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IEEE CANADA DELEGATES AT 90 SECTIONS CONGRESS

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IEEE Canadian Review General Information

The *IEEE Canadian Review* is published three times per year - in January, May and September. The *IEEE Canadian Review's* principal objective is to project an **image** of the Canadian electrical, electronics, communications and computer engineering professions and their associated academic and business communities to :

(i) Canadian members of IEEE;

(ii) Canadian members of the profession and community who are non-members of IEEE;

(iii) the associated academic (i.e. universities, colleges, secondary schools), government and business communities in Canada.

In this context, the *IEEE Canadian Review* serves as a forum to express views on issues of broad interest to its targeted audience. These issues, while not necessarily technologically-oriented, are chosen on the basis of their anticipated impact on engineers, their profession, the academic, business and industrial community, or society in general.

To ensure that the *IEEE Canadian Review* has the desired breadth and depth, five Associate Editors are responsible for identifying issues and screening articles submitted to the *IEEE Canadian Review* according to the following general themes:

1- National affairs
2- International affairs
3- Technology
4- Industry
5- Education

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- The Managing Editor

Copies of the photograph of Canadian delegates at SC90, appearing on the front cover, are available directly from the IEEE Canada office.

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IEEE
Canadian Review

IEEE Canada Delegates at Sections Congress 90

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Sections Congress '90: What Did it Achieve?

by Dr. Tony R. Eastham
Director, IEEE Canada

All IEEE staff members at HQ in New York and at the service centre have a motto on their desks: "Remember the member or members first". This serves as a reminder that IEEE is a service organization. It is directed by volunteers (your Board of Directors) and sustained by members' dues and income from other IEEE activities, such as publications, standards, conferences, and income from investments. And I know the IEEE staff believe that they are part of a service organization, and they try to be helpful and responsive to members' needs and requests. However, staffers seldom hear from the vast majority of members, and the triennial sections congress provides an invaluable opportunity for members and staff to come together, both to talk and to listen.

Thus sections congress is IEEE's big event, and we were honoured to host the first congress outside the U.S.A., at the Royal York Hotel in Toronto. Over 650 delegates, guests and IEEE staff came together in an intensive workshop environment to chart a course for the Institute into the nineties. Yes, a good time was had by all, but I believe that the delegates provided some very specific guidance which will mature into action plans for implementation by the various boards of the Institute.

This issue of the IEEE Canadian Review focusses on SC'90. The Congress was honoured to receive a welcome from the Honourable Lincoln M. Alexander, Lieutenant Governor of Ontario, at the opening session. This was followed by an inspiring address by Dr. Geraldine Kenney-Wallace, president of McMaster University. In view of the interest shown in her presentation, an edited version of Dr. Kenney-Wallace's address appears as the lead article in this issue of the review.

The second feature is a photo-essay of the congress, providing a glimpse of the serious and fun sides of SC'90.

How did congress work? Three broad themes were defined: the big network - IEEE, the chapter: partner with societies and sections, and global visions for the IEEE. Each theme was addressed first in a series of tutorials led by experienced IEEE volunteers. Everyone then came together for a plenary session involving a panel discussion of the issues. Finally,participants in a number of small breakout sessions were mandated with the task of identifying special issues and corresponding actions for IEEE to consider.

All issues and proposed actions for the three themes (over 200 in total) were collected by a review panel. This panel, with staff support, worked overnight to integrate similar statements and to come up with 64 distinct items for consideration by congress in plenary session on the final morning. Each delegate voted by assigning a weighted priority to each item. The voting papers were collected, scanned electronically, and the results presented to the delegates before adjournment of the congress. This resulted in 24 recommendations for action (see page.11)

Each recommendation has now been referred to the appropriate IEEE board for review. The chairman of SC'87–held in Anaheim–reported that 22 of the 24 recommendations from that congress had beed acted upon. I fully expect that SC'90 will be just as productive, for the benefit of the members.

Remember, if you have a concern about the services offered by the IEEE - tell someone: either myself, or Pam Woodrow, or your section chairman, or a staffer in New York or Piscataway will listen and respond. It's your IEEE.

The next sections congress will be held in 1993 in Puerto Rico, again outside the U.S. to emphasize the transnationality of the IEEE. A new set of members will then have the opportunity to steer the good ship IEEE with its, by then, over 350,000 members world-wide.

About the IEEE

The Institute of Electrical and Electronics Engineers, Inc. (IEEE), with headquarters in New York, is a transnational organization with 320,000 members in 137 countries. The world's largest engineering society, its objectives are technical, professional and societal.

The IEEE's technical objectives centre 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 over 16,500 members. The Canadian Region is formed from 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 (p. 3).

Geraldine Kenney-Wallace's Keynote Address at SC'90

"A vision is a dream, and a goal is a vision with a deadline"

I love the title of your meeting, Optimizing Connections, and I began to think about what our connections are in 1990 and where we must be by the year 2000. I have tried to craft a keynote address that is built around the IEEE. With permission, because these are inflationary times, I've given you an extra E. So here we are: **I** quadruple **E**. **I** stands for "international," the first **E** for "education," the next **E** for "electronics in the 21st century," and the final two **E**'s for "ethics" and "equity."

These are the themes around which I am going to weave my remarks. Now, I could have used "excellence," but I think everybody knows what "excellence" means. Striving for excellence is part of being alive and being very good at what you do. I could also have said "environment", but I know you are all very conscious of our environment and of our need to protect it with every piece of ingenuity that we have at our disposal. Indeed, I could go on with other E's, but I decided to stop at I quadruple E. Let me now turn to my keynote address.

"Global Visions," the title of my remarks, have dimensions of physical and intellectual geography which I want to explore with you this morning. To show that even university professors know what an executive summary is, I will give you the headlines first. There are three key messages for IEEE as you look forward over the next decade, summarised in the three points below.

• My first point is that electrical engineering is a substrate. Electronics today has become a substrate technology for future technologies going far beyond our understanding and beyond the accepted and conventional borders of electrical and electronics engineering.

• My second point, which flows from the first, concerns the impact of the research and teaching and the professional activities of electrical engineers. Double E, or now my quadruple E, graduates around the world will have an impact on society that goes far beyond just electrical and electronics engineering. You are increasingly influencing cultural, economic, social, legal and even ethical values. Global visions have dimensions of space and time and will lead to industrial applications about which we can only dream.

• My third point is that electrical engineers, as professionals, must be bold enought to ask pointed questions, and to have the courage to answer with candour and frankness and honesty, while never forgetting how to dream. Are you meeting the challenges and needs of the 21st century? Are you still buried in much of your past, or are you growing and learning from it and building the most extraordinary opportunities for your profession, for our society, for our global visions around the world? These are my questions. It is your challenge to answer them. Remember: a vision is a dream, and a goal is a vision with a deadline. It is really up to you to look at your visions, to share your ideas, to establish your goals, and to work out your own action plans for the next decade.

Indicators of Globalization

What is the kind of world we are living in, and the challenges that we are living with? Let me flesh out my executive summary in three different ways. First of all, I would like to spend a little time on some serious data, for what I call "indicators of globalization". You will see them presented in a somewhat unusual light. Four such indicators really highlight the global changes, and you will find these are indicators with which you are familiar. But consider this: how many people outside this room realize these indicators show, economically, what is happening?

Dr. Kenney-Wallace is the president of McMaster University in Hamilton. On October 5, 1990, she addressed the IEEE Sections Congress 90 in Toronto, Ontario. She shared with her audience some "Global Visions," that, according to her own words, have dimensions of physical and intellectual geography. These are visions for the next decade, which can and should be translated into ideas and into goals. They represent a challenge, that many IEEE members will certainly answer with enthusiasm.

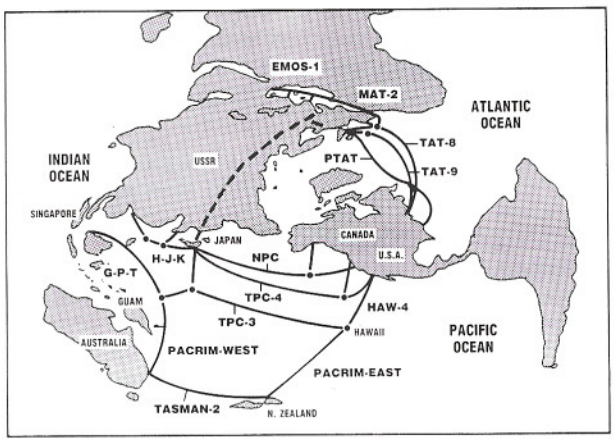
Dr. Kenney-Wallace est présidente de l'Université McMaster à Hamilton. Le 5 octobre 1990, elle s'adressait à l'assemblée au Congrès des Sections du IEEE '90, à Toronto. Elle se déclara solidaire du thème de ce congrès–"Visions Globales"–qui, selon ses propres mots, possède des dimensions géographiques à la fois physiques et intellectuelles. Ce sont des visions pour la prochaine décennie qui peuvent et doivent se traduire en idées et buts; elles représenteront un défi que de nombreux membres du IEEE vont relever avec enthousiasme.

You have a communication function to perform too as professionals, to help communicate the message of globalisation. Then I am going to show a series of vignettes of sciences, technologies, and applications which, to my mind, would not be here today without double E. But they may not be the examples you expect to see. After all, a picture expresses a thousand words. Finally, I will conclude briefly by returning to my opening theme, and look at the kinds of policy issues that must be considered in an action plan. I hope that this approach will help stimulate the very interesting series of workshops that IEEE has arranged for the next few days.

A Global Fibre Optics Network

Let me begin with the first slide (Figure 1) which illustrates a global fibre optic network. This is a slightly unusual projection of the world but note here all the continents, and all the black connecting lines, which are fibre optic cables,

Figure 1 Global fibre optic submarine cable network



either in place or planned for 1993-94. The message is simple: oceans link; they do not divide. Oceans hum with information going back and forth 24 hours a day between the different continents. This is a New World Map. It is an indicator of networking possibilities between the various countries. It is a knowledge map with more dynamic flow linkages and patterns being conceived every day.

