

The First French Language Programs in Electrical Engineering

The establishment of electrical engineering training in the French Education Schools was a long and difficult birth process. In common with most schools there were electrical courses taught at Ecole Polytechnique before the turn of the century. However it was not until 1910 that an attempt was made to regularize electrical engineering. In that year it was offered as a separate option. However, it was an unsuccessful experiment and was abandoned about 1923 when the program was extended from four to five years, becoming once again an entirely general program.

The outbreak of the Second World War caused a change in the public attitude to applied science, especially engineering. With increased awareness across the country there also came recognition in Quebec that there was a dire need for electrical engineers from the French speaking populace. Partly in response to the need for graduates, and to make available appropriate instruction in the discipline for French speaking students, Laval University founded an electrical engineering school in March of 1942. M. Rene Dupuis was its first director, guiding the program through its first formative five years. Thanks to that cooperation for which McGill had already established its reputation, the new school was able to inaugurate a program full-blown, with students allowed to take their programs cooperatively between McGill and Laval. This allowed the first graduating class only two years later, in 1944. The school found immediate support among industry and government alike.

Shortly thereafter the program at Ecole Polytechnique was reorganized to accommodate a degree in Mechanical-electrical engineering. This program was an effort at compromise between the general program, for which the school had become famous, and the specific disciplines clearly needed for the wants of the country. The first three years were entirely common to all disciplines with the fourth year allowing about twenty-five percent specialization, and the fifth about eighty percent. The electrical offering was modest, including only that material which tended to enhance the mechanical program, especially electrical circuits and machines. The electrical program did not become a reality at Ecole Polytechnique until 1958 when the program was reorganized for each of the separate disciplines.

World Wide Web Resources as of March 2000:

École Polytechnique de Montreal - www.polymtl.ca

l'Université Laval - www.ulaval.ca

The War and the Radio Schools

It will be seen from Table II that registration continued to increase during the war years, doubling before the end of the war, and increasing by a factor of almost seven by 1949 before falling off again. Such drastic increases over a relatively short period of time brought with them enormous pressure on the facilities, faculties and resources of the engineering schools. They were exacerbated during the war and thereafter by the additional needs of the country to train technicians, especially in radio technology and radar. Electrical engineering became the favoured discipline, over both civil and mechanical. Technical courses implemented through the universities by the Department of Labour, for both soldiers and civilians employed in the war industries, had a remarkable effect on increasing the awareness of the public to the uses of a technical education. There was an advanced course in communications for the R.C.A.F. at McGill, radio direction finding and other like courses at Queen's, R.C.A.F. and R.C.N. courses at Alberta, and radar and radio courses for the R.C.A.F. and R.C.N. at UNB. These courses proved to be rather demanding. Beginning at UNB in 1941, approximately 100 students were rotated through the four month radio technician course every four months. Temporary faculty were added, then doubled and trebled as the war progressed.

In contrast to the procedures adopted in the United States, prospective engineering students were encouraged to continue with their education. Compulsory service was postponed in order to allow them to do so. South of the border, the only students allowed to continue, even in engineering, were those deemed medically unfit. Partly in response to the need for more trained men, and partly in response to the needs of returning veterans, Saskatchewan, which for many years had run a partial program, implemented a degree program in 1945. The first graduating class of twenty-three appeared two years later.

After World War II

Following the war, a more mature lot of students returned, bringing with them an awareness of the value of engineering education and a determination to continue with pursuit of those studies. Enrollments continued to climb, unchecked for the next few years, to accommodate the returning veterans. At Ajax, immediately outside Toronto, an old shell-filling plant occupying 446 acres and 111 buildings was taken over by Toronto's freshman engineering class comprised mostly of returning veterans. The first two years of the program were carried out at Ajax, with some 2500 engineering students in attendance.

