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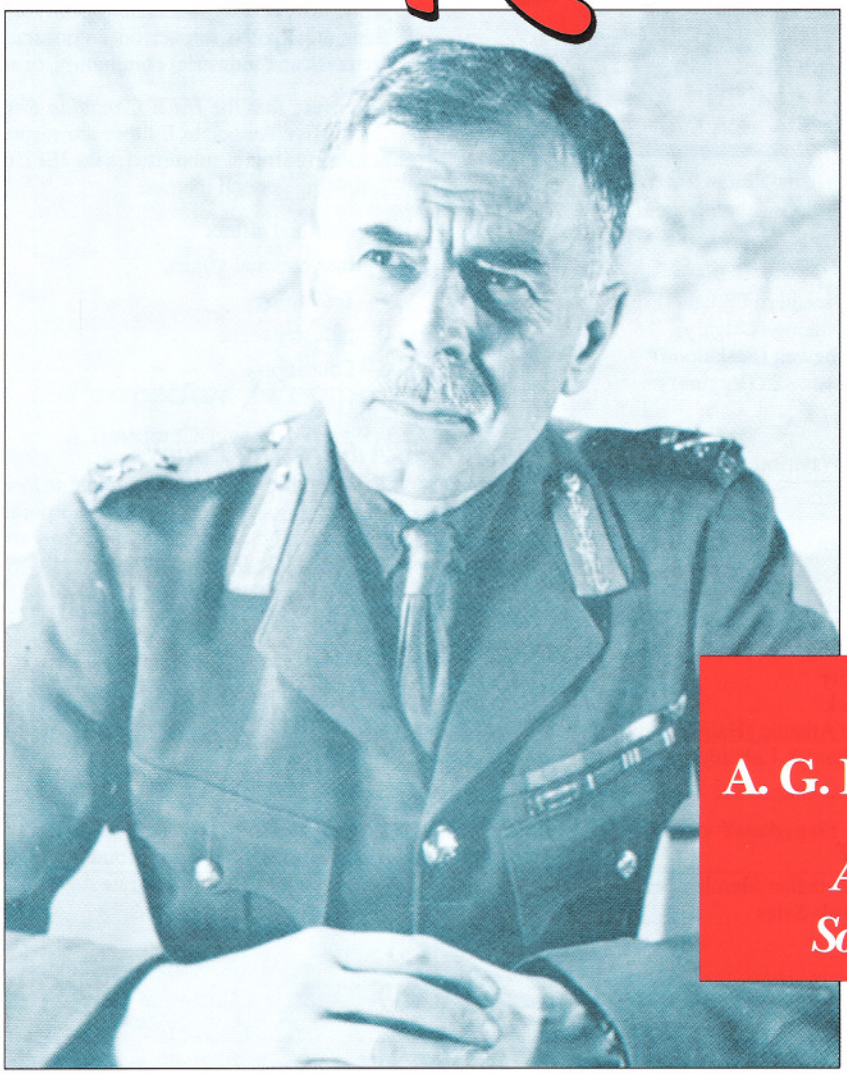

General A. G. L. McNaughton

A Canadian Son of Martha

The Institute of Electrical and Electronics Engineers Inc.

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IEEE Canadian Review General Information

The *IEEE Canadian Review* is published quarterly - in March, June, September and December. 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, etc.), 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 scene
5- Education

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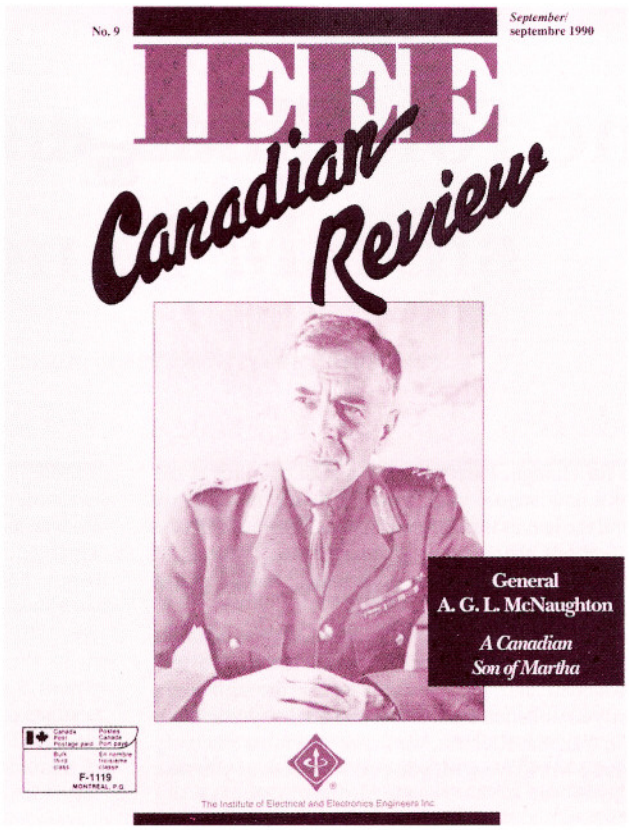
- The Managing Editor



Engineer, scientist, inventor, soldier and statesman, General Andrew G.L. McNaughton was above all a Canadian patriot.

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IEEE Canadian Review is published quarterly by IEEE Canada. IEEE Canada is the Canadian Region of the Institute of Electrical and Electronics Engineers, Inc. **Address:** 7061 Yonge St. Thornhill Ont. L3T 2A6 Canada, **Telephone:** (416) 881-1930. Responsibility for the contents rests upon the authors and not upon the IEEE, or its members. **Annual Subscription Price:** Free of charge to all IEEE members in Canada. For IEEE members outside Canada: $16 per year. Price for non-members: $24 per year. **Advertising:** For information regarding rates and mechanical requirements, contact Jean Bonin, *SOGERST*, 2020 University St., 14th floor, Montréal, Québec H3A 2A5. Tel. (514) 845-6141. **Reprint Permissions:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy for private use of patrons. Instructors are permitted to photocopy isolated articles for non-commercial classroom use without fee. For other copying, reprint or republication, write to Manager of Canadian Member Services at IEEE Canada. Printed in Canada. Postage paid at Montréal Canada. **Postmaster:** Send address changes to *IEEE Canadian Review,* 7061 Yonge St., Thornhill, Ont. L3T 2A6 Canada.

A Time for Change

Fall is a time for change. Parents heave a sigh of relief at the beginning of a new school year, frost forms on the ripening pumpkins, and the leaves turn golden brown. Thus it is with the IEEE. Most sections change executives over the summer, and September signals the start of new programs of technical and social events.

Thus it is also with your *IEEE Canadian Review.* Richard Marceau has passed on the editorial baton to a new team. IEEE Canada has a large debt of gratitude. Richard founded and guided the Review through eight excellent issues, and firmly established the Review as a quality publication for electrical engineers in Canada. Richard, we thank you most sincerely for your inspiration and hard work. We wish you every success as you take up new challenges.

I should like to express my appreciation to Jorge Campos for agreeing to take on the task of Production Manager. As an interim measure my wife, Gerry, and I are managing the Review prior to handing over to a new Managing Editor next year. Bear with us while we learn the do's and dont's of magazine production. Apologies for the late delivery of this issue; we should be back on track in the new year.

For the Review to be a success, it must contain what you want to read. Of late, we have been trying to combine technical reviews with the occasional historical article, as in this issue, and with news which we hope will interest IEEE members in Canada. Do we have the right mix? Your comments would be most welcome.

We do need carefully prepared articles. Please accept this as an open invitation to take pen to paper, or digit to WordPerfect, and prepare an article on any relevant subject about which you feel you are an authority. A letter to the appropriate Associate Editor or to myself expressing your interest in writing on a specific topic would be appreciated in the first instance.

We like to think of the IEEE as a dynamic organization which evolves in response to the needs and concerns of its members. The Sections Congress, held at the Royal York Hotel, Toronto, October 4-7, provided a very effective means of sampling the opinions and ideas of the membership.

by Dr. Tony R. Eastham
Director, IEEE Canada

This event now happens every three years, and this was the first Congress outside the U.S., the previous two being in Boston in 1984 and Anaheim in 1987. Essentially, all the action items from the previous Congress have now been acted upon. The Toronto Congress, which attracted over 600 delegates and 200 guests, further served to chart a course for the IEEE through the 1990's. A report on this major event will appear in the next issue of the Review.

What initiatives are planned for 1990-91? I share the view of my predecessor, Bob Alden, that it should be possible for there to be a single EE society in Canada; one which would be recognized as Region 7 in the transnational Structure of the IEEE and which would serve as the national society in Canada. Exploratory discussions are being held with the Canadian Society of Electrical and Computer Engineers (CSECE), and we will, of course, keep the membership informed when new directions and relationships are proposed. In this respect, I sense a certain conservatism — let's try to be more open to advantageous change!

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

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

IEEE Canada is the Canadian entity of this transnational organization, with 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 (page 3).

General McNaughton - A Canadian Son of Martha

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

The ritual of the calling of an engineer to which all engineering graduates are invited in their fourth year of the engineering programme is the keystone of the engineering profession in Canada. At the ceremony, graduating engineers are invited to assemble with practising professional engineers and commit an obligation before them. To adhere to the principles and ethics of their chosen profession. This ritual was originated over fifty years ago by Rudyard Kipling at the request of seven past presidents of the Engineering Institute of Canada and he chose for classical reference, thereby reflecting his perspective and profound respect for the professional engineer, Martha, the sister of May. In the 10th Chapter of Luce of the New Testament, Martha is designated by the Lord for service to mankind; and, through the "Ritual of the Calling of an Engineer" and the symbolic "ring of cold iron", professional engineers accept and transfer this burden from generation to generation.