My question is for your students, your researchers, your professional associates, your colleagues, the bankers, the private sector, the investment people, and the government policy makers. Does everybody recognize the opportunities offered by this network which increasingly facilitates the exchange and controls the flow of information? This is the knowledge network in physical reality and our future challenge is to organize knowledge, not to drown under what seems an overwhelming amount of information.

To organize knowledge is to act. To know is to be smart. To know what you do not know is to be smarter still. But to get access to what you need to know, and fast, is perhaps the biggest challenge in the future.

The fibre optic links are big businesses in themselves. Establishing such a link is an enormous opportunity for design, fabrication, installation, and the development of new technologies. Science-based innovation has even been involved. Those of you who remember the stories about sharks nibbling fibre optic cables will realize that ensuring routine reliable operation goes far beyond double E work. We have to learn about animal behavior, too!

International Telephone Traffic

Figure 2 is an international telephone traffic map. As indicators of globalization, most people think of trade balances in manufactured goods and so forth. Why not look at the trade balances between the number of minutes we all spend on the telephone or the fax or on data communication systems? This diagram from the Financial Times report in the U.K. simply provides some information about who is doing business with whom in terms of the number of minutes which we use on fibre optic and satellite communication links. Mail is too slow these days. Phone companies, fibre optics, fax machines transcend time and geography. It is quite intriguing to see in balance the inflows and outflows in Europe. Why is this such an interesting and important measure? We usually think of trade in terms of goods, such as manufacturing. But the service sector these days is just as significant and growing rapidly and substantially. In Canada, approximately

INTERNATIONAL TELEPHONE TRAFFIC IN MILLIONS OF MINUTES - 1988

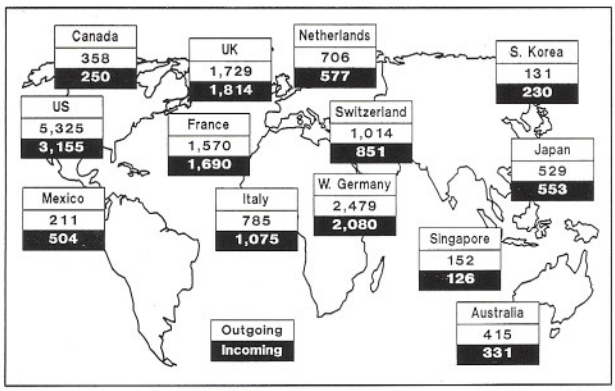


Figure 2 International telephone traffic in millions of minutes - 1988

65-70% of our activity is based on services. Thus there is a need to find ways of monitoring this activity. As with all indicators, interpretation of trends must take place with a sound knowledge of the policy climate in which the economic activity is measured.

While this map seems to indicate that we Canadians are not communicating as much as some other countries, I hasten to assure you that Canada's outgoing and incoming international indicators look small because they do not include communications between Canada and the United States or Mexico. Because of the telephone regulations, such calls count as domestic traffic. Those of you, like I, who admire Italy, will also appreciate that much of what the Italians are doing is probably not recorded officially! Not every country will have comparable capacity to utilise telecommunications. Initial surprise at Japan's indicators may change when you realize that their telecommunications industry only recently deregulated. Prices are now falling and all communications traffic is now increasing at 40% per year. In summary, there are cultural, regulatory and business environment clues in these indicators and comparisons of the statistics. I think they are an interesting class of new indicator for future monitoring of globalization.

People and Financial Resources

The next two indicators deal with the engines of change: people, and then the financial resources to back those people. I have statistics for only 15 countries. While I could not possibly include data for every country represented at this IEEE conference, if you have additional relevant information and would send it to me, I would be very pleased to include the data in the future.

Figure 3 shows the number of scientists and engineers per unit population in terms of the manufacturing output from a given country, presented over many countries. As more scientists and engineers are educated, and enhance the technological capacity of the work force, there is indeed a very interesting positive correlation with the increase in gross production per unit population in the manufacturing sector (shown in US dollars). For Pakistan, the Philippines, Argentina, S. Korea, Canada, the UK, France, West Germany, Japan and the USA at the top of the graph, this correlation says to society that we need a technologically competent work force. Scientists and engineers give us the know-how, the show-how, and the kind of expert knowledge to build technologies which are revolutionizing industries, our trade and overall productive economic structures in countries of wide ranging economic strengths.

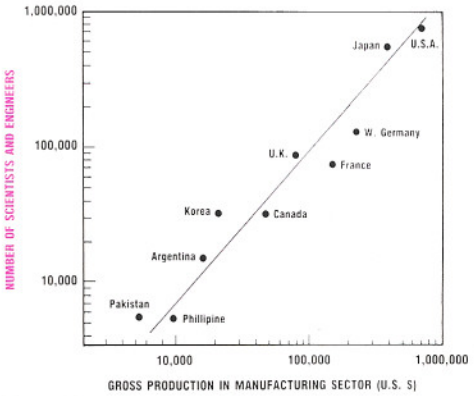


Figure 3

Investments in R & D and Increased Productivity

Some business economist friends and I have arguments about whether to consider input or output indicators. We need both to understand real leverage in an economy. We must put people and their brains to work (input), and then this investment produces manufacturing wealth (output) in society. But that is just the human resource investment. What about investments on the fiscal side?

Figure 4 shows the gross expenditures on research and development, i.e. GERD dollars invested in R & D, for a number of OECD countries, plotted as a function of their gross domestic product (GDP) in billions of US dollars. From Norway, Finland and Austria at the lower end, to Belgium, Australia, Switzerland, Sweden, the Netherlands, Canada, Italy, the UK, France, Germany, Japan and the United States, there is a very strong positive correlation. Investment in R & D seemingly leads to increased productivity in terms of the gross domestic product. As a scientist, I know very well that just because we find a positive slope and a straight line correlation does not necessarily mean that we understand the correlation between the two variables. But I would submit that the empirical evidence in Figures 3 and 4, col-

CORRELATION BETWEEN GERD AND GDP, SELECTED OECD COUNTRIES, 1987
(Sources: OECD, Department of Statistics & Economics, July 1989)

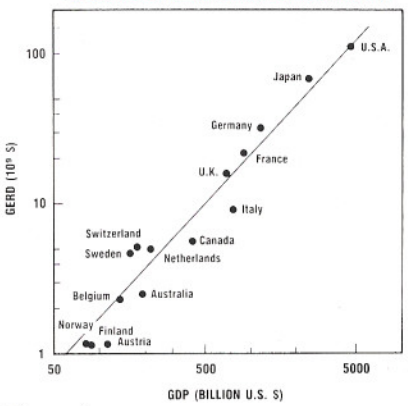


Figure 4

lected over the last decade, is just too good to ignore. For an enhanced prosperity, invest in people, invest in scientists and engineers, invest in research and development and stimulate the innovation chain working. We also need to ensure the governments'social and economic policies are working so that we can put such investment ideas into action for the greater good and the greater betterment of our societies around the world.

If the idea of investment is critical, are these indicators enough? Of course not. Market identification, market share and market performance are key. R & D is a necessary but not a sufficient condition because we have to have leverage into world markets for tradeable goods and services. Where are we going to put the investment? We need to know and understand the economic structure of each country. I am not talking about picking winners in the conventional language of interventionists. I believe in policy creating climates in which winners and ideas can pick themselves and flourish. This means policy makers must appreciate the resource structure of the country, as well as the economic structure. For each industrial sector, the pools of capital, cost of capital, infrastructure, energy, transportation, price of land, education tax, and regulations may vary. Quality of life, the environment, ethics, social justice, equity and the human values that make societies run, because we are of human stuff, must also be included. Ultimately, it is our judgement, backed by knowledge of the indicators, that must be used to make decisions on what to do in the best interests of our societies.

Images of the Impact of EE on Society

Let me move away from indicators and focus on a sequence of images, selected to show where I think electronics and electrical engineering have already made an enormous impact on our society. Even greater impacts will come in the future.

Double E as a substrate technology exists in its own right. It is an independent activity, but I also claim that it is one of the underlying strata of new and emerging sciences, technologies, and industries. Figure 5 may not look like a microscope to you, but it is an optical microscope. The scientific principle upon which it is based is coherent Raman scattering using pulsed lasers. It represents the merging of double E, medical and optical technologies to provide optical images of liposomes down to ten microns, captured in a non-invasive probing manner.

Figure 6 is a galaxy (Triangulum (M-38)). This particular galaxy is a reminder of how, without the information processing and transmission capabilities that now extend over 20 orders of magnitude, we would not be able to receive or organize all the information. The wonderful planetary explorations over recent years have taken our global visions out towards far away galaxies. But you do not have to go beyond our galaxy just to dream. You can make and manufacture in space too.

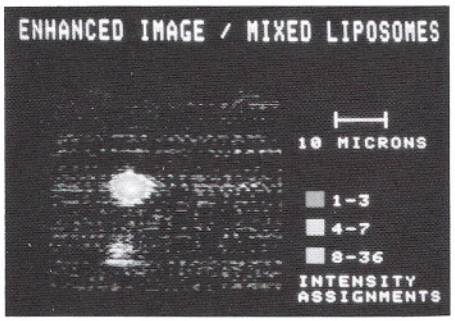


Figure 5

Figure 6

Figure 7 is a hologram of a protein crystal growing in a space shuttle under zero gravity (or at least microgravity 10^{-6}g) conditions. Here again we see in the future the merging of manufacturing technologies created for the pharmaceutical industry with double E and with optical and space engineering technologies. All come together in a fusion of new and important knowledge, which prompts us to pose different questions in our earth laboratories. The substrate of this is double E.

Breaking Down the Solitudes

In Figure 8 are plasma jets in the universe. The radio signals from two galaxies have been processed to give a pictorial representation. In the corner, there is another picture from the Sistine Chapel in Rome. Adam and God, in this painting by Michaelangelo, reach out to touch, just like the radio galaxies are reaching out to touch each other. Technology is also influencing art and archaeology and restoration. Figure 9 is a picture of La Pieta, the marble statue by Michaelangelo also in the Vatican, close to the entrance in St. Peter's. Just the other day, a colleague was explaining the challenges of putting semi-conductor and optical technologies and information processing to work on cleaning and protecting very old marble statues.

