, agriculture or engineering.

L'université de la Colombie-Britannique a dernièrement mis sur pied un nouveau programme destiné à promuvoir l'accès aux carrières en foresterie, agriculture et en génie pour des étudiants autochtones.

In the Winter 1995 (no. 21) issue of the IEEE Canadian Review, Jorge Campos described an initiative sponsored by Québec's Ordre des ingénieurs and Concordia University to help make university education a reality for First Nations students.

The University of British Columbia in Vancouver has also been active in this area.The First Nations House of Learning was established in 1987 to make UBC and its resources more accessible to BC's First People, and to improve the University's ability to meet the needs of First Nations. Through various processes of consultation with First Nations communities, the House of Learning aims to provide a quality post-secondary education determined by the philosophies and values of First Nations.

The First Nations House of Learning is located in the First Nations Longhouse which is the hub of First Nations activities on campus. The Longhouse serves as a "home away from home" where students can study and learn in surroundings which reflect their heritage and culture; and provides a place where First Nations people can share their knowledge and cultures with each other, with the University community and with the larger society. The traditional Salish-style Longhouse structure includes a Great Hall, an elder's lounge, child care facilities, a Sacred Circle, a student and staff lounge, kitchen, a library/resource centre and administrative offices.

The House of Learning promotes a number of initiatives designed specifically for First Nations students. These include: First Nations Health Careers, Native Indian Teacher Education Program, First Nations Law Studies and Ts"kel Graduate Studies. The House of Learning is committed to assisting First Nations students achieve their academic goals in all areas of post-secondary study.

The following text describing a new program to encourage students of aboriginal descent to pursue careers in forestry, agriculture or engineering, is taken from an article written by Shannon Horne and Treena Derrick, two students in that program, which appeared in the Winter 1995 issue of the UBC's alumni magazine, "The Chronicle".

First Nations Professional Sciences Access (FNPSA) is a five year program for students of aboriginal descent who wish to complete a bachelor's degree in forestry, agriculture or engineering. The goals are to instill in the students the skills necessary to fulfill university entrance requirements and provide a transition into each student's chosen faculty. Not only does the program provide academic upgrading, but it also acquaints each student with First Nations culture, history and ideals. Orignally, there were twenty-five students carefully selected to take part in the FNPSA. There are now sixteen, including one who has begun studies with the Faculty of Forestry. The coordinator of FNPSA, Cliff Grant, is dedicated to ensuring the success of his students.The program is funded by the B.C. Ministry of Skills, Training and Labour, B.C. Hydro, and various other organisations concerned with the advancement of aboriginal students.

The inaugural year of the UBC Access Program began with a four-week orientation in July and August, 1995. It familiarized students with their mentors and instructors, the UBC campus, and the city of Vancouver. The instructors assessed the educational background of each student, tested the students' knowledge, and prescribed personalized programs of study for the Access year.

Two months into the Access year, students were occupied with courses such as mathematics, chemistry, biology, physics, english, computer science, and First Nations studies; these will enable them to fulfill entrance requirements for the faculty of their choice. Many students are significantly challenged by their new academic lifestyle. In the midst of this challenge, students are still enjoying the opportunity that they have been given to enrich their minds and lives. They find many occasions to reflect on what this program has come to mean to them and their goals and aspirations. According to Gerald Nyce, a future forestry student, "I find this program to be a very challenging experience. All theses courses make for a very interesting life on campus, as well as in the Longhouse." Future chemical engineer, Treena Derrick, comments, "I like that I'm getting a full dose of academics, not only in a university setting, but also in a First Nations setting. It is great to be able to learn amongst some of the future leaders in the First Nations communities."

Six months later, students began their four year bachelor's degree programs, in September 1996. Students feel assured that the preparatory year will prepare them for the rigours they will face in the coming years and are confident that they will be capable of achieving their academic goals. In the minds of many students is the awareness that they are only at the beginning of a journey. In the words of Shannon Horne, future agriculturalist, "We, as students, are here not only to brighten the future for ourselves, but also for the whole Native community."

Power /Electrotechnique

Geomagnetically induced currents: - Causes, Effect, and Mitigation

by Tom Molinski - Manitoba-Hydro

Geomagnetically induced currents (GIC's) that can flow in power systems are caused by geomagnetic storms. Geomagnetic storms are originated by solar flares from the sun. The GIC's and the corresponding harmonic currents may cause detrimental effects to power systems such as equipment damage (eg. to transformers, generators, capacitor banks), improper relay operation, and even system shut down. This article summarizes various research efforts studying the cause, effect and mitigation of GIC's in power systems.

Les orages géo-magnétiques induisent des courants dans les réseaux électriques qui peuvent perturber leur fonctionement . Non seulement peuvent-ils endommager les équipements tels que transformateurs, génératrices et bancs de condensateurs, causer un déclenchement intempestif des relais de protection, mais aussi entrainer à la limite, une panne de réseau. Cet article résume les recherches en cours sur les causes des courants géo-magnétiques, leurs effets sur les réseaux et les moyens de mitigation envisagés.

Geomagnetically induced currents (GIC's) have been known to occur in power systems for more than 50 years, and were considered harmless. However, in the last 25 years it was realized that large GIC's can flow in power systems and become problematic. Utilities susceptible to GIC do not want to rely on luck, that the geomagnetic storm will not affect them, or if it does, the loading conditions at the time will allow enough margin to ride through it. This is precisely why utilities today are studying the cause, effect and mitigation of GIC's.

It is because of the excellent co-operation of the scientific community involved in this research that we have the understanding that we have today; and it is necessary to continue this co-operation for a more thorough understanding of these immensely complex phenomena. Several institutions (Canadian Electrical Association (CEA) in Canada, and Electrical Power Research Institute (EPRI) in USA, among many others) are actively involved in this research.

The effect of GIC's on electric utilities has been the topic of research and discussion for many years. However, it was the "great storm" of March 13, 1989, causing a blackout of the entire Hydro-Quebec system, that prompted utilities to realize that a better understanding of GIC's was necessary.

CAUSE OF GIC's

Geomagnetic storms are the root cause of GIC's, which flow into the grounded neutral points of power systems. The source of geomagnetic storms is the Sun, which is 150 million kilometres (93 million miles) away from the earth. Some understanding of the physics involved will assist the reader to appreciate how difficult it is to predict geomagnetic storms and why today's predictions are only about 15-30 percent accurate. This makes it difficult for utilities to take precautionary measures (usually costly) when many alerts are false alarms. It is noteworthy that five or six utilities do take some action on this basis, typically reducing line or transformer loadings.

More frequent and more intense geomagnetic storms occur when sun spots, which are dark areas on the surface of the sun, cause large ejections of charged particles (solar flares) or coronal mass ejections from the sun's outer atmosphere (corona). Charged particles are always flowing from the sun toward the earth, creating what is called the solar wind. During solar flares, the stream of charged particles that flows towards the earth significantly adds to the existing ambient solar wind. These charged particles are mostly made up of hydrogen ions, helium ions, and electrons.

Sun spot activity and thus geomagnetic storms are cyclic, with peaks (intensity and frequency of occurrence) transpiring about every 11 years. The eleven-year cycle is thought to relate to reversal of the main magnetic (dipole) field polarity of the sun. Should a geomagnetic storm occur then there will likely be anotherone 27 days later when the solar flare is again in line with the earth (the sun makes a complete rotation on its axis every 27 days). The last peak period of geomagnetic storm activity occurred between 1989 and 1992. We are presently in a solar minimum and anticipate another peak around the year 2000. It has been observed that there is a three-year time lag from the peak sun spot activity to the peak geomagnetic storm activity. The current thinking is that certain large activities on the sun are only visible by X-ray imaging and these activities are causing geomagnetic storm peaks after the telescopically visible sun spots disappear.

There are presently two theories that rationalize the occurrence of solar flares. The first and most widely accepted is that the sun's corona, made up of a hot shroud of gases, is usually enslaved by the sun's magnetic field. At times the field weakens allowing some of these gases to escape. The second theory is that the sun's magnetic field is disrupted and actually catapults these gases outward. Both these theories suggest changes that are occurring to the sun's magnetic fields, for which the reasons are unknown at this time.

The solar wind travels towards the earth at a speed of 500-1000 kilometres (300-600 miles) per second, taking 2-3 days to reach the earth's own magnetic field, called the magnetosphere. The solar wind also has a magnetic field associated with it. It is the orientation of the solar wind's magnetic field that determines whether or not a geomagnetic storm will occur. It should be noted that the orientation of the vertical component solar wind's magnetic field can be either northward or southward. The earth's magnetic field is oriented from south to north and tends to prevent the solar wind from entering the earth's magnetosphere. However, if the magnetic field of the solar wind is oriented from north to south (opposite to the earth's magnetic field) then the field lines of the solar wind and the magnetosphere "reconnect" [1], allowing the solar wind to enter the earth's magnetosphere, giving a possibility of a geomagnetic storm.

This effect may be compared with the attraction of magnets of opposite polarity while magnets of the same polarity repel each other.

Engineers as agents of social change ?

Trends in the 21st century point to an ever-increasing rate and volume of change, with technology penetrating every aspect of life. Engineers are rarely thought of as agents of social change but they are key in developing the technologies that can change how business is conducted, the nature of social institutions and human behaviour. The proliferation of high speed internet access has revolutionized business and personal communications, changing the norms for social interaction in society. Businesses can find it costly to maintain multiple interfaces to accomodate users at different levels of technological acceptance. Witness the continuation of telephone banking alongside the more advanced computer banking. Newer technologies come along that can benefit more individuals, but older technologies do not always disappear.

"Managing the problems associated with technology adoption is critical to the economic and social well being of any society" (The Social and Economic Costs of Technology Resistance)

CONTENTS / SOMMAIRE

Education / *Éducation*

The Social and Economic Costs of Technology Resistance

by *Wayne Fisher, NCR, Waterloo, and Slawo Wesolkowski, IEEE Canada*

The increasing penetration of technology into all aspects of our lives means that the ability to adopt new technologies will be critical to the success of businesses and individuals in the 21st century. High levels of technology resistance in the society as a whole suggest that substantial numbers of people will have difficulty keeping up with the volume and rate of change. Failure to resolve these competing forces threatens to disenfranchise large numbers of people both economically and socially, and substantially increase the costs for the businesses, governments and institutions that need to introduce new technologies to stay competitive, but at the same time need to provide access to people who cannot use the new interfaces. Meeting the challenge of how to migrate individuals and groups from technology resistance to technology acceptance and, then, from one generation of technology to another will require a substantial investment in research on how to effectively introduce new technologies.

La pénétration croissante de la technologie dans tous les aspects de nos vies signifie que la capacité d'adopter de nouvelles technologies sera critique au succès des entreprises et des individus au 21ème siècle. Les niveaux élevés de la résistance de technologie dans la société dans l' ensemble suggèrent qu'un nombre important de personnes auront de la difficulté a suivre le volume et la cadence du changement. Un échec de la résolution de ces forces concurrencielles menace de disenfranchiser un grand nombre de personnes économiquement et socialement, et d'augmenter substantiellement le coût pour les entreprises, les gouvernements et les institutions qui ont besoin d'introduire ces nouvelles technologies pour rester concurrentiel, et en même temps ont besoin de fournir l'accès aux personnes qui ne peuvent pas utiliser les nouvelles interfaces. Le défi de comment aider les individus et les groupes qui sont résistant a la technologie a faire la transition a l'acceptation de la technologie et puis d'une génération de technologie a une autre exigera un investissement monétaire important pour étudier le meilleur moyen d'introduire les nouvelles technologies.

1. Introduction

One rarely discussed aspect of technology is the role engineers play as agents of economic and social change. In most cases, this is an indirect role as designers and developers of new technologies that will change our behaviour, the way we conduct business and the nature of our social institutions. However, as McLeod et al. state in their article on integrated media systems "current and future scientists and engineers need the ability to understand and synthesise solutions to problems for which they were never trained" [1].

Technology drives economic and social change. However, the success of a technology is determined by the ability of businesses, governments and individuals to adopt that technology. The rate of technology adoption is important. The impact of new technologies in areas including work, transportation, communication, health, education, merchandising and recreation is extensive and growing as technology becomes the dominant element in our on economic and social lives.

This article explores two themes: the factors influencing the rate and degree of technology adoption and the social and economic costs associated with introducing new technologies. In exploring these two themes, we will address two important questions: How is society affected by new technologies? How can we mitigate the impact of new technologies on society?

The literature on 21st century technology trends and issues [2,3] forecasts major changes in technology interfaces that will transform the way we act and interact. In particular, the widespread diffusion of multi-modal interfaces incorporating visualization (including animation, 2D and 3D representation), hearing, movement and touch will complete the transition from specialized to consumer-ready technologies. This is potentially a reoccurrence of the trends, which catapulted multimedia and the Internet to their current level of acceptance [4].

The capacity or willingness of individuals to use these new technologies will affect all segments of society. Businesses and governmental agencies are under continuous pressure to use technology regardless of whether individuals want to or are able to do so. Consequently, individuals who cannot or will not use the technologies are at risk of being left out economically and socially. Companies whose market success depends on technology adoption by individuals or other organizations may see their growth rates reduced or eliminated. Organizations whose success depends on the ability of their own staff to use technology will need to ensure that their entire staff is capable of using the latest generation of technology. Finally, the cost of maintaining multi-channel interfaces to support both the technologically capable and technologically resistant segments of the population will increase due to the need to upgrade each of the interfaces as the technology itself evolves.

However, the increasing penetration of technology into all aspects of human activity coupled with large numbers of technology resistors, suggests that problems associated with technology adoption will increase irrespective of the design of the interfaces. Managing the problems associated with technology adoption is critical to the economic and social well being of the society. Enabling society to capture the benefits of technology advances will require a shift in the way companies and institutions introduce technology, as well as the way they train and support technology users. The rapid rate of change and evolution of technologies also means that organizations will need to find ways to reduce the large number of interface channels as they strive to manage their infrastructure and support costs.

The article is arranged as follows. Section 2 reviews the technological and sociological factors affecting the ability of individuals and organizations to introduce and adopt new technology. Section 3 describes the social and economic costs of having large numbers of people who are not able to use new technologies. Section 4 identifies some of the additional factors that need to be addressed in migrating people from technology resistance to technology acceptance and from one generation of technology to the next. Section 5 concludes the article.

2. Factors Affecting Adoption Of New Technologies

Many factors impact people's ability to adopt new technologies. However, the two which stand out as major challenges to the timely adoption of new technologies by the society as a whole are high levels of technology resistance and the penetration of technology into all aspects of contemporary life.

A. High Levels Of Resistance To Technology Throughout The Society

A recent book by Weil and Rosen [5] divides technology users into

three groups based on their psychological response to new technology (see Figure 1). The three groups differ in their response to the use of new technology and the amount of support they require to adopt a new technology. Moore defines technology adopters in a very similar way from a marketing perspective [6].

Early adopters (estimated to be 10% to 15% of the population) are willing to teach themselves how to use new technologies. Members of this group will accept the frustrations of trying to make the technology work as part of the challenge and joy of working with technology. This group corresponds to the innovators and early adopters defined in marketing terms.

Hesitant users (estimated to be 50% to 60% of the population) are willing to use technology, but only if given some degree of support in learning and/or using the products and systems. This group corresponds to the early majority pragmatists and some of the late majority conservatives defined in marketing terms.

Technology resistors (estimated to be 30% to 40% of the population) are highly resistant to technology. Members of this group are not risk takers and interpret problems with technology as a reflection on their own abilities (or lack thereof). This group corresponds to the laggards defined in marketing terms. It is very difficult to migrate them to a new technology.

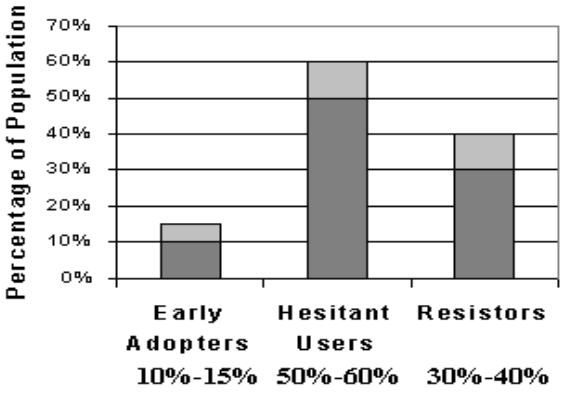

Figure 1: Categories of technology adopters [5]

Only 10% to 20% of the population, buy or adopt technology because of novelty or performance [6]. The remainder waits until the technologies are simple enough for them to use. In other words, most late adopters want convenience, ease of use and reliability and will not adopt until the technology is at this level [7]. It has taken decades for large numbers of late adopters to accept technologies such as the television, telephones, microwaves, VCRs, computers, and ATMs (Automatic Teller Machines). The short lifespan of new technologies and new interfaces does not allow us the luxury of long time periods to migrate late adopters to new generations of technology.

The implications for organizations introducing new technology are clear. Only a certain segment of the society is willing (or has the skills) to keep up with the technology change. For others, the change is forced on them. Will technology resistors ever ask for the changes? Probably not. This group will require high levels of support and maintenance to avoid non-use or misuse of the technology. Will this change over time? Again, probably not.

B. The Increasing Penetration Of Technology Into All Aspects Of Life

The rate and extent of technology introductions has reached the point where technology is penetrating all aspects of our lives. For example, teller transactions can be replaced by ABMs, computer banking, and telephone banking. Telecommunications options include telephone answering systems, cellular phones, call forward and messaging options, and the use of menu based telephone systems to screen and direct incoming calls for many businesses and governmental agencies. New wireless technologies promise to dramatically increase the number of devices, applications, and opportunities for use available to individuals.

The penetration of technology, including the requirement that individuals communicate with businesses and institutions via technology, puts people who cannot or will not use technology in a difficult position. In many cases, they need to pay additional fees (e.g. today in North America most banks charge higher fees for simple transactions processed by a teller rather than through an automatic banking machine). The continuing push towards automation as a means of reducing costs and improving competitiveness means that people will increasingly need to be technologically literate to participate in the society.

Companies face the same challenges for their own employees as they introduce new technology. While some segments of the workforce may be technologically able, even organizations that develop technology have large numbers of support workers who fall into the hesitant user and resistor categories.

3. *The High Costs Of Technology Resistance*

One of the critical issues facing society is the need to ensure that as many participants as possible can share the benefits that new technologies bring. Failure to help migrate as many people as possible to the use of new technologies will affect the well being of both individuals and society as a whole.

The social and economic costs of people not being able to use technologies are substantial. For individuals, the costs can be measured in lower incomes, fewer employment opportunities and potential social isolation. While some groups (e.g., technical professionals, people in companies that have a strong technology infrastructure, and people who are young enough to have grown up with technology) can readily adapt to newer generations of technology, other groups have more difficulty. For example, substantial numbers of people only use technology for specialized work-related functions or only use computers on an occasional basis. Older workers may have had only limited exposure to technology during their careers, much of it with older generation technology. Many people adapt to one generation of technology and find it difficult to move to another interface (hence, all the training courses offered each time a new generation of office suite software is released). Research in the area of ageing and technical adoption shows that older adults are interested in and able to adopt new technologies, but need additional support to do so [8].

The intersection of the ageing baby boomer generation, increasing rate of technology change and increasing penetration of technology into all aspects of our lives suggests that the need for additional support for older persons will grow substantially over the next 15-25 years (see Figure 2). Similar data from other industrialized countries (US, Japan, Western Europe show that up to 19% of the population will be over 65 years of age by the year 2015 [9].

Technology resistors present many serious problems for businesses and institutions. The current trend to offering multi-channel delivery systems (e.g., user choice of bank teller, ATM, telephone banking or Internet banking) is attractive because of the cost savings as human tellers are displaced by technology. However, the overheads associated with maintaining multiple channels will rise over time as the technology underlying each channel evolves and businesses have to pay the price for upgrading and maintaining each channel [10].

Companies trying to increase the penetration rate for their technology products or to move consumers from one generation of technology to the next will need to find ways to move beyond selling products to motivated and capable people if they are to overcome competition and market saturation.

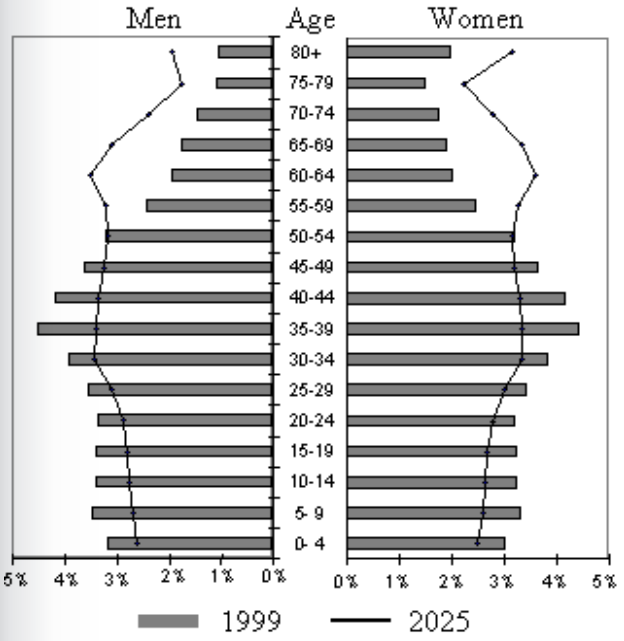

Figure 2: Canadian population distribution by age and sex, 1999 and 2025 [9].

Governments will bear the social costs of non-participants in terms of welfare and other service costs. Governments, like businesses and institutions, will have to bear the expense of introducing and maintaining multi-generational, multi-channel interfaces. Finally, all organizations need to upgrade their internal systems and train their staff. But this will be difficult for employees who are themselves hesitant users or technology resistors.

4. Meeting The Challenges Of The 21st Century

As our society approaches the 21st century, the authors anticipate that one of the key challenges that individuals, businesses, institutions and governments will face in the next century will be how to migrate technology resistors and individuals with low technology capability to being technologically capable and then from one generation of technology interface to the next. Among the factors that need to be managed are the following:

- Rapid changes in interfaces and mode of interaction: Technology is evolving from single mode interfaces to increasingly visual, multi-dimensional, multi-modal interfaces that require people to be equally competent in managing words, images, and sound [1,11].
- An ageing population: Data show that over 32% of the US population will be over 50 years of age by the year 2010, compared to today's figure of 27%. Comparable data for Japan for the year 2010 show 40% of the population will be over 50 [9].
- Cultural differences and preferences within increasingly multi-cultural societies: 1996 Canadian Census Data show that more than 10% of the population uses a language other than English or French at home [9]. Cultural differences, expectations for face to face contact, social niceties, literacy, language of communication, and cultural aesthetics, as well as previous experience with automation and technology will all affect the rate of adoption of new technology.
- The increasing complexity of technology: Technologies seem to be increasing in complexity as can be seen with new software, the increasing presence of self-service options such as kiosks, on-line banking, shopping and airline reservations.
- The need to interact with technology as a precondition to contacting other persons: Companies use technology to screen and direct people, as for example, with some voice messaging systems, and individuals have to interact with technology whether they like it or not.
- The need to migrate users to new generations of technology as a precondition to abandoning legacy systems: New technologies enable a wider range of people to share the benefits that technology brings. However, the older technologies are not disappearing [10].

5. Conclusion

The continued advancement of technology carries with it the potential to raise the standard of living and quality of life for everyone. Our challenge is to enable those people who are hesitant or resistant to make the transition from low technology environments to technology rich ones. Because many of the factors that make people hesitant or resistant are psychological, sociological or economic, making the interfaces more accessible, affordable or easy to use will not be sufficient to accomplish this goal. Future research needs to answer the questions: Do we have the capability to migrate people, particularly technology resistors, from low technology environments to the current generations of technology and beyond? How will businesses and governments pay for and manage technology resistors? The social and economic costs of not resolving the issues around who can share the benefits of technological advancements are too high to ignore.

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IEEE Canada News

At the recent IEEE Sections' Congress 1996 in Denver, two members of IEEE Canada were honored for their contributions to Region 7 activities. In the photo right, receiving their awards from Dr. Ray Findlay (Vice-President, Regional Activities Board) are Jacek Chrostowski and Ibrahim Gedeon.

Jacek received his award for "Leadership in developing new electronic ser- vices for IEEE Canada". Ibrahim received his award for "Outstanding contributions in promoting IEEE/Industry relations". We offer our congratulations to both winners.

Photo: (from left to right),]. Chrostowski, R. Findlay and I. Gedeon

Subject: Moral of the week

One day an expert in time management was speaking to a group of busi- ness students and, to drive home a point, used an illustration those students will never forget.

As he stood in front of the group of high powered overachievers he said, "Okay, time for a quiz."

Then he pulled out a one-gallon, wide-mouth Mason jar and set it on the table in front of him. He then produced about a dozen fist-sized rocks and carefully placed them, one at a time, into the jar. When the jar was filled to the top and no more rocks would fit inside, he asked, "Is this jar full?"

Everyone in the class said, "Yes."

The expert said, "Really?"

He reached under the table and pulled out a bucket of gravel. Then he dumped some gravel in and shook the jar causing pieces of gravel to work themselves down into the space between the big rocks. He asked the group once more, "Is the jar full?"

By this time the class was on to him. "Probably not," one of them answered. "Good!" he replied.

He reached under the table and brought out a bucket of sand. He started dumping the sand in the jar and it went into all of the spaces left between the rocks and the gravel. Once more he asked the question, "Is this jar full?"

"No!" the class shouted.

Once again he said, "Good."

Then he grabbed a pitcher of water and began to pour it in until the jar was filled to the brim. Then he looked at the class and asked, "What is the point of this illustration?"

One eager beaver raised his hand and said, "The point is, no matter how full your schedule is, if you try really hard you can always fit some more things in it!"

"No," the speaker replied, "that's not the point. The truth this illustra- tion teaches us is: If you don't put the big rocks in first, you'll never get them in at all."

What are the 'big rocks' in your life? Your children....Your loved ones.... Your education....Your dreams....A worthy cause... Teaching or mentor- ing others... Doing things that you love....Time for yourself.....Your health....Your significant other.

Remember to put these BIG ROCKS in first or you'll never get them in at all. If you sweat the little stuff (the gravel, the sand) then you'll fill your life with little things you worry about that don't really matter, and you'll never have the real quality time you need to spend on the big, important stuff (the big rocks). So, tonight, or in the morning, when you are reflecting on this short story, ask yourself this question: What are the 'big rocks' in my life?