On the 50th anniversary of the famous "incandescent lamp" which transformed the world, Thomas Edison, fatigued and aged, made the following statement:

"I would be embarrassed at the honours that are being heaped upon me were it not for the fact that in honouring me, you are also honouring the vast army of thinkers and workers of the past, and those of the present and the future, without whom my work would have gone for nothing. If I have spurred people to greater efforts and if our work has widened the horizons of thousands of men and women, and given even a little measure of happiness in the world, I am content."

Brigadier-General McNaughton, D.S.O., aged thirty-one

Being spurred to greater efforts; widened horizons; the provision of a measure of happiness; contributions to increased living standards of the world's people — all of these are the challenges which have been met by famous engineers of the past. They await each generation of engineers as they graduate and prepare for future works. The United States has its Edisons, its Westinghouses, and Steinmetz; and there are the Watson-Watts of Britain and the Werner von Brauns of Europe. In Canada, we have one name too — Andrew George Latta McNaughton, more commonly referred to as "Andy" or "A.G.L." McNaughton — a Canadian patriot who served his country with prodigious energy as an engineer, a scientist, an inventor, a soldier, and a statesman for over fifty years. A politician he was not. But like Winston Churchill, the

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

Andrew George Latta McNaughton (1887-1966) *was a Canadian patriot who served his country with prodigious energy as an engineer, scientist, inventor, soldier and statesman for over fifty years. He is remembered by most as a military man who later became a member of the Canadian Cabinet, assuming the post of Minister of Defence. His many other contributions to Canada are generally not realized.*

We believe that Canadian electrical engineers who are aware of the McNaughton Medal but are perhaps not familiar with all of General McNaughton's scientific and engineering achievements, will be impressed and proud to count him one of their own. This condensation written by Ted Glass, IEEE Winnipeg section, of the three-volume biography, "McNaughton," written by the late John Swettenham, historian of the National War Museum, and published by Ryerson Press, will appear in two parts. Part I ends at the outbreak of war in 1939. Part II will be reprinted in the December 1990 issue of IEEE Canadian Review.

Ted Glass's condensation was reviewed by John Swettenham and used at the official opening of the first McNaughton Learning Resource Centre in the Department of Electrical Engineering at the University of Manitoba, on January 30, 1979. The McNaughton Medal, Certificate and the full 3-volume biography of General McNaughton are presented annually to outstanding Canadian engineers in recognition of their important contributions to the profession.

Andrew George Latta McNaughton (1877-1966) fut un patriote canadien qui a servi son pays avec une énergie prodigieuse en tant qu'ingénieur, scientifique, inventeur, soldat et homme d'état pendant plus de cinquante ans. On se souvient surtout de lui comme d'un militaire qui devint membre du Cabinet Fédéral en tant que Ministre de la Défense; ses autres contributions à la nation canadienne n'en sont pas moins importantes.

De nombreux ingénieurs canadiens connaissent la Médaille McNaughton, mais beaucoup moins les réalisations scientifiques et en ingénierie du général McNaughton; nous croyons qu'ils seront fiers de le compter parmis les leurs.

La biographie en trois volumes "McNaughton" (Ed. Ryerson Press) écrite par John Swettenham, historien du Musée National de la Guerre, a été condensée en deux articles écrits par Ted Glass - IEEE Section de Winnipeg. La première partie (publiée ici) illustre la vie et les réalisations du général McNaughton jusqu'à l'aube de la guerre en 1939. La seconde partie sera publiée dans la prochaine édition de cette revue.

Cet ouvrage de Ted Glass a été revisé par John Swettenham et cité à l'ouverture officielle du premier Centre de Ressources Éducatives McNaughton au Département de Génie de l'Université du Manitoba, le 30 janvier 1979. La médaille McNaughton, le Certificat et la biographie en trois volumes du général McNaughton sont présentés annuellement à un ingénieur canadien pour son importante contribution à la profession.

greatest of public servants of whom it has been said that there was no event of any significance in Britain and Europe during his lifetime in which he did not play some part, the same can be said for the electrical engineer, A.G.L. McNaughton, during his lifetime of service to Canada.

Early Background

McNaughton was a westerner — born in Moosomin, Saskatchewan, in 1887. His aptitude for engineering applications surfaced early and an episode is recorded of his experiments beneath the "big sky" of the prairie with the study of trajectory of a missile propelled through a length of copper tube by powder from several shotgun shells at an unlucky gopher. Fifty-six years later, the head of Britain's anti-aircraft command during World War II wrote of the man who was that boy: "McNaughton was probably the best and most scientific gunner in any army in the world. His ideas were colossal..."

As an early teenager in Moosomin, McNaughton had the benefit of his family background. A study some years ago by the Institute of Electrical and Electronic Engineers surveyed the family heritage of professional engineers practising in the United States. The result, probably predictable, confirmed that unlike the professions of law, medicine and dentistry, with high public visibility, a majority of professional engineers enter the vocation from non-professional family backgrounds on farms and in small communities. Many engineering graduates today may easily relate to this. And in one sense, this is a source of strength of the engineering profession, since, as undergraduates, engineers are attracted to it from basic interest in the application of the principles of science rather than for atavistic reasons such as identification with known and successful professionals in the family or the community. There are very few "iron rings" seen on farms or in small towns. At the same time, it is this absence of "success-oriented" references in our profession which often limits and obscures the horizons of opportunities and challenges. And during the short twenty-eight months of a vigorous undergraduate training there is little, if any, emphasis on this important factor.

McNaughton's family background was business-oriented, with experience in organization, administration and even engineering. His clan traces back to a steamship engineer who, in 1765, was associated with the activities of James Watt and his invention of the first condensing steam engine for ship propulsion. In Moosomin, the family with strong mid-Victorian roots of ethics, integrity, and industry, established a successful retail hardware business which continues to be remembered by the R.D. McNaughton Curling Trophy at the annual Moosomin bonspiel. To the McNaughton family, education was venerated and virtuous, but there was little facility for secondary education in the prairies in 1900. Supported by prosperity from a successful business, the two sons were enrolled in Bishop's College School in Lennoxville, Quebec - where the wealthy had sent their children since its founding in 1842. Andrew's scholastic record was a succession of major awards, and in 1905 he matriculated to McGill - then the most exciting school for science and engineering in Canada. His courses prepared him for graduation as a hydro-electric engineer and they exposed him to the physics lectures of Ernest Rutherford, later Lord Rutherford, who developed when at McGill his Nobel Prize winning theory of radioactivity. It was during those heroic days of McGill physics when Rutherford was unravelling the mysteries of the structure of matter that McNaughton became fascinated with science and the search for scientific truths - a fascination second only to his compelling interests and talents for the practical applications of the principles of science. It should be noted that the relatively new field of electrical engineering was considered to be an "extension of physics", and in fact Lord Kelvin is often referred to as the world's first electrical engineer. McNaughton graduated with honours in 1910 and was persuaded to continue at McGill for his Master's degree. This was awarded in 1912 for work related to "high voltage electric phenomena". In the new high voltage laboratory McNaughton first encountered and experienced an "oscillograph room" and "two cathode ray tubes by Braun". For the two years, 1912 to 1914, prior to World War I, McNaughton worked as a consultant on the high voltage transmission of electric power; and he published six papers on the subjects of insulation phenomena, flashover characteristics of suspension insulators with low frequency voltages, and transient and steady state performance of electric transformers.

McNaughton when commanding the 11th Howitzer Brigade, 1916

The Soldier-Engineer

During his academic years, and his two years as a consultant, McNaughton contributed his extra-curricular interests to "soldiering" as an artillery officer in a field battery in Montreal. The Dominion of Canada Artillery Association sponsored an annual gunnery competition for the Governor General's Trophy and within one year of his joining the third Field Battery, Captain McNaughton was selected to represent Canada in international competition. Thus, two of the foundations of McNaughton's life were firmly established - engineering and soldiering.