The story was similar elsewhere: UNB leased the Canadian Basic Infantry Training Centre on what is now Fredericton's Exhibition Grounds. That, together with the C.W.A.C. quarters, was renamed Alexander College (in honour of Governor-General Viscount Alexander). The 50 buildings housed the entire freshman class of 490 and provided accommodation as well. This did not entirely meet the needs of the returning veterans; so additional army huts were moved to the main campus to help cope with the influx. There was a very decided shift to University



Returning veterans engineering classes were held at Alexander College named after Viscount Alexander.



Albert Foster Baird graduated from UNB in 1914. During and after World War II he supervised the UNB Radio School. Here he presents a certificate to a successful candidate under the watchful eye of a commanding officer.



RCN Radio School at UNB, 1945. Photo courtesy of UNB.

education and to technical education as well: classes all over were enormous. The class spirit engendered among the returning veterans became a legacy which influenced their children, and probably their grandchildren. The classes never again returned to their former tiny sizes. From this point on and through the sixties expansion became the watchword.

The situation was much the same in the west. At Manitoba engineering classes were held in an old ice rink with temporary partitions. In the winter months the students claimed the building insulation levels were suitable for a good ice surface. In the other seasons, since the partitions were open to the rafters, said to be the habitat of the pigeon population of the entire city, there was a certain natural hazard to both students and faculty.

TABLE I
ESTIMATED ENROLLMENTS FOR THE SENIOR YEAR OF ELECTRICAL ENGINEERING PROGRAMS

	1923	1933	1943	1953	1963	1973	1983	Total
McGill	25	17	14	30	57	78	162	3248
Toronto	21	+	40	65	55	93	129	4192
UNB	12	+	12	13	22	26	49	1200
Queen's	13	+	21	27	36	44	79	1838
Nova Scotia	+	11	11	31	40	19	35	1292
Manitoba	13	+	34	16	45	85	103	2495
Alberta	+	16	16	10	41	72	89*	2222
UBC	+	+	18	23	52	68	101	2155
Laval				9	21	21	80	1197
Saskatchewan				9	33	48	46±	1193
RMC					19	14	45*	415
Western					10	26	52	445
Ottawa					17	34	85	645
Québec á Sherbrooke					11	38	45	555
École Polytechnique					63	77	114	1607
Waterloo					24	111	156	1893
McMaster					8	29	66*	566
Windsor					13	18	43±	439
Carleton					7	54	95	692
Concordia						74	68*	702
Calgary						37	64	498
Québec á Trois-Rivières						29	24	181
Memorial							13	124
Lakehead							25	126
Regina								
Victoria								
TOTAL			166	233	574	1095	1768	29920

N.B. – These estimates are taken from published data wherever known

Sources: the Engineering Institute of Canada (EIC), Engineering Manpower News and information received from individual universities

* Includes Computer Enginnering,
± Reported as Computer Engineering
+ Not reported

General McNaughton and His Cathode Ray Direction Finder

Prior to the war there was very little effort to establish applied research programs in the academic communities. In 1916 the Federal Government had established an Honorary Research Council to promote research. This group became the National Research Council in 1925, and, under the chairmanship of Dr. Henry Marshall Tory, used its meagre resources to encourage research through the award of scholarships to promising students, and grants to university researchers. Dr. Tory served as its first president from 1928 to 1935, succeeded by Gen. A.G.L. McNaughton from 1935 to 1939. Gen. McNaughton, a graduate in electrical engineering in the 1910 class at McGill, had obtained his M.A. Sc. from McGill in 1912 and announced his intention of pursuing an academic career. But for the intervention of war he might well have done so. However, after serving in the first war, he was persuaded to continue in the forces. He continued his scientific inquiries additionally, pioneering research on the "cathode ray direction finder" as well as on electronic ballistic missile control. Gen. McNaughton's stewardship was as hampered by want of funds as that of Dr. Tory, in spite of the growing menace of a second world war. At the outbreak of war he was recalled to active service, turning over control of NRC to Dr. C.J. Mackenzie, the Dean of Applied Science at Saskatchewan, and a 1909 graduate in engineering from Dalhousie. Dr. Robert William Boyle (UBC) took over as Director of Physics and Electrical Engineering to coordinate the radar research efforts. With additional inputs from Queen's, McGill, UBC and Toronto, Canada's war research efforts were born, and with them the establishment of a viable university research effort in electrical engineering.