Then, put those in your jar first.

Bob Mcleod
Markham, ON

Awards Presentation

Remise des prix

26th Canadian Conference on Electrical and Computer Engineering

26ième Conférence canadienne de génie électrique et informatique

May 5–8 Mai, 2013; Regina, SASK

http://www.ieee.ca/awards

IEEE Canada 2013

Awards Programme
Programme des Prix

Awards presented in reverse order/ Prix présentés en ordre inverse

IEEE Canada Achievement Awards

A.G.L. McNaughton Gold Medal for exemplary contributions to the engineering profession.

R.A. Fessenden Medal for important contributions to the field of telecommunications engineering.

Power Medal for important contributions to the field of electric power engineering.

C.C. Gotlieb (Computer) Medal for important contributions to the field of computer engineering and science.
Award established in 2007.

Outstanding Engineer Award for outstanding contributions to Electrical and Electronics Engineering.

J.M. Ham (Outstanding Engineering Educator) Medal for outstanding contributions to engineering education.
Award established in 1994.

Robert H. Tanner Industry Leadership Award for important leadership contributions in Canadian industry where there is significant activity in areas of interest to IEEE.

IEEE Canada Service Awards

W.S. Read Outstanding Service Award for outstanding and sustained service to IEEE Canada and the Institute.

J.J. Archambault Eastern Canada Merit Award for meritorious service in eastern Canada at the local IEEE Section and Area level.

M.B. Broughton Central Canada Merit Award for meritorious service in central Canada at the local IEEE Section and Area level.

E.F. Glass Western Canada Merit Award for meritorious service in western Canada at the local IEEE Section and Area level.

Prix de distinction honorifique de l'IEEE Canada

Médaille d'or A.G.L. McNaughton pour contributions exemplaires à la profession d'ingénieur.

Médaille R.A. Fessenden pour contributions importantes dans le domaine du génie des télécommunications.

Médaille en Puissance pour contributions importantes dans le domaine du génie électrique.

Médaille C.C. Gotlieb (Médaille en Informatique) pour contributions importantes en informatique.
Récompense établie en 2007.

Prix d'excellence en Ingénierie pour contributions exceptionnelles au génie électrique et électronique.

Médaille J.M. Ham (Médaille d'excellence en enseignement du génie) pour contributions exceptionnelles à l'éducation en génie.
Récompense établie en 1994.

Prix leadership industriel Robert H. Tanner pour contributions importantes au niveau du leadership dans l'industrie canadienne où il y a une activité significative dans des domaines d'intérêt de l'IEEE.

Prix pour états de services de l'IEEE Canada

Prix d'excellence de service W.S. Read pour service exceptionnel et soutenu à l'IEEE Canada et à l'institut.

Prix d'excellence J.J. Archambault de l'est du Canada pour service méritoire dans l'est du Canada au niveau des sections et zones locales de l'IEEE.

Prix d'excellence M.B. Broughton du centre du Canada pour service méritoire dans le centre du Canada au niveau des sections et zones locales de l'IEEE.

Prix d'excellence E.F. Glass de l'ouest du Canada pour service méritoire dans l'ouest du Canada au niveau des sections et zones locales de l'IEEE.

2013 IEEE Canada A.G.L. McNaughton Gold Medal

For Pioneering contributions to modeling of semiconductor devices

Jamal Deen (FIEEE) is Senior Canada Research Chair in Information Technology, Professor of ECE and Professor of Biomedical Engineering at McMaster University. He completed his Ph.D. at Case Western Reserve University where he was both a Fulbright-LASPAU Scholar and an American Vacuum Society Scholar. His doctoral work on dynamic temperature measurements and combustion optimization in rocket and jet engines was sponsored and used by NASA, Cleveland, USA.

Dr. Deen is regarded as the worldís foremost authority in modeling and noise of electronic and optoelectronic devices. He has successfully transferred powerful engineering and circuit models for high-performance semiconductor devices to several companies. His practical models and experimental innovations for reliability prediction have contributed significantly to the design and manufacture of reliable high-performance photodetectors. Dr. Deenís research record includes more than 460 peer-reviewed articles and six patents that have been used in industry. He is the author/editor of 20 books and conference proceedings, the textbook Silicon Photonics ñ Fundamentals and Devices, 16 invited book chapters, and has received 12 best paper/poster awards. Over his career, he has won more than fifty awards and honours.

Dr. Deenís peers have elected him to Fellow status in nine national academies and professional organizations, including The Royal Society of Canada (RSC), The American Physical Society and The Electrochemical Society.† His other awards and honours include the Callinan Award and the Electronics and Photonics Award from the Electrochemical Society; a Research Award from the Humboldt Foundation; the Eadie Medal from RSC; the Fessenden Medal from IEEE Canada; and two honorary doctorates from University of Waterloo, Canada and Universidad de Granada, Spain.

Médaille d'or A.G.L. McNaughton de l'IEEE Canada 2013

Pour contributions d'avant-garde à la modélisation des dispositifs à semi-conducteurs

Jamal Deen (FIEEE) est le titulaire de la chaire de recherche du Canada en technologie de l'information et est professeur de génie électrique et informatique et de génie biomédical à l'université McMaster. Il a obtenu son Ph.D à l'université Case Western Reserve où il bénéficia de la bourse Fulbright-LASPAU et de la bourse de l'*American Vacuum Society*. Son travail doctoral sur les mesures dynamiques de température et sur l'optimisation de la combustion dans les fusées et les moteurs à réaction a été financé et utilisé par la NASA.

Dr. Deen est une autorité mondiale en matière de modélisation et de bruit dans les dispositifs électroniques et optoélectroniques. Il a transféré des modèles de circuits hautes performances à semi-conducteur à plusieurs compagnies. Ses travaux ont significativement contribué à la conception et à la fabrication de photodétecteurs fiables et très performants. Dr Deen est l'auteur de plus de 460 articles de revue et détenteurs de six brevets utilisés dans l'industrie. Il est l'auteur / éditeur de 20 livres et comptes rendus de conférences, du manuel *Silicon Photonics – Fundamentals and Devices,* de 16 chapitres de livre sur invitation et a reçu 12 prix de meilleur article / affiche. Il compte à son actif plus de 50 distinctions.

Dr. Deen est Fellow dans neuf académies nationales et organisations professionnelles parmi lesquelles la société royal du Canada (SRC), l'American Physical Society et l'Electrochemical Society. Il a également obtenu le prix Callinan, le prix électronique et photonique de l'Electrochemical Society, le prix de la fondation Humboldt pour la recherche, la médaille Eadie de la SRC, la médaille Fessenden de l'IEEE Canada et deux doctorats honoraires des universités de Waterloo au Canada et de Granada en Espagne

sponsored by / commandité par IEEE Canada

2013 IEEE Canada R.A. Fessenden Medal

For contributions to electromagnetic modeling and communication devices & systems

ZhiZhang (David) Chen (FIEEE) is currently a professor and the Head of the Department of Electrical and Computer Engineering, Dalhousie University, Halifax, Nova Scotia. He received his degrees from Fuzhou University of China, Southeast University of China, and the University of Ottawa. For the past 23 years, he has been teaching undergraduate and graduate courses in RF/Microwave communication electronics and systems, antennas and electromagnetics.

Dr. Chen's research has led to profound understandings and a new branch in computational electromagnetics. Of particular note, he has developed new methods for modeling RF/microwave communication devices and components at the electromagnetic field level. The continued citation and use of his first two papers on unconditionally stable numerical techniques, published in 1999 and 2000, are prime examples of the depth of his contributions. He has also developed new signaling and processing techniques for ultra-wideband impulse radios and a new class of compact circuits and systems for wireless applications.

Dr. Chen has authored or co-authored more than 230 technical papers and industrial reports, published one book, had four patents, served on editorial and review committees, and been guest editors of special issues. He was also Chair of IEEE Canadian Atlantic Section and the founding Chair of the joint IEEE Chapter of Signal Processing and Microwave Theory and Techniques at the Section. He received the 2005 Engineering Award from Engineers Nova Scotia and teaching and research awards from Dalhousie University. He is a Fellow of IEEE and the Canadian Academy of Engineering.

2013 IEEE Canada Power Medal

For contributions to the field of power quality and power system harmonics

Wilsun Xu (FIEEE) currently holds the position of NSERC/AITF/APIC Senior Industry Research Chair in Power Quality at the University of Alberta which he joined in 1996. From 1989 to 1996, he worked in Powertech Labs and BC Hydro. He obtained his B.Eng. from Xian Jiaotong University of China in 1982, M.Sc. from the University of Saskatchewan in 1985, and Ph.D. from the University of British Columbia in 1989.

Dr. Xu's main research contributions to the field of power engineering are in the areas of power quality and voltage stability. He is one of the pioneers who investigated the dynamics of voltage collapse. One of his works revealed how slow response (and inexpensive) equipment can be used in its prevention, earning a US Electric Power Research Institute (EPRI) Innovator Award. He is known internationally for developing standards on harmonic emission control, techniques for disturbance source identification, and algorithms to predict the impact of power disturbances.

Dr. Xu is a Fellow of the Engineering Institute of Canada and IEEE. He has been a member or chair of various IEEE PES committees, including the IEEE Std. 519 Working Group, the Power Quality Subcommittee, and the Harmonics Modeling and Simulation Task Force, the latter receiving a PES Working Group Award. Dr. Xu cofounded the Alberta Power Industry Consortium in 2008 to support research, student training, professional development and industry cooperation. He also served on the Board of Electricity Sector Council, Human Resources and Skills Development Canada. Dr. Xu has published extensively in international journals and conferences. He has been granted several patents, one of which has been commercialized.

Médaille R.A. Fessenden de l'IEEE Canada 2013

Pour contributions à la modélisation électromagnétique et aux dispositifs et systèmes de communication

ZhiZhang (David) Chen (FIEEE) est professeur et chef du département de génie électrique et d'informatique de l'Université Dalhousie à Halifax, Nouvelle-Écosse. Il est diplômé de l'Université de Fuzhou et de l'Université du Sud-est à Nankin, en Chine, ainsi que de l'Université d'Ottawa, au Canada. Depuis 23 ans, il dispense les cours de systèmes et communications radiofréquences et hyperfréquences, d'antennes et d'électromagnétisme aux étudiants du premier cycle et des cycles supérieurs.

Les recherches du Dr Chen ont fait avancer les connaissances et donné naissance à une nouvelle discipline dans le domaine des simulations en électromagnétisme. Spécifiquement, il a mis au point de nouvelles méthodes de modélisation des dispositifs et composants de communications radiofréquences et hyperfréquences à l'échelle du champ électromagnétique. D'ailleurs, nombre d'articles citent ou s'inspirent de ses deux premiers articles sur les techniques numériques inconditionnellement stables publiés en 1999 et en 2000, ce qui témoigne de la valeur de sa contribution. Il a également élaboré de nouvelles techniques de signalisation et de traitement des impulsions radio à bande ultra-large ainsi qu'une nouvelle gamme de circuits et de systèmes compacts pour les applications sans fil.

Le Dr Chen, titulaire de quatre brevets, a publié, seul ou en collaboration, plus de 230 articles techniques et rapports industriels ainsi qu'un livre. Il a siégé dans des comités de rédaction et de lecture et a été le rédacteur en chef invité pour des numéros spéciaux. À cela s'ajoute la présidence de la section canadienne atlantique de l'IEEE et la fondation de la sous-section de l'IEEE consacrée au traitement numérique du signal et à la théorie des hyperfréquences, dont il a été le premier président. Il a également reçu le prix 2005 d'excellence en génie de l'Ordre des ingénieurs de la Nouvelle-Écosse et le prix pour l'enseignement et la recherche de l'Université Dalhousie. Le Dr Chen est membre agréé de l'IEEE et de l'Académie canadienne du génie.

Médaille d'électricité de l'IEEE Canada 2013

Pour contributions à la compréhension et au diagnostic des problèmes de câbles électriques

Wilsun Xu (FIEEE) est actuellement titulaire principale de la chair de recherche industrielle NSERC/AITF/APIC en qualité de puissance à l'université d'Alberta où il travaille depuis 1996. De 1989 à 1996, il a travaillé à Powertech Labs et BC Hydro. Il a obtenu son B.Eng à l'université Xian Jiaotong en chine en 1982, son M.Sc à l'université Saskatchewan en 1985, et son Ph.D à l'université de Colombie britannique en 1989.

En ingénierie de puissance, les contributions du Dr. Xu couvrent la qualité de puissance et la stabilisation de tension. Il est l'un des pionniers dans l'investigation de la dynamique des chutes de tension. L'un de ses travaux a démontré comment des équipements à grand temps de réponse peuvent servir à leur prévention, ceci lui a valu le prix d'innovation de l'Electric Power Research Institute (EPRI). Il est reconnu mondialement pour le développement des normes de contrôle des émissions d'harmoniques, pour les techniques d'identification des sources perturbatrices, et pour les algorithmes de prédiction de l'impact des perturbations de puissance.

Dr. Xu est Fellow de l'institut canadien des ingénieurs et de l'IEEE. Il a été membre ou président de divers comités IEEE PES notamment l'IEEE Std. 519 Working Group, le Power Quality Subcommittee, et l'Harmonics Modeling and Simulation Task Force. Dr. Xu a cofondé l'Alberta Power Industry Consortium en 2008 pour soutenir la recherche, les stages académiques, le développement professionnel et la coopération industrielle. Il a aussi servi au sein du comité du conseil sectoriel de l'électricité, ainsi qu'à Ressources Humaines et Développement des Compétences Canada. Dr. Xu a publié nombre d'articles dans des revues et conférences. Il détient plusieurs brevets dont l'un est commercialisé.

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2013 IEEE Canada C.C. Gotlieb Medal

For outstanding contributions to multimedia applications, computing & communications

Abdulmotaleb El Saddik (FIEEE) is currently a University Research Chair and Professor in the School of Electrical Engineering and Computer Science at the University of Ottawa, where he is also the director of the Multimedia Communications Research Laboratory (MCRLab). He received his Dipl.-Ing and Dr.-Ing. degrees from Darmstadt University of Technology, Germany.

Dr. El Saddik is an internationally-recognized scholar who has made strong contributions to the knowledge and understanding of multimedia computing, communications and applications, particularly in the digitization, communication and security of the sense of touch, or haptics, which is a new medium that is significantly changing the way in which human-to-human and human-computer interactions are performed.

Author and co-author of four books and more than 400 publications, Dr. El Saddik also acts as Associate editor of several journals and transactions, and serves on several technical program committees of numerous IEEE and ACM events. He has supervised more than 100 researchers. He is the first Canadian in Computer Science & Engineering to receive the Friedrich Wilhelm Bessel Award from the German Humboldt Foundation. Among his many honours are the 2011 Cátedra de Excelencia from Universidad Carlos III de Madrid, Spain and the 2010 IEEE Instrumentation and Measurement Society Technical Award for his outstanding contributions to multimedia computing. He received the University of Ottawa Faculty of Engineering's George S. Glinski Award for Excellence in Research (2012) and the IEEE Ottawa Educator Award (2012). He is ACM Distinguished Scientist, Fellow of the Engineering Institute of Canada, Fellow of the Canadian Academy of Engineers and Fellow of IEEE.

2013 IEEE Canada Outstanding Engineer Award

For Pioneering contributions in Biomedical Engineering

Rangaraj M. Rangayyan (FIEEE) is a Professor of Electrical and Computer Engineering at the University of Calgary since 1984, where he is also an Adjunct Professor of Surgery and Radiology. In 2003, he was recognized by appointment as "University Professor." Dr. Rangayyan received degrees from the University of Mysore in India, and the Indian Institute of Science, Bangalore.

Dr. Rangayyan has made numerous original contributions to the area of biomedical engineering, with a focus on biomedical signal and image analysis. He has developed many innovative methods of digital image processing and pattern recognition for computer-aided diagnosis of breast cancer. His works on the identification of architectural distortion in mammograms could aid in early stage detection. He has also developed several digital signal processing methods for noninvasive diagnosis of knee-joint cartilage pathology via analysis of vibration signals. He has published more than 150 papers in journals and 250 papers in conference proceedings. He is the author of two textbooks: Biomedical Signal Analysis (IEEE/ Wiley, 2002) and Biomedical Image Analysis (CRC, 2005). He has coauthored and coedited several books, including one on Color Image Processing with Biomedical Applications (SPIE, 2011).

Dr. Rangayyan has been recognized with the 1997 and 2001 Research Excellence Awards of his Department at the University of Calgary, and the 1997 Research Award of the Faculty of Engineering. He received the IEEE Third Millennium Medal in 2000, and has been elected as Fellow of the IEEE, Engineering Institute of Canada, American Institute for Medical and Biological Engineering, SPIE, Society for Imaging Informatics in Medicine, Canadian Medical and Biological Engineering Society, and Canadian Academy of Engineering.

Médaille C.C. Gotlieb de l'IEEE Canada 2013

Pour contributions remarquables aux applications, traitement et communications multimédia

Abdulmotaleb El Saddik (FIEEE) est titulaire d'une chaire de recherche, professeur de génie électrique et informatique et directeur du laboratoire de recherche en communications multimédia (MCRLab) à l'université d'Ottawa. Il a obtenu ses diplômes Dipl.-Ing et Dr.-Ing à l'université technologique de Darmstadt en Allemagne.

Dr. El Saddik a contribué significativement à la compréhension et à la connaissance des calculs multimédia sur les plans communications et applications, particulièrement dans la communication et la sécurité dans le domaine de l'haptique qui est une nouvelle approche qui modifie profondément la manière par laquelle les interactions homme-homme et homme-ordinateur sont réalisées.

Dr. El Saddik est l'auteur / co-auteur de quatre livres et de plus de 400 articles. Il est également rédacteur en chef adjoint de plusieurs revues et transactions et participe à divers comités techniques de l'IEEE et de l'ACM. Il a supervisé plus de 100 chercheurs. Il est le premier canadien à recevoir, en ingénierie et science informatique, le prix Friedrich Wilhelm Bessel de la fondation Humboldt. Parmi ses nombreuses distinctions, on trouve la Cátedra de Excelencia de l'université Carlos III de Madrid en Espagne en 2011, et en 2010 le prix IEEE Instrumentation and Measurement Society pour ses contributions exceptionnelles dans les applications multimédia. Il a reçu en 2012 le prix George S. Glinski de la faculté d'ingénierie de l'université d'Ottawa pour l'excellence en recherche et le prix IEEE Ottawa pour la qualité de ses enseignements. Il est chercheur émérite de l'ACM et est Fellow de l'Institut Canadien des ingénieurs, de l'académie canadienne du génie et d'IEEE.

Prix d'excellence en génie de l'IEEE Canada 2013

Pour contributions d'avant-garde au génie biomédical

Rangaraj M. Rangayyan (FIEEE) est professeur de génie électrique et informatique à l'université de Calgary depuis 1984. Il y est aussi professeur adjoint de chirurgie et de radiologie. En 2003, il a été reconnu comme professeur d'universités. Dr. Rangayyan est diplômé de l'université de Mysore en Inde et de l'institut indien des sciences à Bangalore.

Dr. Rangayyan a apporté des contributions originales en ingénierie biomédical spécifiquement dans l'analyse des images et des signaux. Il a développé plusieurs nouvelles méthodes de traitement d'images et de reconnaissance des formes pour le diagnostique du cancer du sein assisté par ordinateur. Ses travaux sur l'identification de la distorsion architecturale dans les mammographies peuvent aider dans les étapes préliminaires du diagnostique. Il a également développé des méthodes de traitement des signaux pour le diagnostique non invasif des pathologies du genou. Il a publié plus de 150 articles dans des revues et 250 articles de conférences. Il est l'auteur de deux manuels : Biomedical Signal Analysis (IEEE/ Wiley, 2002) et Biomedical Image Analysis (CRC, 2005). Il est co-auteur et coéditeur de plusieurs livres dont un sur le traitement d'images couleurs pour les applications biomédicales (SPIE, 2011).

Dr. Rangayyan a obtenu en 1997 et en 2001 le prix d'excellence en recherche de son département à l'université de Calgary, et en 1997 le prix de recherche de la faculté d'ingénierie. Il a reçu en 2000 la troisième médaille du millénaire IEEE et a été élu Fellow de l'IEEE, de l'institut canadien des ingénieurs, de l'institut américain d'ingénierie médical et biologique, de SPIE, de la société pour l'imagerie informatique en médecine, de la société canadienne d'ingénierie médical et biologique, et de l'académie canadienne du génie.

2013 IEEE Canada J.M. Ham Medal

For excellence in graduate supervision

Leslie Rusch (FIEEE) is currently a professor at Université Laval. She received the B.S degree with honors from the California Institute of Technology in 1980, and M.A. and Ph.D. degrees from Princeton University in 1992 and 1994, respectively, all in Electrical Engineering. Prof. Rusch is an IEEE Fellow with20 years of experience in optical communications, more than 3000 citations and 90 journal publications.

Prof. Rusch has an outstanding ability to guide graduate students and is keenly involved in their research. She creates an enriching and stimulating research environment within the Center for Optics, Photonics and Lasers at Laval, recently updated with a major Canadian Foundation for Innovation grant. Prof. Rusch is responsive to her students' requests for direction and advice, anticipating their challenges and offering guidance to increase their chances of success. She helps develop her students' abilities to explain their work and to interact with others, with papers and presentations coached to be well structured and lucid. She creates networking opportunities for her students in industry and academia, part of their preparedness that sees them readily establish careers in their area of expertise, both in Canada and abroad.

Prof. Rusch was recognized in 2012 with the U. Laval Graduate Supervision award. Her students provide regular tribute in their thesis acknowledgements, including "Not only did she inculcate me with a rigorous culture of scientific research, but also, she taught me how in practice we can combine professionalism with a liberal mind, a tolerant attitude, and a devotion to help the people who depend on us."

2013 IEEE Canada Robert H. Tanner Industry Leadership Award

For sustained leadership in the commercialization of wireless technology

James Maynard (SMIEEE) is President and CEO of Wavefront, Canada's Centre of Excellence for Wireless Commercialization and Research. Wavefront accelerates the growth and success of wireless companies in Canada by connecting them with critical resources, partners and opportunities. James is an accomplished business development strategist with a proven track record of creating innovative business practices and partnerships for the technology sector.

Prior to taking the helm of Wavefront, James was Founder of VST Canada, where he helped grow the company to be Canada's largest digital narrowcasting network, and was part of the team that closed VST's joint venture with Daktronics to form Fuelcast Media Network. Previously, he established Sapient Technologies Group, a successful business strategy consulting firm for early to mid-stage technology companies. He has also held senior level business development and marketing positions at Wang Labs and Sun Microsystems.

Recognized as a Canadian business leader, James has advised on numerous international trade and investment policy panels. In 2012, he was recruited by the Department of Foreign Affairs and International Trade (DFAIT) to advise on their new Foreign Investment Promotion Strategy, and is recognized as an Investment Champion in the program. James holds several Board positions including Director at DigiBC, and Chair of the Trade Member Council and Board Member at the Canadian Wireless Telecommunications Association (CWTA), as well as Grand NCE and AdvantageBC. James is the past Vice-Chair of the Okanagan Research Innovation Council (ORIC). James holds a Bachelor of Administration with Distinction from the University of Regina, and completed the Executive Marketing program at Queen's University Graduate Studies.

Médaille J.M. Ham de l'IEEE Canada 2013

Pour excellence en supervision d'étudiants diplômés

Leslie Rusch (FIEEE) est actuellement professeure à l'Université Laval. Elle est titulaire d'un baccalauréat en sciences avec distinction du California Institute of Technology (1980) ainsi que d'une maîtrise (1992) et d'un doctorat (1994) en génie électrique de l'Université Princeton. Membre agréée (fellow) de l'IEEE, la Pre Rusch cumule 20 ans d'expérience en communications optiques, plus de 3 000 citations et pas moins de 90 articles publiés dans des revues spécialisées.

Elle possède un don remarquable pour guider les étudiants diplômés dont elle suit de près les travaux de recherche. Elle a également su créer un environnement de recherche enrichissant et stimulant au Centre d'optique, photonique et laser de l'Université Laval qui s'est récemment vu accorder une importante subvention de la Fondation canadienne pour l'innovation. La Pre Rusch est à l'écoute de ses étudiants et sait les diriger, les conseiller et anticiper leurs difficultés pour mieux les guider sur la voie de la réussite. De plus, elle leur apprend à expliquer leurs travaux et à interagir avec leurs interlocuteurs, ainsi qu'à préparer des textes et des exposés bien structurés et clairs. Elle favorise le réseautage de ses protégés au sein de l'industrie et du milieu universitaire, tant au Canada qu'à l'étranger, ce qui constitue un atout essentiel au lancement rapide d'une nouvelle carrière dans leur domaine d'expertise.

En témoignage de son dévouement, l'Université Laval lui a d'ailleurs décerné, en 2012, le prix Encadrement aux cycles supérieurs. Il n'est pas rare que ses étudiants réservent quelques lignes de leur thèse pour lui rendre hommage, notamment en ces termes : « En plus de m'avoir inculqué la rigueur si essentielle à la recherche scientifique, elle m'a fait découvrir qu'on pouvait, dans la pratique, conjuguer professionnalisme, progressisme, tolérance et dévouement à l'égard de ceux qui comptent sur nous ».

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Prix d'excellence en leadership industriel Robert H. Tanner de l'IEEE Canada 2013

Pour leadership soutenu dans la commercialisation des technologies sans fils

James Maynard (SMIEEE) est président et chef de la direction de Wavefront, centre d'excellence en commercialisation et en recherche du secteur sans fil au Canada. L'organisme vise à accélérer la croissance et l'essor des entreprises canadiennes de ce secteur en mettant à leur disposition des ressources essentielles et en les aidant à trouver partenaires et débouchés. Ce fin stratège du développement d'entreprises a fait ses preuves en création de pratiques commerciales novatrices et de partenariats dans le domaine des technologies.

Avant de prendre la barre de Wavefront, M. Maynard, fondateur de VST Canada, devenu, grâce à sa contribution, le plus vaste réseau canadien de diffusion ciblée numérique, a fait partie de l'équipe qui a réuni les sociétés VST et Daktronics pour créer le Fuelcast Media Network. Auparavant, il avait fondé le Sapient Technologies Group, agence de services-conseils en stratégie commerciale spécialisée dans les jeunes entreprises de technologie et celles en post-démarrage. Il a aussi assumé les fonctions de cadre supérieur en expansion de l'entreprise et en marketing pour Wang Labs et Sun Microsystems.