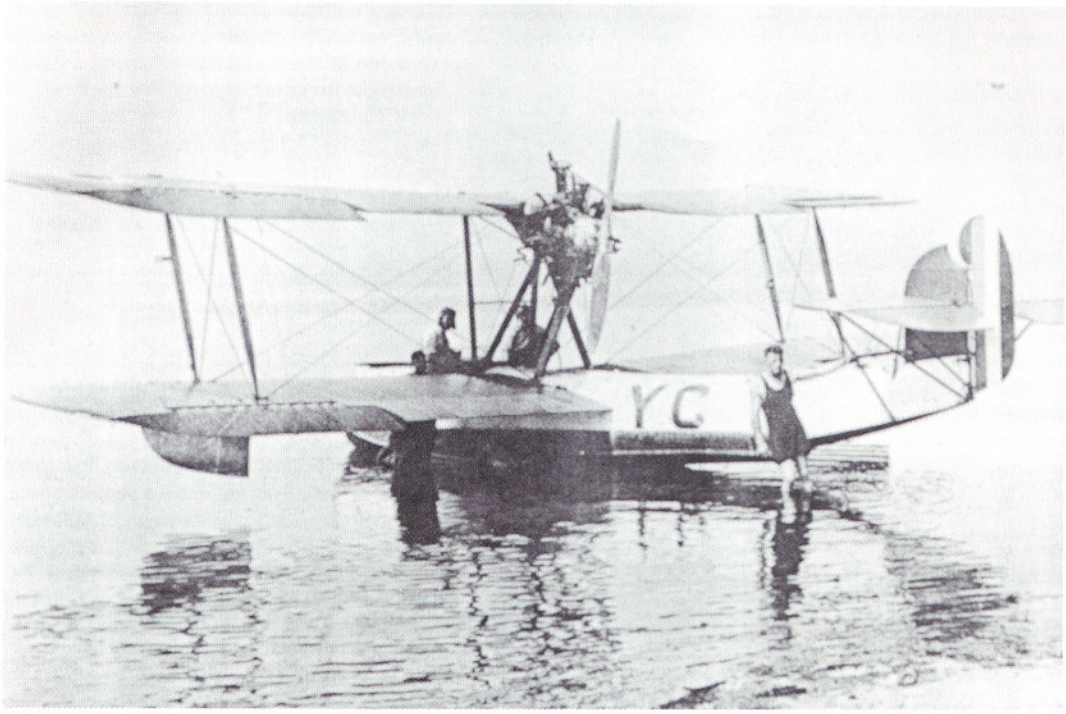
On August, 4, 1914, Great Britain declared war on Germany, and Canada was automatically involved. McNaughton's artillery unit was called to active service on August 6. By mid-October he was in England, and four months later, he and his battery were in artillery action in Belgium.

War stories are often long and tedious and filled with a combination of heroics, cowardice, inhumanities and wanton destruction. McNaughton experienced his share, including a serious shrapnel wound to his left arm which hospitalized him for several months. During a period of convalescence, he registered as an electrical engineer under the National Registration Act of Britain and produced a range-finding table which permitted "moving targets of opportunity to be engaged with great accuracy". This document dated 1916 is in the Artillery Museum at Camp Shilo in Manitoba.

Back in action, and in command of a brigade, McNaughton continued to apply his engineering training to military technology and to improve the accuracy of artillery warfare. Correction factors for barometric pressure ambient temperatures, temperature of the explosive charge, and wind directions were analysed and defined. Range-finding techniques by visual flash-spotting were supplemented by analysis of sound waves and aerial photography. Great was the day for McNaughton when military scientists arrived at his battery with newly-developed oscilloscopes and electronic communications equipment.

Through the historic deeds of its warrior, a country and a nationality are often identified. It was the great military victory by the Canadian Corps at Vimy Ridge at Eastertime of 1917 which focused the attention of the world on Canada as a nation grown beyond its dependent position as a crown colony of the British Empire. The successes of the Canadian Forces at Vimy is attributed in large part to the new standards of artillery warfare introduced and directed by Colonel A.G.L. McNaughton. In the battles of Hill 70, Passchendeale, Amiens, the Hindenburg Line, and finally at Valenciennes, the Canadian Corps with McNaughton as its brilliant artillery expert achieved a reputation unsurpassed in any of the Allied armies. Canada had earned the right to call herself a nation and this autonomy was officially confirmed by the Statute of Westminster of 1931.

McNaughton of the 1920's and 30's emerged as a combination of soldier, scientist, and engineer. The world of the early nineteen twenties was unstable and McNaughton identified three probable dangers confronting Canada. First, the extension of the Bolshevik Revolution in Russia and the danger of the overthrow of law and order as the Winnipeg Strike of 1919 seemed to indicate. Second, unrest in Canada that might lead to the danger of invasion



Canadian Vickers' first indigenous design, the Vedette, in this case a Mk. II. Notice the wire mesh between the struts behind the cockpit. This helped prevent foreign matter flying back into the propeller. The Vedette was used extensively on forestry and photographic patrols during the twenties and thirties.

from the United States and third, the Japanese "a virile, industrious, and warlike nation across the pacific. McNaughton's thoughts at the time were governed by the realization that "The Millennium of everlasting peace has not yet arrived and Canada must be prepared to defend itself".

But he was not a militarist. "Too much emphasis," he said, "on military preparation tends to restrict national development and, hence, weaken our defence when it is most needed. War preparation must not be allowed to overshadow peacetime developments."

He was clearly aware that practically every line of endeavour of the professional engineer in military life is duplicated in the civilian life of a new country in the stage of rapid material development. As he saw it, Canada required a military organization which would not disrupt, but would supplement the economic life of the country. Wireless operators of the Signal Corps. For example, could provide services to the government that would aid the economic development of the nation, as could airmen of the infant Royal Canadian Air Force by cropdusting and forestry patrols, and mapping in the north.

Other principles were included by McNaughton in his work on the "Otter Commission" which studied and recommended on Canada's post-war defences. For the few battalions of the militia to be retained, he insisted (despite five rejections by Ottawa) that the French-Canadian Royal 22nd Regiment (the famous "Van-Doos") be included. The valour and distinction of this regiment, in World War II and the Korean conflict, proved the wisdom of his foresight.

Sea, Air and Land

In 1920, the grain interests of Western Canada combined with those in the US mid-west to agitate for a deep-sea St. Lawrence waterway from Lake Ontario to Montreal. McNaughton, representing the Department of National Defence, was appointed to the Joint Board of Engineers to study the project. His paper, supported by graphs and appendices, recommended the dimensions for a seaway based on the types of ships then under construction throughout the world, the draft of these freighters, the types of freighters in service at the time, and a 20-year prediction of ships of the future. When the St. Lawrence Seaway was finally constructed thirty years later, the dimensions recommended by McNaughton continued to be valid.

The early 1920's saw the opening of the "Air Age" in Canada. Alcock and Brown had completed a transatlantic flight from Lester's Field in Newfoundland to Ireland and war surplus aircraft and war-trained pilots were developing a commercial charter industry for passenger service, forestry patrols, and exhibition flying. In 1880, Britain had transferred the Northern Archipelago to Canada and ownership of the many northern islands was later confirmed by the posts of the Royal Canadian Mounted Police. In 1923, this vast area occupied some 600,000 square miles to the north of the continent and very little of it had ever been seen. Acting on a comprehensive report recommending the use of aircraft to open up resources of the north, McNaughton, as Deputy Chief of the General Staff, encouraged the Vickers Company of Montreal to design and build aircraft "especially for air photography and for flights from small lakes and ponds".

"The Vickers Vedette", a single engine pusher propeller flying boat, was the first aircraft designed and built in Canada to meet Canadian specifications for Canadian conditions.

It was important to install radio stations in the north and, during the development of the Vedette, McNaughton persuaded the government to allow his Royal Canadian Corps of Signals to provide assistance to the non-military branches of the government. Under his Chairmanship, a Northwest Territories and Yukon Signal Service Committee was organized and at the outbreak of World War II in 1939, a 19 station network was in operation as "the pulse of development in the north". It later provided the basis for northern weather reports and by 1959, when incorporated with the distant Early Warning Radar defence line, it was recognized as "probably the finest military signals communications organization in the world".

Topographical Surveys was the next challenge accepted by this great Canadian. The Survey Section of the General Staff in 1922 was totally bogged down in the manual preparation of maps to the scale of one inch to the mile. Each new map required two years of advance notice. From his artillery experiences, McNaughton knew that aerial survey was a practical method for mapping and in 1924, at his direction, the RCAF assisted surveyors for the first time with the experimental photographing of 40 square miles from an altitude of 6,000 feet. The techniques were proven sound and by 1931 Canada had published maps for 45,000 square miles of its territory. In 1933 he was Chairman of the Associate Committee for Survey Research organized by the National Research Council and the result of this Committee was the establishing of a national index of map photographs, one of the first nations of the world to do so.

It was through this combination of the Vickers Vedette, the Northwest Territories and Yukon Radio System, and the technology of aerial surveys that McNaughton accelerated the development of the rich resources of the north. And always, there was the by-product of national defence.

The Cathode-Ray Direction Finder

On the day of the launching of the first Vedette in 1923, McNaughton was in a railway parlour car returning to Ottawa. In an atmosphere of some exuberance, the discussion with his colleagues focuses on the potential of the little flying boat for northern development, and the need for air navigation aids. Radio beacons at widely separated points were obviously practical, but how would the planes locate their own position in space? Radio systems and rotating loop antennae could be used to detect maximum and minimum signals but with noise interference of the engine the accuracy of such a system would be inadequate. As McNaughton was later to say, "The cathode ray direction finder was invented under the spell of the launching of the

Vedette". From his early experiences at McGill, and later with the artillery sound rangers, he knew that a cathode ray tube could be used to indicate visually the exact direction from which radio signals were received. In the parlour car that night, he committed his idea to paper. Later, he procured a sensitive type of Braun tube and initiated a programme with Major W.A. Steel of the Royal Canadian Corps of Signals to apply his theory to a working model. Provisional protection was secured in Canada under Caveat No. 15414 dated August 22, 1923, and in Britain under application 23262/23, in June of the same year. The Canadian Patent was issued to Steel and McNaughton on June 30, 1925. A similar patent was issued to Watson-Watt in June, 1926 and he later claimed a substantial monetary reward for his "invention". (He did not get it, in view of the Steel-McNaughton patent.) In fairness, it must be noted that Watson-Watt applied the principle of radio direction finding to the development of radar - so important during the Battle of Britain. Both Steel and McNaughton contributed to the development of the first cathode-ray direction finder to be manufactured by industry for the Armed Services. In 1937 they assigned their patent to the National Research Council for the grand sum of $1 each.