Figure 8

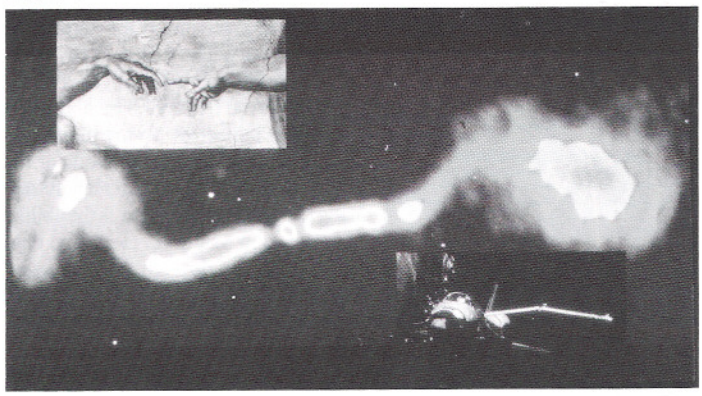


Figure 7

Figure 9

One of our distinguished university visitors, who is an art historian, art curator and art conservationist now based in Los Angeles, was telling me how he first graduated in double E at McMaster University. Thus, we have the marriage of art and technology. It is, however, interesting to pose the question: is it art or is it science? In each of these examples, there is a strong aesthetic as well as technical quality.

One of the unusual features of McMaster is that we have a twin honours program in arts and science. For those of you who might question whether academically the standards are good enough for an individual to graduate and continue on to advanced study as an engineer, a scientist, an artist or humanist, the answer is "yes." A thousand young people across this country tried to get into our limited program with 55 places in 1990, and a 93% minimum entry standard was the result. I would love to expand this program, because it is a symbolic and a real manifestation of the potential creativity of the human mind.

In conclusion, the impact of double E is going far beyond the laboratory. There are many solitudes in this world, but the one that is gradually breaking down, I hope, is between the arts and the sciences. Next time you go to a movie, watch some of those special effects and ask who is working with the director, the artists and the designers. Without doubt, the members of the team will include professional double E's!

Time Scales

Finally, let us look at some images from the laboratory of a modern optics professor, working on the time scale of femtoseconds (10^{-15} seconds) in laboratory. There is also an aesthetic quality, a beauty in lasers. A femtosecond is indeed a very short interval of time — you may be more familiar with picoseconds (10^{-12} seconds) as the time visible light takes to travel about three tenths of a millimetre. Nothing travels faster than the speed of light. Now I challenge the double E/D converter which would help me capture data shown in Figure 10 on these time scales. Light moves about 30% faster than electrons, and current in 50Ω cables, so I leave the challenge with you and future generations. The demand is there.

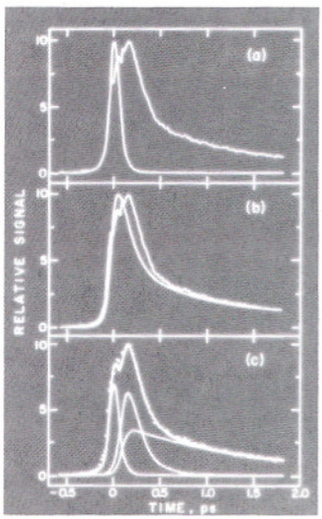


Figure 10

Optics and electronics are increasingly coming together in applications which will revolutionize design of laser transmitters and receivers in the semi-conductor industry. The fusion of EE work with medicine and with art can also be extended to the resource base and pharmaceutical industries. To my mind, one of the most exciting applications of recent work in our ultrafast laser laboratory at the University of Toronto, is the ability to monitor, in real time, electronic currents as they go through the circuits of devices, using non-invasive optical techniques, on a time scale of 10^{-13} seconds. From a research perspective, we need to become more aware of what we can do optically and what we can do electronically. This new optoelectronics thrust is a world-wide phenomenon, linked to Figure 1, and should help to break down the solitudes wherever they exist in the universities, in the private sector labs, and in the government labs. We need to talk to each other much more, across disciplinary borders and across sectors, and to fuse our expertise. The gains of such interaction are often unexpected, and range from intellectual to market profits.

An Action plan

Let me conclude my address by offering some ingredients for an action plan. Electronics, quantum electronics, and now the mixing of optics and electronics to allow these new types of optoelectronic measurements, will have an enormous impact on computers. We still dream about optical computers, as a total system, but there are optical modules in some computers already. If this marriage of technologies allows us to take events from a laser laboratory into a manufacturing laboratory... If this allows us to go from the depths of the earth in exploratory mining and metal processing industries all the way to spaceships and alloy manufacturing in nearby galaxies...If the engineering and market challenges are there, and the visions and dreams and sense of scientific adventure are strong.. what do we need to do back on planet earth to make this happen?

I have a few suggestions and issues for the action plan. The first one, of course, is to focus on innovation. Innovation in education, in research, in industry. My message is: innovate, don't litigate! In days when the arguments in the courts take longer to resolve than the arguments with nature in research projects, let us get on with the real work of generating new ideas and products.

This brings me to my second point. Innovation also means that an individual or organization must get credit for what has been already contributed to the project and what can be expected as gain, whether by contract or by intellectual credit. I urge everybody to look at intellectual property issues (IPR) as we do more and more in partnerships together. That global knowledge network raises IPR issues of who owns what and who gets the credit. Trade and technology are inextricably intertwined these days. In entering partnerships or research fields, we must respect each other's intellectual property, trademarks, licenses and so forth, because there is more heat and less light in the argument when there is something commercially valuable to argue about. We should all become aware of how legal and regulatory issues in IPR are changing. And for those of you who might not realize how important IPR has been for a long while, the first patent attorney in the United States was Thomas Jefferson! Clearly the interest in IPR has been highlighted by the present General agreement on tariffs and trade (GATT) discussions that will help shape our future trading relations.

If we move on from trade and technology and intellectual property to look at new types of strategic alliances, we come to the subject of consortia. In Canada, we now have many very interesting experiments of research and development consortia involving universities, government labs and private sector labs. The breadth of innovation and development of potential new technologies created by teams that cross disciplines are proving to be very exciting. These consortia help share the risk; they share the cost in precompetitive research. They are not surrogates for market activity, nor are they interventionist or protectionist. Free market ideas prevail more effectively once a prototype design is developed. Consortia do not operate as well once the precompetition stage has passed, as experience shows. But in reseach they offer ways of creating results faster because the problems offered are too complex to undertake in a linear or sequential fashion. In this respect, as host to now over a hundred consortia, Canada is indeed an experimental laboratory.

There are two more points I wish to put into the action plan, namely issues of time scales and of ethics. It takes a long time for an idea to get from the lab into the marketplace, and very often our rules, regulations and policies, particularly the focus on quarterly shareholders' reports, do not allow for that long term development. If we look at the time scales of trade and those of technology, and the rapidly changing but innovative world we compete in, we must make sure we understand each other's time scales. We must allow enough time to get projects done, results delivered and the impact of our work evaluated properly.

Finally, I should like to add ethical behaviour. So many issues of privacy, individual rights, collective rights and social responsibility challenge us today, such as tapping cellular phones, or examining the transition between the economic private and public good, or patenting of biological lifeforms. The world has changed. We have to know a little about each other's research or business in order to understand the ethical sensitivities and values. While we must invest in brains especially when times get tough, we must also remember that brains and ideas come in different guises. They come in women and in men, in people from all ethnic groups. Being smart, being knowledgeable and being intelligent have cultural connotations and are reflected in different ways at different times. Let us have ethical and equitable behaviour, and let us see IEEE showing leadership here, building upon your new rich cultural diversity in your membership.

Two compasses

In concluding my remarks, I want to show you a compass, in fact, two compasses. The first in Figure 11 is the planet. It denotes global visions in international education, electronics for the 21st century, environmental integrity, and ethics and equity as part of your set of professional values. The compass appearing in the second figure (Figure 12) is a three thousand years old Chinese


Figure 11

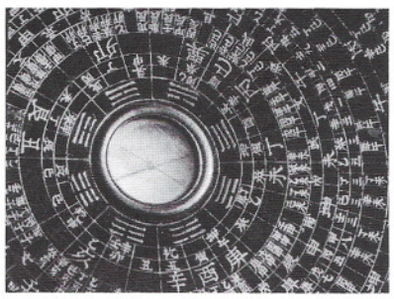


Figure 12

compass. I wanted to show this at the end of my talk so I could finish by asking: Are your attitudes tuned to the 21st century? Are your cultural values and thoughts tuned to the needs of the betterment of all of our societies — east, west, north and south? Are the specialists and generalists among you capable of dealing with the global challenges we have today? Today's component is yesterday's system. Are you dreaming already about what yesterday's system can change in terms of double E as a substrate technology for tomorrow's components and tomorrow's design ideas? This compass is a challenge to say: "Do you know where you are going?" And the compass is my gift to you as you begin three days of exciting and stimulating discussions. I hope that you know exactly where you are going, members of IEEE. Have the courage and the confidence and the bravado to do it well, and share it with all of us. Congratulations on this meeting , and good luck with your global visions. Thank you.

Sections Congress '90 in Pictures

Over 650 delegates, guests and IEEE staff from around the world came together at the Royal York Hotel in Toronto during the period October 5-7, 1990. Their mission: to discuss and make recommendations upon how the institute can and should evolve to meet the needs of its members in the 1990's.

The Welcoming Reception, Sponsored by IEEE Canada

IEEE Canada Director, Tony Eastham, and his wife, Gerry, welcome delegates and guests to the reception.

Vijay Bhargava, IEEE Canada Director-elect, discussing the congress with Pam Woodrow, Manager, Canadian member services.

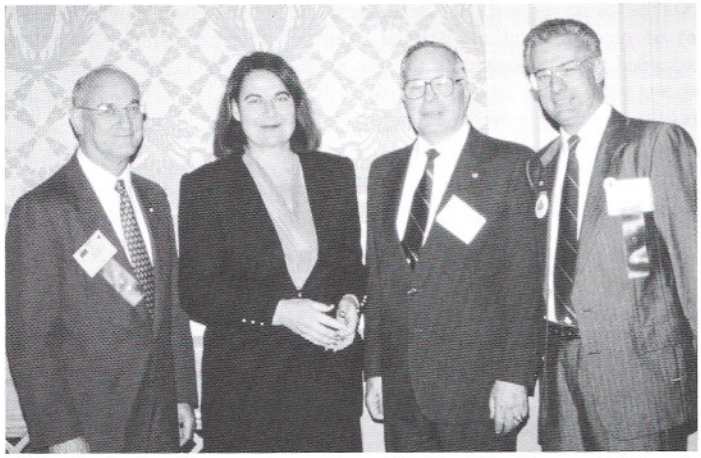
At the closing session, each delegate received a voting sheet with a listing of 64 recommendations derived from the breakout groups. Delegates assigned priority weighting to each recommendation and the individual sheets were collected and electronically scanned in order to present the results to the congress before adjournment.