Graduate Schools: an Expanding Universe

The increased efforts to establish applied research in the engineering schools did not immediately bring commensurate increases in post graduate enrollments in the years immediately following the end of the war. It was not until after the great influx of veterans had been cleared through the system that sufficient resources were available to allocate to graduate instruction. In the mid-fifties programs began to expand, as will be seen from Table III. Whereas during the era prior to the second world war, when graduate degrees were awarded sporadically and then only by a few schools, by 1958 there were eleven schools offering graduate programs. By 1983 this number had more than doubled, to twenty-four. In the same time the total number of graduate students registered had grown from 107 to 1549. The later programs have a large number of students registered either part-time or in cooperative programs, reflecting a growing awareness in industry of the importance of continuing education and further training.

A Plethora of New Programs for the Computer Era

The invention of the electronic computer had had little impact on industry in those early years after the war. However, as the commercially exploitable advantages of the new tool were recognized, so was the need to train personnel in the design, application and implementation of these devices. As the effects were felt in the industrial community for more and better trained personnel, the demand for electrical engineers grew. Western and Sherbrooke were the first universities to implement electrical engineering programs in this new wave, both starting in 1954, with Western's first class graduating in 1958 and Sherbrooke's the following year. There followed in rapid succession new programs at Carleton (1957), Ottawa (1957), Ecole Polytechnique (1958), and Royal Military College (1959). Many of these had engineering schools long before. For example, RMC was originally founded as a military engineering school, opening its doors to its first class of eighteen students in 1876. RMC had established an electrical engineering program in 1951 which continued through a four year program with

intended degree recipients required to attend another institution in the final year. Similarly, École Polytechnique had enjoyed a long and distinguished reputation as one of the first engineering programs in Canada, founded 18 November 1873. Although there was an electrical course as part of the regular general program for many years, the first actual degree program in electrical engineering did not come about until eighty-five years after its founding. Over the next few years, as more and more graduates from these new schools joined the work-force, the output of EE graduates more than doubled.