McNaughton, as Chief of the General Staff, visits Halifax, 1930.

Imperial Defence - A Canadian Aspect

In 1927 McNaughton was selected to attend a special course for high ranking military officers at the Imperial Defence College in England. The threat of another war was becoming apparent, and during the programme, he presented two papers of later significance to Canada. One was an analysis of the defence of Hong Kong in the event of military action by Japan which concluded that the British garrison could not be protected. In 1941, a Canadian-born officer in the service of the British Army persuaded the Canadian government to assign two battalions of Canadian soldiers to the defence of Hong Kong. The tragic story of the Winnipeg Grenadiers and the Royal Rifles of Canada, their surrender after six days, and four years of imprisonment and starvation, continues as a legacy today of this decision.

The second contribution of McNaughton to the studies concerned the "Principles of Imperial Defence - A Canadian Aspect". For the first time, the Defence College was made aware of the emerging Canadian autonomy with full expectation of its rights to identity and independent decisions. "The time has passed when any of the principal Dominions will accept a dictum from the central government of the United Kingdom. No dominion government of the future will be content to hand over its troops without retaining responsibility for the direction of their employment".

The Imperial conference of 1930 produced the Statute of Westminster, signed in 1931. From that time on, "Canada was no longer a British colony, but a free and independent nation, voluntarily linked with other free nations of British origin in a Commonwealth of Nations in which all are on equal footing and from which any of the partners has the right to secede at any time". McNaughton attended as the sole Canadian defence adviser but he was also invited to join the committee to consider the constitutional relationships. McNaughton, the statesman, was beginning to emerge.

A Transatlantic Air Route from Canada to England

Lindbergh's solo flight across the Atlantic in 1927 fired the imagination of air pioneers in both the U.S. and Europe. But the development of the shorter transatlantic air routes confirmed by Alcock and Brown, and by Lindbergh, had failed to develop because of inadequate funding and lack of interest. Pan American Airways was growing powerful and had plans to establish a southern route air service from New York to Europe via Bermuda and the Azores. Control would be in the hands of the U.S. and France. McNaughton clearly foresaw the expansion of this southern route to include a direct route from Boston to the British protectorate of Newfoundland and on to Ireland. This would bypass Montreal and Canada completely. The solution to this dilemma came in 1932 on the occasion of an Imperial Economic Conference to be held in Ottawa. McNaughton saw an opportunity to demonstrate, at little cost to Canada, the advantages of a direct transatlantic air route from Canada to England. As Chairman of the Canadian Aviation Committee he encouraged the support of the Post Office to establish a combined air-steamship service for the transmitting of mail to and from Europe during the Conference. Mail originating in London would be flown to Cherbourg in France, thence by ocean liner to the Straight of Belle Isle, and from a pick-up at sea, it would be flown to Ottawa by way of Montreal. Return mail would duplicate the route in reverse. This ship-to-shore experiment reduces the mailing time from more than a week to four days and resulted in an agreement with Britain that, for future development of transatlantic air routes, preference would go to the direct route Britain - Irish Free State - Newfoundland and Canada. Shortly after this decision, Pan American Airways approached Newfoundland with an offer to establish an American-based transatlantic route. With the support of the Canadian and British governments, McNaughton, who had no more than an empty purse and some antiquated aircraft, was successful in his negotiations both with Newfoundland and U.S. to secure a place for Canada in transatlantic flying that was eventually filled by TransCanada Airways.

The St. Lawrence Seaway

During this period of vigorous activity to establish an air industry for Canada he was also the driving force behind the improved Welland Canal, opened during the Conference. This was to be one of the important links in the future St. Lawrence Seaway.

As one historian writes, "It was McNaughton rather than any civilian or committee of civilians who took charge at the request of the Canadian Prime Minister (Bennett) of the arrangements for the Imperial Economic Conference. His expertise in hydro-electric and related engineering projects led to his membership on, and domination of, the Government's interdepartmental advisory committee on the St. Lawrence Seaway. He had become, perhaps, the most powerful public servant in the country."

"We Must Get Hope Back into the Minds of our People"

Canada of the early 30's was caught up in a world wide economic depression. The crash of the New York stock market in 1929 initiated the slump and, by the end of 1930, the wheels of industry in North America had ground to a halt. On the prairies the tragedies of the depression were compounded by a drought - day after day of cloudless skies and a hot sun shining relentlessly down. Cattle weakened and died, soil and seed drifted away under the slightest breeze. Entire families bundled their worldly assets into carts and old cars and moved on in search of productive land. In the cities and towns there was no work; breadlines and soup kitchens opened to feed the hungry and idle population; and on the political scene, Tim Buck and his Canadian Communist party found a ready audience among the demoralized masses. As the depression deepened, a moral rot began to pit the soundness of this young, proud, independent, and self-reliant country.

McNaughton saw the condition of the country in 1932 and was appalled - an estimated 70,000 of the unemployed were homeless, single men - "mostly young". In their ragged platoons were the prospective members of Canada's

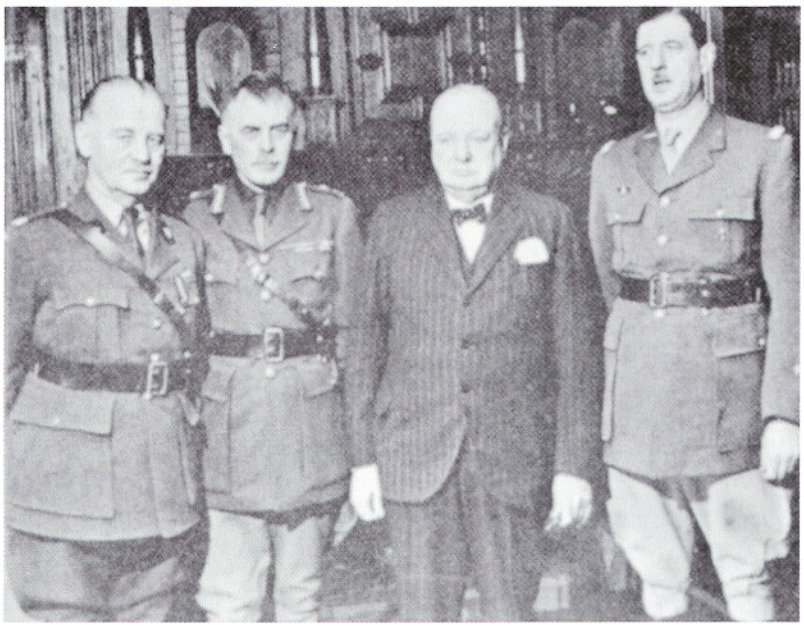
Armed Forces should the country become involved in war. Here also were the prospective members of what Karl Marx had called the Industrial Reserve Army, the storm-troopers of international revolution.

What to do with 70,000 single, homeless transients, riding freight cars from coast to coast and sleeping in the jails of small communities? "We must," said McNaughton, "get hope back into the minds of our people." The essence of his plan was to build up morale through work, to proceed by persuasion and not by compulsion, and to do everything possible to facilitate the flow of men back to industry as soon as they would be mentally and physically fit, and opportunities available. Moreover, he wished to avoid a penitentiary type of soulless work. To provide work which would "capture the imagination" and give them something that they themselves would recognize as having meaningful value for the good of the country.

The McNaughton Plan, approved by parliament in 1932, called for the immediate employment of 2,000 civilians at a daily wage of $1 per person. This $1 would include food, clothing, and accommodation plus 20¢ per day for personal spending.

The army with its organization, its depots and camp facilities would provide the men's clothing, and food, transport and medical supervision. Military engineers would supervise the work, but there was to be a complete absence of military discipline and drill. All officers and military personnel wore civilian clothes, and no man was kept in the camps against his will. Anyone wishing to leave was given clothing and transportation to another chosen place of work. If he failed to find it, he was welcomed back. The work week was eight hours per day with Saturday afternoons and Sundays free for rest and relaxation.

By June of 1933, 10,000 men were employed on 28 projects across the country, and in the following three years, this had increased to 20,000 workers. And the majority of these projects were the construction of airfields and facilities for the TransCanada air project. With its vast distances, the future of Canada, as McNaughton saw it, would be in the air. In addition to the work opportunities, teachers were employed in the camps to supervise training and correspondence courses, and countless numbers of men emerged from this period as skilled and semi-skilled tradesmen, physically fit, with greatly increased opportunities for regular employment.



General Sikorski, General McNaughton, Winston Churchill and General de Gaulle visit Headley Court, February, 1941.

In spite of continuous political agitation by opposition political parties (and labour unions) at the intrusion of the militia to solve a civilian problem, the world in 1936 had begun to emerge from the depression. As employment opportunities opened up the camps were closed. The final accounting confirmed a total cost for the scheme of 22 million dollars; the value of works completed was estimated at 18 million dollars — a mere cost of 4 million dollars to salvage the hopes of 170,000 young Canadian men who had been in the camps at one time or another.

The "Father of Air Canada"

McNaughton had also been appointed Chairman of an Inter-Departmental Committee on Trans Canada Airways. During the years 1933-1935, this committee acted on behalf of the federal government to liaise with international airlines - Pan American for the U.S. and Imperial Airways for Britain, to protect Canadian interests in international flying; to purchase or lease land; to construct airfields, navigation aids, and communications facilities; and to study the types of aircraft to be used in flight schedules.