The 24 highest priority recommendations are listed on page 11. All these recommendations were subsequently assigned to the most appropriate IEEE board for review and action.

An offer you can't refuse! Ken Peacock (Hamilton) offering kites, IEEE Canada ties, and other IEEE paraphernalia at IEEE Canada table.

The congress was honoured to receive a formal welcome from the honourable Lincoln M. Alexander, Lieutenant Governor of Ontario, at the opening session.

SC'90 Chairman, Wally Read (Newfoundland-Labrador) addresses the opening plenary session.



Following her inspiring opening address, Dr. Geraldine Kenney-Wallace is thanked by IEEE Executive Director, Eric Herz (left), IEEE President, Carleton Bayless (right) and Tony Eastham, IEEE Canada Director.

Bob Winton (centre) the Region 8 forward planning coordinator, chairs an unrehearsed session on the roles of the Regional Activities Board (RAB) and the Technical Activities Board (TAB), with Bob Alden (right), the RAB Vice-President, and Kel Nagle (left), the TAB Vice-President.

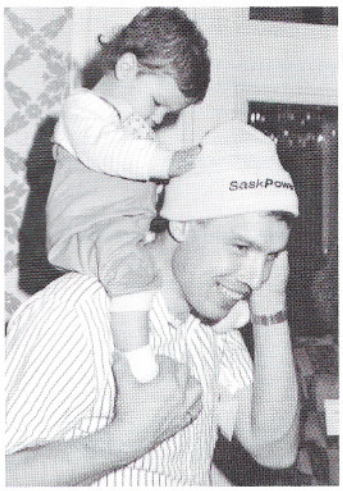
A tutorial to introduce a topic relevant to one of the theme sessions of SC'90.

One of the three plenary theme sessions.

Ray Findlay (Hamilton, and Student Activities Council Chairman) helps delegates at a breakout session to identify a concern and to recommend an action item for consideration by congress at the closing plenary session.

Oktoberfest: Hat night at SC'90

Wally Read illustrates the transnationality of the IEEE.



Mike Boudreau (Vancouver) introduces his son to the IEEE.

Awards

Bob Alden (Vice-President, RAB) presents Brent Hughes (Vancouver) with the "Golden Disc" award in recognition of his work on developing section membership data diskettes.

Harry M. Ellis (left) with Leslie McNaughton-Sykes (the daughter of General Andrew G.L. McNaughton) following receipt of the IEEE Canada McNaughton Medal for 1990 at the Awards Banquet at SC'90.

President-elect Eric Sumner looks ahead to the challenges and opportunities for the institute in the 1990's.

Sections Congress '90: Issues and recommended actions

In priority order, as voted upon during the final session

1. Members' employers support of IEEE activities. Develop plans for enhancing corporate support of employee involvement in IEEE, emphasizing value of membership to the employer.
2. Retention of graduating students. Develop programs and activities specifically aimed at recent graduates.
3. Increase publication of applied and tutorial type papers in all Institute publications.
4. Cost and accessibility of reliable electronic communication. Develop funding programs to enhance and expand electronic communication facilities.
5. Improve materials and programs for Section/Chapter officer training.
6. Develop methodologies to increase participation by members from Regions 7-10 in IEEE Society and Institute leadership positions.
7. Optimize IEEE expertise to assist in development of international standards.
8. Speaker availability. Produce annual updates of Speakers Bureau Listing with an electronically accessible data base.

9a. Dissatisfaction with Section Rebate structure and distribution of funds among Sections, Societies and Chapters. Re-examine rebate allocation structure and formula.

9b. Student branch counselor effectiveness. Develop programs which address Student Branch counselor recruitment and training.

10. Make available Society outstanding speaker lists, videotapes, and other technical programs to Sections without Chapters.
11. Accessibility of resources and information on operational procedures for small Sections. Establish an international 800 number.
12. Improve interest and excitement in science and technology among students aged 5-14 years of age. Develop a flexible media program to be administered transnationally by Sections, which incorporates a recognition system for volunteer participation.
13. Section responsibility for student activities. Initiate and improve interaction between Student Branch and Section.
14. Level of collaboration between IEEE, National Societies and other organizations. Develop means to promote more effective collaboration.
15. Sharing Society conference surpluses with Chapters. Establish guidelines to effect the sharing of surpluses.
16. Extent of IEEE activities outside the United States. Hold more conferences and administrative meetings outside the U.S.
17. Improving Section meeting attendance. Provide Technical Interest Profile (TIP) to identify members who may be interested in attending local meetings.
18. Major changes in the volunteer structure must be submitted to members for consideration
19. Sensitivity and effectiveness of membership promotional materials. Develop IEEE membership promotional material targeted to specific languages and cultures.
20. Sections want information and guidance on how to solicit Society conferences. Develop guidelines and information regarding the bid and proposal process for Society conferences.
21. Lack of identified support for persons who are involved in responsible ethical actions. Provide specific measures of support to members who have been placed in jeopardy as a result of ethical actions.
22. Conflicting conference schedules for similar technical subjects. Establish a clearinghouse for conferences with electronic access to information.

23a. Concerns regarding potential dues assessment to older and Life members. Maintain current benefits to older and Life members.

23b. Develop a new officer mentor program utilizing experienced past officers for Sections and Chapters.

24. Inadequate EE understanding and influence over ecosystems. Publish special editions of SPECTRUM and appropriate journals addressing this topic.

General McNaughton - A Canadian Son of Martha, part 2

Engineer, scientist, inventor, soldier and statesman, Andrew McNaughton was above all a Canadian patriot

by Ted Glass
Westinghouse Canada Inc.
Winnipeg, Manitoba
Director Region 7, 1978-79

Andrew George Latta McNaughton (1887-1966) brought his extraordinary creative talents as an applied scientific research engineer to the field of war, and his capacity for logical, military thinking to the arenas of politics, diplomacy and technology. Many people regarded him as a genius. Throughout his life, he devoted his energies to ensuring that Canadians were respected for their accomplishments, whether technical, military or diplomatic, and that Canada was accorded her due recognition as a sovereign, independent nation.

Part 2 of this condensation of the three-volume biography, "McNaughton", written by the late John Swettenham, deals with the ups and downs of General McNaughton's remarkable career from the outbreak of war in 1939 to his death in 1966.

Andrew George Latta McNaughton (1887–1966) a apporté au domaine militaire sa remarquable créativité en tant qu'ingénieur en recherches scientifiques appliquées, et aux arènes politiques, diplomatiques et technologiques ses capacités de penseur et de logicien militaire. Beaucoup l'ont considéré comme un génie. Au cours de sa vie, il a dévoué ses énergies pour garantir que les canadiens seraient respectés pour leurs accomplissements, aussi bien techniques que militaires et diplomatiques, et que le Canada serait légitimement considéré comme un pays indépendant et souverain.

La deuxième partie de ce condensé de la biographie en trois volumes "McNaughton", écrite par le regretté John Swettenham, illustre les hauts et les bas de l'impressionnante carrière du général McNaughton, pour la période débutant à l'ouverture des hostilités en 1939 jusqu'à son décès en 1966.

In September, 1939, Canada was again at war, a mere 21 years after the signing of the Armistice which ended World War I. And as a candidate for the leadership of Canada's forces, McNaughton's record was second to none. He was a proven battle-experienced artillery officer, a superb organizer, and a commander; he had been Chief of the General Staff, the top army appointment, for an unprecedented double-term; he was also a practical engineer with wide scientific knowledge and an inventive mind; and he knew the equipment and organization required by a modern army. No other military officer in Canada could match these qualifications. On October 6, McNaughton turned NRC over to Dr. C.J. Mackenzie as Acting President and became Inspector General of Units of the 1st Canadian Division as a first step to his appointment as leader of the Canadian Armed Forces overseas.

Sicily, August, 1943

His experience during the six years of the war saw him at the height of prestige that would sour later through the complications of political expediency and the differences of opinions and judgments of other high ranking and pragmatic military leaders. The base for his success was an extraordinary capacity to comprehend the fundamentals of complex military actions and a creative mind to respond with appropriate solutions. And as always, his eagerness to encourage new technology. Repeatedly, and at great length, he pursued his objective that no Canadian soldier would go into battle without the best equipment that was within the capabilities of Canada's best scientific, mechanical, and industrial resources to produce. From his position as President of NRC which he continued to hold during the war years, he imposed effective influence. And from his own creative and innovative mind a continuous flow of ideas was combined with those introduced by others.

One continuing problem for the ballistics specialists was the need for higher velocity armour-piercing projectiles. McNaughton's earlier ideas of tapered barrels, although proven effective, had deficiencies; his new proposal, however, was one of simple engineering ingenuity. A small-bore missile, enclosed in a light metal "carrier" shoe, would be fitted into the shell of a larger bore gun. At the muzzle of the gun the "carrier" shoe would be discarded; and the smaller bore missile, with little resistance from the air, would proceed to its target with greatly increased velocity. Thus, high velocity small-bore armour-piercing shells, and lower velocity heavier artillery shells, could be fired from the same gun. It is interesting to note that the space Research Institute of McGill University uses a gun to carry out its high altitude research projects; and the space packages sent soaring into the upper atmosphere are a development of McNaughton's "sabot" anti-tank ammunition of 1942. It was later adopted as the first ammunition to be standardized by Britain, Canada, and the United States.