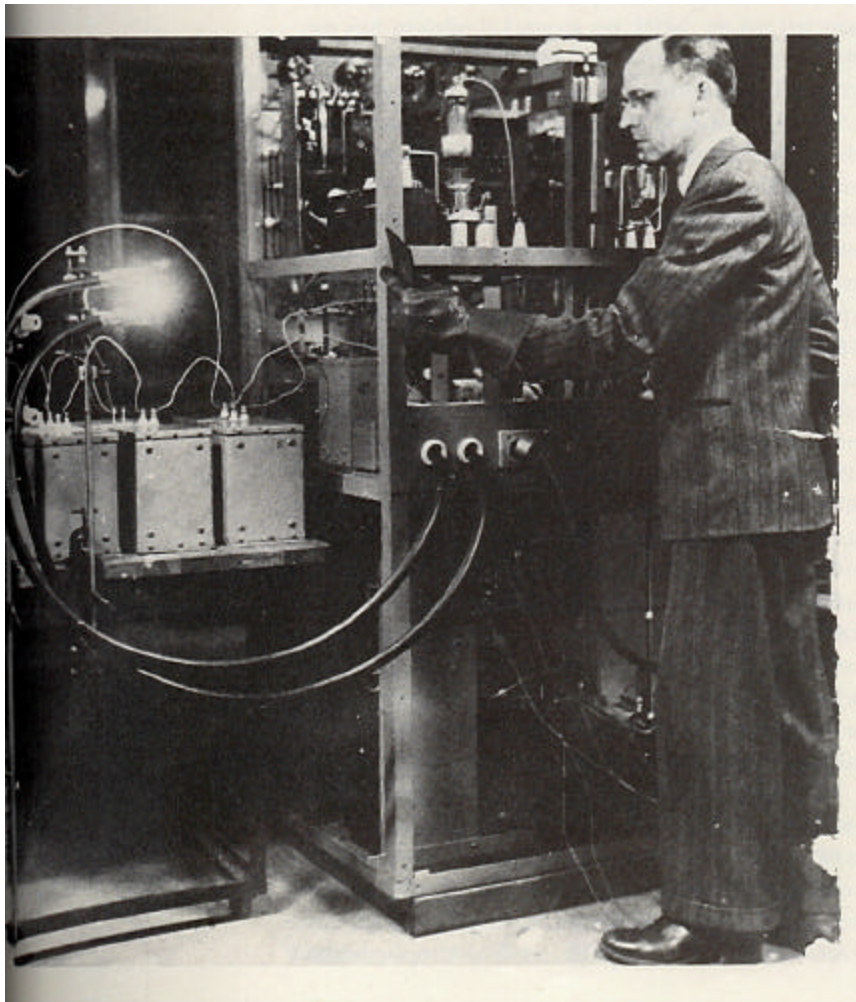
The Electrical Program at Concordia University is the happy amalgamation of the traditional Quebec program of Loyola College and the progressive program at Sir George Williams University. Although the Engineering Faculty was founded at Loyola in 1954 it was not for several years that the program was expanded to allow students to proceed to the degree of Bachelor of Science. The school served the west end population of Montreal, while Sir George Williams, located in the downtown sector of the city, a few blocks from McGill, served the rest of the city. The program at Sir George Williams was directed as much to part-time students in evening classes as to the regular full-time students. The campus consisted of the building itself, occupied for classes both day and evening. Loyola's first Electrical Graduates appeared in 1965 while the first from Sir George appeared two years later. The combination of two programs



École Polytechnique Building, Montreal, until 1958.

under the umbrella of Concordia University in 1974 gave a strong flexibility of purpose, producing a bilingual program to serve the working students as well as the more traditionally-oriented full-time students.

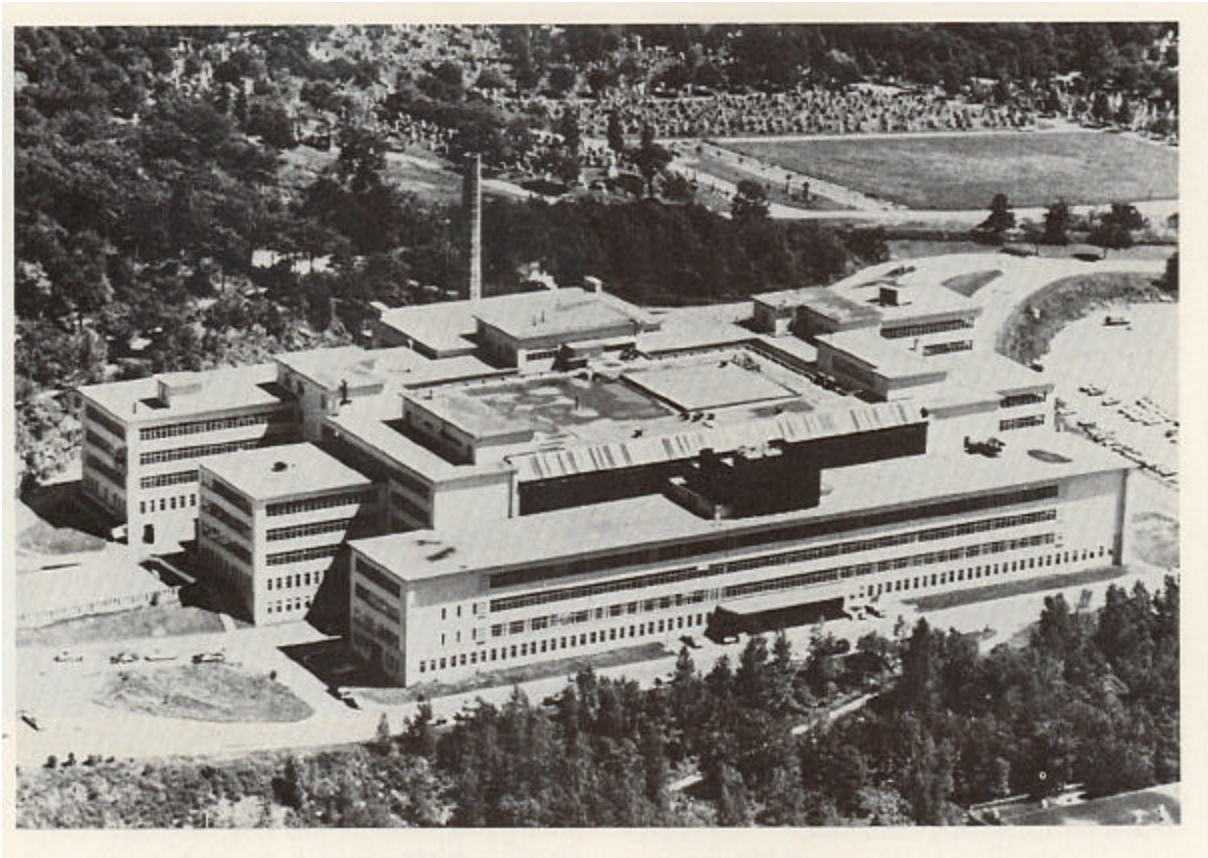
The University of Waterloo was established as a cooperative degree program, with students assigned to four-month work terms every other term except the final set. There are now cooperative programs at a number of universities; including Memorial, Sherbrooke, Ottawa, and UBC.