Thus, the unemployment relief camps and the Trans Canada Airways study committee provided the base for TransCanada Airlines, formed by an Act of Parliament in 1937. TCA was a 100% Canadian company, the principal officers of which were all Canadian citizens. In 1965 the company became Air Canada.

This was "engineer" McNaughton at his best - combining the primary function of employment with the need for a Canadian air service; and with a third by-product of strengthening the military defence of the country. For an air link between the Atlantic and the Pacific, with Japan threatening on the one hand and Hitler on the other, an all Canada air link between these two would be essential. That the successful outcome of these projects was largely due to McNaughton's dynamic leadership there is no doubt. He has often been called the "Father of Air Canada". In the New Year's Honours List of 1935 McNaughton was appointed Companion of the most Honourable Order of the Bath for his exceptionally fine work in directing unemployment relief, and in the construction of airplane landing fields across Canada.

The Soldier-Engineer Becomes President of the National Research Council

In the same year, 1935, McNaughton was appointed President of the National Research Council, a nineteen year old institution chartered to co-ordinate and promote scientific and industrial research in Canada. NRC was a peculiarly Canadian device, fitted to a country with vast areas, a small population, and with very little money. Its short history had been complicated by government involvement, marginal financial support, supplemental volunteer and unpaid support by university professors, and a vigorous belief in its autonomy to direct its own fortunes. McNaughton entered this uncongenial research environment as an outsider. To many of the faculty members distributed across the country, the appointment of a "soldier-engineer" to preside over their scientific bailiwick was suspect. They had overlooked one important factor - McNaughton was essentially one of them, an engineer/scientist. Under his dynamic leadership the apathy caused by poorly paid scientists and underequipped laboratories was eliminated; finances were made available and the activities of the group were accelerated in preparation for a war which McNaughton perceived to be inevitable. But this purpose, had it been apparent, could have destroyed NRC. In a later tribute by his successor, Dr. C.J.MacKenzie, McNaughton was identified as a man well-versed in pure science but more interested in its application. He was the ideal applied-scientific research engineer, capable of intense concentration, and he knew where applied science was going industrially. Unlike his military experience, at NRC he never gave orders. He operated as all good research scientists operate, and he never interfered with personal liberty. Soon the icy reserve that had greeted his arrival melted and was transformed into warm respect.

His contributions to NRC were summarized by Dr. MacKenzie who gave him full credit for shaping the organization at the turning point of its development. By obtaining land for the Montreal Road site laboratories of NRC, he provided for the rapid expansion of the 300 people to a world-recognized focal point for scientific research by 6,000 scientists and engineers that was of great importance in World War II. Viewed in terms of lasting benefit to Canada, his four years at NRC may well be the most important thing he ever did. These years were also among the most tranquil and satisfying of his incredible career.

To be continued

The World of Cellular

Cellular technology paves the way for mobile communication.

by Tony Hontzeas
Ericsson Communication Systems
Town of Mount Royal, Quebec

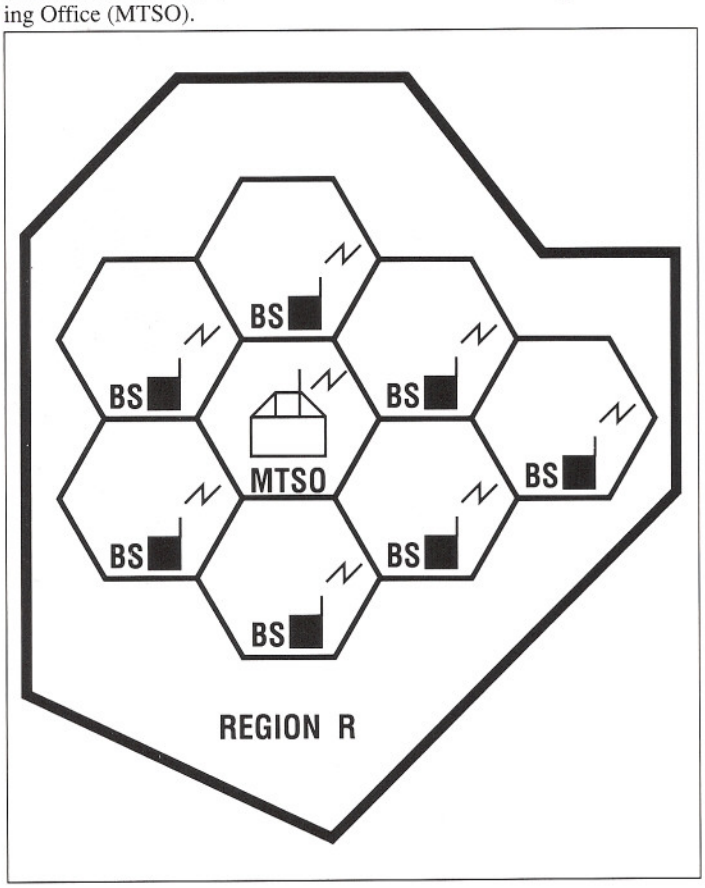
Although experiments involving mobile communication took place as early as the 1920's in cities such as Detroit and Cleveland, it was the discovery of frequency modulation that provided the viable foundation on which the mobile communications industry was built. FM tripled the dynamic range of the broadcast, required much less power and was much more resistant to inherent propagation problems such as flutter and capturing.

The first major test of FM mobile technology was seen in the second world war, when several hundred thousand mobile phones were constructed for use in military vehicles and aircraft. By the end of the war, FM mobile equipment had become ubiquitous and the US radio industry was ready to launch into the commercial field.

Following the war, mobile telephone service began to develop in major American cities. In 1946, in St. Louis, AT&T obtained a licence from the newly formed FCC to operate the first truly mobile telephone service. Initially, subscribers were allowed to receive calls in their vehicles through the public telephone network and eventually to place calls to the landline network. These first systems used FM transmission and were centered around a single powerful transmitter which had a coverage radius of about 80 km. Demand for the service grew at such a rate that the capacity of the system was soon overrun, resulting in frequent congestion and subscribers who found themselves less and less able to use their phones at peak hours. The motivation for technological innovation in mobile telephony thus resulted from chronic capacity and frequency spectrum shortage. At this time, the resultant system overload was mainly due to the fact that there was a far greater number of customers than channels available to serve them. At that time each customer was allocated one particular channel, since the bandwidth allocated by the FCC was far too narrow to allow the addition of new channels.

The above limitations were surpassed by technological innovation. First and foremost, the FM receiver design was improved to the point that the bandwidth requirements of a particular unit were halved to 30 kHz and secondly a feature known as Automatic Trunking was added. Automatic

Figure 1 A region R is divided into cells. Each cell has its own base station (BS) and the base stations are connected to the Mobile Telephone Switching Office (MTSO).



Mobile telephone services

In 1946, AT & T obtained a licence from the newly formed U.S. Federal Commission of Communications to operate the first truly mobile telephone service. This system used FM transmission and was centered around a single powerful transmitter, which had a coverage radius of about 80 km.

Since then the cellular telephone concept involved into highly sophisticated systems. Such features as frequency reuse and cell splitting, allow cellular systems to bypass many of the problems that an inadequate spectrum allocation would originate. Further, cell locating, handoff and roaming contribute to offer the subscribers a phone service with a quality similar to what they would normally get from a landline network.

Les services de téléphone mobile.

En 1946, AT&T obtenait licence de la toute nouvelle Commission Fédérale des Communications (É-U) pour opérer le premier véritable service de téléphone mobile. Ce système employait la transmission FM et gravitait autour d'un unique transmetteur très puissant qui couvrait un rayon d'environ 80km.

Depuis, le concept du téléphone cellulaire a évolué vers des systèmes très sophistiqués. Des caractéristiques telles la réutilisation de fréquence et la division de cellules permettent aux systèmes cellulaires de contourner plusieurs des problèmes que pourrait induire une allocation inadéquate du spectre de fréquence. De plus, la localisation des cellules «handoff and roaming» ont contribué à offrir aux usagers un service téléphonique de qualité semblable à celle offerte par le réseau traditionnel.

Figure 2 A sectoral antenna commonly used by base stations

Trunking enables a particular mobile station to tune to a variety of frequencies rather than to one fixed frequency. This meant that each mobile had the ability to scan the airwaves and seize any idle channel in a given set of frequencies. This scanning was initially performed manually but was later automated. In the mid 1960's, coinciding with the FCC's allocation of the upper UHF band for mobile communication, AT&T introduced a mobile system containing enhanced features such as automatic trunking, direct dialling and full duplex service under the name of Improved Mobile Telephone Service (IMTS)[1].

The IMTS network was based on having a single powerful base station transmitter of about 250 watts that had the ability to cover a service area of radius 50 km. Transmitters utilising the same frequency range had to be spaced no less than 100 to 160 km from each other so that co-channel interference could be avoided. The base station had the ability to interface with the standard telephone network, and the number of channels allocated to a particular service area was directly proportional to the number of subscribers. Hence as demand grew, more channels had to be allocated and since the number of available channels was limited, a backlog of customers who desired but were unable to obtain mobile phone service developed. This meant a loss of revenue for the mobile operator (usually referred to as the Radio Common Carrier or RCC) and dissatisfaction among existing customers as the system was frequently congested, thus barring attempts to place or receive calls. Clearly another technological advance was needed. This solution came with AT&T's introduction of the Advanced Mobile Phone System (AMPS)[2], otherwise known as the Cellular System.