Acteur de premier plan dans ce domaine au Canada, M. Maynard a conseillé de nombreux comités en commerce international et en politique d'investissement. En 2012, le ministère des Affaires étrangères et du Commerce international a fait appel à lui pour l'élaboration de sa nouvelle stratégie de promotion de l'investissement étranger dont il s'est fait le porte-étendard. M. Maynard siège à plusieurs conseils d'administration, notamment à titre de directeur de DigiBC, de président du Conseil des membres fournisseurs et de membre du Conseil d'administration de l'Association canadienne des télécommunications sans fil, ainsi que de Grand NCE et d'AdvantageBC. Il a déjà assumé la vice-présidence de l'Okanagan Research Innovation Council. Il est titulaire d'un baccalauréat en administration avec distinction de l'Université de Regina et d'un diplôme d'études supérieures spécialisées en marketing pour dirigeants de l'Université Queen's.

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2013 IEEE Canada W.S. Read Outstanding Service Award

For his clear vision, leadership and exemplary service to the Region 7 and IEEE

Wahab Almuhtadi (SMIEEE) is a professor and coordinator of Algonquin College/Carleton University Joint Degree Program "Bachelor of Information Technology - Photonics and Laser Technology." Dr. Almuhtadi is also the R&D Coordinator at the Faculty of Technology and Trades, Algonquin College, where he provides academic leadership in applied research, and oversees research projects in photonics, optical and wireless communications. He earned his M.Sc. (1986) and Ph.D. (1990) in Electrical Engineering from Brno University of Technology, Czech Republic.

An active volunteer since 1994, Dr. Almuhtadi has organized and chaired numerous national and international engineering conferences, symposia, and workshops. Becoming Ottawa Section PES Chapter Chair in 1996, in this role he was a driving force behind the establishment in 2001 of a series of annual Electrical Power Symposia that, with his continued strong involvement, first expanded to be an IEEE Canada East Conference in 2007, then to eventual full sponsorship by IEEE Canada as the annual IEEE EPEC. He was the Executive Conference Chair of IEEE ICC 2012, a paperless plus event that attracted more than 3,000 attendees from around the globe, with equal participation from industry and academia. Currently, he is Chair of the IEEE Canada Conference Advisory Committee. Dr. Almuhtadi served as Ottawa Section Chair 2007-2008, and was then elected IEEE Canada East Area Chair 2011-2012. He is a Member of IEEE Canadian Foundation, and Member of IEEE MGA CLE Committee.

Dr. Almuhtadi has received several recognition awards from IEEE, academia and industry (e.g. IEEE Leadership Award 2010, Algonquin College Laurent Isabelle Award 2009 for Teaching Excellence, and NISOD 2006 Award).

2013 IEEE Canada J.J. Archambault Eastern Canada Merit Award

For outstanding and longtime contributions to section and regional activities

Paul Thorburn (LSMIEEE) recently retired as a Group Leader from the National Research Council in St. John's, NL, having previously worked as an Instrumentation Systems Engineer at NRC's Institute for Ocean Technology. Prior to that, he taught at the Marine Institute of Memorial University. At the start of his career in 1970, following graduation in Electrical Engineering from the Technical University of Nova Scotia (TUNS), now the Faculty of Engineering of Dalhousie University, he joined the Electronic Design Section of the Bedford Institute of Oceanography. There Paul worked on oceanographic instrumentation, with a focus on temperature, salinity and pressure measurements. During this time he also completed a M. Eng. from TUNS. He left to become Manager of the Shoe Cove Satellite Station in St. John's, his home town.

Paul has been active with the NL Section of IEEE for many years, serving at different times as Section Chair, Treasurer, and Secretary, as well as on Committees of the Newfoundland Electrical and Computer Engineering Conference (NECEC), the Canadian Conference of Electrical and Computer Engineering (CCECE) and the IEEE International Electric Machines and Drives Conference (IEMDC). Paul was Membership Chair of the Eastern Canada Council, and in 2000 was a recipient of the IEEE Third Millennium Medal.

Outside of engineering, Paul is a member of the East Coast Trail Association and a frequent hiker on that trail. He was a Vice-President, Board member and coach in the St. John's Minor Soccer Association. Being an early-morning type, he is usually at the St. John's YMCA before 6:00 a.m., to exercise and jog, albeit rather slowly.

Prix d'excellence de service W.S. Read de l'IEEE Canada 2013

Pour sa clairvoyance, leadership, et service exemplaire à la Région 7 et à l'IEEE

Wahab Almuhtadi (SMIEEE) est professeur et coordinateur du programme d'étude commun "Baccalauréat en sciences de l'information – Technologie Laser et Photonique" entre le collège Algonquin et l'université Carleton. Il est aussi coordinateur R&D à la faculté de technologie et des métiers du collège Algonquin où il supervise des projets de recherche appliqués en photonique et en communications optiques et sans fil. Il a obtenu son M.Sc. en 1986 et son Ph.D. en 1990 en génie électrique à l'université technologique de Brno en République Tchèque.

Volontaire actif depuis 1994, le Dr. Almuhtadi a organisé et dirigé plusieurs conférences nationales et internationales, des symposiums et des ateliers. Devenu président de la section PES d'Ottawa en 1996, il a été un élément moteur pour la mise en route en 2001 d'une série annuelle de symposiums sur l'énergie électrique, ce qui deviendra, toujours sous son impulsion, une conférence IEEE du Canada de l'est en 2007, puis l'évènement annuel IEEE EPEC entièrement commandité par IEEE Canada. Il était le président exécutive de l'IEEE ICC 2012, un évènement qui a regroupé plus de 3000 personnes de part le monde, avec une égale participation des industries et des universités. Actuellement, il est le président du comité consultatif des conférences d'IEEE Canada. Dr. Almuhtadi a servi comme responsable de la section d'Ottawa entre 2007 et 2008 et a ensuite été élu responsable de l'IEEE du Canada de l'est entre 2011 et 2012. Il est membre de la fondation l'IEEE Canada, et membre du comité IEEE MGA CLE.

Dr. Almuhtadi a reçu plusieurs distinctions industrielles et académiques d'IEEE. Ce sont par exemple le prix de leadership IEEE en 2010, le prix Laurent Isabelle du collège Algonquin pour l'excellence en enseignement en 2009 et le prix NISOD 2006.

Prix d'excellence J.J. Archambault de l'est du Canada de l'IEEE Canada 2013

Pour contributions remarquables et de longue durée aux activités de section et régionales

Paul Thorburn (LSMIEEE) a récemment pris sa retraire comme responsable au conseil national de la recherché à St. John's, NL. Il a eu à travailler comme ingénieur en systèmes d'instrumentation à l'institut d'océanographie du NRC. Avant cela il a enseigné à l'Institut d'études marines de l'université Mémorial. Après l'obtention de son diplôme en génie électrique à l'université technique de Nouvelle-Écosse (UTNE actuellement faculté d'ingénierie de l'université Dalhousie), il a rejoint la section conception électronique de l'institut d'océanographie de Bedford en 1970. Là, Paul a travaillé sur l'instrumentation en océanographie, spécifiquement sur la mesure de la température de la salinité et de la pression. Durant cette période, il a achevé un M. Eng. à l'UTNE. Il devient par la suite manager à la station satellite Shoe Cove à St. John's, sa ville natale.

Paul a été actif à la section NL d'IEEE pendant plusieurs années. Il a été notamment président, trésorier et secrétaire. Il a aussi siégé au comité de la conférence du génie électrique et informatique de Terre-Neuve, au comité de la conférence canadienne du génie électrique et informatique et à celui de la conférence internationale IEEE sur les machines électriques. Paul a été le responsable d'adhésion au sein du conseil du canada oriental et récipiendaire, en 2000, de la médaille IEEE du 3ieme millénaire.

En dehors du domaine de l'ingénierie, Paul est membre de l'association de la trainée de la cote est et part fréquemment en excursion sur cette trainée. Il a été vice Président, membre du conseil et entraineur de l'association de soccer mineur de St. John's. Étant un lève-tôt, il se rend au YMCA de St. John's très tôt chaque matin pour faire du jogging, bien qu'il avance de plus en plus lentement.

sponsored by IEEE Canadian Foundation / commandité par Fondation canadienne de l'IEEE

2013 IEEE Canada M.B. Broughton Central Canada Merit Award

For inspired leadership and dedication to IEEE

David Hepburn (LSMIEEE) is a 1952 graduate of the University of Stafford (U.K.) with a Graduate Member Diploma of the IEE (now the IET). He became a member of Professional Engineers Ontario in 1958. In 1961-62, he attended a Master's level course in high voltage power systems, organized by General Electric Co and Union College, Schenectady, N.Y. His first employment was with Shawinigan Water and Power Co. In 1965, he joined Acres Consulting Ltd., as Chief Electrical Engineer on Churchill Falls in Labrador. Following that project, he embarked on a 30-year career with the organization in managing overseas projects, spanning 28 countries.

Increasingly Dave's career led him towards humanitarian applications of technology. After leaving Acres he continued to work as a consultant for the World Bank, Asian Development Bank, CIDA and CESO. He joined the IEEE Educational Outreach Program in 2005, establishing numerous relationships to promote the resources available through it. In 2006, and each year since then, he has organized an IEEE booth at the annual conference of the Science Teachers' Association of Ontario, over time arranging for lesson plan demonstrations. He has done similar work in Saskatoon and Montreal – the latter en Francais. He has presented to Niagara District Science Department heads, and judged at numerous of its Science and Engineering Fairs. As educational outreach activities within IEEE Canada have coalesced under the Teacher In-Service Program (TISP), he has enthusiastically shared his expertise in working with pre-university educators, writing three detailed lesson plans

Dave was elected a Fellow of the IEE in 1973, and a Life Member of the IEEE in 1994.

Prix d'excellence M.B. Broughton du centre du Canada de l'IEEE Canada 2013

Pour leadership inspiré et dévouement à l'IEEE

David Hepburn (LSMIEEE) a obtenu son diplôme de l'université de Stafford au Royaume Unis en 1952 et a un certificat de membre diplômé de l'IEE (actuellement IET). Il est devenu membre d'Ingénieurs Professionnels de l'Ontario en 1958. Durant l'année académique 1961-1962, il a assisté à un cours de maitrise sur les systèmes électriques haute tension qui était organisé par General Electric Co et l'Union College, Schenectady, N.Y. Il a obtenu son premier emploi à la Shawinigan Water and Power Co. En 1965, il a rejoint Acres Consulting Ltd. comme chef ingénieur électrique aux chutes Churchill à Labrador. Dans la continuité de ce projet, il s'est engagé dans 30 ans de carrière dans l'organisation de gestion des projets d'outre mer qui couvre 28 pays.

De façon croissante la carrière de Dave l'a mené à promouvoir les applications humanitaires des technologies. Après avoir quitté Acres, il a continué à travailler comme consultant à la banque mondiale, à la banque asiatique de développement, au CIDA et au CESO. Il a rejoint le programme IEEE Educational Outreach en 2005 et y a établi plusieurs partenariats. Chaque année depuis 2006, il organise une cabine IEEE à la conférence annuelle de l'association Ontarienne des enseignants de science en y faisant des démonstrations de plans de cours. Il l'a fait aussi à Saskatoon et à Montréal. Il l'a présenté aux chefs des départements de sciences du district de Niagara, et a été jury de plusieurs de ses foires de science et d'ingénierie. Après que les activités de travaux associatifs d'IEEE Canada se sont regroupées dans le Teacher In-Service Program (TISP), il a partagé, avec enthousiasme, son expertise en travaillant avec les enseignants des cycles d'études pré-universitaires et a rédigé trois plans de cours détaillés.

Dave a été élu Fellow de l'IEE en 1973, et membre à vie d'IEEE depuis 1994.

2013 IEEE Canada E.F. Glass Western Canada Merit Award

For Exceptional Service to IEEE and Humanity

Mooney Sherman (SMIEEE) is an IT professional specializing in network security, communications, and most recently, cloud computing. Educated in London, New York and Canada, her experience with cloud computing predates the coining of the phrase. She currently is an independent consultant offering expertise in IT security, compliance and privacy.

Joining IEEE in 2001, Mooney became an active volunteer in Northern Canada Section's Computers/Communications/Solid-State Circuits Chapter in 2003, serving in various positions on the executive. She was then Section Vice-Chair from 2006 to 2009 and Chair from 2009 to 2011. Mooney was one of the first to join IEEE Canada's Humanitarian Initiatives Committee at its formation in 2009, becoming its Treasurer in August 2012. Around the same time, she became active in IEEE Canada's Teacher In-Service Program (TISP), working with other Section volunteers to assist local science teachers in delivery of design-oriented lesson plans, and volunteering on weekends at Math Kangaroo workshops. She has played a pivotal role in gaining participation of TISP in Board-wide science-related teacher workshops. Mooney was part of the organizing committee for the 2011 Mississauga TISP Workshop and currently serves as TISP Canada co-secretary.

Outside of IEEE, Mooney gives back to the community through volunteer work with groups such as the Strathcona Senior Centre, where she teaches computer skills to seniors. She also holds offices in the Canadian Citizen Federation, the Centennial Montessori Society, the Northern Light Toastmasters and the Riverbend Community League. Mooney has won numerous awards, including the Jason Lang Scholarship for Academic Excellence, the Premier's Award of Excellence, and the Alberta Education Recognition Award for Best Service.

Prix d'excellence E.F. Glass de l'ouest du Canada de l'IEEE Canada 2013

Pour service exceptionnel à l'IEEE et l'humanité

Mooney Sherman (SMIEEE) est une spécialiste en sécurité réseau, en communications et tout récemment en informatique en nuage. Elle a été éduquée entre Londres, New York et le Canada. Son expérience dans l'informatique en nuage précède l'invention de cette expression. Elle est consultante indépendante dans le domaine de la sécurité informatique et du respect de la vie privée.

Mooney a rejoint IEEE en 2001 et est devenue, en 2003, volontaire active dans le chapitre Informatique/Communications/Circuits à l'état solide de la section du Canada du nord et y a servi à plusieurs postes de l'exécutif. Elle a ensuite été vice présidente de 2006 à 2009 et présidente de 2009 à 2011. Mooney a été parmi les premières à rejoindre, dès sa formation en 2009, le comité d'initiatives humanitaires d'IEEE Canada. Elle en est devenue trésorière en Août 2012. À la même période, elle est devenue membre du Teacher In-Service Program (TISP) d'IEEE Canada. Elle et d'autres volontaires assistaient des enseignants de science dans la production des plans de cours orientés conception, tout en étant volontaire aux ateliers Math Kangaroo. Elle a joué un rôle important dans la participation de TISP aux ateliers Board-wide science-related teacher. Mooney était membre du comité d'organisation de l'atelier TISP Mississauga en 2011 et est actuellement co-secrétaire de TISP Canada.

En dehors d'IEEE, Mooney offre bénévolement son temps à la communauté en travaillant avec des groupes comme le centre pour personnes âgées Strathcona où elle enseigne l'informatique. Elle est aussi active à la Fédération Citoyenne du Canada, au Centennial Montessori Society, à la Northern Light Toastmasters et à la Riverbend Community League. Mooney a remporté plusieurs distinctions, parmi lesquelles la bourse Jason Lang pour excellence académique, le premier prix d'excellence et le prix de l'Alberta pour l'éducation.

IEEE members elected as 2013 IEEE Fellows

Ramachandra Achar—Ottawa, ON
For contributions to interconnect and signal integrity analysis in high-speed designs

Kwok Kee Chan—Brampton, ON
For development of planar lens beamforming networks and broadband antennas

Louis A. Dessaint—Montreal, QC
For contributions to simulation and control of power systems and electric machines

Branislav V. Djokic—Ottawa, ON
For contributions to precision metrology in electrical power applications

Ali Emadi—Hamilton, ON
For contributions to electric power conversion and control for electric and hybrid vehicles

Aaron Fenster—London, ON
For contributions to medical Imaging and ultrasound-guided intervention

Clément Gosselin —Quebec, QC
For contributions to parallel robotic mechanisms and to underactuated robotic hands

Geoffrey Stephen Klempner—Toronto, ON
For contribution to steam turbine-driven generators

Tamas Linder—Kingston, ON
For contributions to source coding and quantization

Yan-Fei Liu—Kingston, ON
For contributions to digital control techniques of power electronics converters

Jean Mahseredjian—Montreal, QC
For contributions to computation and modeling of power systems transients

Kipling Gordon Morison—Burnaby, BC
For contributions to on-line stability assessment tools for power systems

Serge Pelissou—Varennes, QC
For contributions to characterization of extruded cables and components in their life cycle

Jon George Rokne—Calgary, AB
For contributions to computer graphics and geographic information systems

Richard C. Rose—Montreal, QC
For contributions in acoustic modeling of automatic speech and speaker recognition

Weiming Shen—London, ON
For contributions to agent-based collaboration technologies and applications

IEEE David Sarnoff Award

Sajeev John—Toronto, ON
"For the conception and development of light-trapping crystals and for leadership in elucidating their properties and applications in photonics."

IEEE Charles Proteus Steinmetz Award

Mohindar S. Sachdev—Saskatoon, SASK
"For contributions to and leadership in the development of guides, recommended practices, and standards for power system protection."

IEEE Medal in Power Engineering

Hermann W. Dommel—Vancouver, B.C.
"For pioneering contributions to the methods of analyzing electromagnetic transients and optimal power flow in electric power systems."

Membres de l'IEEE élus Fellows de l'IEEE 2013

Ramachandra Achar—Ottawa, ON
Pour contributions à l'interconnexion et à l'analyse de l'intégrité du signal dans la conception de dispositifs haut débit

Kwok Kee Chan—Brampton, ON
Pour le développement d'antennes large bande et de réseaux de lentilles plans formateurs de faisceaux

Louis A. Dessaint—Montréal, QC
Pour contributions à la simulation et au contrôle des installations et machines électriques

Branislav V. Djokic—Ottawa, ON
Pour contributions à la précision métrologique dans les systèmes électriques

Ali Emadi—Hamilton, ON
Pour contributions à la conversion de l'énergie électrique et aux mécanismes de contrôle pour véhicules hybrides et électriques

Aaron Fenster—London, ON
Pour contributions à l'imagerie médicale et aux interventions chirurgicales guidées par ultrasons

Clément Gosselin—Québec, QC
Pour contributions aux mécanismes robotiques parallèles et aux mains robotiques sous-actionnées

Geoffrey Stephen Klempner—Toronto, ON
Pour contributions aux génératrices à turbine à vapeur

Tamas Linder—Kingston, ON
Pour contributions au codage source et à la quantification

Yan-Fei Liu—Kingston, ON
Pour contributions aux techniques de contrôle numérique des convertisseurs en électronique de puissance

Jean Mahseredjian—Montréal, QC
Pour contributions au calcul et à la modélisation des coupures dans les installations électriques

Kipling Gordon Morison—Burnaby, BC
Pour contributions aux outils d'évaluation en ligne de la stabilité des installations électriques

Serge Pelissou—Varennes, QC
Pour contributions à la caractérisation des câbles extrudés et des composants dans leur cycle de vie

Jon George Rokne—Calgary, AB
Pour contributions à l'infographie et aux systèmes d'informations géographiques

Richard C. Rose—Montréal
Pour contributions à la modélisation acoustique de la reconnaissance automatique de la parole

Weiming Shen—London, ON
Pour contributions aux technologies de collaboration à base d'agents et à leurs applications

Prix IEEE David Sarnoff

Sajeev John—Toronto, ON
"Pour la conception et le développement des cristaux capteurs de lumière et pour son leadership dans la description de leurs propriétés et applications en photonique"

Prix IEEE Charles Proteus Steinmetz

Mohindar S. Sachdev—Saskatoon, SASK
"Pour contributions et leadership dans le développement de guides, de pratiques recommandées, et de normes pour la protection des installations électriques."

Médaille Ieee du Génie Électrique

Hermann W. Dommel—Vancouver, B.C.
"Pour contributions d'avant-garde aux méthodes d'analyse des coupures électromagnétiques et de flux optimal d'énergie dans les systèmes électriques."

Acknowledgements / Remerciements

Medal photos courtesy of Gary Gerovac Photography
Photos de médailles courtoisie de Gary Gerovac Photography

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Networking and IEEE

There was a day—not that long ago—when introducing oneself at a social event as a "network engineer" would have drawn a blank stare. "Networking" meant establishing new personal contacts, usually from face-to-face meeting. We lead off with a student report of how IEEE—certainly of benefit for network engineers—also facilitates very meaningful personal connections, right across the world.

A REPORT FROM BOB ALDEN AND GUY OLIVIER gives us a snapshot of the stages of growth of the IEEE Canadian Foundation, which is of such vital importance in supporting student activities.

ALEXANDRE ABECASSIS HAS REPORTED on intellectual property aspects of technology with his "Newslog" column since 2001. A "distributive" violin duet leads this item.

"IEEE not only acts as a technical exchange forum, but also as a cultural one" (Networking the World in Latin America)

CONTENTS / SOMMAIRE

Networking the World in Latin America

by Anna Zyzniewski
IEEE Student Member, Waterloo, ON

1.0 Introduction

IEEE not only acts as a technical exchange forum, but also as a cultural one, which was evidenced at a Region 9 Student Branch meeting. The Region 9 Student Branch Leaders Workshop - Reunión Regional de las Ramas 2000 or RRR2000, which took place in Mexico, gathered IEEE student branch representatives from across South America (Region 9), but also from North America and Europe.

Region 9 is one of the fastest growing regions within the IEEE with an especially significant steady inflow of student members. In 1999, there has been an increase in student membership by 15.4%. That's more than in any other region. Even though IEEE membership is growing in South America, the challenges are numerous.

Student volunteers work very hard to keep their fellow students within the IEEE organization, and try to attract new members. Two branches from Peru and Brazil respectively expressed concern that IEEE still needs to regain confidence in the region. Members view the organization as a technical magazine subscription (which are often delivered late or not delivered at all). Another branch in Guatemala needed to rebuild itself as it was "forgotten", therefore students had to regain credibility by gaining support of the dean of engineering at their university. But some student branches, such as one in Argentina, did not even have full support from the professors in the electrical engineering department. Thus, students in these regions often feel that they have to work very hard just to receive minimal attention and support locally to effectively run student branches.

2.0 Why are student congresses needed?

Student IEEE members are often unaware of the opportunities within the IEEE. One of the reasons is that crucial information does not always percolate as fast to members that are at the bottom of the organization's structure. This conference was an excellent source of information gathering and exchange.

For example, many were unaware of the scholarship opportunities that are available from the IEEE and its societies such as the Computer Society. Only a few students at the meeting were a member of an IEEE technical society, which means that the benefits of those society memberships are poorly understood. The conference also showed that students were often unaware of the opportunities that can be found within IEEE. One of the reasons is that they often do not contact IEEE representatives due to a more reserved email etiquette in their countries and to the language barrier.

IEEE not only acts as a technical exchange forum, but also as a cultural one.

Most of the discussions during the workshop were geared at strategies to attract new members to student branches. This meeting, therefore, enabled ideas to be exchanged in an interactive and informal way.

3.0 How to grow student branches?

One of the obstacles in attracting new members in South America is the language barrier since IEEE information is disseminated practically only in English. The members feel it is essential that some of the information be disseminated in their native language to attract new members, as well to keep active members within their districts [Editor's note: the IEEE is now thinking of translating certain static information such as application forms into the five United Nations languages]. One of the recent achievements in attracting new members has been the production of a video promoting the Graduates of the Last Decade (GOLD) program in Region 9 that was put together in Spanish and in Portuguese.

In one of the sessions students presented challenges and successes within their branches. Here is a list of some interesting ways that were used to attract new members:

- Make presentations and informative sessions for first year students,
- Close the gap between academia and the corporate world by inviting speakers from local companies for a company-sponsored luncheon presentation,
- Advertise the benefits of paper publishing on undergraduate level,
- Create alliances with local professional organizations, other than the IEEE,
- Run social events such as dances as a way to market the IEEE,
- Invite professors to talk about their own research, scientific interests and career paths,
- Undertake social events with student members such as a skiing trip in the winter, or hiking in the summer,
- Build a strong portfolio of past events to build a reputation to attract future student members, and
- Delegate work to existing student members and make them feel like they own the branch or society chapter.

A follow-up workshop allowed participants to brainstorm ways of improving activities within the student branches. A group brainstorming exercise was conducted by dividing participants into groups addressing different activities: membership retention, attracting new members, leadership, fund raising, communication, and new events.

4.0 So what's next?

The first meeting which attracted students from a number of regions took place in Netherlands in 1999 and had 60 participants. The student branch leadership workshop in Mexico was the second meeting to attract students from regions other than the host region. This conference showed yet again that IEEE student branches are very active. Furthermore, student members were raising vital questions to the future survival of the IEEE.

The success of this meeting was evident through the enthusiasm and participation of all students. Now, students are also planning an IEEE global student conference and feel it is a necessary next step to further remove boundaries and allow for the flow of information between all parts of the world.

The next Region 9 student workshop will take place in Brazil in November 2001 while the next Region 7 student workshop will be in Calgary in late September 2001. I strongly urge any branch leader and student members to take part in these workshops. It has been a tremendously enriching experience for myself and the other participants. Finally, I would like to acknowledge the generous support from the IEEE Foundation, which made it possible for students from various regions outside of Region 9 to participate in this gathering.

About the author

Anna Zyzniewski completed M.A.Sc. in Systems Design Engineering at the University of Waterloo in June 2001. Her experience encompasses working for engineering consulting firms in Canada and in Japan, the steel industry, and the Canadian government. From September 1999 to October 2000, she was in Japan as a visiting researcher at Kyoto University and an intern at the United Nations Environment Programme (UNEP). She has been an IEEE student member since 1999. She is currently the student member on the IEEE Women in Engineering Committee. She may be reached at anna@ieee.org.

Today in the Stock Market

Helium was up, feathers were down.
Paper was stationary.
Fluorescent tubing was dimmed in light trading.
Knives were up sharply.
Cow steered into a bull market.
Pencils lost a few points.
Hiking equipment was trailing.
Elevators rose, while escalators continued their slow decline.
Weights were up in heavy trading.
Light switches were off.
Mining equipment hit rock bottom.
Diapers remain unchanged.
Shipping lines stayed at an even keel.
The market for raisins dried up.
Cola fizzled.
Caterpillar stock inched up a bit.
Sun peaked at midday.
Balloon prices were inflated.
And batteries exploded in an attempt to recharge the market.