J.C. Bernier, founder of the Electrical Department at École Polytechnique in Montreal, at work in the laboratory. Here, in 1930, Professor Bernier experimented and produced the first successful television pictures in Canada.

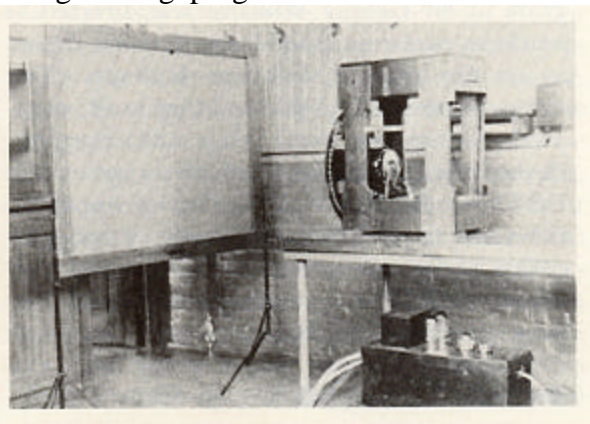
From this point on there were a number of sociological and technological changes which combined to influence the growth of the engineering schools. The various provincial governments, led by Ontario, adopted the concept of "Universal Access" to higher education. Consequently, through the sixties there were enormous building programs throughout the country, as the universities embarked on a course of unconstrained expansion. The numbers of prospective students were swelled by the "post-war baby boom", those children born immediately after the war maturing to university age in the mid to late sixties. In this period only two new programs were established: at Calgary, the satellite campus of the University of Alberta became the University of Calgary, beginning an electrical program in 1965, and at the Université de Québec à Trois Rivières a program was begun in 1969.