In addition to his technical contributions to the race for more effective weaponry, he had also forged a Canadian Army, 170,000 strong and fully trained for action as a completely co-ordinated ground force of artillery,

armour, infantry, and support services. But this was to lead to disfavour by both the British authorities and his own government at home. From the days of Vimy Ridge, and supported by the Statute of Westminster, McNaughton pressed with relentless determination for autonomy of operation of the Canadian Armed Forces. No longer should Canadian troops be assigned piecemeal at the convenience of some non-Canadian military high command. They would organize and train as a fully integrated force under the leadership of Canadian officers and they would accept their assignments as a single unit. Though approved in principle, acceptance of such independence by the British Commands was difficult and restrained. To complicate matters, the Minister of National Defence in Ottawa, J.L. Ralston, became concerned at the absence of headlines in the Canadian Press regarding the Canadian army which had not yet been in action. For continued support of the voting public, Ralston required that some form of activity be found for the trained troops. The result was the dispersal of units to other commands - a Corps was sent to Italy, and the shattering of McNaughton's dream of an autonomous Canadian Army that could strike more effectively as an integrated unit and accept the full responsibility for its performance.

The recorded military victories of World War II would be credited to British and U.S. armies, and Canada would be deprived of national recognition. McNaughton stated that, if dispersal of the army was the policy of the Canadian governement, someone who believed in it should be placed in charge; he himself did not.

In these clashes of authority, McNaughton was the loser and in 1944 his restless and incisive intelligence and singularly compelling personality that had dominated the Canadian Army for almost five long years passed from the European stage. He was 57 years old and retirement might have been the next step. In fact, it was the beginning of the fourth phase of his remarkable career.

The Conscription Crisis Leads to His Appointment as Minister of National Defence.

On leave from active duty and in Canada, many honours and awards were conferred upon him. An honorary degree from the University of Saskatchewan to honour its native son; a public holiday on his visit to Moosomin. Diplomatic appointments were offered and the suggestion was made and accepted by King George VI that he be the first Canadian Governor General. But all these were swept aside by the conscription crisis that arose in Canada in 1944.

The conscription issue originated from a shortage of volunteer infantry replacements in the European war theatre. McNaughton believed that no effective military unit outside of home defence could be organized under any compulsory system and until 1944 this question, so sensitive in Canadian politics, had been avoided. But in 1944, military conscription, supported by the Minister of National Defence, threatened to split the government of MacKenzie King and indeed the country. In the words of the Prime Minister, "The situation was acute and a way had to be found to save the government, to save a terrible division in the country, and to secure the urgently needed military reinforcements". He felt that McNaughton could solve the problem. Amidst high political drama, Ralston resigned and McNaughton was appointed Minister of National Defence. During the ensuing months limited conscription, but not universal conscription, as had been advocated, resolved the crisis. But during this emotional state of the country, McNaughton suffered two humiliating defeats in a bid for elected office - one a "safe" Liberal seat in a by-election in Ontario, and the second in the federal election of 1944 in the riding which included Moosomin, the home of this famous son. He was not, and never would be, a party politician.

McNaughton broadcasts to Great Britain on the international control of atomic energy, November, 1947

The Liberal government, however, survived. This rejection by Canadian voters in two elections denied him a seat in parliament, and indirectly the office of Governor General. But it also opened the way for him to be of even greater service to his country.

United Nations Diplomat and Atomic Energy Expert

In August of 1945, with the six years of warfare ended, McNaughton resigned as Minister of National Defence and was appointed Canadian Chairman of the Canada-United States Permanent Joint Board on Defence. In April of 1946 he was appointed Canadian representative to the United Nations Energy Commission and head of the Atomic Energy Control Board of Canada. In 1948 he was selected to be the permanent delegate of Canada to the United Nations and the representative of Canada on the Security Council. In January of 1950 he was appointed to the International Joint Commission which deals, in the main, with boundary waters questions. This was the one appointment in his later career which he valued above all the others. As Ross Munroe of Southam newspapers wrote: "At the United Nations McNaughton presented the Canadian attitudes on control of the atom for peaceful purposes with an earnest persuasiveness and clarity that stand out like a beacon light in an assembly where diplomatic double-talk is too often practised". At age 61 the soldier's "Andy" had been a long way up - a long way down - and now he had come a long way back. Instead of retreating into a melancholy retirement after his departure from the army command and two defeats at the electoral polls, he plunged into the new technology of atomic energy and made himself an expert. As President of the Atomic Control Board of Canada, McNaughton was responsible for the control, development, and application of atomic energy for the benefit of Canadians. On the international scene, AECB was responsible for Canadian nuclear obligations which would emerge from the United Nations debates.

McNaughton was convinced that the Candu type reactor was the best design for Canada and that its first large-scale use should be to generate electricity. The combination of abundant resources of natural uranium and heavy water would generate lower cost power than any other existing design for large base-load stations in a utility system with low capital charge rates. Also during this period, Canada pioneered in the production of over 100 radioactive isotopes for use in cancer treatment, agriculture, and industry.

On the Security Council of the United Nations, he was appointed President and during his one month rotating period he steered this, the most powerful committee of the UN, through the thorny issues of Indonesian independence from the Netherlands, disputes between India and Pakistan and the partition of Palestine to create the sovereign Jewish state of Israel.

At the close of Canada's first two-year term on the Security Council, it was McNaughton the realist who "set the hallmark of patience, pragmatism, and mediation on Canadian diplomacy". An almost "fierce energy" on behalf of the Council and international peace was combined with the natural courtesy and attentiveness of a born gentleman, to make him one of the most respected and beloved of all diplomats representing their countries at the United Nations.

"The Strong Man Armed Keepeth the Peace"

And his work as Chairman of the Canadian Section of the Canada-U.S. Permanent Joint Board on Defence was no less prestigious and important to the future of Canada. "The strong man armed keepeth the peace" was a

favourite quotation and he believed that Canada should be one of a large company of free nations pledged to mutual support. But her sovereignty must be respected. The nuclear and conventional arms "race" between Russia and the U.S. was escalating at a dangerous rate and Canada was the geographic "buffer zone" between these two super powers. From 1945-1959 McNaughton carried the responsibility to define the role of Canada in this dangerous game. His knowledge of the Canadian north from the developments in the 30's of the Northwest Territories and Yukon communications system was invaluable and provided the base for Canada-U.S. co-operation in the building of the distant early warning, the mid-Canada, the pinetree and birchtree radar lines. These early warning lines were the heart of North American defence policy.

Standardization of hardware was another of the many major interests of McNaughton and the Joint Defence Board. The British system of screw-threads, for example, was based on a thread angle of 55°; the American system on an angle of 60°. Though seemingly insignificant when compared to international diplomacy and the Cold War, McNaughton estimated this lack of standardized threads added many millions of dollars cost to the supply of manufactured goods. Under his incessant "prodding" a Declaration of Accord on the uniformity of screw threads between Canada and the U.S. and Britain was signed at the National Bureau of Standards in November, 1948. "The standardization of screw threads may sound trivial", he said, "but it is one of the greatest things we ever did."

Canada's representative at the United Nations, 1946-1950

McNaughton Insists on the Use of Canadian Industrial Equipment

On the Joint Board McNaughton not only concerned himself with assuring an "honourable partnership" between the military forces of the U.S. and Canada, but he was equally concerned that similar honour and recognition extend to Canada's industry. During the war Canada had demonstrated its ability to invent, develop and produce any article of war of any size within the physical capacity of her plants. It was essential to the future that these facilities continue to be supported in the procurement of equipment for defence projects.

In the electronics industry particularly, Canada had long confirmed its capability to develop and manufacture the most sophisticated communications systems in the world. For the northern radar installations he insisted, in spite of American skepticism and some discouragement from prime contractors in the U.S. on the acceptance of the principle "that electronic equipment at installations on Canadian territory should, as far as practicable, be manufactured in Canada".

On the 33-station Pinetree Line, for example, the revenues from the manufacture in Canada of the electronics equipment as a whole covered the complete costs of the eleven stations which were built and manned by the RCAF. And the experience brought forth many compliments from the American forces in the field - "the relative lack of troubles, the amazing interchangeability of parts and superior operating characteristics" - led them to consider the Canadian produced equipment equivalent to and often superior to that received from American industry. It was Canadian equipment, designed for the northern Canadian environment, and the industry continues to thrive today.

Development of Hydro-Electric Power

One other contribution of significance involved the development of the aluminum industry in Canada. Until the mid-fifties, the aluminum smelters which require large quantities of inexpensive hydro-electric energy, had been developed from the rivers in Québec at Beauharnois, Shawinigan Falls, Arvida, and Isle Maligne. A second centre was to be built at Kitimat in northern B.C. and McNaughton now looked to Labrador and the promotion of interest in the development of Hamilton Falls.

The British Newfoundland Corporation (BRINCO) had been granted extensive concessions in the area. In 1953 at a meeting with McNaughton, his advice to BRINCO was that the development of the hydro-electric power of Hamilton Falls should be given high priority. He had flown over the area and had studied the geological data. Not only did he suggest to them how the site should be developed - a low dam above the falls to divert the water through a tunnel or canal to a powerhouse in the Hamilton Canyon located below the falls, but he also voiced the belief, contrary to others, that a service railway to the iron ore railway be run due west of the falls rather than follow a more obvious but more costly circuitous route suggested by others. There is no more effective illustration of his wide-ranging interests, his thoroughness and his grasp of engineering essentials. The generating station at Churchill Falls is now completed. With seven million horsepower installed capacity, it is larger than the huge Soviet hydro-electric plant at Bratsk in Siberia, and one of the largest in the world.

Under McNaughton, the Joint Defence Board rarely met in the bureaucratic centres of Washington or Ottawa. It was his belief that the Board should always go "where the problems were, because in that environment the solutions would most likely be found".

The International Joint Commission

As Canadian Chairman of the International Joint Commission, Andrew McNaughton experienced more of the great challenges of his career and also perhaps his most discouraging failure. The IJC dates back to 1909 and is accountable to both the Canadian and U.S. governments for the management of waters which flow across some 5,655 miles of the boundaries between the two countries, including Alaska. No problem is too large or too small for this organization and can cover the millions of acre-feet of storage on the Columbia and St.Lawrence to several thousand acre-feet of spring run-off from the Souris River in Saskatchewan and Manitoba. And decisions associated with the smaller streams could establish constitutional precedents for principles to be applied to the more massive projects.