Lewis Vaughan
Montreal, QC

IEEE Canadian Review magazine #37; page 14

The slippery slope of shortcuts (*why we still need engineers*).

Sent in by Lewis Vaughan and colleagues.

IEEE Canadian Review magazine #47; page 3

Become A Lake

An aging Hindu master grew tired of his apprentice complaining, and so, one morning, he sent him for some salt. When the apprentice returned, the master instructed the unhappy young man to put a handful of salt in a glass of water and then to drink it.

"How does it taste?" the master asked.

"Bitter," spit the apprentice.

The master chuckled and then asked the young man to take the same handful of salt and put it in the lake. The two walked in silence to the nearby lake, and once the apprentice swirled his handful of salt in the water, the old man said, "Now drink from the lake."

As the water dripped down the young man's chin, the master asked,

"How does it taste?"

"Much fresher," remarked the apprentice.

"Do you taste the salt?" asked the master.

"No," said the young man.

At this, the master sat beside the young man who so reminded him of himself and took his hands, offering, "The pain of life is pure salt, no more, no less. The amount of pain in life remains the same, exactly the same. But the amount of bitterness we taste depends on the container we put the pain in. So when you are in pain, the only thing you can do is to enlarge your sense of things... Stop being a glass. Become a lake."

Bob McLoud
Markham, ON

IEEE Canadian Review magazine #37; page 14

Contest: Caption to photo in Canadian Review CR42

STOP!
Electrons Crossing Ahead

Sent in by: A. Mikolajewski, Toronto, ON

IEEE Canadian Review magazine #43; page 3

Are you riding a dead horse?

The tribal wisdom of the Dakota Indians, passed on from generation to generation, says that when you discover you're riding a dead horse, the best strategy is to dismount. In modern corporate and governmental America, however, a whole range of advanced modern strategies are often employed, such as:

- Buying a stronger whip,
- Changing riders,
- Threatening the horse with termination,
- Appointing a committee to study the horse,
- Sending a Congressional delegation to see how other countries ride dead horses,
- Lowering standards so that dead horses can be included,
- Reclassifying the horse as "living impaired,"
- Hiring contractors to ride the dead horse,
- Harnessing several dead horses together to increase their speed and power,
- Providing additional funding and/or training to increase a dea horse's performance,
- Doing a productivity study to see if a lighter rider would improve a dead horse's performance,
- Declaring that, as the dead horse does not have to be fed, it is less costly, carries lower overhead, and therefore contributes substantially more to the bottom line than do some other horses, particularly those classified as "not-quite-dead-yet,"
- Re-writing the minimum performance requirements for all horses,
- Promoting the dead horse to a supervisory position, and
- Repetitively re-assess the horse's performance until it rises from the dead...

Sent in by Satya P. Roy
Cedar Rapids, Il, USA

IEEE Canadian Review magazine #38; page 26

The IEEE Canadian Foundation

Going National

The foundation was created in 1992 by transforming IEEC Inc., which operated a conference in Toronto that ran from 1955 to 1987. Charitable activities started in 1972 when excess conference reserve funds were directed to support IEEE activities in Canada. In time, a pattern of primarily funding student activities at Canadian IEEE student branches emerged through a program of Grants and Scholarships.

The IEEC Inc. directors were from the Toronto area, the conference venue. This local group was augmented by adding, every second year, the retiring IEEE Canadian directors - sequentially from western, central, and eastern Canada.

The foundation is continually evolving its program of grants and scholarships, in a manner which conforms to Canadian charitable institution law, with a recipient and donor base which is quintessentially Canadian - two languages and geographically widespread.

Milestones

- 1972 - first grant to Canadian Region
- 1979 - first McNaughton Centre at the University of Manitoba - the brainchild of Ted Glass (1978-79 Director)
- 1985 - first scholarships were awarded to a University of Toronto student.
- 1989-92 - legal process to create the foundation
- 1993 - charitable (tax) status is granted
- 1994 - first solicitation of donations using membership renewal
- 1995 - first use of the web - which becomes our major communication channel and business mode
- 2001 - first cross-Canada committee (members from Vancouver, Kitchener-Waterloo, & Canadian Atlantic sections)
- 2002 - first Québec members elected
- 2003 (planned) - first use of web conferencing for annual meeting

Our 29 McNaughton Learning Resource Centres are distributed across Canada as follows; Western Canada 8, Ontario 12, Québec 6, Maritimes 3.

Communication with the fifty some student branches was initially through the IEEE Canada office. Following the office closure in 1992, the foundation started to use e-mail and progressed to web-based services as a cost effective communication medium to reach all Canadians.

We believe that the synergy of combining human and financial resources in Toronto and Montreal offers the best way be reach our goal to provide web-based services (general information, on-line and mail-in application forms, donation mechanisms, feedback and inquiries) in both languages and with the necessary sensitivity to differing cultures that characterize our Canadian sections and student branches.

Foundation Contacts:

web: http://www.ieeecanadianfoundation.org

Donation phone number: 705 743 7712

La Fondation canadienne de l'IEEE

S'étend et devient nationale

La fondation a été mise sur pied en 1992 à partir de IEEC Inc, qui organisait des conférences à Toronto de 1955 à 1987. Cependant, dès 1972, le surplus des conférences servaient à supporter les activités de l'IEEE au Canada. Les fonds ont été principalement utilisés pour soutenir le développement des branches étudiantes par le truchement de subventions et de bourses d'études.

Les directeurs de IEEC inc. provenaient de Toronto, ville ou se tenaient les conférences. Avec le temps, ce groupe a été élargi par l'addition, à tous les deux ans, des directeurs canadiens de l'IEEE qui sont habituellement choisis en rotation dans les trois conseils, (ouest, centre et est) du IEEE Canada.

Les programmes de subventions et de bourses d'études ont évolué afin de satisfaire aux lois canadiennes sur les organismes de charité et de respecter les réalités canadiennes: répartition géographique des donneurs et des récipiendaires et bilinguisme.

Historique

- 1972 - Première subvention à la région canadienne de l'IEEE.
- 1979 - premier Centre McNaughton à l'Université du Manitoba, une idée originale de Ted Glass directeur en 1978, 1979.
- 1985 - première bourse d'études accordée à un étudiant de l'Université de Toronto.
- 1989-1992 - démarches légales pour créer la fondation.
- 1993 -octroi du statut d'organisme de charité.
- 1994 - première sollicitation publique lors du renouvellement de la cotisation annuelle des membres de l'IEEE.
- 1995 - début de l'utilisation de l'Internet qui est devenu le principal canal de communication et d'opération.
- 2001 - premier comité pan-canadien avec des membres de Vancouver, Kitchener-Waterloo et des sections de l'Atlantique.
- 2002- élection des premiers membres québécois
- 2003 - assemblée annuelle via l'Internet?

Nos 29 Centres McNaughton sont répartis d'un bout à l'autre du Canada: ouest canadien: 8, Ontario: 12, Québec 6 et région Atlantique: 3.

Les communications entre les branches étudiantes se faisaient originalement au travers du secrétariat de l'IEEE. Après sa fermeture en 1992, la fondation a commencé à utiliser le courrier électronique, moyen qui, par la suite, à évoluer, vers l'utilisation des services en ligne qui rejoignent maintenant tous les membres canadiens.

Nous croyons que le temps est venu de combiner les ressources humaines et matérielles de Toronto et de Montréal afin d'atteindre les objectifs de la fondation et d'offrir des services en ligne bilingues (information générale, formulaires électroniques, mécanismes de don, demandes de renseignement et réponses) qui satisferont les particularités de diverses sections canadiennes et des branches étudiantes.

Coordonnées de la Fondation:

Internet: http://www.ieeefondationcanadienne.org

Dons par téléphone: 705 743 7712

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Bob Alden est le president de la Fondation canadienne de l'IEEE et ancien directeur et vice-président de l'IEEE.

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Guy Olivier is a member of the IEEE Canadian Foundation, the IEEE Montreal section Chair, and President of Montreal Conferences Inc.

Canadian Newslog / *Coupures de presse Canadienne*

Newslog Editor

Rédacteur des coupures de Presse

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Veuillez faire parvenir les coupures de presse proposées par e-mail à alexandre.abecassis@ieee.org

MONTRÉAL, QC, Nov. 9, 2001. For the first time, a distributive violin duet was performed in real-time over a wide area in full-screen video. The two performers, separated by several kilometers, were able to see each other using the RISQ (Quebec Scientific Information Network) network. The software was developed by Stephen Spackman from McGill University. The system does not use any signal compression.

LAVAL, QC, le 15 nov. 2001. Le centre de cardiologie de Lavalette à Montpellier (France) a choisi la compagnie québécoise Electromed Inc pour fournir une solution en imagerie médicale. Le système développé par Electromed Inc permet notamment l'acquisition de données provenant de salles d'angiographie cardiaque et périphérique ainsi que d'échographie cardiaque, l'archivage et la transmission de dossiers médicaux complets.

TORONTO, ON, AUSTIN, TX, Nov. 26, 2001. 724 Solutions which provides secure mobile Internet infrastructure software and application has been chosen as one of the top emerging companies for 2002 by US based Computerworld, Inc. The company has been chosen for its innovation as well as for its ability to develop its strategy.

LONDON, ON and ROCKVILLE, MD, Nov. 7, 2001. Celera Genomics and Compaq Canada Corp form an exclusive marketing distribution agreement. Compaq Canada will be the preferred distributor of access to the Celera Discovery System (CDS) which is Celera's proprietary bioinformatics platform to provide access to its data. Celera announced last year the first assembly of the human genome.

TORONTO, ON, Nov. 5, 2001. The Department of Computing and Information Science of Queens University announced that it is using Avaya's collaborative technology to create the first the first integrated operation room with Kingston General Hospital enabling more than 30 graduate students to use their laptop to monitor orthopedic surgeries.

MAGOG, QC, le 30 oct. 2001. La ville de Magog qui produit 10% de sa consommation électrique a signé une entente de 12 mois avec Captech Multicom inc. pour un projet de télémétrie de la consommation électrique. 100 participants de type "résidentiel" et 100 participants de type "commercial" pourront avoir accès de façon intéractive aux données concernant leur consommation électrique respective. Une alarme pourra même éventuellement être activée par les utilisateurs si des consommations excessives sont détectées.

WATERLOO, ON, Oct. 22, 2001. Research in Motion (RIM) and Informatica Corporation announced an agreement to integrate Informatica's product within the Blackberry wireless system. This agreement will enable corporate users to receive alerts through their wireless system. Furthermore, this will allow the users to receive indicators, enterprise communication details, etc. With such informations, nomadic users may be able to perform wise decisions according to critical data. The solution is provided using a secure connection.

TORONTO, ON, Sep. 25, 2001. AirIQ which was formed in 1997 as a partnership between Bell Mobility, Lenbrook Inc. and Veridian engineering announced a contract with Dunkin' Donuts for fleet management service. AirIQ solution uses Internet through wireless solution, Global Positioning System (GPS) technology and digitized mapping.

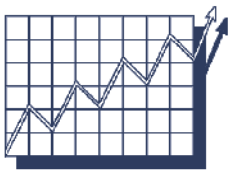
SAN DIEGO, CA, le 11 sep. 2001. Sirific, société crée par un professeur de l'Université de Waterloo (Ontario), a dévoilé une technologie permettant la conversion des radiofréquences au sein d'un seul composant électronique. L'architecture logicielle développée permet le support des standards AMPS, TDMA, EDGE, CDMA2000, GSM, GPRS et W-CDMA ainsi que les technologies Bluetooth et IEEE802.11.

LAVAL, QC, le 10 sep. 2001. L'École de Technologie Supérieure (ÉTS) a adopté les produits de Colubris Networks comme la norme de formation pour les cours de télécommunication concernant la technologie IEEE 802.11b. Colubris Networks développe des solutions d'accès sans fil sécurisées. Les routeurs offrent par exemple des accès sans fil sécurisés à d'autres réseaux, locaux ou étendus. Les produits de Colubris Networks intègrent notamment des fonctionnalités de réseau privé virtuel (VPN), de coupe-feu (Firewall).

HALIFAX, NS, Aug. 27, 2001. An home telehealth service was launched by March Networks and We Care Health Services Inc. The goal of the service is to evaluate a telehealth service involving 140 clients. The solution will enable remote nursing visits and vital sign monitoring through the deployment of interactive video, audio and data transmission over a IP network. The solution should reduce the cost of the health care system according to one of the CEO of We Care Health Services Inc.

MONTRÉAL, QC, Aug. 21, 2001. Andromed has received a Canadian patent for its electronic stethoscope. Andromed has created the first fully electronic stethoscope. The electronic stethoscope comprises filtering circuits to filter for instance low frequency rumble which originate from the patient or the practitioner movements in order to provide cardiac and the pulmonary sounds. Furthermore, this electronic stethoscope allows the practitioner to auscultate heart valve prostheses.

TORONTO, ON, le 7 nov. 2001. Telus Mobilité a réalisé une démonstration de son accès Internet haute vitesse, grâce à l'utilisation de la téléphonie de type troisième génération (3G), au congrès annuel et salon des télécommunications Communications 2001. Le réseau 3G de Telus Mobilité utilise la norme CDMA2000 et permettra des taux de transfert minimum de 144kbps. La majeure partie du réseau 3G de Telus Mobilité au Canada sera réalisée d'ici le début 2002.



L'Institut en génie de l'énergie électrique: un modèle unique de collaboration université-industrie pour la formation de la relève

by *Géza Joós, directeur général de l'Institut*
Guy Scott, Trans-Énergie, Montréal, QC
Gilles Roy, École Polytechnique de Montréal, Montréal, QC

Abstract

As a result of evolving technological and structural factors, industry will need an increasing number of electrical power engineers. The creation of the Institute is the response of one of the largest Canadian utilities to the need for training the new breed of power engineers it plans to recruit in the next 10 years. The article describes the mandate and structure of the Institute, the cooperation and involvement of universities and industry, and the proposed training.

Sommaire

L'industrie aura besoin d'un nombre croissant d'ingénieurs spécialisés en génie de l'énergie électrique, un besoin lié à de nouveaux facteurs technologiques et structurels. La création de l'Institut est la réponse d'une des plus grandes entreprises d'électricité canadienne à la formation de la nouvelle génération d'ingénieurs qu'elle compte recruter durant les 10 prochaines années. L'article décrit le mandat et la structure de l'Institut, la collaboration et l'implication des universités et de l'industrie, et la formation proposée.

1.0 Introduction

Si depuis plus de vingt ans, le nombre d'étudiants se spécialisant en électrotechnique se maintenait à un niveau faible dans la plupart des universités du Québec, tout autant que dans le reste de l'Amérique du Nord, ce nombre a diminué dernièrement suite à l'engouement pour les nouvelles technologies de l'information. En conséquence, la plupart des universités ont réduit l'importance de leurs programmes en énergie électrique. Cette attrition des programmes correspondait aussi à l'attitude de l'industrie ces dernières années: réduction des effectifs, absence presque totale de recrutement de jeunes ingénieurs, réduction du soutien à l'enseignement et à la recherche. Pourtant, l'industrie de l'énergie électrique vit de changements majeurs: sa restructuration, qui requiert de nouvelles approches technologiques et commerciales, les nouvelles technologies et les nouvelles contraintes d'opération, et les départs massifs à la retraite s'échelonnant sur les 10 prochaines années. Cette situation préoccupe aussi les principales organisations scientifiques impliquées dans l'industrie électrique, soit le Conseil International des Grands Réseaux Electriques (CIGRE), qui a mis sur pied un groupe de travail chargé d'examiner la question [1], et l'IEEE [2]. La création de l'Institut et son financement par Hydro-Québec sont une réponse directe et concrète aux problèmes de l'industrie et permettront de relancer la formation en énergie électrique à travers tout le réseau universitaire québécois. Parmi les actions envisagées, on compte sur une nouvelle formation en énergie axée sur les besoins de l'industrie, comprenant de nouveaux cours et laboratoires, des projets industriels, des stages en industrie et sur une implication concertée de l'industrie dans le programme de formation.

2.0 La situation dans les universités et le marché de l'emploi

Pendant des années, la plupart des universités du Québec ont offert des orientations en énergie électrique, discipline traditionnellement connue sous le nom d'électrotechnique, à un nombre généralement faible mais stable d'étudiants. Le domaine a longtemps été perçu comme ayant atteint sa maturité et offrant peu de défis technologiques. Les possibilités de carrière restaient limitées et peu attrayantes du fait de l'absence de recrutement important dans les grandes entreprises. Les coupures budgétaires dans les universités, au milieu des années 1990, ont forcé beaucoup d'institutions à réduire le nombre de cours offerts dans cette discipline, voire à l'abandonner complètement. De plus, l'attrait marqué des étudiants pour les domaines liés aux technologies de l'information, à savoir les télécommunications et l'informatique, a encore contribué à la réduction du nombre de candidats à la formation en énergie électrique. En conséquence, durant les deux dernières décennies, peu de ressources matérielles, en particulier au niveau des laboratoires, ont été consacrées par la plupart des universités à ce domaine, et peu de postes de professeur ont été créés. Dans certaines universités, on a même assisté à des suppressions de postes. Dans le contexte actuel, la formation en électrotechnique est en général peu justifiable financièrement pour la plupart des universités.

Pourtant, depuis deux ans, la situation au niveau de l'offre d'emploi connaît un revirement. Les entreprises produisant de l'électricité, comme Hydro-Québec, ou celles fabriquant du matériel de production et de conversion d'énergie, de même que celles offrant des services dans ce domaine, voient leur personnel et leur expertise diminuer à cause des départs à la retraite. Par ailleurs, on prévoit des investissements importants dans de nouveaux équipements de production d'électricité. À cela s'ajoutent de nouvelles structures et méthodes de fonctionnement des systèmes de production d'électricité, liées entre autres à la déréglementation des marchés. Finalement, l'électronique de puissance a pris un essor considérable, en particulier à cause des besoins des nouvelles technologies de l'information et de la commande industrielle. Les universités ont donc noté récemment une augmentation significative des offres d'emploi, qu'elles ne sont pas en mesure de combler faute de candidats. De plus, face à l'évolution de la nature des emplois en génie de l'énergie électrique, il s'avère nécessaire de repenser le contenu et la nature de la formation.

3.0 La nécessité d'une action concertée

Compte tenu des mécanismes de financement des universités et du peu d'attrait de la discipline auprès des étudiants, la relance des activités d'enseignement et de formation exigeait une action concertée. Certaines universités, dont l'Université Concordia et l'École Polytechnique, conscientes des difficultés auxquelles elles ont eu à faire face pour maintenir leurs activités en génie de l'énergie électrique, se sont donc adressées à Hydro-Québec, à l'automne 2000 pour lui proposer la création d'un institut dans ce domaine. Quatre autres universités de la Province de Québec, dont les universités McGill, Laval, de Sherbrooke, et l'École de technologie supérieure se sont jointes aux discussions avec Hydro-Québec. Ces discussions ont abouti, en automne 2001, à création de l'Institut en génie de l'énergie électrique (IGEE). L'objectif premier de cet Institut est de relancer, grâce au financement d'Hydro-Québec, la formation en génie de l'énergie électrique, en particulier au premier cycle, soit celui du diplôme d'ingénieur.

4.0 L'Institut, une solution globale à la formation

Compte tenu des besoins limités d'Hydro-Québec, soit environ 25 étudiants par an, sur les 10 à 15 prochaines années, auxquels viendraient s'ajouter environ 15 étudiants recrutés par les autres entreprises de l'industrie électrique, il a été décidé de regrouper les ressources et d'offrir un programme unique, répondant aux attentes générales de l'industrie. Étant donné que les compétences requises d'un ingénieur en génie de l'énergie électrique doivent rester de nature fondamentale, le programme de spécialisation proposé ne couvrira que la dernière année du diplôme d'ingénieur, qui en compte normalement quatre. De plus, pour cette dernière année, on cherchera à regrouper, dans la mesure du possible, les étudiants à un seul endroit, à savoir les locaux de l'Institut. On utilisera les ressources professorales des universités participantes, ainsi que, dans la mesure du possible, leurs laboratoires spécialisés. Le financement d'Hydro-Québec servira à la préparation du nouveau programme et au développement de cours et de laboratoires spécifiques. Des fonds seront consacrés à la mise sur pied d'un programme de formation continue et au développement de cours aux cycles supérieurs. Enfin, l'Institut fournira un soutien au regroupement des chercheurs et au développement d'infrastructures et de laboratoires inter-universitaires.

L'Institut, de par sa structure et son indépendance vis à vis des universités, maintiendra une grande souplesse dans son programme de formation et pourra répondre rapidement aux besoins évolutifs des industries électriques. Ayant son siège social dans des locaux mis a sa disposition par l'École Polytechnique de Montréal, l'Institut disposera de salles de cours, de laboratoires d'enseignement et de recherche, et de locaux administratifs. Toutefois, l'Institut respectera, de par sa nature et son mode de fonctionnement, les modes de fonctionnement des universités.

5.0 La formation en génie de l'énergie électrique

L'Institut a pour mission de former des spécialistes dans les principaux aspects du génie de l'énergie électrique, incluant la génération, le transport, la distribution et la conversion d'énergie. L'ingénieur devant avoir une solide formation de base en génie et en génie électrique, celle-ci sera laissée aux universités et l'Institut n'encadrera que la spécialisation. Cette formation spécialisée servira les besoins non seulement d'Hydro-Québec, mais aussi des fournisseurs de matériel et de services. Elle couvrira les questions touchant la planification et l'expansion des réseaux électriques, la production d'une énergie électrique de qualité et l'intégration des nouvelles technologies d'information et de commande. L'électronique de puissance, de plus en plus employée, sera aussi enseignée, compte tenu des besoins industriels importants. De plus, afin de permettre aux étudiants d'accéder à un marché du travail plus vaste, tant au niveau local qu'international, une partie des cours du programme seront offerts en langue anglaise.

Pour l'année académique 2002-2003, le programme encadré par l'Institut et adopté par toutes les universités participantes comprend six cours obligatoires, formant la concentration en génie de l'énergie électrique : électronique de puissance, réseaux électriques, systèmes électromécaniques, électricité industrielle, appareillage et commande industrielle. L'Institut prévoit aussi mettre sur pied des cours optionnels sur les sujets suivants : matériaux de l'électrotechnique, réglementation, normes et environnement, comportement des réseaux électriques et protection des réseaux électriques. Tous les cours sont assortis de laboratoires. L'industrie participe à la définition des contenus et dans certains cas fournit l'expertise technique. Compte tenu de la participation d'universités à l'extérieur de la région de Montréal, on envisage la possibilité de développer des cours de formation à distance.

Avec ce nouveau programme, on espère attirer en nombre suffisant les meilleurs d'étudiants. Une publicité appropriée et des mesures incitatives devraient assurer une plus grande visibilité et un plus grand attrait pour la discipline : bourses, stages, offres d'emploi, entre autres. De plus, avec le soutien d'Hydro-Québec et de l'industrie, des campagnes de recrutement seront menées pour sensibiliser les étudiants aux nombreuses possibilités de carrières offertes dans le domaine de l'énergie électrique, et pour améliorer l'image de la profession.

6.0 Le partenariat universitaire

Le programme de formation développé par l'Institut sera mis à la disposition des universités participantes, qui participeront au recrutement des étudiants. Même si ceux-ci suivent les cours de l'Institut, ils resteront inscrits dans leur université d'attache et obtiendront leur diplôme de cette université. Grâce à ses ressources et à son financement, l'Institut permettra d'offrir un programme diversifié en énergie électrique. Le corps professoral proviendra essentiellement des ressources existantes dans les universités et, dans la limite de ses moyens. L'Institut cherchera également à financer de nouveaux postes de professeur, assurant ainsi la relève du corps professoral. Enfin, les laboratoires spécialisés de ces institutions seront aussi mis à contribution.

7.0 La contribution des industries

Hydro-Québec et les industries participantes seront invités à participer à la définition des programmes d'étude et à impliquer leur personnel, comme chargés de cours et experts, dans les enseignements. On compte en particulier sur leur expertise dans le développement des aspects pratiques de la formation, à savoir les travaux dirigés et l'apprentissage en laboratoire. L'industrie sera invitée à soutenir la mise en place de ces laboratoires spécialisés. Parallèlement, elle sera invitée à offrir des bourses d'études, à encadrer des projets de fin d'études, à offrir des stages en industrie, et dans la mesure du possible proposer des emplois aux finissants.

8.0 Résumé

Grâce à la mise sur pied de l'Institut et à ses activités en génie de l'énergie électrique, Hydro-Québec et les industries participantes auront à leur disposition une main d'oeuvre qualifiée et en nombre suffisant pour satisfaire leurs besoins à court et à long termes. Le modèle proposé pour l'implication de l'industrie dans la formation offre une grande flexibilité : il permettra à l'Institut d'adapter facilement ses programmes et de s'impliquer, non seulement dans la formation de la relève, mais aussi dans la formation continue et dans la formation à distance, et ce tant au niveau du diplôme d'ingénieur et qu'au niveau des études supérieures.

9.0 Remerciements

Nous tenons à remercier l'Association de l'industrie électrique du Québec (AIEQ) pour la permission qu'elle nous a accordée de reproduire de larges extraits de l'article que nous avons publié dans le numéro 3, volume 19, janvier 2002, de la revue CHOC.

10.0 References

[1]. L'enseignement de l'ingénierie des systèmes électriques, B. Corderoy, G. Karady et T. Papazoglou. ELECTRA, no. 192, pp. 18-22, octobre 2000.

[2]. Challenges and initiatives in power engineering education, S.N. Singh, IEEE Computer Applications in Power, pp. 36-41, Volume 14, Issue 2, April 2001.

À propos de l'auteurs

Géza Joós (M'78 - SM'89) a obtenu un M.Eng. et un Ph.D. en génie électrique de l'Université McGill, Montréal, en 1974 et 1987 respectivement. Professeur à l'Université McGill depuis 2001, il est impliqué dans des travaux de recherche fondamentale et appliquée liés à l'application de l'électronique de puissance. Il est vice-président de l'Industrial Power Converter Committee de l'IEEE Industry Applications Society, participe à des groupes de travail de IEEE Power Engineering Society et est impliqué dans le développement de normes IEEE. Il est membre de l'exécutif du Comité national canadien de CIGRE.

Guy Scott a obtenu un B. Sc. A. et une M. Ing. en génie électrique de l'École Polytechnique (Université de Montréal) en 1975 et 1980 respectivement. Depuis 1975, il travaille en planification à Hydro-Québec. Il est présentement Chef Études de réseau et Critères de performance à la Direction Planification des Actifs et Affaires réglementaires de Hydro-Québec - TransÉnergie. Il est membre de l'IEEE et de l'Ordre des Ingénieurs du Québec.