At the same time main-frame computers began to appear on campuses not only as applications tools for both administration and research, but also as undergraduate teaching tools. The great space race, with its enormous technological effort, provided a remarkable stimulus for increased technical education. With the resultant stimulus to things electrical, enrollments took another great leap. The number of graduates increased from 543 in 1960 to 953 in 1970, almost doubling in the decade. However, from this point on governments began to reverse themselves, cutting down on available funds for building, or eliminating them altogether as the depression of the seventies set in. Funding became more scarce as the decade proceeded. There was still some



École Polytechnique Building, Montreal, since 1959. Photos courtesy of École Polytechnique, Montreal.

commitment to technological enterprise, with tacit approval for improvement in the smaller provinces, including especially Alberta, Manitoba, New Brunswick and Newfoundland. Memorial University expanded its program to include a four year electrical degree in 1970, with the first graduating class appearing four years later, at the same time as the first graduating class from Lakehead University (founded as a degree program in 1972 to complement the existing technology diploma programs). The most recent addition to the electrical engineering education group is the University of Victoria. An electrical engineering program was formed there in 1983. The faculty plan was to admit 70 students to first year during 1984, with 40 to be admitted to second year. A program at Regina, begun as a partial program in 1972, has recently been expanded as a degree program in the associated area of Electronic Information Systems, thus capitalizing on the microelectronic revolution as well as the advent of microcomputers as business and industrial assets. According to a 1983 census there were 7601 students registered in electrical and computer engineering programs in Canada, an increase of 11% over the previous year. Looking to the future it seems evident that enrollments may be expected to increase on an expanded scale.



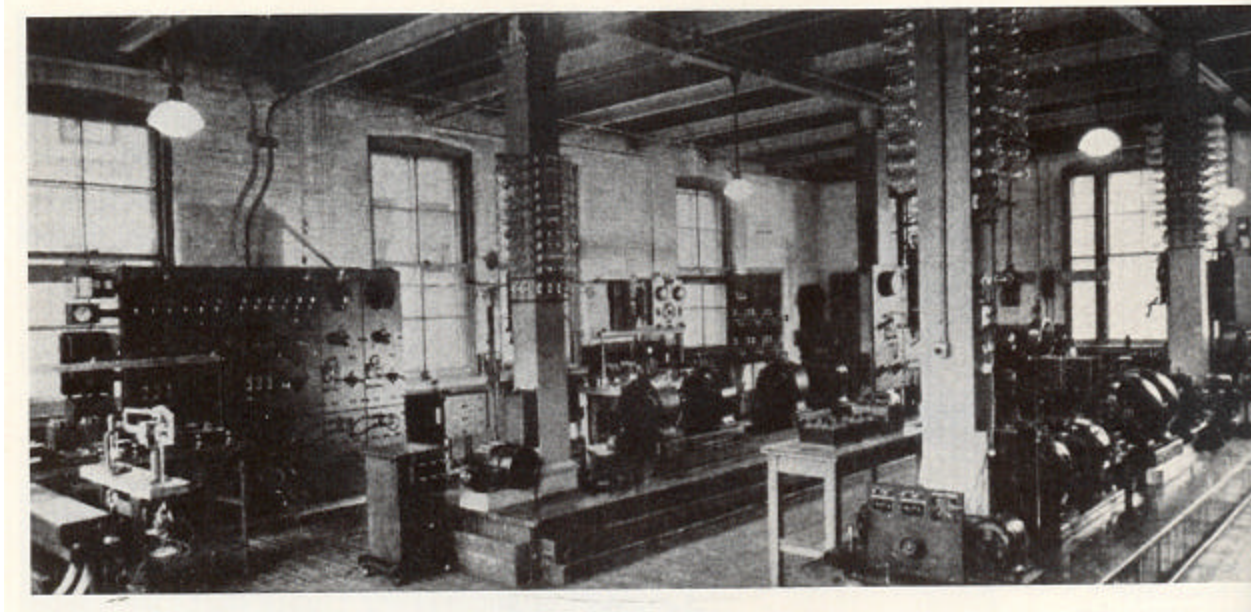
*Apparatus at École Polytechnique used for the first successful experiments to produce television pictures.
Photo courtesy of École Polytechnique.
(See "Report on Television" by J.A. Ouimet in the The Engineering Journal of EIC date of March 1950).*