The Cellular Concept

A typical cellular system is shown in Figure 1. A given geographical region is divided into subregions know as CELLS. Each cell consists of a base station (BS) which is a low power transmitter/receiver that can communicate with the mobile stations (MS) that are inside that particular cell.

An MS consists of a transceiver and a control unit. The transceiver can tune to any of the FM channels in the 800 MHz band of the cellular system and is mainly used for speech. The control unit is used to transmit and receive signalling information from the BS.

A particular BS can transmit and receive information through a set of voice channels which are usually used for speech, and one setup or control channel which is usually used to coordinate activities with the particular MS. Therefore a cellular service area is composed of a finite number of cells organized in a way that best serves that area. The base stations within these cells are controlled by a Mobile Telephone Switching Office (MTSO), which is nothing more than a telephone switch with extra digital features programmed for cellular control. The MTSO controls both the cell site and many of the functions performed by an MS. Further, an MS can freely travel through any of the cells controlled by an MTSO.

If the cells are a sufficient distance apart then, since the BS power at each cell site is quite low, then these non-adjacent cells have the ability to participate in Frequency Reuse (FR). FR simply means that the set of frequencies that a particular cell uses is not mutually exclusive of those used in a cell a sufficient distance away. If cell A uses a setup channel at frequency K, then cell C may also use a channel at the same frequency K provided that sites A and C have a low BS transmission power and hence minimise co-channel interference. Further, if the number of subscribers within a certain region increases and comes close to congesting a cell, then cell splitting is performed. Cell splitting takes place by lowering an existing BS transmission power and adding more low power base stations, thus "splitting" a cell into one or more cells. As the number of cells is increased, FR may be used more frequently, thus increasing the number of available channels and increasing the system's ability to handle more traffic within the FCC's 800-900 MHz spectrum allocation.

Calls to and from a Mobile Station

When an MS is not taking part in a call (i.e. when the handset is on-hook), the mobile's control unit monitors the setup channel data that may concern the MS. When a call is being made to the MS, the MS number is placed over the setup channel by the BS, and the MS is effectively paged. Upon recognition, the MS seizes the setup channel and acknowledges the page. The BS then issues a voice channel number to the MS, and the mobile and cell site switch to the new voice channel. The subsequent voice channel is used for ringing and conversation.

Figure 3 A mobile phone.

A call originating from an MS is similar except that the mobile seizes the setup channel (if one is available) when the unit goes off-hook. The voice channel selection and designation, as well as signalling and conversation occur as above. If a setup channel is not available, a busy light is illuminated on the portable indicating that service is not available at this time.

Locating, Handoff and Roaming

When an MS is on-hook, the control unit continually monitors the setup channel. If the channel is too weak as when, for example, the mobile moves away from the BS and approaches a cell boundary, the mobile station's control unit finds and locks to a stronger setup channel usually belonging to a neighbouring cell.

When an MS is off-hook, i.e. when a call is in progress, the voice channel's signal strength is sampled every few seconds and when the quality begins to deteriorate, as when the MS approaches

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[1] *Improved Mobile Phone Service (IMTS) is a registered service mark of the AT&T company.*

[2] *Advanced Mobile Phone Service (AMPS) is a registered service mark of the AT&T company.*

a cell boundary, the MTSO immediately requests all the neighbouring cells to provide measurements of the mobile's transmission. This is called *locating*. When the data arrives, the MTSO selects the cell with the best overall measurements and in whose vicinity the mobile is deemed to be located, selects an available voice channel within that cell and signals the MS to switch to that voice channel, thus placing it in the control of the new cell. The mobile is thus handed-off from one cell to another. Handoff is not limited to cells within a particular exchange but also to cells controlled by other exchanges.

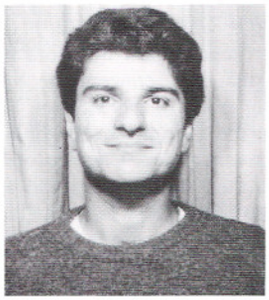
Finally, if a user moves from a cell controlled by one RCC to one which is governed by another RCC, he is performing inter-exchange *roaming*. Of course, there has to be a prior agreement between the two different RCCs to allow their corresponding customers to use the two different networks.

It should be emphasised that locating, handoff and roaming are all performed automatically by the system and subject a minimum disturbance on the subscriber. A particular user can thus start a call on the highway, continue the conversation through the downtown area of a city and out into the country without being aware of the events taking place (i.e. locating and handoff) to support and maintain the call.

Conclusion

With the principles of frequency reuse and cell splitting, cellular systems solve many of the problems that may arise from an inadequate spectrum allocation. Further, locating, handoff and roaming offer a subscriber the same quality of phone service that he or she would normally get from a landline network. Finally, the increasing demand for mobile data communication and the coming digital cellular wave promise to highlight cellular technological development in the years ahead.

About the author



Tony Hontzeas received his Bachelor of Engineering degree in Electrical Engineering (Computer Option) from McGill University in December 1986 and is presently employed as a Member of Technical Staff for Ericsson Communication Systems in Town of Mount Royal, Quebec.

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

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

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

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

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

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

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

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

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

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

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

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

From Kiev to L'viv

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

Zhytomyr

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

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

rehearsing for the evening's entertainment.

After a few more hours, the bus crossed the boundary between the oblasts (provinces) of Volyn and L'viv. It stopped briefly in the town of Olesko, where the group photographed Olesko's famous castle, today a museum. Then, on to L'viv.

About thirty kilometres or so from L'viv, the waterpump broke. Ihor went to call the rector for the Institute and get the HAI, who arrived shortly and flagged down a truck, driven by two young men and directed them to tow the bus to the next HAI station, about fifteen kilometres further. The young men, who were carrying a payload from the Carpathians, reluctantly agreed and towed the bus to the outskirts of L'viv. There, the group waited for instructors from the Institute, who promised to come with their cars to drive the group to its L'viv destination.

standards, they were more than adequate. In the morning the group was served a remarkable breakfast in the restaurant annex to the Zhytomyr hotel, which included "keefer" - a local delicacy similar to yogurt. Before departing, the group had an opportunity to talk with some of the local residents, most of whom expressed great anxiety about the effects of the Chernobyl disaster on the future of the region. They spoke cynically of the official "thirty kilometre zone"

After breakfast, the bus left Zhytomyr. On the highway the group learned about the so-called "HAI" (pronounced 'hayee'), the Soviet version of traffic police, which were stationed every so many kilometres. En route to Novhorod Volynski, the next destination, the group saw several private farms as well as many large collective farms. People are skeptical about privatization, because they fear that it may be shortlived. "Why put in all that work, only to have it confiscated again once it's successful?", one person remarked.

Novhorod Volynski

In downtown Novhorod Volynski, the bus stopped for about an hour and the Canadians wandered about freely. The meat and grocery store shelves were almost empty; shortages were apparent everywhere. Where something was in stock, there were long line-ups.

The bus continued its journey through the Volyn region, passing historical towns such as Korets, Ostroh — places once ruled by fabulously wealthy magnate princes (the Ostroh princes once owned over 1100 cities, towns and villages!) The landscape was charming, rolling hills, lush vegetation and pretty villages. Here and there, people were pasturing cows along the roadside (Soviet citizens may now own a specified number of livestock).

Along the highway, the group observed the process of "derussification" in the roadsigns — almost all "o's" were struck out and replaced by "i's", e.g. Baranovka was now Baranivka, etc. (a significant linguistic difference between the Russian and the Ukrainian language).

Rivne

In the city of Rivne, the group ate a fabulous lunch at a cooperative restaurant. Neither the instructors nor the students were accustomed to seven or eight course meals and the everpresent supply of cognac from Odessa, which was used to propose numerous toasts to peace, goodwill and just about everything else during the course of a meal. At this restaurant, a rock group was

The wait at this location proved to be quite revealing to the Canadians as it provided the first evidence of the new religious freedom blossoming in the Soviet Union. On the other side of the highway, behind a cemetery, a new church was being constructed. Shulakevych and Yanchynski walked over and learned that this was to be a Ukrainian Greek Catholic church. Although the population of the Western Ukraine, and especially L'viv province, was predominantly Greek Catholic, this denomination was outlawed after the Second World War, and its buildings and properties were given over to the Russian Orthodox Church.

L'viv - The Suputnik (Sputnik) Hotel

Finally three instructors from the Institute arrived with their cars and transported the group to its destination, which turned out to be the Suputnik (Sputnik in Russian) Hotel, a newly constructed Komsomol building on 116 Bozhenko Street. It was situated in a new area of L'viv, and was surrounded by many newly constructed buildings, including a shopping mall.

Upon arrival, each Canadian student and instructor was given a bouquet of flowers by the hosts, and within a short time the rector, Kazimir Ivanovych Pyrozhak, several department heads, instructors and students congregated in the hotel suite. Caviar, cognac, and fresh strawberries were served and after a very cordial evening, plans were made to meet next day at the Institute and finetune activities for the two-week stay.

Early next morning, as for almost every morning for the next two weeks, the Canadians were met at the Suputnik by the L'viv students Nadia Romanets, Taras Khoma, Andrei Mytnyk and Andrei Muryn. The students arranged for the group to take breakfast in the downstairs restaurant of the hotel. After breakfast, a few instructors from the Institute drove the group to the central downtown campus of the Institute on 10 Tchkalova Street. It was quite busy as students were attending the last few lectures before exams.