Hommage à Jean-Jacques Archambault

Le 23 décembre dernier, le Québec perdait l'un de ses plus brillants inventeurs. Il s'agit de monsieur Jean-Jacques Archambault, ingénieur retraité d'Hydro-Québec et inventeur de la ligne à 735 kV. Au début des années 60, cette invention constituait une première mondiale qui valut à l'entreprise la reconnaissance de tous les spécialistes du domaine de l'électricité. Au début de l'année 2001, l'Ordre des technologues professionnels du Québec nommait l'introduction de la technologie de transport à 735 kV la technologie québécoise du XXe siècle.

Afin de manifester concrètement son engagement à l'égard des étudiants du programme de l'Institut, Hydro-Québec vient de décerner en mars 2002 sept bourses Jean-Jacques-Archambault d'un montant de 5 000 $ chacune aux diplômés de la promotion 2001-2002. Les bourses ont été nommées en mémoire de cet ingénieur passionné de recherche qui devrait leur servir de modèle. L'entreprise espère pouvoir attribuer 15 bourses par année aux étudiants des promotions à venir.

Renewable Energy - ways to make it work

In 2003 interest in developing renewable energy sources ran high. The International Energy Agency had predicted a 2.7% per annum increase in hydropower usage over the period of 1997-2020. Renewables were expected to be the fastest growing energy source with a predicted annual growth rate of 2.8% in the OECD countries. (International Energy Agency, World Energy Outlook 2000) In keeping with this heightened interest included are two related articles: applications for photovoltaic cells and the production of hydroelectric hydrogen.

WHEN DISASTER STRIKES, engineering skills are often needed to restore essential community infrastructure. Recognizing this need RedR Canada (Registered Engineers for Disaster Relief) was formed in 2001. Their mandate is to provide engineering expertise to front line humanitarian relief agencies.

"Projected world primary energy demand will increase by 57% between 1997 and 2020" (World Energy Outlook 2000)

CONTENTS / SOMMAIRE

Industry / *Industrielle*

Powering the Future with Photovoltaics

by *Anton Driesse*
Queens University, Kingston, ON

Abstract

Photovoltaic cells convert energy from sunlight directly into electricity without moving parts or chemical reactions. The technology of photovoltaic cells and of the components that make up photovoltaic systems continues to evolve and mature, but it is already the technology of choice to provide electricity in many situations. This article provides an introduction to photovoltaics and an overview of the different system components and configurations with reference to applications in which they are used. The article also describes recent developments from the research side, and identifies some starting points for further reading on this subject.

Sommaire

Les cellules photovoltaïques transforment l'énergie solaire en électricité sans moyens mécaniques ou processus chimiques. Cette technologie évolue sans cesse, tout comme celles des autres composantes qui constituent les systèmes photovoltaïques, mais elle est déjà une option privilégiée pour assurer l'approvisionnement en électricité dans de nombreuses situations. Cet article se veut une introduction aux systèmes photovoltaïques : il a pour but d'expliquer leur fonctionnement et de donner un aperçu de leurs différentes composantes, configurations et applications. Des développements récents dans ce domaine de recherche sont également présentés, ainsi que quelques références pour approfondir le sujet.

1.0 Introduction

Photovoltaic cells perform an impressive feat: they transform radiant energy from the most abundant, least expensive and widely available source - the sun - into one of the most versatile energy forms known - electricity. The cells accomplish this without moving parts or chemical reactions; their operation causes no noise or environmental pollution. With such attributes, could they be the solution to the world's energy problems? Despite impressions given by the global petroleum trade and continental electrical grid operators, many energy needs can in fact be met using alternate technologies such as photovoltaics. What's more, the alternate technologies can be better overall solutions.

In the 50 years since researchers at the Bell Labs in New Jersey created the first practical cells, photovoltaic (PV) systems have become the technology of choice for an increasing range of applications - from outer space to pocket calculators, to weekend cottages. Technological advances, declining system costs and rising prices for conventional energy make PV systems ever more viable as a solution to an ever wider range of energy needs.

PV systems are also being used successfully as distributed electrical generation sources feeding into the electrical grid (as opposed to constituting an alternative, such as grid-independent power). Such grid-connected systems can be integrated into building designs to provide secondary benefits such as shading and can also offset other building material costs (Figure 1). Specialized products are already on the market to facilitate integration of PV into various types of roofs, such as shingles or tiles, feasible on a mass-market scale.

Identifying appropriate applications for PV systems is both a business opportunity and engineering challenge, as it requires an understanding of a variety of topics. The challenge is well worth accepting, since a successful PV installation is a win-win-win for suppliers, consumers and our natural environment alike.

Figure 1: A 20 kW grid-connected, building-integrated PV system at Queen's University provides summer shading and year-round electricity. (Photo: Anton Driesse)

2.0 The Solar Resource

Although sunshine is widely perceived to be variable and difficult to predict, the sun in fact provides the earth with a nearly constant influx of energy. In specific locations this influx is modulated by atmospheric or climatic conditions and of course, the rotation of the earth. At first this variability appears to make the sun a very unreliable source of energy, but is this really so?

The motion of the earth around the sun is very predictable. Sunrise and sunset times can be calculated with high precision and the exact path of the sun in the sky as seen from any position on earth can be determined for any relevant future date. Both daily and seasonal variations are well understood and reliable.

Atmospheric conditions are more difficult to predict, but in this case the accuracy of the predictions depends on how far into the future they are made, and what period of time the prediction represents. For example, it may be possible to achieve a very high accuracy for predictions that are merely one hour in the future; or for predictions several years into the future that represent monthly averages. In fact, long-term monitoring has shown that such averages show only small variation from year to year and can therefore be quite reliably predicted.

The key to using the sun's energy is to understand its variability, and to understand how this variability relates to the energy needs of the application. These may correlate positively, such as in the case of a pump to provide drinking water; or negatively, such as in the case of street lights. When the correlation is less than perfect a PV system requires either a supplementary source of generation (making it a hybrid system) or some form of energy storage. A mechanical tracking system can also be used to keep solar cells facing the sun throughout the day and year, thereby modifying the energy supply profile as well as increasing the capacity factor (Figure 2).

Industry /*Industrielle*

Integrated Stand-alone Renewable Energy System Based On Energy Storage In The Form Of Hydrogen

by *Kodjo Agbossou, Mohan Kolhe, Jean Hamelin, Tapan K. Bose*
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Abstract

Electrolytic hydrogen offers a promising alternative for long-term energy storage of renewable energies (RE). A stand-alone RE system based on hydrogen production has been developed at the Hydrogen Research Institute and successfully tested for automatic operation with designed control devices. The system is composed of a wind turbine, a photovoltaic array, an electrolyser, batteries for buffer energy storage, hydrogen and oxygen storage tanks, a fuel cell, AC and DC loads, power conditioning devices and different sensors. The long-term excess energy with respect to load demand has been sent to the electrolyser for hydrogen production and then the fuel cell has utilised this stored hydrogen to produce electricity when there were insufficient wind and solar energies with respect to load requirements. The RE system components have substantially different voltage-current characteristics and they are integrated on the DC bus through power conditioning devices for autonomous operation by using the developed control system. The experimental results clearly indicate that a stand-alone RE system based on hydrogen production is quite safe and reliable.

Sommaire

L'hydrogène électrolytique offre une alternative prometteuse pour le stockage à long terme des énergies renouvelables (ER). Un système à ER autonome basé sur la production d'hydrogène a été développé et testé avec succès, à l'Institut de Recherche sur l'Hydrogène. Le système est composé d'une éolienne, de panneaux solaires, de batteries comme mode de stockage énergétique tampon, de charges CC et CA, d'un électrolyseur, de réservoirs d'hydrogène et d'oxygène pour le stockage, d'une pile à combustible, d'un module de contrôle, d'appareils d'interface de puissance et de plusieurs capteurs. L'excès d'énergie à long terme, par rapport aux besoins de la charge, est dirigé vers l'électrolyseur pour la convertir sous forme d'hydrogène stocké sous pression. Cet hydrogène est ensuite utilisé pour alimenter la pile à combustible afin de produire de l'électricité lorsque les énergies éoliennes et solaires sont insuffisantes pour satisfaire les besoins de la charge. Les composantes du système à ER ont des caractéristiques tension-courant substantiellement différentes et elles sont intégrées au bus CC via des interfaces de puissance, pour une opération autonome en utilisant le système de contrôle développé. Les résultats expérimentaux indiquent clairement qu'un système à ER autonome basé sur la production d'hydrogène est sécuritaire et fiable.

1.0 Introduction

Energy storage can play an important role in the development and operation of an environment friendly renewable energy (RE) system. The integrated wind and solar energy system, based on long-term seasonal storage as electrolytic hydrogen (H_2), is considered a promising alternative to overcome the intermittence of the RE sources [1-2]. In comparison to commonly used battery storage, H_2 is well suited for seasonal storage applications, because of its inherent high mass energy density. A typical self-sufficient RE system must include both short-term and long-term energy storage. A battery bank is used for short-term energy storage due to its high charging-discharging efficiency, and also to take care of the effects caused by instantaneous load ripples / spikes, electrolyser transients, wind energy peaks. However, batteries alone are not appropriate for long-term storage because of their low energy density, self-discharge and leakage. The combination of a battery bank with long-term energy storage in the form of H_2 can significantly improve the performance of stand-alone RE systems. In such a RE system, electricity production in excess of demand is converted to H_2, using an electrolyser; electricity requirement in excess of production is met by converting H_2 to electricity through a fuel cell. The intent is to demonstrate that H_2 is a practical energy storage medium for RE and that it is safe and reliable.

The overall RE system performance is very sensitive to local weather conditions, and to achieve an adequate performance from such a system requires appropriate components and well-designed control system [3-5]. The control system for proper energy management in a stand-alone RE plant was a real challenge. We have designed and developed a control system with power conditioning devices to integrate the different components of the RE system and to manage the energy flow in the system to assure continuous supply of the load demand. The system parameters are monitored continuously for real time operation and control. The system operation has been tested for autonomous operation and technical feasibility of the stand-alone RE system based on hydrogen production. Our integrated RE system has been in operation for the last 2 years.

2.0 System Description

The stand-alone RE system based on hydrogen production has been tested successfully at the Hydrogen Research Institute (HRI). The system consists of a 10 kW wind turbine generator (WTG) and a 1 kW (peak) solar photo voltaic (PV) array as primary energy sources. The excess energy with respect to load demand has been stored as electrolytic hydrogen through a 5 kW electrolyser and utilized to produce electricity as per energy demand through a 5 kW fuel cell system. The RE system components have substantially different voltage-current characteristics and are integrated through the developed power conditioning devices on a 48V DC bus, which allows power to be managed between input power, energy storage and load. The DC-DC buck and boost converters are connected for power conditioning between the electrolyser and the DC bus, and between the fuel cell and the DC bus, respectively. The schematic of the RE system is shown in Figure 1 and the system components' specifications are given in Table 1.

Current from the DC bus bar keeps batteries (short-term energy storage) charged, feeds power to the load bank via an inverter and also supplies power to electrolyser via power-conditioning device. To simulate any type of electrical load profile, we have used DC and AC programmable loads. Our developed RE system has also a programmable power source at DC bus and can be used to test the system, when there is no power available from wind and solar energy system. The programmable power source can simulate any type of intermittent power output. The electrolyser and the fuel cell are major components of the RE system. We have also studied the polarization characteristics of them, which depend mainly on voltage, current and temperature. The different sensors are used to record real time voltages and currents of WTG, PV array, DC bus / battery, electrolyser, fuel cell, load, H_2 detectors, electrolytic H_2 flow rate from the electrolyser, H_2 consumption rate in the fuel cell, oxidant consumption rate in the fuel cell, H2 and oxidant pressure in the fuel cell, fuel cell stack temperature, electrolyzer cell temperature, DC-DC converter (boost and buck) duty ratio. There are also some sensors in the electrolyzer and the fuel cell system that provide the secondary information.

3.0 RE System Operation and Control

A control system is required for efficient energy management and autonomous operation of the RE plant. The control system is a challenge because the sensor data is required for continuous real time operation and the same control algorithm is needed to send signals to

RedR - Registered Engineers for Disaster Relief

Established in London in 1979, RedR is now an international organization working to save lives and reduce suffering around the world from offices in the U.K., Australia, New Zealand, Canada and India. Members provide engineering expertise and technical, logistical and management support to front-line humanitarian relief agencies like the Red Cross, CARE, Oxfam and Save the Children.

Every year, millions of people at home and around the world suffer the devastating impact of natural and man-made disasters. Humanitarian agencies and governments respond with financial aid, and shipments of food, clothing and medical supplies.

At RedR, members complement the front-line relief groups by providing technical assistance vital to restoring the everyday lives of the affected communities by:

- Rebuilding roads and bridges,
- Re-establishing fresh water supplies,
- Managing waste,
- Restoring communications,
- Protecting the environment, and
- Managing financial, material and human resources

1.0 RedR Canada

In January 2001, the Association of Consulting Engineers of Canada (ACEC) signed a memorandum of understanding with RedR International, paving the way to the establishment of a RedR office in Canada. RedR Canada was incorporated as a federal charitable society in August 2001 when three other leading engineering organizations joined the ACEC as Founding Partners:

1. The Canadian Council of Professional Engineers (CCPE), representing the 160,000 professional engineers licensed to practice engineering in Canada;
2. The Engineering Institute of Canada (EIC), representing the engineering technical societies;
3. The Canadian Academy of Engineering (CAE), which honours individuals who have had eminent careers in engineering.

2.0 Update on Activities

RedR Canada has completed its first year of operations with very encouraging results. The Board of Directors finalised and adopted a governance model along professional lines, a start-up strategy was elaborated, membership recruiting and accreditation processes were set-up, 36 members were successfully registered, a member training plan was developed and initiated, and field placements were orchestrated.

On September 1, 2003, a grand ceremony was organised in Ottawa in honour of the humanitarian work performed by Her Royal Highness the Princess Royal (Princess Anne). Firstly, Princess Anne addressed the second annual general meeting of RedR Canada held at the Fairmont Château Laurier hotel noting that she agreed to come to the RedR annual meeting because she believes the organization has an enormous potential to make a difference. And she urged different aid delivery groups to work together to find ways of delivering assistance efficiently. Having money is not enough, she said; there must be co-ordination, understanding and efficient use of the expertise available. The party then travelled to Rideau Falls Park, where HRH laid a wreath of flowers on the monument to honour Canadian humanitarian aid workers following prayers led by representatives from seven of Ottawa's religious faiths. A group of about 150 was in attendance, including families of aid workers who lost their lives in the performance of their duties.

Later that night, at the Chateau Laurier, Princess Anne received the first RedR Canada Award for Meritorious Service in Humanitarian Aid, which was presented by the then Minister for International Cooperation, the Honourable Susan Whelan.

by *Kirk Thompson*
Executive Director of RedR Canada, Ottawa, ON

3.0 Membership

RedR Canada now has 36 members on the 2000 strong global Register and has created a new class of membership, reflecting the requirements of many of its clients: the Member-in-Training. Like the successful Engineer-in-Training program of the provincial engineering governing bodies, RedR's MIT program brings in younger and less experienced engineers to acquire experience, whereby they can become full members. With regards to membership, the goal is to recruit at least 14 more members by the end of the year.

4.0 Placements

Of the Canadian membership, four of them are presently on assignment overseas as a result of their own efforts. RedR Canada was instrumental in placing a New Zealand engineer with an American non-government organization (NGO) operating in Iraq. All Canadian members are well-qualified and the aim is to place as many of them as possible with RedR clients - the NGOs who operate on the front lines of disaster relief. But the office lacks the resources at present to do this in any meaningful way and we therefore hope to engage the efforts of volunteers to seek out placement opportunities.

5.0 Training

RedR's Canadian Training Program was initiated with a 2-week training program in Kingston that certified 8 Canadians as RedR Trainers and 21 Canadian participants which took an Essentials of Humanitarian Practice course. The idea of this first training period was to develop a pool of Canadian trainers able to present training packages in Canada and the rest of N. America as demands require, and to present the first RedR Canada training course. The course was led by a UK training team and produced a very successful event. All participants expressed that the course had been very good and all had fully participated.

In the near future, RedR Canada plans to establish and improve the training skills and confidence of the new trainers with several 2-day "So You Want To Be an Aid Worker" courses in the Ottawa, Kingston, Toronto and London (Canada) areas. Efforts are also under way for 3 day Conflict Resolution and Media relations skills course.

6.0 The Future

At its most recent general assembly in Auckland, NZ, RedR International decided to start addressing needs in disaster preparedness, in addition to its traditional markets in disaster relief, and to pursue partnerships in the commercial sector. This new development was supported by the Canada office and should be of considerable interest to engineering consulting firms with staff working on overseas development projects. RedR Canada will take a proactive position with regard to assisting disaster preparedness and is prepared to promote engineering services in this regard.

But to achieve this new objective, RedR Canada must first focus on two key goals - firstly, to spread awareness about RedR Canada, particularly within Canada's engineering community, and secondly, to create a stable financial basis from which to operate. RedR Canada is the only Canadian charitable organization that focuses on providing engineering expertise to disaster relief and preparedness operations, and every Canadian engineer should rightly be proud of the role that this organization is playing to help alleviate worldwide suffering. It is hoped that RedR Canada will become one of the charities of choice for the engineering community and that all engineers will consider making a modest contribution to support its activities.

To find out more about Red, visit our web sites: www.redr.ca and www.redr.org

Emerging disciplines - biomedical engineering

Changes of pressure, tension, shear stress, expansion, compression, velocity in the propagation medium… Discussion of an optical fibre? No! The answer is: arteries and the effect of ultrasound waves. The combination of elecrical engineering and medicine began moving beyond just the design of medical equipment to actual treatment, in this case using optical telecommunications-based techniques to treat strokes.

THE FIRST TRANSATLANTIC telephone cable (TAT-1) caused waves of its own. We look back fondly at a particularly well attended Milestone ceremony on a beautiful fall day in Newfoundland.

TERRY MALKINSON HAS BEEN with the *IEEE Canadian Review* since 1998. His "View from the West" column has been a staple since the fall of 2006, along with his insightful summaries in "Engineering Management."

"The field of health care relies increasingly on technology, with biomedical and electrical engineers leading the way"

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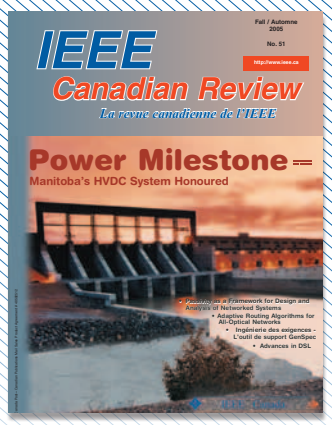
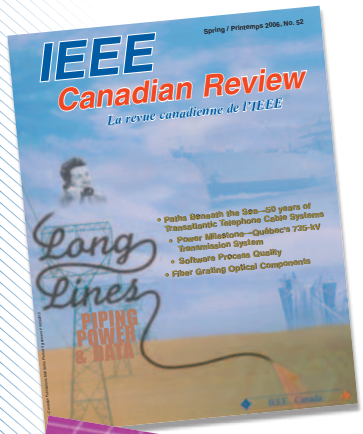




An optical-telecommunications-based technique to disrupt stroke using the artery as an acoustic Biological fiber

by *Zoubeir Hajri[1], Habib Hamam[2], Mounir Boukadoum[3] and Réjean Fontaine[1]*
[1] Université de Sherbrooke, QC
[2] Université de Moncton, NB
[3] UQAM, QC

1.0 Introduction

Thrombosis is the presence of a coagulated blood clot inside a blood vessel causing a deceleration of the blood flow (Figure 1). When the clot is located in the brain, it may cause a stroke, also called a brain attack (Figure 2). It is well known that this cardiovascular disease represents an important cause of death in the world. The main treatment of stroke is medicines and drug therapy which will thin the blood and make it flow more easily. Furthermore, surgery can be employed to treat acute stroke or to repair vascular damage in the brain [1]. Meanwhile, therapeutic methods based on the application of ultrasound waves have also been used to disrupt strokes in vivo and in vitro. However, there is currently an additional interest in this problem due to progress in bioacoustics.

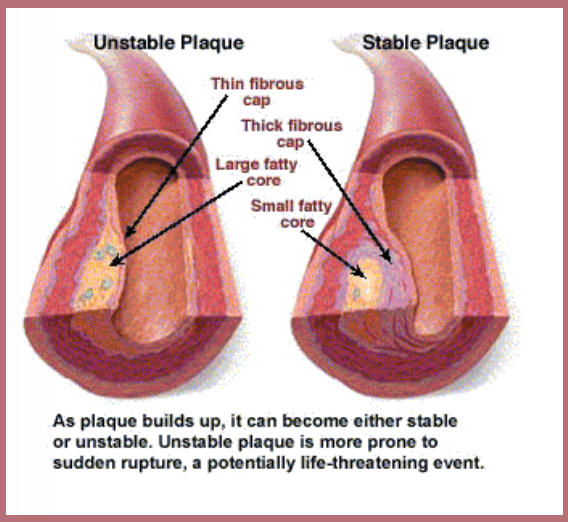


Figure 1: Plaque blocking the artery

It is well known that the ultrasound is widely used in medical diagnosis and therapy. On the one hand, the ultrasound energy is a non ionizing radiation, which does not impose hazards such as chromosome breakage and cancer development. On the other hand, it has several physiological effects based on the increase of inflammatory response, on the repair of the damaged tissues and on the heating of soft tissues.

A number of medical applications such as the ultrasound therapy of the occlusion of blood vessels were proposed. The methods based on the application of ultrasound waves use either an ultrasonic energy guided by a catheter [2], or an ultrasound radiation [3]. The first method has been used to dissolve clots in vitro, in animal models and in patients [2], whereas the second method has been reported in vitro and in animal models [3].

Both techniques have engineering problems. Most of the technical disadvantages of a catheter system are due to its poor efficiency as a RF/W radiation source. Consequently, the power loss in the coaxial cable and its subsequent heating during power delivery lead to a breakdown in the dielectric and the catheter material. In addition, there is the difficulty of designing a unidirectional antenna that can radiate energy into the diseased and not the surrounding healthy tissues. These limitations are unacceptable when a catheter system is used to treat life-threatening venous disorders, stable and unstable plaque, arteriosclerosis, or deep-seated tumor. The technical problems related to the radiated waves take on a different form and concern both diagnostic and therapeutic aspects related to physics and to the engineering of hyperthermia. With this technique, the incident wave undergoes multiple scattering inside the patient's body and, because the evanescent waves are difficult to mea-

Abstract

Because the number of applications for therapeutic and diagnostic medical ultrasonound systems continue to increase, there is a need to improve the efficiency of these acoustic techniques. In this frame, this paper reports on a new mildly invasive therapeutic method to disrupt stroke. The proposed method is based on the propagation of ultrasound waves inside a carotid artery, which is viewed as an optical fiber. The challenge, then, is to determine the feasability and the efficiency of such technique. The preliminary results of this study are presented. At 1 MHz ultrasound frequency, the penetration depth is about 21.7 cm, which is sufficient to reach and dissolve cerebral clots by transmitting an incident wave relatively far from thrombosis location. To reach this penetration depth, a saturation acoustic pressure of 1.5 MPa must be not exceeded. A temperature rise rate of about 0.46 °C/s for an intensity of 100 W cm^{-2} is observed. Pulsed waves are used to enhance cavitation, which is considered as the most likely and dominant mechanism for blood clots disruption. The project is embedded in the framework of a collaboration project involving three Canadian universities namely, Université de Sherbrooke, Université de Québec à Montréal and Université de Moncton.

Sommaire

Puisque l'utilisation des ultrasons pour des applications thérapeutiques et diagnostiques continue à augmenter, il y a un besoin d'améliorer l'efficacité de ces techniques acoustiques. Dans ce cadre, cet article traite une nouvelle méthode thérapeutique modérément invasive pour le traitement des maladies thrombotiques cérébrales. La méthode proposée est basée sur la propagation des ondes ultrasonores dans l'artère carotide, qui est regardée comme étant une fibre optique. Le défi, alors, est de déterminer la faisabilité et l'efficacité d'une telle technique. Les résultats préliminaires de cette étude sont présentés. À une fréquence d'ultrasons de 1MHz, la profondeur de pénétration est environ 21.7 cm, qui est suffisant pour atteindre et dissoudre les caillots cérébraux en transmettant une onde incidente relativement loin de la thrombose. Pour atteindre cette profondeur de pénétration, une pression acoustique de saturation de 1.5 MPa ne doit pas être excédée. On observe un taux d'élévation de la température d'environ 0.46 °C/s pour une intensité de 100 W cm^{-2}. Des ondes pulsées sont employées pour favoriser la cavitation, qui est considérée comme le mécanisme le plus susceptible et dominant pour la destruction des caillots de sang. Le projet entre dans le cadre d'un projet de collaboration entre trois universités canadiennes notamment, l'université de Sherbrooke, l'université de Québec à Montréal et l'université de Moncton.

IEEE Milestone: 40th Anniversary of TAT-1

First transatlantic telephone cable system

On Sunday, September 24 an IEEE Milestone commemorating the first transatlantic cable was dedicated at the site of a former cable station of the system in Clarenville, Newfoundland. There are approximately 60 of these milestone sites in the world honouring significant achievements in the history of electrical and computer engineering, of Six Milestones are in Canada. In recognition of its pivotal role in the development of worldwide communications, half of the Canadian sites are in Newfoundland. The first successful transatlantic telegraph cable, in 1866, is commemorated by a Milestone at Heart's Content. There is a Milestone at Signal Hill in St. John's honouring the reception of the first wireless signal across the Atlantic by Marconi in 1901. The latest Milestone recognises Clarenville as the eastern terminal of the first transatlantic telephone cable, TAT-1 which entered service on September 26, 1956.