TABLE II
TOTAL REGISTRATION IN ELECTRICAL ENGINEERING IN THE WAR YEARS

1937-38	1940-41	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50
321	380	470	55	579	671	926	1583	2032	1719

TABLE II
GRADUATE STUDENT REGISTRATION IN ELECTRICAL ENGINEERING PROGRAMS

	1958-9	1962-3	1967-8	1972-3	1977-8	1982-3
Nova Scotia	1	8	41	27	17	34
UNB	2	18	34	51	45	32
Laval	7	19	38	42	30	45
École Polytechnique	1	4	19	52	115	106
McGill	21	26	57	91	107	126
Queen's	7	17	23	47	34	53
Toronto	31	29	179	170	241	229
Manitoba	12	36	63	55	61	125
Saskatchewan	5	11	34	25	38	38
Alberta	4	15	52	67	37	63
UBC	16	28	59	58	44	51
Ottawa		23	31	57	52	70
Carleton		2	78	112	133	137
McMaster		1	37	27	48	77
Waterloo		13	70	60	108	82
Western		1	4	8	11	15
Windsor		2	15	22	29	33
RMC			5	14	27	39
Calgary			7	25	39	33
Sherbrooke			9	21	40	22
Regina				7	2	0
Concordia					120	113
Memorial						12
Québec á Trois-Rivières						14
TOTAL	107	253	853	1038	1378	1549



First Electrical Laboratory in the old building at École Polytechnique on St. Denis Street, Montreal. Photo courtesy of École Polytechnique.

Women in Engineering

There are records of women attending extension classes in electrical subjects as early as 1892, when Dr. A. Wilmer Duff, of the University of New Brunswick, gave extension courses in Saint John to a class of twenty-six, which included several female students. However, there are no records of registration in a full time program until Elsie Gregory MacGill entered Toronto, becoming, in 1927, the first woman graduate in electrical engineering in Canada. It is interesting to note that she went on to study aeronautical engineering in the United States, returning to Canada to work in the aeronautical industry. She supervised design on both the Hawker Hurricane and the Curtis Wright Helldiver during the second world war.

There were no significant numbers of women in electrical engineering, however, until the early seventies, when the percentage of female students registered rose gradually to about seven percent.

Of Graduates and Faculty

Mention has already been made of some of the contributions of faculty and graduates over the years. In reality, the list would be very long were all the accomplishers and contributors to be named. Such a list would have to include those who have made significant contributions through research and invention; those who have served as professors and lecturers in Universities both inside and outside Canada; those who have risen to positions as Department Heads and Presidents of Universities; those who have reached the top in small and large Consulting Engineering firms and who have helped to develop Canada's reputation for engineering around the world; those who have opened up businesses in their respective fields of expertise and thus contributed to the development of the Canadian Electrical and Electronics Industry; those who have become executives and presidents of Canadian Corporations, large and small; those who have risen to the upper levels of responsible position in the Electrical Power Industry and the Communications Industry; and those who have entered government service in research, administrative, military or political activities.

There are many professors and lecturers in Canadian Universities and Technical Colleges who have made significant contributions through their technical paper presentations at International Conferences and through the Transactions publications of the Institute of Electrical and Electronics Engineers, the Engineering Institute of Canada and its international affiliations and other technical societies.

Were we to mention the individual contributors over these past 100 or more years to Canadian scholarship, to teaching, to research, to community, to business, and to national and professional service within and outside of our country the list would be endless. We are very sure that this established pattern will continue into the future to further establish Canada's position as one of the leading technologically developed nations.

Canada's First Institutes of Technology

The present community college concept grew out of the junior colleges founded as satellite institutions to the universities about the turn of the century. They included Victoria College, an extension of Macdonald College in British Columbia. Victoria College was founded in 1903 and gave extension courses until about the start of the First World War, when it closed its doors. It reopened in 1920 as an affiliate of the University of British Columbia, offering junior college work in several fields, including pre-engineering. For the better part of the century it operated as a liberal arts and science college until it separated from the University of British Columbia to become Victoria University in 1963. As of September, 1984, its doors were opened to its first classes in a cooperative program in Electrical Engineering.