As Canadian head of the IJC the remarkable career of A.G.L. McNaughton had turned full circle - from his early training at McGill as a hydro-electric engineer to the major international decisions associated with the St.Lawrence River in Ontario, and the Columbia River basin in British Columbia.

The St.Lawrence Seaway

First, the St.Lawrence Seaway. Andrew McNaughton's first exposure had occurred in the early 30's when an agreement was all but concluded between the two countries to develop the inland waterway from Montréal to Lake Ontario. Faced with powerful opposition from the railroads in Canada and the U.S. and also from the provincial governments of Ontario and Québec, the project was stymied for twenty years. But in the late 40's the needs of Canada had changed. It was no longer just a question of providing a waterway for ocean-going ships to transport grain from the prairie provinces. High grade iron ore was being mined in Québec and Labrador for the refining furnaces in Ontario and the Great Lakes steel plants of the United States. And, for the expanding industries of Ontario and New York, low cost hydro-electric power had become a necessity. To the multi-facetted visionary that was McNaughton, any one of the combined benefits of power generation, transportation, and military defence (for power hungry industry is an essential for war), was vital to the interests of Canada. But powerful opposing forces in the United States continued to obstruct.

McNaughton carefully organized his sources of support on both sides of the border and separated the issues of transportation and power. He developed a proposal whereby Canada would build its own all-Canadian waterway and the State of New York would participate with Canada in the joint development of hydro-electric power. This separation of the projects provided the key to the success of both. Initial reaction from the U.S. press was one of disdain and contempt - "pure poppy-cock" said the New York Herald Tribune; "Physically impossible for Canada to build the seaway alone" stated the Saturday Evening Post. But after legislation by the Canadian government to authorize the project, and an interview with the determined Canadian, the Herald Tribune reversed its long-standing opposition in an editorial which announced, "The St.Lawrence River is the border common to both countries, and by every concept of statesmanship, neighborliness, and international relationship, it ought to be developed as a co-ordinated responsibility". The influential New York Times followed with further support - "The opposition from railways, shipping lines and ports, no longer makes sense... McNaughton's plan is as good for us as it is for the Canadians". Canada had its seaway, and its power project as well.

Much later an American member of IJC reported: "General McNaughton contributed more than any single individual. In the histories of the St.Lawrence Seaway it will be unnecessary to mention his name. It will automatically be linked because of the contributions he has made".

Proposals for the Kootenay - Columbia River Systems - McNaughton Fights for Canada's Interests

But the Columbia River basin story was different. The Columbia River, one of the greatest in the world for storage and for hydro-electric power, originates in the Columbia Lake of Eastern British Columbia. The first 465 miles of the 1,212 mile long river is in B.C. and from its source to discharge into the sea it falls almost three thousand feet. Though the drainage area in Canada is only 15 percent of the total, this snow-melt river from the Rockies accounts for one third of the volume of water that flows in the river. Compared to the three other great rivers of North America, the Mississippi, the St.Lawrence, and the Mackenzie, the power potential of the Columbia is greater; the 7000 MW of hydro-electric power generated at the St.Lawrence Seaway was by far overshadowed by the 35,000 megawatt potential of the Columbia. But the Columbia, because of its snow-melt source, is subject to seasonal fluctuations of 40 to 1; during the spring run-off, forty times the volume of water of the time of minimum run-off roars down in flood, not only wasted for power generation, but causing millions of dollars of damage. Storage dams for flood control and for power generation were a natural combination of benefits to Canada and a natural challenge for Andrew McNaughton.

The United States had built power plants along their Grand Coulee section of the Columbia but firm generation capacity was limited by too few storage dams. Increasing industrial developments in their Pacific Northwest created a demand for electric power and it was obvious that storage dams in B.C. would produce enormous benefits from increased generation as well as flood control.

At the outset McNaughton set the stage for the heroic debates to follow. "It is a Canadian responsibility - not theirs", he said, "that we should assess the value of these resources and require due recompense if indeed we are to consent to their use for someone else's benefit at all".

Adding to the drama was the peculiar geographical location of the Kootenay River, another snow-melt river and another source of power originating in the eastern Rockies of British Columbia and flowing southward to the United States. Near the community of Canada Flats in B.C., the Kootenay River is a short mile from the Columbia River flowing northward and approximately parallel. At this point the two rivers are at the same elevation and a dam on either would divert the water flow from one to the other. All this was well known to McNaughton from his work in British Columbia in the 1920's and 30's.

On January 15, 1951 the Americans submitted an application to the International Joint Commission to build a power dam on the Kootenay River at Libby, Montana, just south of the international boundary. The negotiations were on, and were to continue until 1964 - 13 years later - with the signing of the final agreements.

Libby was the one location available to the Americans for storage to any large extent of the waters of the Kootenay or its tributaries. But the dam, while on American soil, would create a storage reservoir which would flood back 42 miles into Canadian territory. This project could not be worse from the point of view of Canada. Storages sited on the Columbia River as far north as possible would provide to Canada the benefits of controlled flows for the generation of power over a greater length within her own territory. The United States would similarly benefit downstream, both for increased power capacity and flood control. Libby Dam, on the other hand, would benefit only the Americans and the flooding of Canadian soil for forty miles would force the evacuation of residents from their homes and disrupt established highways, railroads, and communication systems. For this the United States offered seven million dollars compensation, a generous allowance when compared with zero for the earlier flooding of Canadian territory by the forebay of the Grand Coulee Dam on the Columbia River.

An examination of the South Saskatchewan River project with Gordon Mackenzie of the Prairie Farm Rehabilitation Administration.

"Downstream Benefits"

As McNaughton explained in the initial response to the proposal to build the Libby Dam, "Storage of water is far more precious than the most precious of mines, for the reason that water will go on forever whereas minerals are a wasting asset used up in being put to use." Almost one million kilowatts of electric power could be produced at Libby and in other downstream plants by building

the dam, but none of that would be possible if Canada refused the water to be stored. Canada then was entitled to a fair return of the benefits that would accrue downstream from a Canadian natural resource and its storage on Canadian territory. His claim, which came to be known as "Downstream Benefits", warned that there would be no development at Libby or anywhere else until there would be agreement for equitable evaluation and sharing of these benefits. The Americans were surprised and indignant - "Whoever heard of downstream benefits?" But their free ride on Canada's waterways was over.

During the stalemate of two years, McNaughton forced the Americans' hand by proposing an alternate plan for development of the Kootenay-Columbia River System. A dam at Dorr, just north of the border would impound the rivers not only of the Kootenay, but also its main tributaries the Bull and Elk Rivers. A second dam north of Dorr at Bull River and equipped with pumps would elevate the water from the Dorr pool two hundred feet and transfer it to the pool at Bull River. From there it would be released into the Columbia River. At that point water raised 200 feet would be available for 2,400 foot head of hydro-electric potential at the Luxor site (Canal Flats) of the Columbia River, an exceptionally profitable investment. At the main storage site of Mica Creek, where powerful tributaries of the Canoe and Wood Rivers enter the Columbia at the location where the northward flowing river finally turns south, the major dam would be built. This would provide for storage of the maximum volume of water at the highest elevation of the system. Mica would be the site of one of Canada's largest hydro-electric generating stations.

Conservationist, 1962-1966

Construction costs would be substantial and the United States had no interest in sharing them. Why should they? The water would eventually reach them anyway. But at this point McNaughton played another trump card. Precedent had established the right of one country to divert waters flowing to the other with compensation to be paid for any "injury". And with great charm he had "provoked" the Counsel for the United States interests to emphasize this right. It was then that he proposed to divert surplus water from the Columbia by way of a tunnel into the all-Canadian Fraser River. Water to the Grand Coulee Dam would continue unchanged, there would be no injury, but there could be no expansion. The intransigent attitude of the Americans over the principle of downstream benefits began to shift, and they agreed to discuss compensation in terms of money.

But again McNaughton proved to be a difficult and determined negotiator. "Money", he argued, "had a tendency to lose its value over the years and any sums fixed now might bear no relation to future benefits". As an alternative he suggested that a true measure of the value of water in the future for hydro-electric generation would be the equivalent of the cost of peak power generation from coal-fired or nuclear plants. In other words, the value of water storage for peak generation should be 3-4 times the value for base-load or normal generation, since the only alternative would have to be added costs of generation from thermal plants.

Enter short-term political expediency. Kaiser Aluminum offered to build a small storage dam at Castlegar in British Columbia and twenty percent of the increased power generated downstream would be returned to the province at no cost. The Puget Sound Utilities Council offered to build a dam at Mica and generation equipment would be supplied by the province. The Premier of British Columbia was delighted; McNaughton was not.

Included in all McNaughton's plans for the development of these vast hydro-electric resources were suggestions whereby storage of water could be made available for use by the United States. But in every case he insisted on appropriate compensation to Canada for her resources and for services rendered.

The negotiations were long and difficult - the Americans brought forth their "tough negotiators" to stand up to McNaughton. They would fight for the Libby Dam, not because it offered greater benefits, but simply because it was the key to future control of the Columbia River. Kootenay waters would be secured by Libby; a future diversion to the Columbia would cause measurable injury to their own needs were the dam secured.

But for every position and threat raised by the American negotiators, McNaughton countered with the skill of a military general and the understanding of a hydro-electric engineer. And on every occasion, his case for Canada's interest was completely supported by recognized precedents and international law.

Although he was a tough bargainer, Andrew McNaughton earned the respect and admiration of his adversaries. Senator Mike Mansfield of Montana, a powerful proponent of the Libby Dam, put it this way: "McNaughton is one of the most determined men to come up against in negotiation. He is extremely nationalistic, and in the right sense. And insofar as the Columbia Studies are concerned, he is by far the best informed man on either side of the table".

By 1956 the original positions of the United States had begun to change; but in the sensitive diplomatic ranks in Ottawa there was concern. Calling a "spade" by its right name, while refreshing to hardier souls, was really "quite undiplomatic". Nevertheless, events in 1959 saw McNaughton firmly in control despite complications introduced by the diplomats and government economists, and particularly the provincial politicians of British Columbia who were off on another course to develop power on the Peace River. Fifty percent of all downstream benefits was accepted as valid and compensation would be returned in "value - holding electricity, not inflation - vulnerable dollars". The Canadian press was jubilant.