The TAT-1 inaugurated the modern era of global communications. Before TAT-1, voice was carried on unreliable radio channels and text messaging was carried on submarine telegraph cables (the technology of the previous 90 years), which was reliable, but slow and expensive. TAT-1 operated with exemplary reliability until 1978, when advances in technology made it obsolete. An article giving details of TAT-1, as well a history of submarine telegraph and telephone cable can be found in the spring 2006 edition of the IEEE Canadian Review.

by *Jeremiah F. Hayes*
Concordia University

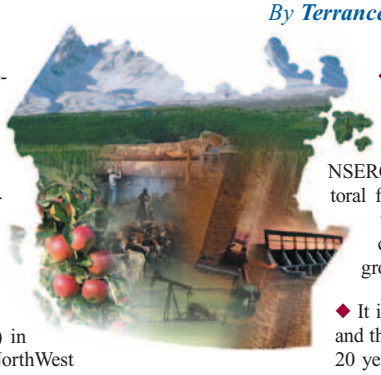
The dedication ceremony, blessed with fine weather, drew about 100 spectators. The roster of speakers began with greetings and best wishes for the political leaders of the community: Mayor Fred Best of Clarenville, Ross Wiseman, MHA, Trinity North and Bill Matthews, MP, Random-Burin-St.George. Dr. Camilla O'Shea from the Clarenville Heritage Society eloquently explained the role of Clarenville in the transatlantic project. The Heritage Society and the town of Clarenville were instrumental in establishing the Milestone. The role of the people of Newfoundland in telecommunications was celebrated by Dr. Wallace Read, a resident of Cornerbrook and the former president of the IEEE. Dr Ferial El-Hawary, President Elect of Region 7 conveyed the best wishes of IEEE Canada. Dr. Jerry Hayes, a former worker on TAT-1, called for a moment of silence remembering the men and women who worked for global telecommunications. The plaque was unveiled by Lloyd Currie and Kathleen Chafe. Ms. Chafe, Chair of the Newfoundland-Labrador Section, did wonderful work as chair of the committee that arranged the ceremony. Gerard Dunphy, IEEE Canada External Relations Groups Chair and a past Chair of the Newfoundland-Labrador Section, was the Master of ceremonies.

A proud and happy moment at the dedication of the TAT-1 IEEE Milestone plaque, September 24, 2006

From left to right: Gerard Dunphy, IEEE Canada External Relations Groups Chair; Dr. Wally Read, IEEE Canada Past President; Kathleen Chafe, Chair of Newfoundland-Labrador Section, IEEE Canada; Dr. Camilla O'Shea, Clarenville Heritage Society; Ferial El-Hawary, President-Elect of IEEE Canada; Ross Wiseman, MHA - Trinity North; Bill Mathews, MP - Random-Burin-St. George; Dr. Jerry Hayes, IEEE Life Fellow, author/historian; His Worship Fred Best, Mayor of Clarenville. *Photo courtesy of Kirk Squires.*

A View from the West

By ***Terrance Malkinson*** *University of Calgary Senate Member*



- The Alberta Energy and Utilities Board (EUB) predicts continued massive growth in the oilsands sector, where more than $100B worth of projects is scheduled for construction in the next decade. Oilsands production is expected to triple in the next 10 years to three million barrels a day. Concerns however have been expressed on the need to improve the infrastructure necessary to support the development, improve transportation to the area, and ecological issues associated with oilsands development.

- More than 500 people met in Edmonton (Alberta) in July at the 16th annual summit of the Pacific NorthWest Economic Region to examine energy workforce issues. http://pnwer.org/meetings/Summer2006/ 06%20Summit.htm. At least $US 100B in energy projects are projected over the next ten years to meet the unprecedented growth in the regions energy sector to accommodate rises in power demand. The projects will require a huge workforce. Indeed a looming labour shortfall in many business sectors is of concern to industry leaders.

- Enmax Energy Corporation and its partners have been chosen by BC Hydro to develop four "green" energy generation projects that will come on-steam over the next three years. Two of the projects are run-of-river hydro plants of 10 megawatts each and the remaining two projects will generate clean electricity using waste heat recovered from gas compressor stations.

- WestLink Innovation Network Ltd (http://www.westlink.ca/) is a university-based network for coordinating activities, bundling technologies and sharing information between its members. One of the strategies offered by WestLink is its technology commercialization internship program (TCIP) that specializes in developing Canada's future technology commercialization leaders. They help develop people who know technology but who also know management and have entrepreneurial skills.

- Industry Canada's office of consumer affairs in Ottawa recently released a 90-page guide which offers step-by-step information on how to adopt Corporate Social Responsibility (CSR). "Corporate Social Responsibility: An Implementation Guide for Canadian Business"(http://strategis.ic.gc.ca/epic/internet/incsr-rse.nsf/ en/Home). CSR is generally understood to be the way an organization achieves a balance or integration of economic, environmental, and social imperatives while addressing shareholder and stakeholder expectations. Corporate social responsibility is a concept that is increasingly being incorporated into good business practice within Canada and globally.

- The Natural Sciences and Engineering Research Council of Canada (www.nserc.gc.ca) recently announced 475 new grants worth $56.7M and 922 scholarships worth $15.9M in the prairie provinces. NSERC supports over 22,000 university students and postdoctoral fellows in their studies. NSERC awards are building a world-class research environment throughout Canada creating the skilled workforce needed to sustain economic growth and job creation.

- It is hoped that the softwood lumber deal between Canada and the US will help revitalize the forestry industry which for 20 years has struggled through closures, downsizing, globalization, and many other pressures. Softwood lumber is one of Canada's largest exports to the United States, with 21.5 billion board feet of lumber shipped in 2005 alone. Those exports were worth $8.5B. This trade matters to both Canadians and Americans. Canada's forestry sector employs approximately 280,000 Canadians, and roughly 300 communities are dependent upon the forestry sector. US lumber producers cannot meet domestic demand for softwood lumber. Canada now supplies over a third of the United States' consumption of this product.

- Alberta-based SemBioSys Genetics Inc. (www.sembiosys.com) a biotechnology company focused on the development, commercialization, and production of biopharmaceuticals and non-pharmaceutical products based on its proprietary technologies recently received is 20th US patent. SemBioSys' management and scientific team members are active contributors to the plant-made pharmaceutical scientific community and have been at the forefront of developing regulations for the production of pharmaceutical producing plants, working with the USDA, the FDA and the Canadian Food Inspection Agency (CFIA).

About the Author

Terrance Malkinson is a proposal manager/documentation specialist, an elected Senator of the University of Calgary, a Governor of the Engineering Management Society, international correspondent for IEEE-USA Today's Engineer Online, editor-in-chief of IEEE-USA Today's Engineer Digest, and editor of IEEE Engineering Management. The author is grateful to the Haskayne School of Business Library at the University of Calgary. He can be reached at malkinst@telus.net.

IEEE Canada representatives at the 735 kV Milestone

From left to right: Ron Potts, Vijay Sood, Gilles Baril, Amir Aghdam, Ray Findlay, Dominic Rivard, André Dupont (one of the HQ pioneers who worked on the project), Bill Kennedy, Paul Fortier, André Morin and Xavier Maldague.

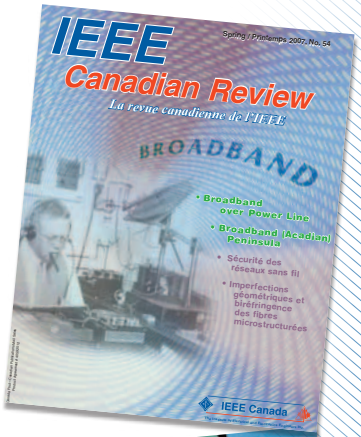
Seated: Mme Denyse Guay-Archambault; Guy Monty, responsable de la construction des lignes à 735 kV.

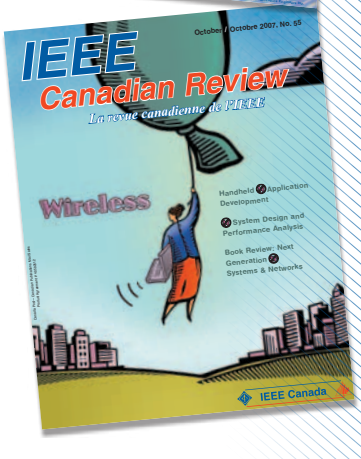
A plaque honouring the world's first 735 kV transmission line was unveiled at Hydro Québec's Montréal head office on December 13, 2005. Commissioned into service in November, 1965, the line ran from the Manic-Outardes generating complex on the Manicouagan River in north-east Québec to load centres in the south of Quebec. The portion of the line servicing Montréal was 600 km. The father of the 735 kV system is generally considered to be Jean-Jacques Archambault, the Hydro Québec engineer to whom the problem of the vast transmsission distance was brought.

Canada's first foray into space -Alouette 1

Alouette I, the first Canadian-built satellite had more than a few sceptics to convince when initial plans for it were discussed at the Pentagon in 1958. Expected by some to function for less than 2 hours, it endured until 1972, having transmitted 10 years of comprehensive and detailed data about Earth's ionosphere and upper atmosphere. Despite unanticipated design challenges requiring novel approaches the satellite was ready for launch on schedule with much cooperation between project engineers and the Defense department. The recognition for needed expertise in satellite communication was the impetus for the development of a strong domestic space industry. Canada went on to develop Alouette II and two observatory satellites, Isis I and II launched in 1969 and 1971. The Canadian Space Agency launched MOST, a micro satellite in 2003 followed by SCISAT for ozone exploration in the same year.

"One of the ten most outstanding achievements in Canadian engineering in the past 100 years" (Centennial Engineering Board of Canada, 1987)





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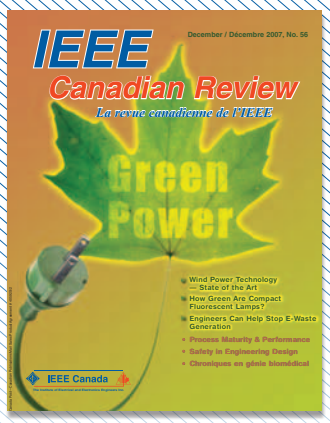

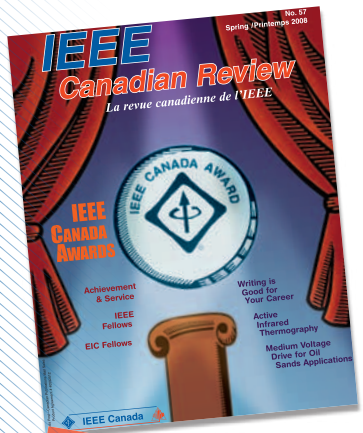

The Alouette Satellite Program
An International Milestone in Canadian Science and Engineering

By Colin A. Franklin, SMIEEE
Chief Electrical Engineer, Alouette I program

Abstract

With the launching of Canada's first satellite Alouette 1 from Vandenberg Air Force base, California on 29 September, 1962 Canada became the third nation in the world, after the Soviet Union and the United States, to design, build and control a satellite. The Topside Sounder Alouette 1 was an immense scientific and technological success. It was designated by the Centennial Engineering Board of Canada in 1987 as one of the ten most outstanding achievements in Canadian engineering in the past 100 years and in 2007 was designated an "event of national historic significance" by the government of Canada. It was also designated an IEEE Milestone in Electrical Engineering and Computing. This paper describes the little known origins of the program in the Department of National Defence, how the satellite was designed and its significance for the future of Canada in space. Rather than a detailed technical presentation it is more of a personal perspective from someone who was there from the beginning.

Sommaire

Avec le lancement du premier satellite canadien Alouette 1 depuis la base aérienne de Vandenberg (Californie) le 29 Septembre 1962, le Canada devient la troisième nation au monde après l'Union Soviétique et les États-Unis à concevoir, construire et opérer un satellite. La sonde en contre-haut Alouette 1 a été un immense succès scientifique et technologique. Elle a été désignée par le Comité du centenaire du génie canadien en 1987 comme une des plus remarquables réalisations du génie canadien des derniers 100 ans, et en 2007 comme un « événement d'importance historique nationale » par le Gouvernement du Canada. Elle a aussi été reconnue comme un Jalon du IEEE en génie électrique et informatique. Cet article décrit les origines peu connues du programme au ministère de la défense nationale, comment le satellite a été conçu et son importance pour le futur du Canada dans l'espace. Plutôt qu'une présentation technique détaillée, il s'agit plutôt de la perspective personnelle de quelqu'un qui y était depuis le début.

The Defence Research Telecommunications Establishment (DRTE), Ottawa is where the Alouette program was conceived and where the first two satellites were largely designed and built. It was one of a number of establishments of the Defence Research Board (DRB) which reported to the Minister of Defence. DRTE had its origins in ionosphere sounding activities carried out by the Canadian Armed Forces and NRC during WW II. Before the satellite era, radio propagation via the ionosphere was the main method of long distance communications, other than via landlines and underwater cables. Subsequently DRTE became a leader in the field of ionosphere research and by the late 1950s had become one of the foremost research establishments on the continent, with Radio Physics, Communications, and Electronics laboratories that were on a par with any in the world. In 1969 DRTE was transferred to the newly created Department of Communications and renamed the Communications Research Centre (CRC). CRC is now an agency of Industry Canada and is the government of Canada's primary laboratory for R&D in advanced space and terrestrial communications.

With the launching of Sputnik in October 1957 it was realized at DRTE and elsewhere that a satellite-borne radar would provide a very powerful means of exploring the ionosphere from above (topside sounding), and that this could have important implications for long distance radio communications. The origin of the idea, is not clear but it was Dr. Eldon Warren who picked up the concept and put forward the daring proposal that DRTE should build a swept frequency topside sounder.

In July 1958, Lloyd Berkner, Chairman of the Space Science Board of the National Academy of Sciences of the United States announced that space and facilities in satellites would soon be available and called for suggestions for experiments on the upper atmosphere. This produced an immediate response from Peter Forsyth at the University of Saskatchewan for a rudimentary single frequency sounder - which was later expanded to four frequencies. At a meeting in October 1958, called by H.G. Booker of Cornell University to discuss ionosphere experiments in satellites, a number of groups in the USA and two from Canada – DRTE and the University of Saskatchewan - indicated their interest in topside sounding.

Eldon Warren

Jim Scott

This meeting resulted in Jim Scott, the Chief Superintendent of DRTE submitting a proposal to build a topside sounder satellite, firstly to ARPA at the Pentagon in Washington on 13 November 1958 and then to the newly created NASA on 31 December 1958. Not a simple sounder operating on a few frequencies, but a 0.5-12 MHz swept-frequency one that duplicated in a satellite the functions of ionosphere sounders then used from the ground (see Fig. 1). In the meantime, and on the assumption that the proposal would be accepted, work began on the satellite project at DRTE in January 1959. Sputnik and the cold war produced a sense of urgency.

NASA officials listened to the Canadian proposal with more than a little scepticism. They were convinced that the power and antenna problems involved, and the sheer technical complexity of installing the equivalent of a bottom side sounder in a satellite was far too difficult to do at that time. International science was a definite plus for the fledgling NASA, however, so they agreed to invite DRTE to join their Topside Sounder Working Group, to launch the Canadian experiment. They sent the proposal along to the Central Radio Propagation Laboratory (CRPL) at Boulder, Colorado, to examine it for scientific merit and engineering feasibility. The CRPL agreed with the NASA view that the proposal was too ambitious, so their report recommended a fixed-frequency experiment as a first-generation Topside Sounder, and that DRTE "be encouraged to develop its swept-frequency system as a second-generation experiment."

A remarkable feature of the proposal was the absence of a serious feasibility study – apart from some basic calculations by Eldon Warren. For example no one knew how to design the sounder antennas or what the size, weight, and power consumption of the instrumentation might be.

There was no MOU and instead the agreement was formalized in an exchange of letters between the DRB Chairman (Zimmerman) and the Administrator of NASA in August 1959. It was to be a cooperative undertaking between Canada and the U.S. with each country paying its own costs in the project. The principal Canadian objectives of the program are listed at the top of the next page.

The Canadian contribution was to consist of the following: develop an ionospheric sounder for installation in a satellite to be provided by NASA; construct three models, one for installation in a satellite, one spare and one prototype; provide telemetry and recording equipment for at least one year at each of four stations, Resolute Bay, Churchill, Ottawa and St John's; exchange copies of all ionograms with cooperating agencies. The United States agreed to provide the launch vehicle, launch facilities, and a worldwide network of ground stations. The U.K. joined the program later and provided four telemetry stations. As the project progressed three additional experiments were included - to measure cosmic noise, very low frequency (VLF) radio emissions and energetic charged particles. The last experiment was contributed by NRC.

By late 1959 however it became clear that the sounder system was too complex to be designed independently of the satellite. This meant that DRTE would now have to provide three satellites (two flight models and a prototype). This news was reportedly not well received at DRB HQ and ultimately led to a major diversion of finances and manpower from other programs in DRTE plus a subsidy from DRB itself.

The rest is history; the CRPL/NASA fixed frequency satellite (S-48) suffered delays, the Canadian satellite (S-27) kept more or less on schedule; S-48 suffered more delays; S-27 was launched on 29 September 1962, to become Alouette 1, the first satellite to be designed and built by a nation other than the United States or the Soviet Union. S-48 was eventually launched in August 1964. NASA later admitted publicly that they and CRPL were so convinced that S-27 could not possibly function for more than an hour or two, if at all, that they had made no plans to use data from it. In fact Alouette 1, constructed at a time when most satellites had a useful lifespan of a few months, continued to function and provided a wealth of data for ten years before it was turned off from the ground.

2.0 Design Challenges

Text books on space technology and the in-orbit radiation environment were non-existent and the open literature and internal NASA reports were sparse. The young Canadian engineering team had no prior experience in the design of space systems and hardware but was highly skilled in the emerging area of solid state electronics. It also had the great advantage of being in day-to-day contact with scientists in the Radio Physics and Communications Laboratories in DRTE. The decision by NASA to provide a relatively large launch vehicle, a Thor Agena-B, was a great help and eliminated weight as a serious constraint in the design of the satellite. Finally there was the excellent support received from the emerging Canadian space industry and the close working relationships and trust that developed with our NASA, CRPL and AIL (Airborne Instrument Laboratories) colleagues - AIL built the U.S. topside sounder. Indeed, once the technical work started we dealt with our US colleagues as if we were all part of one big family.

Little of the technology developed for ground-based sounders was directly applicable. Aside from the use of vacuum tube systems with their associated reliability problems and weight, size and power consumption, these sounders typically used large antennas and high power transmitters. Initially it was thought that these problems might best be solved using a swept-frequency CW radar instead of a more conventional pulse system, and a good deal of time was lost on this approach [1]. The development of a vacuum tube transmitter was then undertaken – but abandoned when a parallel development showed the required performance could be obtained using transistors [2].

There were strenuous debates on the subject of transmitter power. Caution said to keep it low for reasons of cost, reliability and power consumption. The bolder approach eventually prevailed and a transmitter power ten times greater than the calculated minimum needed was finally chosen. This was a milestone decision since it greatly eased the antenna design and the mass production of high quality ionograms.

There were more stormy debates, this time on cosmic noise. Two attempts were made to measure cosmic noise using Javelin rockets launched from Wallops Island in 1959. They failed. In 1960 a 3.8 MHz cosmic noise receiver was designed and flown on a U.S. navy TRANSIT navigation satellite, providing the first measurements of cosmic noise to be made above the ionosphere [3].

One of the most difficult problems was the design of the sounder antenna system which had to cover a 0.5-12 MHz frequency range. This eventually consisted of two antennas in a crossed dipole configuration - 150ft tip-to-tip for the lower half of the frequency range and 75 ft tip-to-tip for the upper half of the frequency range [4]. Fig.2 shows the satellite with antennas extended during tests at de Havilland.

After examining a range of possibilities, all of which seemed impractical, a solution to the problem was found in a visit by DRTE engineers to NRC. A design by George Klein for an extendible antenna was suggested as a possible approach. A 20ft antenna had been designed and built by Klein at NRC in 1951, as a solution to a UK requirement for an antenna for a radio beacon to be dropped by military aircraft.

It looked promising and was forwarded to de Havilland (later Spar Aerospace) for evaluation and possible development. Klein's key idea was to preform a thin flat strip of spring steel into a cylindrical tube with an overlapping seam, and heat treat it. It is then stored in flat form on a spool. On extension the steel strip curls into its pre-

PRINCIPAL PROGRAM OBJECTIVES

- Provide a basis for improvements in shortwave radio communications, particularly at higher latitudes, through a better understanding of the physics of the ionosphere
- Acquire a better understanding of the properties of the ionosphere for the scattering and deflection of radar beams
- Develop a Canadian capability in space technology

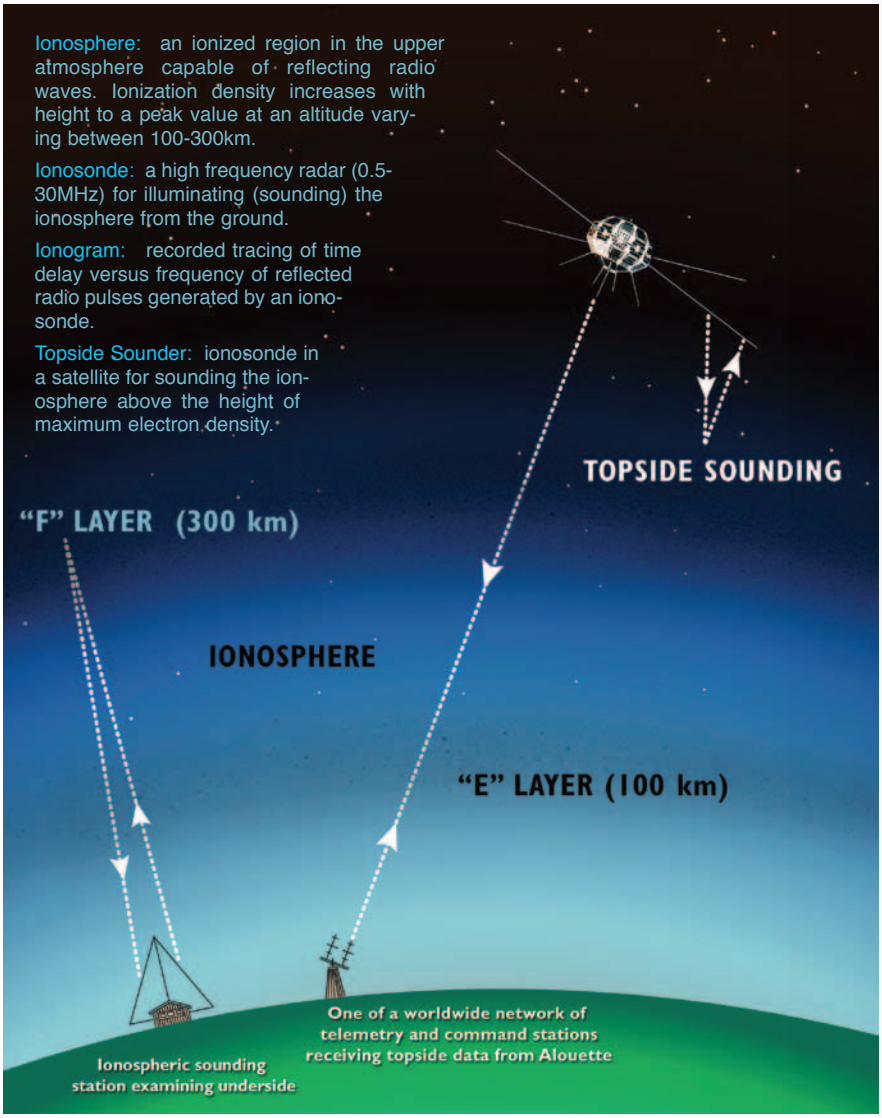

Figure 1: Bottom and Topside Sounding

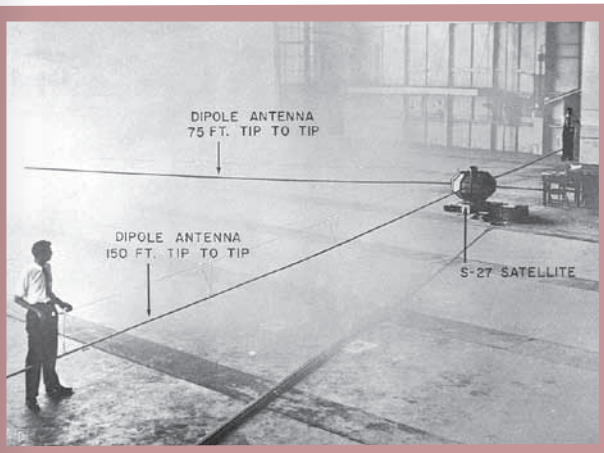

Figure 2: Satellite with Antennas Extended

formed shape to form a tube with considerable bending strength. A major devel-opment effort was required by de Havilland to convert the basic idea into an antenna for space use. (See across this page an Alouette STEM antenna module, serial no. 001). Mechanisms based on the concept subsequently became known as STEM devices or storable tubular extendible members and have been used on many domestic and international space missions. A test flight on a Javelin rocket from Wallops Island was carried out to test the extension of a pair of STEMs in space. It was a partial success; one STEM did not fully extend.

The VLF experiment was added almost too late in the program. The DRTE scientist responsible for its inclusion was Dr. Jack Belrose. It consisted of a 400 Hz – 10 kHz receiver connected to a sounder antenna - at a small risk to the main experiment. Designed and developed in six weeks, it was said to be the most cost effective experiment on the satellite and was a good example of how quickly decisions could be made and implemented on the program.

The design of the telemetry system was unexpectedly difficult. The sounder antennas generated multiple nulls in the radiation pattern of the telemetry antenna. Because the satellite was spinning, these nulls would have produced regular drop-outs in telemetry – which in turn would have hampered data analysis and severely reduced the value of the ionograms. The effect of the nulls was largely eliminated through a novel design of the telemetry and command antenna system in the satellite, and by diversity reception and combining on the ground [5].

Nine months before launch we had no telemetry transmitter to send the ionosphere data to the ground. This was due to the supplier, a major U.S. aerospace company, finding the specifications too difficult to meet. When John Stewart at RCA Victor (in Montreal, now EMS Technologies) heard of our dilemma over breakfast at a Solid State Circuits conference in Philadelphia, he proposed that his team could do it. He was told to go ahead, forget about costs and contractual details, and get us an engineering model within two months. He succeeded, the subsequent flight models operated flawlessly, and the design became the standard for subsequent Canadian and U.S. ionosphere sounder satellites [6].