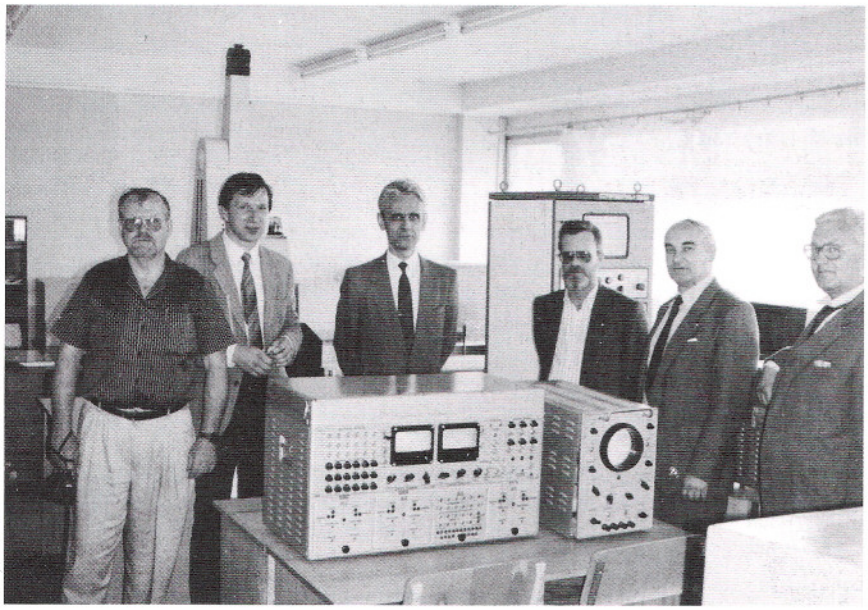
Kazimir Ivanovych Pyrozhak

The exchange persons from both countries met in rector Pyrozhak's spacious office. A large oil painting of Lenin still hung above his desk. With Yanchynski translating, everyone sat around a large table, while the rector welcomed the Canadians officially, elaborated on his ideas on activities he considered important for the visitors, and also asked for specific requests and suggestions from the group.

He accepted the plaqued replica of the Red River Ox Cart, commemorating the exchange, which Shulakewych presented to him. He also expounded on the history of the Institute, its modus openrandi, its accomplishments and its problems. He did all of this against the backdrop of current socio-political developments.

Pyrozhak's main expectation of the exchange was that genuine, human contact be established between individuals at Red River Community College and the L'viv Trade and Economy Institute, two similar educational institutions with common goals but within two different (at least currently) political systems. He indicated his hope that this pioneering endeavor would be the first of many exchanges between the two colleges.

From the educational standpoint, the Canadians would meet with department heads, instructors, presidents and members of various campus organizations, and students in general. They would be able to sit in classes as well as visit and observe college facilities. Moreover, arrangements would be made to visit other educational institutions, e.g. the L'viv Polytechnical Institute.



At L'viv Polytechnic. In the background, the Finnish robot FIORA. From left to right: Andrew Bereza, ACC staff L'viv Trade & Economy Institute

To ensure success on the human level, Pyrozhak expressed the belief that it was crucial for the Canadian visitors to develop an appreciation of Ukrainian history and culture by touring museums, libraries and historical sites, and to visit with the families of both students and instructors from L'viv. He stated categorically that the Canadians would be free to come and go as they pleased, that ample free time would be scheduled to permit unstructured and unsupervised, personal exploration of the city.

To put the plan into practice, a tentative timetable of educational and cultural activities was drawn up, which was more or less followed for the term of the visit. For example, a two-day excursion to an Institute Camp in the Carpathian Mountains was cancelled because the site was being used to house children from Chernobyl.

June 5 and 6, The Old City.

The group went on a walking tour of the Old City. Although almost every building is a historical and architectural monument, the focus was on the most important or interesting places. On leaving the Institute, the group walked along cobblestone streets and alleys until it arrived at the Ratush (City Hall) which is in the very centre of the so-called "Staryi Rynok" (Old Market Square). The blue and yellow Ukrainian flag was raised above the Ratush, another example of new freedom.

On each corner of the City Hall, there is a fountain, dedicated to Neptune, Diana, Adonis and Amphitrite. They were made in 1793 by the famous sculptor Hartmann Witwer. Rows of numbered ancient buildings, most of them dating back to the XVth and XVIth centuries, surround the City Hall.

The Historical Museum of L'viv comprised building No. 4, 6 and 24.

Building No. 4 (known as the "Black Manse") and No. 5 are examples of early Renaissance architecture, while No. 24 is one of the oldest on the Square and once housed the famous Stavropygian Brotherhood. It was in this building that Tsar Peter I (the "Great") stayed during his visit to L'viv in 1707.

No. 6 was built in 1580 by the architect Petro di Barbone for the wealthy Greek merchant, Konstantine Korniakt. The inner courtyard of this building has open galleries, decorated with Ionic and Tuscanese columns, arches and balustrades. This building also has many Gothic features.

Nos 7, 8 and 9 are contemporary to the Black Manse, while No. 10, built in the mid XVIII century by the Liubomirski magnates, is in the style of Late Baroque, with traces of Rococo. This building later housed the well-known "Prosvita" (Enlightenment) Society.

No. 14 belonged to the Venetian consul Antonio di Massari, who represented the commercial interests of his republic in L'viv at the beginning of the XVIIth century.

No. 28, in the Western corner of the Rynok was built in the late XVIIIth century in the Empirical style.

The group met at the elegant restaurant "Pid Levom" (Under the Lion), and after lunch visited the so-called Museum of Atheism and Religion (now renamed simply "Museum of Religion") and the Apteka Museum - a XVIIth century drugstore.

In the evening, the group attended a performance of Tchaikovski's Swan Lake Ballet at the Franko Opera House.

On the following day, the walking tour of the Old City continued. Places visited included the Arsenal Museum, where there was a very interesting display of weapons and military paraphernalia from various centuries. Downstairs, there was a display dedicated to the "Repressed" — victims of Stalinist terror, who for reasons of political dissent had been sent to various concentration camps during Stalinist times. Also, the Powder Tower (Porokhova Bashta) and various other sites were visited. Taras Khoma, one of the L'viv exchange students proved to be a very knowledgeable guide.

June 7

This day was set aside for individual exploration.

June 8, Zvenyhorod

On early Friday morning, a van picked up the group at the hotel and left for the town of Zvenyhorod, a few kilometres out of L'viv. The group was met by the curator of the on-site museum and a member of the town council. Zvenyhorod, presently under excavation, was an important military outpost of the Kievan Rus' Empire. The Mongol attackers suffered terrible casualties at this site in 1241, and as a result could not continue their effort to conquer Western Europe.

An interesting feature of the site was the large monument by the L'viv sculptor Bohdan Romanets, whose daughter Nadia is part of the exchange. On the way back to L'viv, the group stopped in the town of Davydiv, where it viewed another Romanets monument dedicated to the poet Taras Shevchenko.

The L'viv Polytechnical Institute.

In the afternoon, the group visited the large L'viv Polytechnical Institute, whose main building was formerly the Seim, or Parliament, when L'viv was under Polish rule. Pro-rector Dr. A. Kharchenko officially greeted the Canadians, and gave them a synopsis of the Polytechnic's history and operation.

Afterwards, the Dean of Informational and Instrumentation Technology and various instructors gave the group a tour of the Institute's facilities. In addition to a well equipped computer laboratory, a laboratory housing the Fiora robot from Finland (six azimuths of freedom) was of particular interest. It became obvious that the general educational level of the Polytechnical Institute students was quite high. Following a discussion, course outlines were exchanged.

Borys Shulakewych described the history, structure and operation of IEEE to the extremely interested audience, which would like to start a L'viv chapter, but were quite worried about the hard currency required for membership (Soviet laws do not permit them to have Western currency). In any case, they were hopeful that the politico-economical situation would soon change, and that perhaps some sort of interim arrangement could be worked out.

From left to right: bus driver Victor, Larry Yanchynski, RRCC, Ihor Mytnyk, L'viv Trade & Economy, Todd Atamanchuk, Bill Nanowski and Borys Shulakewtch, RRCC, Andrew Muryn, L'viv T&E, Larry Obelnicki, RRCC.

June 9, Truskavets.

The Canadians were taken on an excursion to Truskavets, a health spa noted for its healing mineral water. It is situated at the foot of the Carpathian mountains, Besides viewing a wedding at a newly opened Greek Catholic church, the Canadians were provided with a wonderful lunch at the Staryi Dub ("Old Oak") Restaurant, operated by Mr. Bilinski, the manager.

June 10

Sunday was set aside as a free day. Some of the instructors and students attended services at various churches. Two religions, the Ukrainian Greek Catholic and the Ukrainian Autocephalous Orthodox, are presently being permitted to function freely after years of operating underground. Almost each day that the group was in the Ukraine, another church would be "liberated" from the control of the Muscovite "Russian Orthodox", which from the Second World War was the only officially sanctioned church.

June 11, Trade and Economy Institue.

Monday was designed for an in-depth tour of the Trade and Economy Institute itself. Of special interest were the computer, physics and electrical laboratories. The computer lab had an IBM 360 and an IBM AT (obtained through Germany at a cost of over eighty thousand rubles). During lunch, Shulakevych and Yanchynski were officially invited by visiting deans Mamaiunus Karshibaievich Pardaiev and Radzhab Adbullaievich Abdulaiev, to attend a computer conference scheduled for August at the V.V.Kuibishev Cooperative Institute in Samarkand, in the Uzbekistan Soviet Socialist Republic.