In 1959, Douglas McKay, the head of the American negotiating team died, and in their recommendation to President Eisenhower, the United States members of the commission noted that Canada's three-man negotiating team was led by a professional engineer and an administrator of great prestige, vigour and ability. It was important for the President to name a worthy American counterpart for A.G.L. McNaughton.

McNaughton's Efforts Thwarted

But the final stages of negotiation took a peculiar twist. When the Canadian team was appointed by Prime Minister Diefenbaker, the old warrior-engineer was not included. In his place was one federal politician, one provincial civil servant from British Columbia and two federal civil servants from Ottawa. The United States team came prepared to drop their Libby proposal and negotiate on the basis of McNaughton's plan. Behind a door covered with sound-dampening green felt an assortment of engineers, economists and politicians met to discuss the fate of the Columbia River basin. When the smoke had cleared, the Canadians had "surrendered and sold the pass". The United States had the Libby Dam and control of the Columbia River storage for all time. British Columbia would receive a single payment of five hundred and one million dollars for downstream benefits (which they never would have got without McNaughton). This did not even cover the costs to Canada to build the dams on their own river. Not a penny of compensation was paid for the use of the additional controlled water for irrigation and flood control after it left the powerhouses. The Senate of the United States ratified the treaty with a vote of 99-1 opposed in record time. The government of John Diefenbaker was removed from office in the next election.

McNaughton Continues the Fight for Control of Canada's River Systems

McNaughton, who had retired, was 78 years old; and although the battle for the Columbia basin was lost there was one last campaign to attract his interest and his little diminished energies. Throughout the Columbia River debates he was aware that the sale of downstream benefits and the generation of electricity for cash or some other form of compensation was not the paramount issue. The real issue was the treaty itself and who would control the flow of Canada's abundant fresh water river systems. Of all the resources of any nation, fresh water is by far the most important. Without it there is no survival. With insufficient quantities there is inadequate sanitation and disease is prevalent. Crop failures produce famines and the starvation of people and animals. Factories depend on it for power and the production processes. It requires 9,000 to 19,000 gallons of water to produce one ton of steel; 5,000 to 65,000 gallons to produce a ton of paper; 60,000 gallons to produce 1,000 lbs of textiles and 300 gallons to produce one gallon of beer.

To the United States, the Columbia River Treaty was the signal that all Canadian water was for sale at bargain rates. And just three weeks after the signing of the protocol to the treaty, a report was released to the American public by the Ralph M. Parsons Co. of Los Angeles, labelled the North American Water and Power Alliance. Referred to as a "concept", it defined a plan for "collecting excess water from the northwestern part of the American continent (Canada) and distributing it to the water short areas of Canada, the United States, and Mexico". Of the total amount of water collected, only 18 percent would remain in Canada. Initial reaction from the American press and the American financial communities was favourable. Canadian water was essential to support their economic growth and standard of living. And all that was required was to convince Canada that Canadian water was a "continental resource" to be shared by all.

McNaughton's entire life had been committed to the calculated and relentless pursuit of Canadian interests to assure the development of a strong and independent country. He was determined to fight this latest intrusion into Canadian sovereignty, and his strategy was simple and direct - to make Canadians aware of their natural resources and to expose the true consequences of "continentalism" to Canada.

McNaughton launched his counter-attack in the form of three speeches - one to the Engineering Institute of Canada, one to the Canadian Club in Montréal, and the third to Canada's intellectual community of the Royal Society at Sherbrooke, Québec. Through the pages of the Star Weekly he reached the masses of the Canadian population, and as one speech followed the other, one could sense their growing awareness and concerns. The political community was in its usual sense of uncertainty. Prime Minister Pearson stated, "We have lots of water - we will be discussing programs with the United States to move some of our water resources down south". Three days later his Minister of Northern Affairs and Natural Resources, Arthur Laing, rejected the statements from his first Minister. "Diversion of Canadian water to the United States is not negotiable. There is no such thing as a continental resource. We own it".

A.G.L. McNaughton officially retired from the public service in 1962. As a private citizen he continued to fight the Columbia Treaty until its final protocol was signed in 1964. He then accepted the challenge against the Continental Resource interests of the North American Water and Power Alliance, a battle which continued until his death.

On Friday, July 8, 1966, the McNaughtons left Ottawa for a weekend at their cottage. On Sunday they dined with friends at the Seigneury Club in Montebello, and the discussions had turned again to Canada's water resources. The sun was setting behind the hills, and beyond the river the western horizon was black with thunder clouds with tinges of orange and pink. McNaughton loved the sunsets and he invited his guests to share with him his joy of the changing scene. In the early hours of the following morning he died peacefully in his sleep. Canada had its Seaway and its Air Canada. It had full autonomy, and its armed forces were independent. As the journalist Bruce Hutchison described it, Canada was a nation constitutionally British, geographically American, but wholly Canadian. But for the first time in 79 years it was without Andrew McNaughton.

A Sense of Purpose

In summary, if he was a genius (and many have attested that he was), it was his sense of purpose that had made him so. His own words to engineering graduates about to embark on life's great journey testify to the importance that "purpose" had for him.

"If the world of affairs, to which you are now about to transfer your activities, were governed by the laws of logic there would, of course, at once be a proper niche in which your energies would be absorbed...

But fortunately or unfortunately, the one characteristic which seems to be most conspicuous for its lack in the world, as we know it, is logic; and this is the case whether it be in business, in the arts and sciences, in the public service, or in government itself. Everywhere things seem, at least on the surface, to be made up of discontinuities and it is probable that you will find it exceedingly difficult to pick out and identify, let alone to follow, the thread of purpose which, without any doubt, links all things together in a pattern; but it is a pattern in which the harmonies are only revealed by faith and the light of experience; and experience comes only with patience, long continued...

So the path which I predict for you is no smooth open road leading straight into the future, but one of ups and downs; of trials and tribulations, and obstacles. You would not have it otherwise. Steel is not forged except by fire; trials are to consume the dross; and obstacles are a challenge to be overcome so that, when you shall reach the heights of some accomplished undertakings, you may not only take your satisfaction in the end itself but know that you have become a more useful instrument for the further tasks which always lie ahead.

If I have pictured for you a vista not made up of quiet and peace and simple pleasure, there is no need to be pessimistic on that account. For the world, despite its conflicts and uncertainties, or possibly because of them, is a very interesting place. Things everywhere are in a flux of rapid, successive change and nowhere more forcefully than in Canada, this marvellous country of ours, where opportunity expands before the eye in ever-widening fields for useful endeavour...

And so, with the hope of widest benefits to human happiness on the one hand and danger, real and always incipient, on the other, we must have leaders of purpose and clear vision in the choice of objectives - leaders who will give the most careful forethought in planning; leaders who will be ever alert in the nicest balance to safeguard the nation's welfare and at the same time prevent distractions from disturbing the forward course on which we are embarked.

It seems to me that, after Faith in divine Providence, purpose is the great attribute which those who aspire to leadership must strive for.

Purpose - defined and firmly held, and always pressed with vigour..."

How We Honour General McNaughton in IEEE Canada

In 1969, the Canadian Region of IEEE honoured the name of Gen. McNaughton by the establishing of a gold medal granted annually to an outstanding Canadian electrical engineer in recognition of important contributions to the profession.

IEEE Canada and IEEC Inc. also honour Gen. McNaughton through the establishment of the McNaughton Centres for electrical engineering students in colleges and universities throughout Canada (currently there are 19 McNaughton Centres). IEEC Inc. provides generous funding to the centres to purchase equipment and other facilities for the use of EE Students. In addition, IEEC Inc. funds the McNaughton Scholarships for EE faculty.

McNaughton Medal

The 1990 McNaughton Gold Medallist was Harry M. Ellis from Vancouver who started his career in 1945 with CGE and progressed through

Ontario Hydro, BC Engineering and International Power & Engineering Consultants and eventually to BC Hydro.

During the 60's Dr. Ellis directed analytical studies to establish electrical parameters of the Peace River 500 kV transmission system. This project pioneered several innovative techniques in the power system engineering area. It was one of the first to use series-capacitor compensation and braking resistors in conjunction with a high gain, high ceiling voltage static excitation system and a power-based stabilizing signal to optimize dynamic stability. He was also responsible for the technical studies for the HVDC Submarine cable project from the mainland to Vancouver Island - the 3rd to be commissioned in the world and the 1st in North America. It was also one of the first to use an earth return.

In 1975 Harry Ellis was appointed Director, Research & Development, to establish the Surrey Research Centre which he continued to direct until his retirement in 1987.

Dr. Ellis became a Fellow of IEEE in 1970, served as Chairman of the Vancouver Section and was General Chairman of the 1973 Summer Power Meeting held in Vancouver. In 1985 he received the IEEE PES William M. Habirshaw Award. Harry Ellis has written and co-authored many technical papers and an evaluation of any of the projects with which he has been involved would clearly show benefits in safety, reliability and environmental protection.

Past Recipients

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

Presentation of the 1990 McNaughton Gold Medal at Sections Congress '90 to Harry M. Ellis for contributions to the development of a 55 kV transmission grid for British Columbia, including special features to improve system stability. Also, for the conception, construction and operation of one of the most effective utility research organizations in North America. Left to right: Harry Ellis, Leslie McNaughton Sykes (daughter of Gen. McNaughton), Tony Eastham, Director, IEEE Canada.

Wanted - Books

At the presentation of the McNaughton Medal, IEEE Canada also gives a copy of the 3-volume biography of Gen. McNaughton by John Swettenham. "McNaughton" was published in 1968 by Ryerson Press.

We have only a few copies of these books in stock, and ask that anyone who comes across other copies contact the IEEE Canada Office at (416) 881-1930. We are interested in complete sets or individual volumes.

Awards

Frank Pounsett, author of the article on the Wartime Emergence of RADAR appearing in the March 1990 edition of the IEEE Canadian Review, and a Life fellow, was honoured in October by the University of Toronto Engineering Alumni Association at its Awards Banquet for the Engineering Hall of Distinction.

We also congratulate Patrick Beirouti of McGill University for winning the Larry K. Wilson Award. Effective January 1, Patrick is the Region Student Representative, working closely with Ed Spike of the University of Waterloo, as the new Student Activities Chairman.