3.0 Design and Testing

The approach taken on reliability was novel and controversial. Little reliance was placed on statistical reliability calculations. Instead we insisted on a thorough understanding of semiconductor devices and circuit operation and worked closely with manufacturers to ensure that only semiconductors with median parameter values were procured. Circuits capable of operating under much greater than expected temperature and power supply variations were developed to counter expected and unexpected modes of degradation and failure. The consequences of radiation damage to semiconductor components were minimized by designing for far larger variations in transistor parameters than was the accepted practice at the time. This was an early example of what is now known as Robust Design. At the time critics said we would end up damaging components and degrading reliability. Extreme temperature and voltage tests revealed time and again design weaknesses which were often easy to fix, and this was done even when the equipment had passed all its tests. To eliminate single point failures, there were spares for all transmitters and receivers and extensive redundancy in the power subsystem - including spare batteries. A great deal of effort was put into the design of the power subsystem including the design of dc-dc converters, suppression of transients and radio frequency interference, overload protection and dynamic load line analysis. To avoid seriously draining the batteries the satellite automatically switched off ten minutes after being turned on by a ground station. Finally we sent two flight spacecraft and two payload test teams to the launch site and ran a competition to decide which one to launch.

Similarly, on the mechanical side the structure and electronics units were designed for significantly higher than expected vibration levels. Also, deployable items were designed to be tested under 1g conditions on the ground, although critics claimed this was overdesign. Shortly before launch, to the alarm of the design team, the vibration levels previously specified by NASA for the launch vehicle were revised to much higher levels. New vibration tests on the spacecraft were required and were passed with no problems.

The power supply was designed for what appeared at the time to be a very pessimistic figure of 40% degradation for solar cell charging currents, after one year in orbit. This paid off as it allowed Alouette, unlike several U.S. satellites, to survive an unanticipated artificial radiation belt created in July 1962 by a hydrogen bomb test at high altitude over Johnston Atoll (South Pacific.)

With the assistance of the Defence Research Chemical Laboratories, Ottawa (now DRDC) a major effort was made to improve the reliability of commercially available Ni Cd batteries. This resulted in some important differences between the Alouette and ISIS batteries and those used in U.S. spacecraft. The resulting batteries functioned for ten years in Alouette 1 and 2 and twenty years in ISIS 1 and 2 and were superior to those used in any other space program of the period.

The electrical and mechanical design and most of the environmental testing was done in Canada. The Canadian Armament Research and Development Establishment, Valcartier provided the thermal-vacuum test facilities.

The De Havilland Special Products Division in Toronto, later to become Spar Aerospace Ltd, in addition to providing the STEM antennas, manufactured the satellite structure, and performed spin and centrifuge testing [7]. Sinclair Radio in Toronto designed the telemetry, command and beacon antenna subsystem in the spacecraft and were a major contributor in the design of the sounder antenna subsystem. Satellite vibration testing, dynamic balancing and solar simulation in vacuum was done at the NASA Goddard Space Flight Center. Detailed information on the design, construction and testing of Alouette 1 are given in [8]. Three views of the satellite are shown in Figs. 3, 4 and 5. John Chapman, Program Coordinator and Deputy Chief Superintendent of DRTE, is shown in Fig.3. Keith Brown, Satellite Section Head at DRTE and leader of the engineering team, is shown in Fig. 4.

4.0 The Launch Campaign

The two flight spacecraft and their test teams, numbering about thirty engineers and technicians, were flown to Vandenberg Air Force Base California by the RCAF in separate aircrafts. The prototype spacecraft was also brought along to verify any last minute changes on the flight spacecraft and rehearse mating with the launch vehicle. Pre-flight preparations took approximately six weeks. The Thor Agena-B was on a test flight. Alouette was underweight at 320 lbs and the vehicle had to be ballasted for launch.

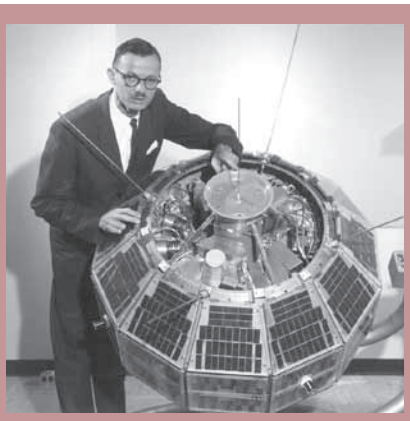

Figure 3: John Chapman with Backup Satellite – Oct. 1962

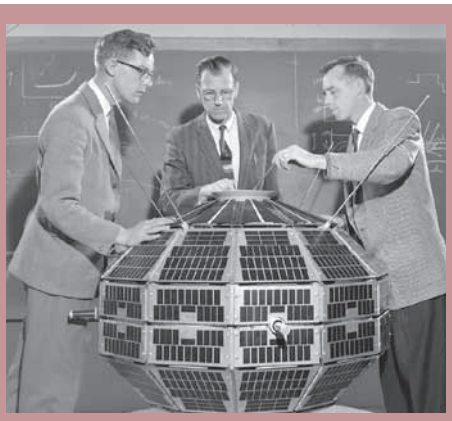

Figure 4: Alouette 1 and, from left to right, Colin Franklin, Keith Brown and John Barry

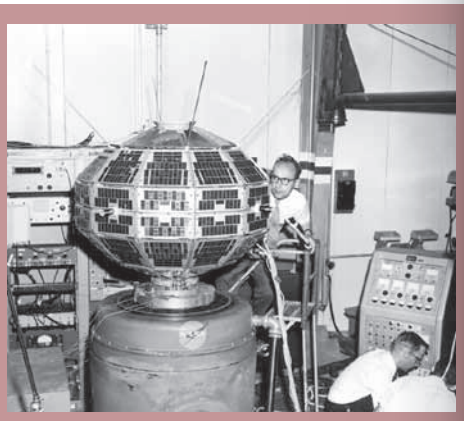

Figure 5: Alouette Vibration Testing, Goddard Space Flight Center

There were a number of launch delays due to Southern Pacific Railroad fruit trains which had the right of way and always arrived without warning, passing within 75 m of the launch pad. Furthermore, every time a launch was scheduled the 43 inhabitants of the nearby village of Surf had to be evacuated.

At launch there were two DRTE engineers at the NASA Fairbanks, Alaska ground station to confirm antenna extension and overall status of the satellite. A NASA ground station in Johannesburg and a ship in the Indian Ocean were to receive vehicle and satellite telemetry. Satellite telemetry was turned on at launch and kept on until injection into a near perfect 1000 km circular orbit at an inclination of 80.5 degrees to the equator. Fairbanks confirmed antenna extension and normal operation of the satellite and this was soon followed amidst much jubilation by the reception of the first ionograms at DRTE in Ottawa.

5.0 Program Achievements

Within a few weeks of the launch of Alouette 1, it was clear that the satellite would provide the comprehensive and detailed data on ionosphere structure that was its primary mission. Alouette 1 ionograms taken one day, six years and ten years after launch are shown in Figs. 6 and 7 on the following page.

This posed the question of whether there should be an ongoing satellite program and, if so, what form it should take. Most of the skills and expertise responsible for the success of the satellite were in a government establishment, and not in industry. If Canada was to reap the full benefits of space technology it needed a strong domestic space industry. John Chapman took the lead in negotiating with NASA a follow-up program of scientific satellites, and took action to ensure that an increasing proportion of the design and construction work would be carried out in Canadian industry. This led to the International Satellites for Ionosphere Studies (ISIS) programme in which Canada and the U.S. shared the major costs for the construction and launching of four more satellites; three Canadian and one U.S. The U.K. and seven other countries actively participated through the provision of telemetry facilities and scientific analysis effort. The three Canadian satellites were Alouette 2 - a refurbished Alouette 1 flight spare spacecraft launched in 1965 along with a U.S. probe satellite, and two observatory satellites ISIS 1 and 2 launched in 1969 and 1971 respectively. The two observatory satellites were heavier and more complex than the two Alouettes, and were prime contracted and built in Canadian industry. They carried tape recorders, probe and particle experiments from the U.S. and the U.K., and in the case of ISIS 2, two optical experiments. The principal experiment in each was still the ionosphere sounder which was essentially an upgraded version of the Alouette 1 system plus a fixed frequency sounder.

A further Canadian satellite in the series ISIS C was to study the higher regions of the ionosphere and magnetosphere out to 20 earth radii with 375 metre crossed dipoles. Planning was terminated on this satellite, to the great regret of the scientists and engineers involved, when the Canadian space program was redirected towards applications. It was necessary to wait 32 years for the next Canadian scientific satellite – the Canadian Space Agency (CSA) micro satellite MOST launched in 2003. This was followed also in 2003 with the much larger CSA ozone explorer SCISAT. Both satellites have been highly successful, are still fully operational, and are a further example of Canadian excellence in space science and engineering.

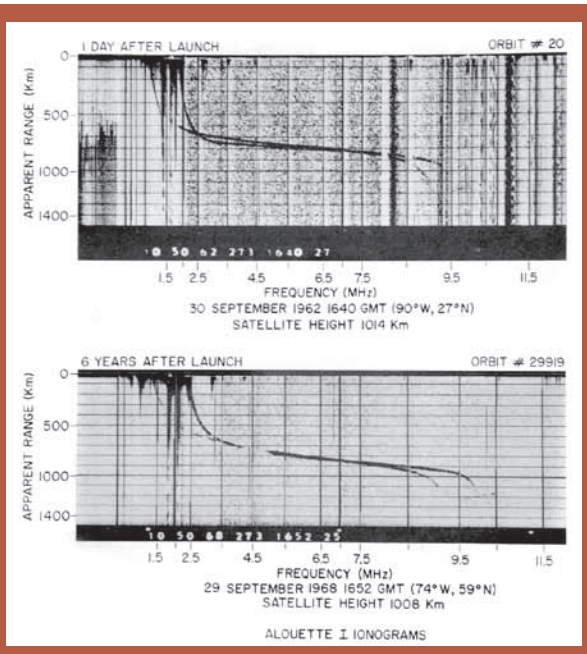

Figure 6: Ionograms – 1 Day and 6 Years After Launch

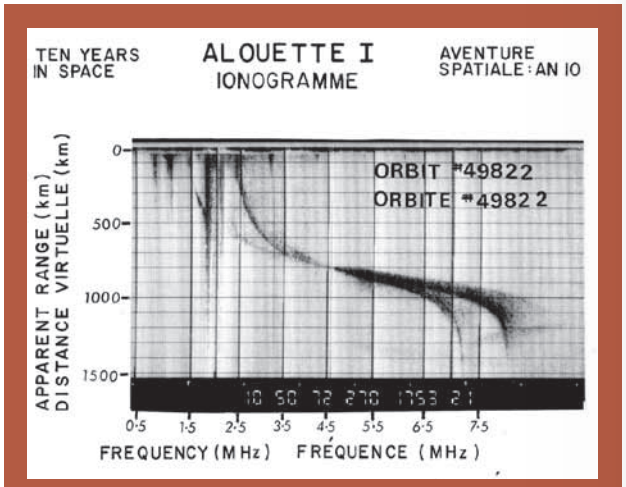

Figure 7:Ionogram – 10 Years After Launch

6. Conclusion

For ten years Alouette 1 provided scientific data that greatly extended our knowledge of the ionosphere and the earth's upper atmosphere. The success of this project led to the creation of Telesat and the Canadian space industry and its expansion into Communications, Remote Sensing, Robotics for the NASA Shuttle and Space Station, and Satellite Aided Search and Rescue. The fact that Alouette 1 performed so well and beyond all expectations gave Canada an international reputation for excellence in satellite design and engineering.

Acknowledgements

The author wishes to thank Louise Casavant and John Brebner of CRC for their assistance in preparing the figures and illustrations. Thanks are also due to Graham Booth and Friends of CRC for many background discussions on the Alouette 1 program and to Dr. LeRoy Nelms for his help on its early history. This paper is based on a presentation by the author at the IEEE International Milestone of Electrical Engineering Ceremony at CRC in 1993.

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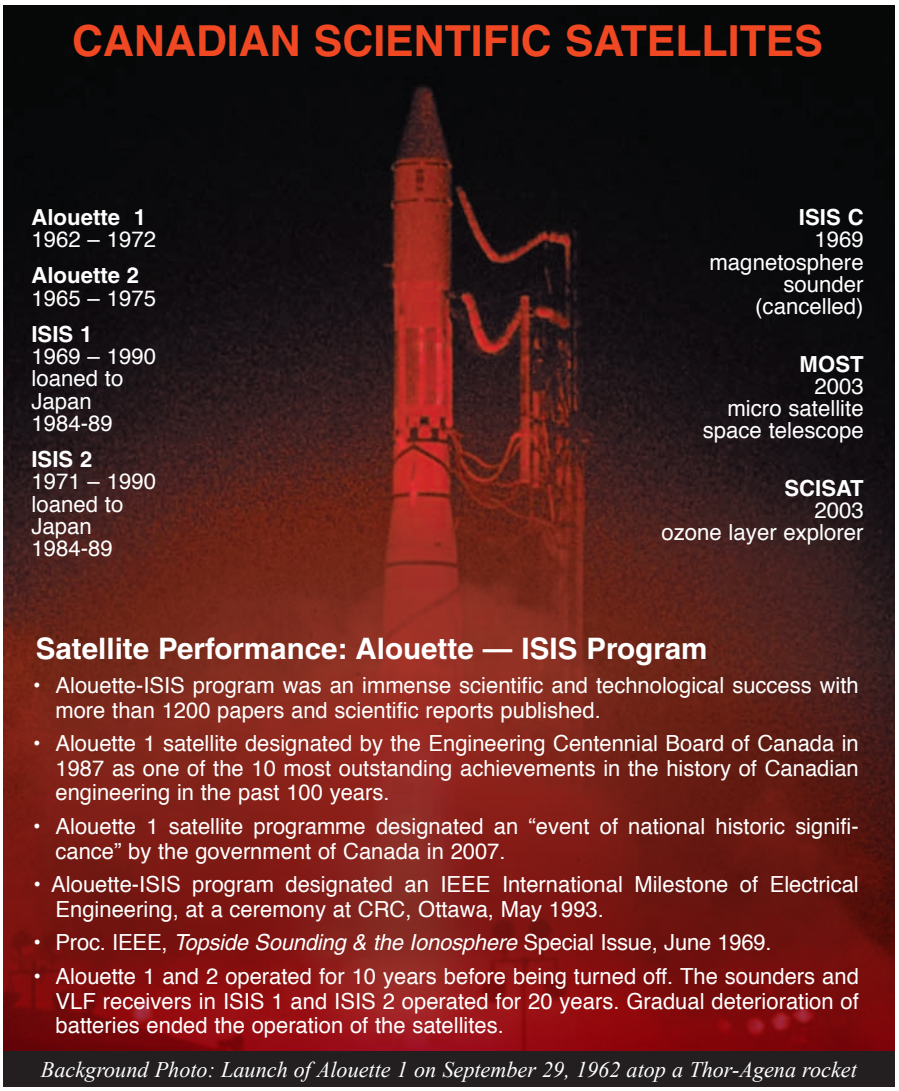

Background Photo: Launch of Alouette 1 on September 29, 1962 atop a Thor-Agena rocket

N.Ed.: This paper was also presented as the "McNaughton Lecture" on May 6, 2008, at the 21st Canadian Conference on Electrical and Computer Engineering. This followed the IEEE Canada Awards ceremony where the author received the IEEE Canada McNaughton Gold Medal in recognition of "outstanding contributions as a pioneer of the Canadian space program and a semiconductor circuit innovator".

About the Author

Colin A. Franklin graduated M.Sc in Physics from Auckland University, New Zealand and Ph.D in Electrical Engineering from Imperial College, London. He was Chief Electrical Engineer for Canada's first satellite Alouette, Chief Engineer for the follow-on ISIS satellite program. He was subsequently Project Manager for the Department of Communications (DOC) Hermes Communications Technology Satellite, and Director General of Space Programs at DOC. He is a Member of the Order of Canada (CM), Fellow of the Royal Society of Canada, Fellow of the City and Guilds Institute of London and Senior member of the IEEE. His awards include the IEEE Canada McNaughton Gold Medal, the Julien C. Smith Medal from the Engineering Institute of Canada, the John H. Chapman Award of Excellence from the Canadian Space Agency, and the Alouette Medal from the Canadian Aeronautics and Space Institute.

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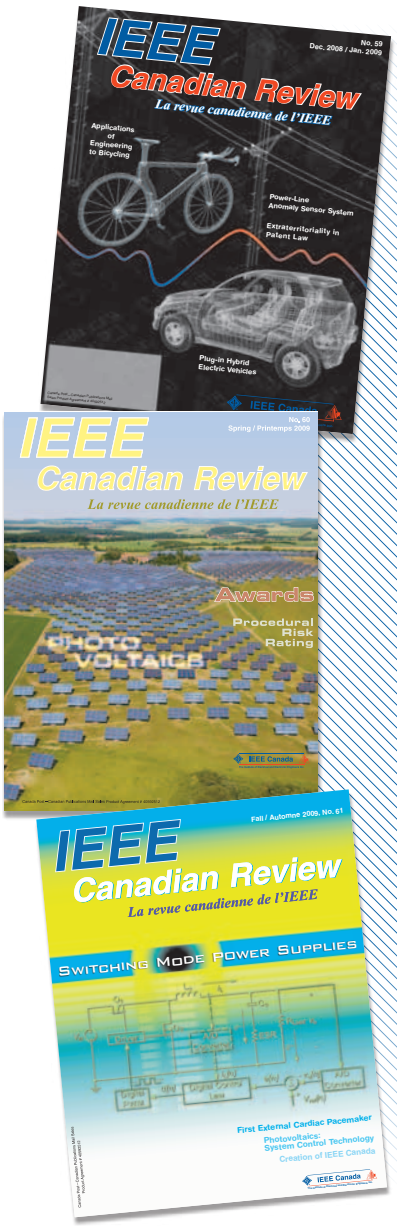
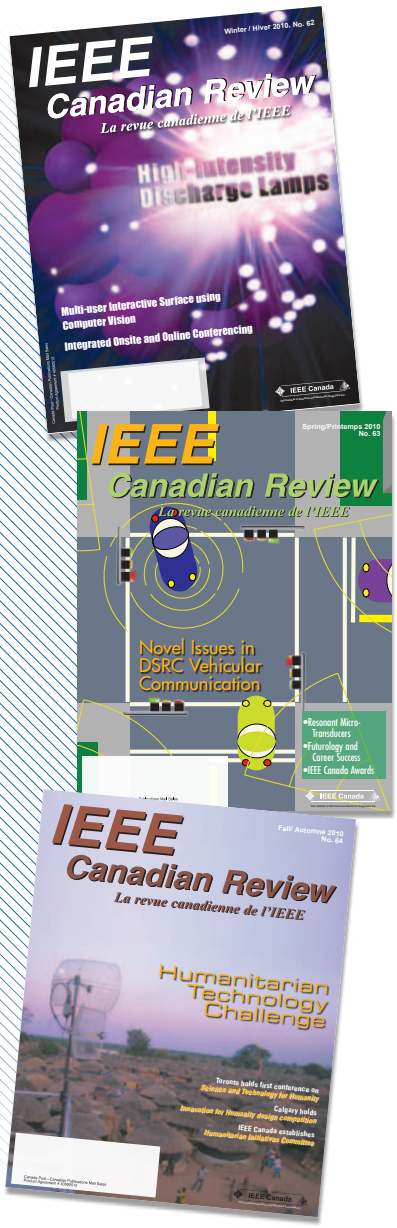
IN 2009 THE EIC COMPLETED a multi-year archiving project. As a result, more than 100 years of engineering history in Canada are now catalogued for ease of use by researchers.

"IEEE Canada is known for being a leader in organizational innovation, having been first in many accomplishments"
(A 25 year history of IEEE Canada)





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41 Boxes, 100 years of Engineering History

41 bankers-size boxes are sitting in the basement of Andrew Wilson, past president of the Engineering Institute of Canada (EIC) and long-time Chair of the EIC History & Archives Committee. They contain the surviving archival material belonging to the Institute and are in need of safe, permanent storage that would also be accessible to those researching the history of engineering in Canada. Much of our profession's history is recorded in there.

EIC began life in 1887 as the Canadian Society of Civil Engineers (CSCE) by means of an Act of the Dominion Parliament. Its membership was based on individual engineers. Although its title used the word 'civil,' the intent was that it should include all disciplines of engineering and, while civil was dominant, the other main ones at the time were mechanical and mining, with electrical and chemical in their emergent stages. CSCE continued to be the name of the organization until 1918 when, in order to broaden its appeal to the growing number of 'non-civil' engineers, the Act was amended and it became the Engineering Institute of Canada. Much later, in the early 1970s, a second significant change came about when EIC formed several semi-autonomous, discipline-based 'constituent' societies which eventually became its "members". Nowadays, it assembles a dozen member societies including its largest by far in individual membership, IEEE Canada.

Over the years, some archival material belonging to the original CSCE and to EIC has been held in the National Archives of Canada (now Library and Archives Canada—LAC), EIC headquarters, constituent societies and a few other places. LAC archives did not fully represent the activities or the publications of the Institute, and recently it has restricted the kinds of material it will accept. The individual member societies, by the way, are responsible for the disposition of their own archival material;CSEE/CSECE/IEEE Canada material is currently being held at Queen's University.

During the course of its history, EIC volunteers kept copies of organizational records and publication—the latter being composed mainly of *Transactions of CSCE, Transactions* of EIC, and the *Engineering Journal* which was published until the mid-1980s. A collection effort which involved EIC Headquarters and various units had concentrated on the period since the end of World War II. Some photographs and memorabilia have also been included. The material in the collection, therefore, provided archival coverage of CSCE/EIC from around 1887 until around the end of the 20th century, but its effective use for historical research was made difficult by a lack of systematic organization and the dispersal of various collections.

This 1891 photo depicting early construction of an electrical machinery manufacturing plant in Peterborough Ontario was taken only four years after the founding of the CSCE. Like the EIC that grew out of the CSCE, it represents the inconnections between the disciplines' histories. Photo courtesy of Canadian General Electric Company Limited.

So, a methodical archival project led by Andrew Wilson began in the early 1990s. The rationale behind it was spelled out by Dr. Norman Ball in 1979 when he was engineering archivist at the National Archives of Canada: *it is up to the profession itself to preserve the raw material of Canadian engineering achievements and make it available for public use.*

Here we are now after a multi-year project involving the collection, sorting, filing and cataloguing of the material. Coverage is sometimes incomplete, but it is possible to do both longitudinal and vertical studies, the latter since some of the preserved material was collected by individuals for specific periods of time. Incidentally, the collected files that cover successful nominations for awards and fellowships provide a significant catalogue of achievements by Canadian engineers. All engineers in Canada should be grateful to Andrew for the immense amount of time he donated to preserve the memory of the profession.

Next steps: The (now much better organized) archives of the Engineering Institute of Canada need a home. The institution accepting this mandate will carry the prestige of being the guardian for a significant portion of Canadian Engineering memory. Discussions are taking place; we will let you know.

Then there will be the question of digitization and web-accessibility. Is there an engineer in the room?

***

The material for this article was provided by Mr. Andrew H. (Drew) Wilson. Andrew is a graduate in mechanical engineering and the liberal arts. He is a past president of CSME and EIC and a past chair of CSME and EIC History Committees.

Montreal and Boston Adopt Each Other

Maybe it's the cold weather; IEEE Sections in Canada are really going after the warm feeling of having a larger family. After Toronto signing an agreement with Pittsburgh Section for 'sibling' status and Ottawa with Twin Cities (Minnesota), Montreal has now signed up with Boston. Yes, hockey archrival Boston. This is only the 7th sibling sections set in the whole IEEE !

This concept of Sister/Sibling Sections has existed for some time as IEEE leaders promoted closer cooperation between Sections, sharing tricks and techniques for unit management, exchanging distinguished lecturers, promoting each other's conferences. Although formalities are minimal for establishing this link, ongoing implementation had been sluggish due to communications costs and haphazard contact as volunteers come and go.

Now it's back with a vengeance, spurred on by Canadians. The latest such initiative started when Montreal Section chair Anader Benyamin-Seeyar was presented the concept at the IEEE Canada Board Meeting last Fall in Quebec City, just before Sections Congress. Dr. Bob Hanna, Past President of IEEE Canada, suggested Boston Section would be a good match with Montreal due to proximity, relative size and technological dynamism.

Anader didn't wait for formal introduction. The next day at Sections Congress he was roaming the hall looking for a Bostonian and found one in John Conrad, at the time Section Vice-Chair and now Chair. John mentioned that Boston had a Sister Section in Japan until 2008, and was more than ready to retry with a closer sibling. He obtained enthusiastic support from Region 1 director Howard Michel and advice from IEEE Past President Art Winston. IEEE Canada President Ferial El-Hawary was certainly upbeat about the prospect (no one who knows her would be surprised…)

Anader wanted this agreement drafted on the spot in Quebec City, but the Boston Section Chair was not present. Oh well, this is not the Big Dig; a simple plan was set up and followed: Agreement drafted, voted on, sent, and signed – as of January 8th, 2009. Welcome to the family!

***

Material for the article provided by Anader Benyamin-Seeyar, IEEE Montreal Section Chair 2007-2008. Warm thanks extended to all volunteers involved, who unanimously supported this effort. Members' suggestions about Boston-Montreal cooperation are welcome.

Great Volunteers

In issue 61, we introduced readers to the IEEE publication *A 25-Year History of IEEE Canada: Advancing Engineering Across Borders*. In this issue we reprint the pages highlighting some of the significant personal volunteer contributions.

Three Canadian members have been elected to the prestigious and demanding position of IEEE President. Three other volunteers were profiled for their contributions in the areas of IEEE membership database management, membership online self-renewal, and the establishment of the IEEE GOLD program. In future issues, we will bring you more news of members' contributions to the IEEE organization.

Canadians and the IEEE Presidency

No history of IEEE Canada would be complete without mention of the members who have been elected to the prestigious position of IEEE President. At this writing, three Canadians have led IEEE in this capacity.

Robert H. Tanner (1915-2002)

Robert Tanner joined the Institute of Radio Engineers (IRE) in England in 1938 after graduating from Imperial College (University of London) with a B.Sc. in Electrical Engineering, later receiving a M.Sc. in Acoustics. He became a Senior Member in 1948 and a Fellow in 1958. Mr. Tanner became Ottawa Section Chairman of Region 7 in 1965 and was Secretary Treasurer from 1963 to 1967. He was elected Regional Director in 1968, appointed Institute Secretary in 1970, elected Vice President in 1971 and President in 1972.