June 12, L'viv Historical Museum, Shevchenki Heritage Park.

The group toured the L'viv Historical Museum (five stories of artifacts and special displays) and also the Shevchenko Ethnographical Museum, where authentic indigenous structures (churches, taverns, peasant homes and buildings) from different regions of Western Ukraine had been assembled and very carefully restored.

June 13, L'viv Art Gallery. The Ukrainian Writers Association.

The group visited the L'viv Art Gallery, where Mrs Lemekha gave them a tour of its very rare holdings (including a collection of icons dating back to the XIIth century). It was very interesting to learn that because of the recent Soviet campaign against alcoholism, a famous painting depicting Cossacks drinking to celebrate a victory had been removed from display.

They were later hosted by the representatives of Ukrainian Writers Association and the recently resurrected Learned Shevchenko Society. Speakers Roman Kupchynski and Oleh K. Romanchuk welcomed the Canadians and after a question and answer session, all present retreated to a very charming cafe downstairs where the atmosphere was more informal.

In the evening, the instructors were invited to a barbecue at a dacha in the country, where they were the guests of the Assistant Minister of Agriculture of the province of L'viv.

June 14, Sculptor Romanets. Institute Choir.

The Canadians visited the studio of the sculptor Bohdan Romanets, where they were shown a display of works that had been banned, and which just a few years ago would have resulted in his imprisonment. The group had lunch with the Romanets family.

In the afternoon, Rector Pyrozhak arranged for the seventy member Institute choir to perform for the Canadians. The choir was outstanding, and had won many national and international prizes for its high calibre performances.

At the entrance to L'viv Trade & Economy Institute. Left to right: Ihor Mytntk, L'viv T&E, Larry Yanchynski and Darcy Hildebrand RRCC, Andrew Bereza, ACC, Todd Atamanchuk and Bill Nanowski, RRCC, Andrew Mytnyk, L'viv T&E, Borys Shulakewych, RRCC

June 15, The Brewery.

The group was given a tour of the L'viv Brewery where they sampled the famous L'viv beer, which is still prepared in a traditional manner from ancient formulas. After the tour, the Canadians were treated to a meal in the elegant in-house restaurant, The Zolotyi Kolos (Golden Ear).

June 16, Farewell. Night train to Kiev.

Rector Pyrozhak hosted a farewell dinner at the Institute. Each member of the group was given an album prepared to commemorate the exchange. In the evening, the Canadians were accompanied to the L'viv Railway Station by almost all of the department heads, instructors and exchange students from the Institute.

After bidding farewell, the Canadians left on board a train bound for Kiev. It was not a first class train, and stopped in almost every town along the route. Ihor Mytnyk and Andrei Murin, who had met the group when it arrived, now came along to Kiev, to ensure that the Canadian visitors would depart safely.

June 17, Kiev–Paris

The train arrived in Kiev at 6:30 a.m. The group was given a brief tour of Kiev and was then taken to Boryspil Airport. The flight stopped briefly at Bratislava and Prague in Czechoslovakia en route to Paris, and in Paris the group stayed overnight.

June 18, Amsterdam.

The group arrived in Amsterdam and from there, the members of the exchange went their separate ways.

Conclusions

The Canadian delegation was treated to a hospitality beyond anything expected.

The visit to Ukraine coincided with an acceleration of the speed and broadening of the scope of monumemtal historical change sweeping the entire Soviet Union, and missed the declaration of Sovereignty by just a few weeks. The Canadians witnessed manifestations of democratization that were inconceivable less than a year earlier. One event, a demonstration in support of the democratic bloc of candidates, had over thirty thousand participants. Most citizens were "glued" to their television sets, following new developments in the parliamentary sessions held in Kiev and Moscow. From the visitors' viewpoint, the coverage of these developments by Canadian media seemed quite superficial.

The Ukrainians showed great interest in all things Western, especially information. They are particularly interested in exchanges of people, information and of course, goods. Professionals in all fields are actively seeking to establish Western contacts and to become affiliated with their Western counterparts. The L'viv Trade & Economy Institute especially, is interested in maintaining exchanges of students and faculty members with Red River Community College.

Ukraine is presently pursuing the process of converting to a free market economy. Its population of over fifty million constitutes a significant consumer base.

One half of the exchange program has been successfully completed; all participants are looking forward to the Fall, when the Ukrainians will visit Winnipeg.

Postscript

The IEEE - Red River Community College/L'viv Institute of Trade & Economy Exchange is enthusiastically supported by the IEEE Winnipeg Section, and has received funding from IEEE Canada and from the IEEE Electro Fund.

We are pleased to report that copies of the IEEE Canadian Review, amongst other items, were distributed during the first part of the exchange.

Calling all radio HAMS: There are two collective amateur radio stations in L'viv Polytechnical Institute: UB4WWWand UB4WWZ

L'viv's radiointerclub "Friendship" (UB4WYL) is very interested in having contacts with any radio amateur club or individuals. For more information please write to:

U.S.S.R.
Postbox 4692
L'viv 290053
President (UB5WAL) Woznyuk Oleksiy Ivanowych

Obituary - George Armitage

It is with great sadness that we report that George Armitage passed away on October 29, 1990.

Born in Montreal in 1910, George began his career by studying medicine for two years at McGill University. In 1930 he left McGill to work for General Dry Batteries, moving to Toronto in 1936 as assistant to the Managing Director. In 1940, he joined Stromberg-Carlson, manufacturers of telecommunications and radio equipment, becoming general plant superintendent by 1949. He then moved on to the International Resistance Co. and later to Philips, where he started the Components Division. In 1960, George formed his own company, Ferritronics Ltd., which is still in operation today. George was also instrumental in the formation of Lazer-Tech Ltd, a printed circuit board manufacturing company, with his son Kenneth.

Although not formally trained as an engineer, George became an associate member of the IRE in 1940, a full member in 1945, a senior member in 1959 and a Life Senior of the IEEE in 1977.

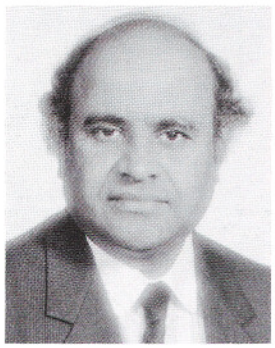
George guided the development of the Region Office in 1972 to serve the membership of IEEE Canada (Region 7), and was its general manger until his retirement in 1983. He will be remembered for his work in educational activities; promoting IEEE short courses such as fibre optics, microprocessors and robotics as he traveled across Canada visiting and helping Sections become more effective. One of his greatest contributions was to support and stress the need for strong Student Branch activity at all the major learning institutions across the country, students being the lifeblood of the IEEE.He is remembered annually in the presentation of the George G. Armitage Outstanding Student Branch Award.

George was a founding member of the International Electrical and Electronics Comference (IEEC), becoming its General Chairman in 1971. He was an active member of the IEEC Inc. Board, participating in the formation of the McNaughton Learning Centres and the McNaughton Scholarships which are administered by IEEE Canada and funded solely by IEEC Inc. These programs continue George's goal to enhance IEEE Student Branch activities across Canada.

George enjoyed life and was frequently found entertaining friends at the "Elms" on the shores of Lake Simcoe with his wife Peg who died in November 1989. He is survived by their children, Kenneth, Joanne and Kimberly, and by 4 grandchildren. George will always be remembered as a friend to us all.

Luc C. Matteau, P. Eng.
November 5, 1990

IEEE Annual Election / *Élections annuelles du IEEE*



As a result of the balloting for the 1990 IEEE elections, Dr. Vijay Bhargava has been declared Director-Elect for IEEE Canada in 1991.

Vijay Bhargava is a Professor of Electrical Engineering at the University of Victoria, and is active as a teacher, researcher and consultant in the area of digital communications. He joined the IEEE as a Student Member in 1970, becoming a Member in 1974 and a Senior Member in 1982. He has served the IEEE in many capacities and is now completing his term as Chairman of the Western Canada Council for 1989-90.

Dr. Bhargava will become the next Director of IEEE Canada for the two year period, 1992-93.

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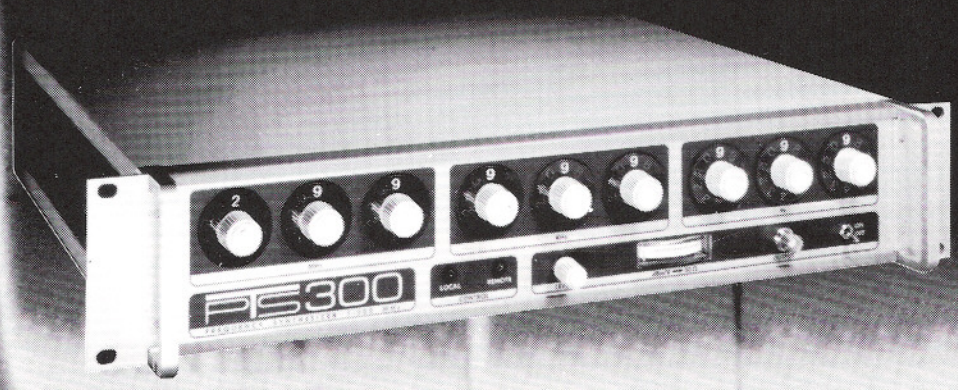

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