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

The agreement impact on the bilateral energy trade

by Jorge Campos
Chief Electrical Engineer
Westmount Light and Power
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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.

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

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?

on energy judged to be in the best national interest. There was also a well justified fear that, after the FTA, provincial programs to encourage local development of resource extraction could be subject to challenge as improper restrictions to energy trade.

Those in favour of the FTA were quick in dismissing the rather negative predictions. For them, the national treatment clause was making no attempt to define national objectives; it merely regulated the means of achieving them. The outstanding point of the energy chapter was rather to secure markets for Canadian energy products in a world with a surplus of oil and they considered the cost paid in terms of lost sovereignty as small.

So, after two years of free trade, who proved to be right? Did indeed the Canadian policy on energy exports change much under free trade? Not really! While some changes took place, there are not yet signs of the dramatic effects forecast.

For instance, as a direct result of the provisions of the FTA on energy, the NEB eliminated its discriminatory "Least Cost Alternative" pricing policy and its "Surplus Test" export licensing requirements on the export of energy to the United States. Nevertheless, neither of these measures accounted for a big change in the overall Canadian policy on the export of energy products.

Under the "Least Cost Alternative" pricing policy, the NEB required energy export prices not to be lower than the least cost alternative for the importing utility. But, such policy had never been fully implemented. It faced rather cumbersome problems, due to the difficulty in obtaining updated prices for energy in the foreign market. Also, most energy sales have been made at commercial terms, covering large periods of time. Such aspects made the application of such a pricing policy almost impossible.

On the other hand, "The Surplus Test" had been a tool used in periods of energy shortage to control the exports of energy to the United States. It consisted of an export licensing requirement asking for evidence that the exported energy represented a surplus in the Canadian market. Officially, the NEB terminated its application on the evaluation of all deals for the export of electricity, oil and natural gas made after January 1, 1989. However, utilities exporting to the U.S. are still required to submit their export proposal for assessment by the NEB. It has been said that such an assessment is only for monitoring purposes, but only time will tell if that is the case.

Similarly, provincial governments keep actively monitoring and controlling any deal that is made to export energy. Export licenses may not be required any longer, but let us not fool ourselves. No export deal will ever take place without the blessing of the provincial government concerned. The final decision to export, under any new contract, may not be dependent specifically on a surplus test or on any other export license, but certainly it still incorporates their basic requirements.

Another good example of the low impact of the FTA on the export policy of energy is reflected in the case of uranium. Specific provisions in the FTA put an end to an irritant in Canada-United States trade in energy. In the past Canada had objected to the export of unprocessed uranium and the U.S. had opposed the import of enriched uranium. The agreement established that uranium can be processed in Canada before being exported to the States, at the same time that it permitted the U.S. to import unprocessed uranium. But, neither country made a commitment to the export or import policy that goes against its interests. The U.S. still does not have to import, and Canada does not have to export, the types of uranium that in the past were found not to be desirable to their economies.

The adherence to national treatment did not also mean that during the last two years U.S. and Canada regulations had to be harmonized. Any new government policy, rule or regulation was able to be implemented as long as it was not discriminatory between the two countries. The Canadian Governments—either federal or provincial—still hold most of the tools to establish domestic energy policy.

In order to exercise its sovereignty, Canada was able, for instance, to control the extraction rate of non renewable resources, to tax either the consumption or the production of all energy products and to adopt policies to encourage the development of its energy resources. The National Treatment Principle also left Canada free to charge different prices for energy in different markets. Any electric power generating utility, for example, was able to continue selling its energy at different prices, getting whatever the traffic would bear. It only was not allowed to establish a policy saying that the price for the energy sold to the U.S. would differ from the price in the home market.

In spite of the initial apocalyptic predictions, the really important significance of the energy provisions of the FTA is that they have not yet affected Canadian sovereignty after two years of free trade. The negative implications have been limited to the extent to which the agreement can constrain future government actions. Canada is committed to a sharing arrangement if, and when, some sudden change causes a crisis of sufficient magnitude to lead the government to unilaterally restrict energy exports in ways that violate current contracts. American users cannot just be cut off, but they will have their supplies cut back in the same proportion as the overall restriction of output. Nevertheless, it must be clearly understood that Canada is under no obligation to sell any particular quantity of energy products to its powerful neighbour, as long as it provides American buyers with access to the required proportion of Canadian supply at commercial terms. Canadians can continue to compete commercially to buy any amount of the Canadian energy supply up to the total amount available.

Even to the extent in which it restricts future policies at the federal and provincial level, the impact of the energy chapter of the FTA may not be dramatic. In fact, any international agreement restricts the sovereignty of its signatories by binding them with real restraints - either directly embodied in the treaty or resulting from later harmonization pressures - upon their policy options. The important point is whether what Canada gave up and what Canada won constitute a reasonably beneficial package. Certain policies may lead to an outcome superior to that which arises when individual nations are free to adopt policies seemingly in their best interest.

Only time will tell if the balance between the concessions on sovereignty and the advantages from free trade, is reasonable. The loss of sovereignty may not have been severe and the benefits of assuring the access of Canadian energy products to the U.S. market are substantial. Much of the future results will depend on the ability of the Canadian government to establish alternative policies which will not violate the spirit of the FTA and which will protect Canada's best interests. The structure required is the use of imaginative taxation, energy pricing and resource development, rather than discriminatory pricing and restrictive export policies.

About the author

Jorge Campos has more than a special interest in International Business. He holds a Master' degree in Business Administration (M.B.A.), with a double concentration in "International Business Management" and in "Management Policy", from McGill University, Montréal.

In 1988, he followed the establishment of the Canada-U.S. free trade area with great interest. Before, he had monitored other processes for the liberalization of international trade. He was invited to Europe in 1987 to participate in a seminar at the University of Tras-os-Montes, Portugal, on the process of the admission of Portugal to the Economic European Community. In this seminar, he presented papers on the social and economic implications of immigration on the development of certain sectors of the population.

Since 1981, J. Campos has worked for Westmount Light and Power, where he is the Chief Electrical Engineer.

1990 IEEE Canada Student Paper Competition

The annual student paper presentations were made at the High Technology Show in Toronto on October 23 1990. Five of the seven winning papers were presented with the students receiving cash awards and certificates, as well as plaques to be taken back to their schools in recognition of their achievements. The winners were:

Western Canada Council

Life Member Award:
Timothy Chia, University of British Columbia
"A Dual Band Satellite Monitoring Station for Educational Use"

Hackbusch Award:
Brendan Frey, Darren Foltinek, University of Calgary
"Optical Character Recognition: A comparison of a Neural Network to Ledeen's System"

Central Canada Council

Life Member Award:
Sam Spoto, Ryerson Polytechnic
"A Digital Process Controller"

Hackbush Award:
David Pitfield, Queen's University
"A Stereoscopic Image Display Device"

Palin Award:
David Bast, Derek Klaassen, Kent Foster, Conestoga College
"The Microprocessor-Based Control of a Prosthetic Limb"

Eastern Canada Council

Life Member Award:
Jeff Carruthers, Carleton University
"Bit Synchronization in the Presence of CoChannel Interference"

Hackbusch Award:
Patrick Beirouti, Nabil Khoury, McGill University
"Adaptive Delta Modulation using the TIMS32010 DSP"

From Left to Right: Sam Spoto, Jeff Carruthers, Nabil Khoury, Timothy Chai, Pam Woodrow, Tony Eastham, Brendan Frey, Patrick Beirouti. Insets: Derek Klaassen, David Pitfield

GST

Effective with the introduction of the GST, IEEE Canada Office will have to charge this 7% tax when selling IEEE and IEEE/ANSI Standards. Please ensure that you include this tax on the order form, after the conversion to Cdn. dollars. The conversion rate for 1991 will be at 1.25, with a 30% discount for IEEE members.

IEEE Conferences in Canada - 1991

April 30-May 1	High Technology Show - Montréal
May 9-10	IEEE Pacific Rim Conference - Victoria
May 14-17	IEEE International Conference on Acoustics, Speech and Signal Processing ICASSP 91 - Toronto
May 26-30	IEEE 18th International Symposium on Computer Architecture - Toronto
May 29-30	IEEE WESCANEX 91 - Regina
May 31	IEEE Newfoundland Section NECEC 91- St.John's
June 3-7	IEEE Pulp & Paper Industry Conference - Montréal
June 17-20	IEEE Digital Cross-Connect Systems Workshop IV - Banff, Alberta
June 24-28	N.American Radio Science Meeting and International IEEE/AP-S Symposium, London, Ontario
Sept 9-11	IEEE Petroleum & Chemical Industry Tech. Conference - Toronto
Sept 25-27	CSECE Conference - Québec City
Oct 23-26	3rd IEEE Alberta Power Quality Conference - Calgary

IEEE PACIFIC RIM CONFERENCE ON COMMUNICATIONS COMPUTERS AND SIGNAL PROCESSING May 9 and 10, 1991

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For more information, contact:
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CALL FOR PAPERS

This conference provides a forum for the presentation of electrical and computer engineering research work carried out in Canada and other countries and to foster interaction between industrial and university researchers. Papers may be presented in English or French. Papers on (but not limited to) the following topics are solicited: *Communications, Signal and Image Processing, Computers, Very Large Scale Integration, Energy, Environment, Computer Vision, Robotics and Control, Electromagnetics, Industrial Materials, Inspection and Processes, Power Systems and Power Electronics, Parallel Processing, Electronics Systems in Transportation, General Techniques for Information Technology, Artificial Intelligence and Neural Networks, Biomedical Applications.*

Please submit three copies of a 400-500 word summary by April 15, 1991 to the technical program chairman (please indicate the topic for your paper).To receive further information, please write to the conference chairman.

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Notification of acceptance/rejection will be sent by May 15, 1991. Accepted papers will be published in the Conference Proceedings. A camera-ready version of the paper must be received by June 30, 1991.

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ICASSP-91

IEEE 1991 INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH AND SIGNAL PROCESSING
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Session 2	9:00am-12:00	☐ "Morphological Signal Processing: Image Analysis and Nonlinear Filtering" (Petros Maragos)
Session 3	1:30pm-4:30	☐ "Signal Processing with Sensor Arrays" (Peter M. Schultheiss)
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