During his year of office, he set up the U.S. Activities Committee (now USAB) and steered the constitutional amendment on professional activities through the Board of Directors. Mr. Tanner was active on several Institute committees, including the chairmanship of a special three-year Long Range Planning Committee and service on the Foundation Board. Mr. Tanner has received two honors from Region 7: the A.G.L. McNaughton Gold Medal in 1974, IEEE Canada's highest award, and the IEEE Haradan Pratt Award in 1981 "for contributions toward professionalism and dedicated service to the Canadian Region, to IEEE and to the profession over many years."

Wallace S. Read

Dr. Wallace Read of St. John's, Newfoundland, Canada, brought a worldview to the IEEE Standards process that forever changed the way the organization serves its constituents. As Vice President of IEEE Standards Activities from 1993 to 1994, he strengthened relations with the International Electrotechnical Commission (IEC), the International Telecommunications Union (ITU) and the International Organization for Standardization (ISO), thereby positioning the IEEE for a greater leadership role in international standards development. During this same period, Dr. Read played a key role in refining the IEEE Standards Activities' structure to better serve industry through the formation of the IEEE Standards Association (SA) and the IEEE Industry Standards and Technology Organization (IEEE-ISTO).

An IEEE Life Fellow, Dr. Read served as IEEE President in 1996 and was on the IEEE Board of Directors for a decade. His many honors include the IEEE Standards Association International Award and the IEEE Power Engineering Society's Power Life Award. Dr. Read has also been a Member of the Order of Canada since 2003 and was the first recipient of the W.S. Read Service Medal in 2000.

Notable Canadian IEEE Members

IEEE is made up of thousands of dedicated, hardworking members who are committed to supporting engineering and the engineering profession in Canada. A special thank you goes out to a few Canadian IEEE members who have been instrumental to changing IEEE in a significant and positive way.

Brent Hughes

As the Publicity Chairman for the Vancouver Section, Mr. Hughes was instrumental in creating the first IEEE membership database (SAMIEEE). The database greatly improved how IEEE accessed member information, allowing us to reach out to members in a more productive and targeted manner. For his efforts, Mr. Hughes received the Distinguished Service Award for 1989-1990 from the Vancouver Section, a Special Recognition Award from the IEEE Regional Activities Board (presented at Sections Congress 1990 in Toronto, Canada) and a Third Millennium Medal in 2000.

Gerald Karam

While serving as the IEEE RAB SAC Chair, Gerald Karam developed the first online registration system. Initially created for students, the early system evolved to make online application more efficient for all IEEE members. Dr. Karam has served as the IEEE-Canada Regional Student Representative, 1985-1986; Chair of the IEEE-Canada Student Activities Committee, 1988-1990; Chair of the Student Professional Awareness Activities (SPAA) Subcommittee of the Regional Activities Board's Student Activities Committee (RAB/SAC), 1992-1994; Vice Chair of RAB/SAC, 1995; and Chair of RAB SAC, 1996-1997. Dr. Karam is an IEEE Senior Member and received the IEEE Third Millennium Medal in 2000, as well as the 1998 Regional Activities Board Innovation Award.

Dave Kemp

Dedicated to helping recent graduates find their way in the engineering profession, Dave Kemp served as the first IEEE GOLD Committee Chair. For this work, he was recognized with the 1997 Regional Activities Board (RAB) Leadership Award. Mr. Kemp served as President of IEEE Canada and Director, IEEE Region 7, 1998-1999 and as IEEE Secretary, 2000. He is a Senior Member of IEEE and a Fellow of the Engineering Institute of Canada. Mr. Kemp has also served on the boards of two Societies and is a member of the ICF.

Canadians and the IEEE Presidency

Raymond D. Findlay

Dr. Raymond Findlay earned his B.A.Sc., M.A.Sc. and Ph.D. degrees from the University of Toronto and began his teaching career at the University of New Brunswick (1967-1981) before joining McMaster University in 1981, where he is currently Emeritus Professor in the Department of Electrical and Computer Engineering. He holds four patents in electromagnetic fields and losses in electrical power devices.

Dr. Findlay has served on the IEEE Board of Directors, 1994-1997, 2001-2003; as President of IEEE Canada, 1995; IEEE Vice President, Regional Activities, 1996-1997; and as IEEE President in 2002. In addition to various regional positions, he has been active in several IEEE Societies and serves on the IEEE Canadian Foundation and the Council of the Engineering Institute of Canada, where he is currently the Chair of the History Committee.

A Fellow of IEEE and the Engineering Institute of Canada, Dr. Findlay's many awards include the IEEE Canada Merit Award, the IEEE Millennium Medal and the W.S. Read Service Award. He was also awarded the 2007 IEEE Canada A.G.L. McNaughton Medal in recognition of "outstanding contributions to the analysis and design of electrical machines, particularly to the theory and measurement of shaft currents in induction motors, and for leadership in the profession." ■

Lancement du site du Réseau global d'histoire de l'IEEE

En 2008 le Réseau global d'histoire (RGH) de l'IEEE a été lancé: http://ieeeghn.org/wiki . Il s'agit d'un nouveau portail à contenu libre développé par le Centre d'histoire du IEEE. Avec des contributions attendues de milliers, possiblement de dizaines de milliers de volontaires, l'IEEE s'attend à ce que le RGH devienne la principale archive publique pour la préservation et l'interprétation de l'histoire de l'innovation technologique.

Pour contribuer au RGH, les membres du IEEE peuvent accéder au site avec leur identification et mot de passe de compte web IEEE. D'autres contributeurs potentiels qui ne sont pas membres IEEE peuvent demander un accès via un lien distinct. Les contributeurs pourront créer de nouvelles fiches et ajouter aux fiches existantes avec des narrations écrites, photos, dessins, schémas, documents, et enregistrements vidéo ou audio.

IEEE Milestone: The First External Cardiac Pacemaker

"His invention saves millions of lives…"

By Visda Vokhshoori, IEEE Toronto Section

The Banting and Best Institute is located half a block east of Toronto General Hospital on the north side of College Street, across from the MaRS building. Its humble looking facade does not reveal to its observer the numerous inventions that were spawned in its halls.

When I arrived for the plaque unveiling ceremony, a little before 2 PM on September 26, I could not help but imagine what would have been like to go back in time and be in the company of the great man, Dr. John Hopps. In his own words, "There was no intent to sit down and develop a pacemaker. As so often happens, one piece of research spins off into something else." [Hopps' interview with CBC Front Page Challenge, 1984] These were humble remarks for a man whose invention has saved and improved lives of millions of people.

Half a century later, the IEEE History Committee and Board of Directors recognize Hopps' Extra Cardiac Pacemaker as a significant achievement and award this invention the IEEE Milestone status. Pelle Westlind, IEEE Toronto Life Member Chair, Patrick Finnigan, IEEE Toronto Section Life Member Vice-Chair, Ferial El-Hawary, IEEE Canada President, and Donald Hopps, son of late Jack Hopps, animated the ceremony. And now the front wall of Best and Banting is adorned with the bronze plaque honoring this far-reaching engineering developement. Congratulations to the inventors, and to the volunteers who steered forward this recognition.

L to R: Ferial El-Hawary, Pelle Westlind, Donald Hopps, Patrick Finnigan

Bob Alden, a recipient of a History Committee Recognition, was honoured November 17, 2009 at the IEEE Foundation Board meeting in Piscataway, New Jersey. This new Recognition Program was approved a few days earlier by the IEEE History Committee. At left the Committee's 2009 Chair, Richard Gowan, makes the presentation.

The citation reads:

"The IEEE History Committee recognizes the contributions to the history activities of IEEE made by Robert Alden, whose efforts have increased the recognition by the general public of technical achievements in IEEE's fields, and enhanced the appreciation of those achievements and their contributions to humanity.

Richard Gowan
Chair, 2009 History Committee"

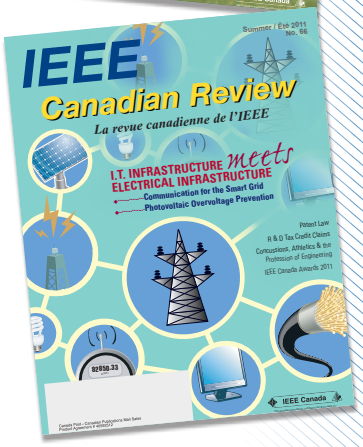
The Irreplaceable Wally Read

With the passing of Wally Read in 2011, there was an outpouring of sadness, not only within IEEE Canada, but across the organization worldwide.

Wally was universally admired, respected and embraced by everyone who had the privilege of working with him. His 35-plus years as an IEEE Canada volunteer began with positions held at the Section level, chairing Canadian Atlantic Section in 1976/1978. His contributions at the Region level were varied and numerous, becoming Region 7 Director in 1984. He became IEEE President in 1996, one of only three Canadians to achieve this honour. Wally Read's outstanding contributions were not confined to IEEE. He was appointed a member of the Order of Canada in 2003.

On the human side friends and colleagues have described him as a warm-hearted, friendly person. Over and over, those who met him recount how he took a personal interest in the lives of others, becoming a mentor to many.

An outstanding communicator in all respects, Wally's stories and flair for the theatric are legend. But he was also an outstanding writer. The *IEEE Canadian Review* was fortunate to have him contribute several times, with two of his submissions included herein.



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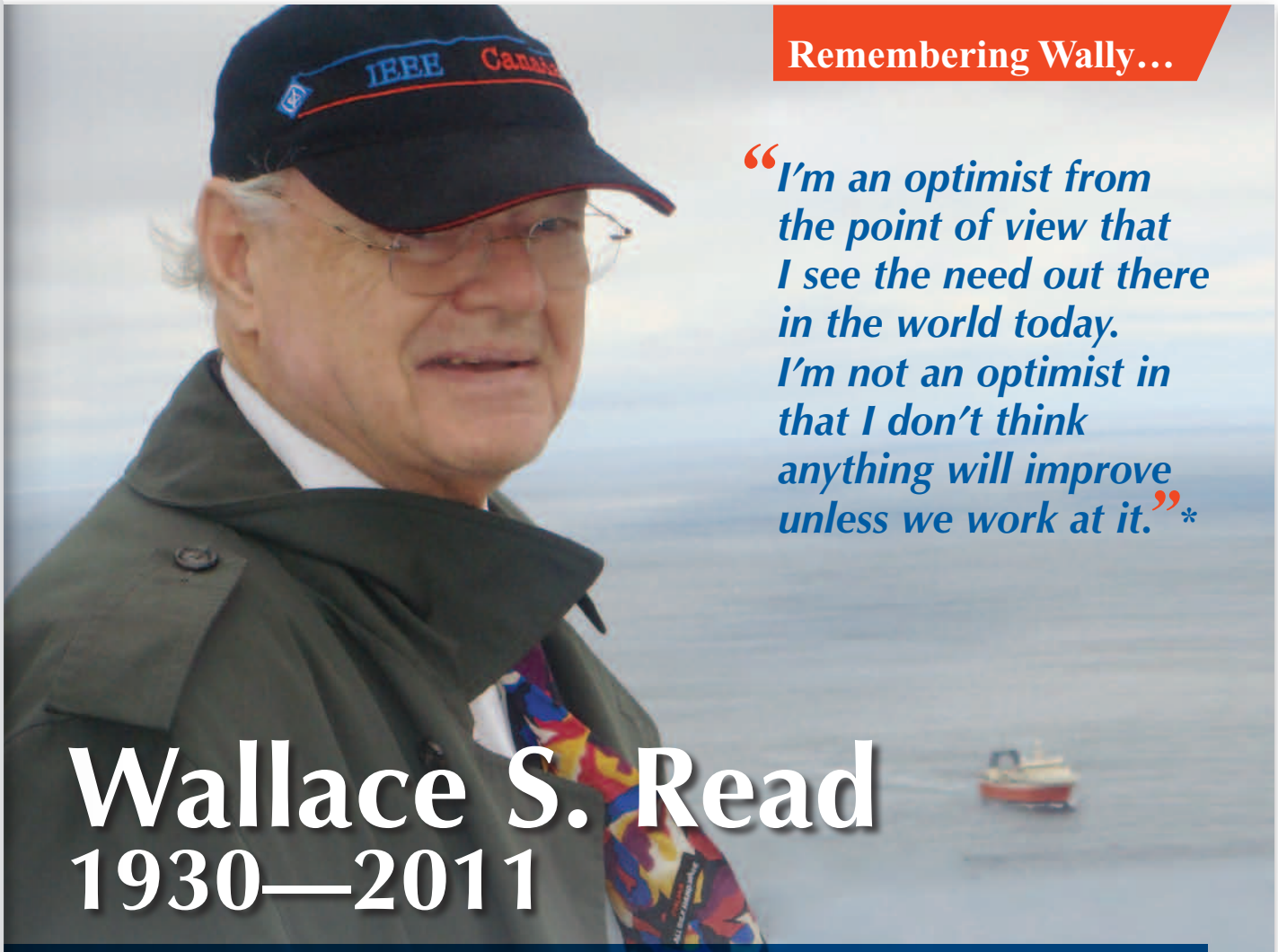
Remembering Wally…



> *"I'm an optimist from the point of view that I see the need out there in the world today. I'm not an optimist in that I don't think anything will improve unless we work at it."**

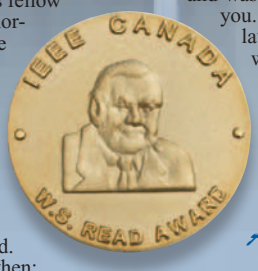
Wallace S. Read
1930—2011

"We've got to talk to the public of the world, and we've got to keep stressing the message with the importance, particularly in our case of electrical technologies, to make sure that the message is public: 'here's what we've done, great technology — needs to be used by the whole world — but don't misuse it."*

The life of Wallace Stanley Read touched so many friends, colleagues, and yes, admirers; we count ourselves most fortunate to have been all three for more than 35 years. Wally taught not by lecturing but by example. He was a model volunteer and above all he demonstrated non-wavering love of his province, country, his fellow humans and indeed, his profession. In recognition of his enormous contributions, IEEE Canada named its highest service honour the "Wallace S. Read Outstanding Service Award," as well as appointing him as its first Director Emeritus.

One of Wally's more recent areas of service to IEEE has been through the IEEE Fellow Evaluation Committee, and we cherish our recollections of the time we spent together there. We also share with so many colleagues and friends fond memories of Wally's sense of humour, as noted in these pages. But Wally's unique way of making you feel the most important person in the room will also be sorely missed. Wally: "We'll meet again, don't know where, don't know when; But I know we'll meet again, some sunny day."

Ferial and Mo El-Hawary, Canadian Atlantic Section

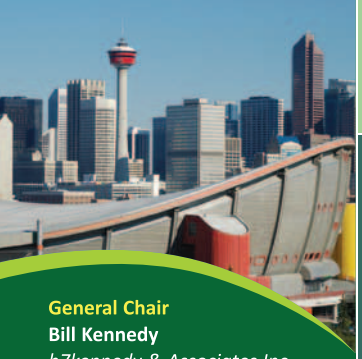


I have been a long-time admirer of Wally for more than 20 years; receiving the "W. S. Read Outstanding Service Award" for 2011 has meant a lot to me. Wally had an ability to captivate you. His warm personality drew you to him. He took an interest in what you were doing and was always ready to share his knowledge and experience with you. It was never a stern talk, but rather one full of comedy, laughter and plenty of wisdom. He could, however, be firm with his position, but always showed respect for your opinions. He was always full of energy, and despite his failing health, participated in IEEE activities and was always the first to volunteer. Now that's an example we should all strive to follow. He will forever be remembered.

"The smile you send out returns to you" – an inscription on the back cover of the Beach Boys "Pet Sounds" LP.

Ashfaq (Kash) Husain, London Section

* *Reprinted with permission:* "Wally Read," an oral history conducted in 2009 by Michael Geselowitz, IEEE History Center, New Brunswick, N.J., USA. *In these excerpts, Wally is responding to a question on the future of IEEE.*



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CALL FOR PAPERS

IEEE EPEC 2014

Electrical Power and Energy Conference

Partnership Between Industrial Users and Power Providers

http://sites.ieee.org/epec2014/

November 12-14, 2014, Calgary, AB, Canada

Fourteenth annual Electrical Power and Energy Conference (EPEC 2014) will take place in Calgary, AB, Canada from November 12 to 14, 2014. The objective of EPEC 2014 is to provide a forum for the exchange of electrical applications technology related to electrical power and energy generation, distribution systems and utilization. The focus for this year's conference will be on partnerships between industrial users and power providers by bringing together industrial users, power providers, manufacturers, consultants and academia to discuss cutting edge topics of interest to all stake holders.

In addition to making technical contribution to EPEC 2014, bring your family to enjoy the culturally diverse, creative and cosmopolitan city with a warm welcoming spirit.

Topics: Papers are invited on all topics of interest related to electric power and energy and especially papers with the following focus:

1. Industrial System Designation (ISD) Partnerships
2. Renewable power generation in Alberta
   - Integration Challenges
   - New technology developments
3. Co-generation
   - New developments
   - Integration
4. Controls
   - 61850 'Goose Messaging'
5. Grounding Philosophy
6. Reactive Power
7. Large Drives
   - Challenges
   - Applications
8. Regulation / Deregulation
   - Experience in Alberta
   - Future developments
   - Integrated system modeling and dynamics
9. Protection
   - Renewable energy integration
   - New developments
10. Smart Grid interoperability

Paper Submission:

The format of the paper should follow the IEEE conference papers style. EPEC 2014 will only accept the electronic submission of a full paper in English with maximum six pages in double column format (submission website address to be announced shortly). Detailed information on paper format and submission procedure can be found on the conference web. Papers presented at the conference will be included in the EPEC 2014 proceedings that will be included in EI Compendex, IEEEXplore and ISI.

Important Dates:

April 30 2014	**Submission of full papers in PDF and organized session proposals**
June 10 2014	**Submission of tutorial and workshop proposals**
June 30 2014	**Notification of paper and tutorial/workshop acceptance**
July 20 2014	**Submission of final camera-ready papers**

Exhibitions:

There will be an exhibition site at the conference. Companies and institutions who are interested are encouraged to contact the exhibition chair for further information.

For more information on EPEC 2014, please contact:

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For detailed up-to-date information, please visit the EPEC 2014 conference web site

IEEE Canada

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APPEL POUR PUBLICATIONS

CEE IEEE 2014

Conférence sur l'énergie électrique

Partenariat entre les usagers industriels et les fournisseurs d'énergie

http://sites.ieee.org/epec2014/

12-14 novembre 2014, Calgary, AB, Canada

La quatorzième conférence annuelle sur l'énergie électrique (CEE 2014) aura lieu à Calgary, AB, Canada, du 12 au 14 novembre 2014. L'objectif de CEE 2014 est de fournir un forum d'échange sur les technologies des applications électriques liées à l'énergie électrique et la production d'énergie, les systèmes de distribution et l'utilisation. L'objectif de la conférence de cette année sera les partenariats entre les industriels et les fournisseurs d'énergie en regroupant des utilisateurs industriels, des fournisseurs d'électricité, des fabricants, des consultants et des universitaires pour discuter de sujets à la fine pointe et d'intérêt pour toutes les parties prenantes.

En plus de faire une contribution technique à CEE 2014, amener votre famille pour profiter d'une ville culturellement diversifiée, créative et cosmopolite avec un esprit chaleureux et accueillant.

Sujets : **Les articles sont sollicités sur tous les sujets d'intérêt liés à l'alimentation et à l'énergie électrique, en particulier des articles mettant l'accent sur:**

1. Partenariats pour la désignation des systèmes industriels
2. Génération de puissance renouvelable en Alberta
   - Défis de l'intégration
   - Nouveaux développements technologiques
3. Cogénération
   - Nouveaux développements
   - Intégration
4. Commande
   - 'Messagerie Goose' 61850
5. Philosophie de mise à terre
6. Puissance réactive
7. Grands entrainements
   - Défis
   - Applications
8. Règlementation / Dérèglementation
   - Expérience en Alberta
   - Développements futurs
   - Modélisation des systèmes intégrés et dynamique
9. Protection
   - Intégration des énergies renouvelables
   - Nouveaux développements
10. Réseaux intelligents et interopérabilité

Soumission d'articles: Le format de l'article doit suivre le style pour les articles des conférences de l'IEEE. CEE 2014 accepte seulement la soumission électronique d'un document complet en anglais avec un maximum de six pages au format de double colonne (l'adresse du site Web pour la soumission des articles sera annoncée sous peu). Des informations détaillées sur le format des articles et la procédure de soumission peuvent être trouvées sur le site Web de la conférence. Les communications présentées lors de la conférence seront incluses dans les comptes rendus de la conférence CEE 2014 qui seront publiés dans EI Compendex, IEEEXplore et ISI.

Dates importantes:

30 avril 2014	**Soumission des articles complets en format PDF et des propositions de séance organisée**
10 juin 2014	**Soumission des séances didactiques et des ateliers**
30 juin 2014	**Notification d'acceptation des séances didactiques et des ateliers**
20 juillet 2014	**Soumission de la version finale des articles**

Exposition industrielle: Il y aura un lieu pour les expositions industrielles lors de la conférence. Les entreprises et les institutions intéressées sont invitées à communiquer avec le Président Expositions industrielles pour plus d'informations.

Pour plus de renseignements sur la conférence CEE 2014, s'il vous plaît contactez :

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Pour des renseignements détaillés et à jour, s'il vous plaît visitez le site Web de la conférence EPEC 2014

IEEE Canada

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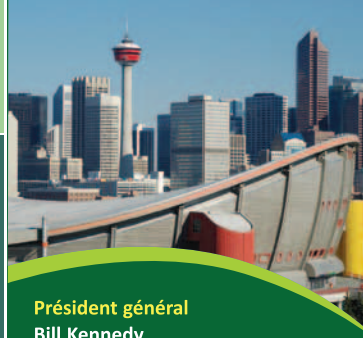

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CCECE 2014

The 27th Annual
Canadian Conference on
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http://www.ccece2014.org

"Electrical and Computer Engineering—The Enabler of the New Economy"

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Call for Papers and Proposals

The 2014 IEEE Canadian Conference on Electrical and Computer Engineering (CCECE 2014) will be held in downtown Toronto, Ontario, Canada during May 5–8 2014. CCECE 2014 provides a forum for the presentation of electrical and computer engineering research and development from Canada and around the world. Papers are invited, in French or English, for the following symposia:

▶ **CIRCUITS, DEVICES AND SYSTEMS**	*Chair: Glen Cowan (Concordia), Emanuel Istrate (UofT)*
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▶ **BIOMEDICAL AND HEALTH INFORMATICS**	*Chair: Carolyn McGregor (UOIT), James C. Lacefield (UWO)*
▶ **COMPUTERS, SOFTWARE AND APPLICATIONS**	*Chair: Ebrahim Bagheri (Ryerson), Jelena Misic (Ryerson)*
▶ **POWER ELECTRONICS AND ENERGY SYSTEMS**	*Chair: Olivier Trescases (UofT), Trevor Grant (Candura)*
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Number of best paper awards will be given as well as arrangements are made for publication of extended versions of selected papers in the *Canadian Journal of Electrical and Computer Engineering* (CJECE). Conference content will be submitted for inclusion into *IEEE Xplore* as well as other Abstracting and Indexing (A&I) databases.

Industrial Exhibits and Sponsorships

For industrial exhibits please contact the Industrial Exhibits Chair at: exhibits@ccece2014.org
For sponsorships please contact the Sponsorship Chair at sponsorships@ccece2014.org

Important Dates

Notification of Acceptance will be sent out:	February 14, 2014
Author's Registration ends by:	March 4, 2014
Advance Registration ends by:	April 1, 2014

Questions or Comments

For any questions or comments, please contact the Conference Chair:
Xavier Fernando, Tel: 416-979-5000 x6077, Fax: 416-979-5280, Email: xavier@ieee.org

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27e Congrès
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"Génie électrique et informatique—Le moteur de la nouvelle économie"

Appel à contributions

Le 27e congrès canadien annuel en génie électrique et informatique (CCGEI 2014) se tiendra du 5 au 8 mai 2014 au centre-ville de Toronto, en Ontario au Canada. Le CCGEI est une plate forme dédiée à la présentation et à la valorisation des résultats de recherches, en génie électrique et informatique, réalisées tant au canada qu'ailleurs dans le monde. Les articles soumis doivent être rédigés en français ou en anglais et s'inscrire dans l'une ou l'autre des thématiques ci-dessous.

▶ CIRCUITS, DISPOSITIFS ET SYSTÈMES	*Prés.: Glen Cowan (Concordia), Emanuel Istrate (UofT)*
▶ COMMANDES ET ROBOTIQUE	*Prés.: Joshua Marshall (Queens), Soosan Beheshti (Ryerson)*
▶ COMMUNICATIONS ET RÉSEAUX	*Prés.: Mark Coates (McGill), Alireza Ghaderipoor (Broadcom)*
▶ INFORMATIQUE APPLIQUÉE AUX SCIENCES BIOMÉDICALES ET DE LA SANTÉ	*Prés.: Carolyn McGregor (UOIT), James C. Lacefield (UWO)*
▶ ORDINATEURS, LOGICIELS ET APPLICATIONS	*Prés.: Ebrahim Bagheri (Ryerson), Jelena Misic (Ryerson)*
▶ ÉLECTRONIQUE DE PUISSANCE ET RÉSEAUX ÉLECTRIQUES	*Prés.: Olivier Trescases (UofT), Trevor Grant (Candura)*
▶ TRAITEMENT DES SIGNAUX MULTIMÉDIA	*Prés.: Xianbin Wang (UWO), Matthew Kyan (Ryerson)*
▶ RÉSEAUX INTELLIGENTS ET ÉNERGIE RENOUVELABLE	*Prés.: Mohammad Dadash Zadeh (UWO), Kankar Bhattacharya (Waterloo)*

Plusieurs prix de meilleur article seront décernés. Les meilleurs articles seront retenus pour publication dans le Journal Canadien de Génie Électrique et Informatique (JCGEI). Le compte rendu de la conférence sera soumis pour inclusion dans IEEE Xplore ainsi que pour indexation dans différentes bases de données.

Expositions industrielles et commandites

Pour les expositions industrielles, veuillez contacter le président du comité des expositions industrielles à exhibits@ccece2014.org.
Pour les commandites, veuillez faire parvenir un courriel au président du comitédes commandites, à l'adresse sponsorships@ccece2014.org

Dates à retenir

Date prévue pour la notification d'acceptation:	d'ici le 14 février 2014
Date limite pour l'inscription des conférenciers:	le 4 mars 2014
Date limite pour l'inscription anticipée:	le 1er avril 2014

Questions ou commentaires

Les questions et commentaires peuvent être adressés au président du congrès :
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