The Provincial Institute of Technology and Art was founded in Calgary in 1916, and was still the only recognized school devoted entirely to the teaching of advanced technical subjects in Canada in 1940. By 1935 Dr. W.G. Carpenter, the Principal of the college, was moved to remark that electricity was the most popular course, superseding even motor mechanics in the number of participants. In 1961 the name of the school was changed to the Southern Alberta Institute of Technology. There were other colleges of diverse natures which deserve some mention, including l'Institut de Technologie de Quebec which was founded in 1907 in Quebec City. This school later formed the genesis for Limoilou, a technical college in Quebec, during the educational reformation in Quebec in 1967. An unusual aspect of technical instruction in Quebec was the assistance lent by private organizations such as the Shawinigan Water and Power Company and the Bell Telephone Company of Canada: for example, the former helped

get the Shawinigan Technical Institute underway, principally as a private venture. Some other colleges continued to offer technology courses, usually at the vocational level at high schools, over the several years until the outbreak of the Second World War. Then it became apparent that there was altogether too little expertise in practical technology to suit the country's needs, especially in electronic and electrical subjects. Consequently a number of schools were established by the various branches of the armed forces; some, as we have already noted, in conjunction with universities, and some operated and staffed by the various services themselves.

Egerton Ryerson's Legacy: A Technical College

The Royal Canadian Air Force established an Initial Training Centre in Toronto in 1940. The buildings for the centre were donated by the Province at the request of the Dominion Government. The principal building in the complex was the old Toronto Normal and Model School built in 1851 under the aegis of Egerton Ryerson. Subsequent occupants of the complex included the Royal Ontario Museum and the College of Art. Toward the War's end it became apparent that some effort would be needed to retrain the returning veterans for civilian service. The Training Centre was deemed ideal for the purpose and was converted into the Training and Re-establishment Institute, offering intensive short courses for both men and women in practical



The Ryerson Building in Toronto, built in 1842-originally opened as the Toronto Normal School. Photo courtesy of Ryerson Polytechnical Institute Archives.

subjects. Under the auspices of the Ontario Department of Education it became the Ryerson Institute of Technology, opening its doors to its first class of technology students in September of 1948. A century after Ryerson had first suggested schools to teach the technological arts, such a school was founded in the very building he had commissioned for teacher training! At about the same time, and roughly through the same route, the Canadian Vocational Training Centre in Moncton, New Brunswick, was founded in the old Royal Canadian Air Force Manning Station. The school opened for its first classes in January, 1946, basically as a retraining centre for returning veterans, to teach technical skills at the trade level. Meanwhile, the universities had adopted a lead role in driving towards a more comprehensive system of alternative higher education. As early as 1957 Dr. Claude Bissell had noted in his "Canada's Crisis in Higher Education", the resolution of the National Council of Colleges and Universities to "commend to the attention of the provincial governments the desirability of establishing more institutes of technology comparable to the Ryerson Institute of Technology". The New Brunswick government was one of the first to respond, perhaps because the establishment and structure of such an undertaking were already in place. Construction began at the Mountain Road site in Moncton for the New Brunswick Institute of Technology in 1959. The resources and staff of the Vocational Training Centre became the nucleus of the new Institute. The first class in the greatly expanded and upgraded program began in 1961.



Eric L. Palin, pioneer instructor and Director of Electric and Electronic Technology and Radio and Television Arts at Ryerson Institute of Technology.

World Wide Web Resources as of March 2000:

Ryerson Polytechnic University - www.ryerson.ca



*Early work in television, 1951, at Ryerson.
Photo courtesy of Ryerson Polytechnical Institute Archives.*



Extract from the Ryersonian, December 1949-a student newspaper: "Television came to Canada on November 14, 1949 as Ryerson Institute of Technology presented the Dominion's first live television to an audience of over 300 radio and television dealers from the Toronto District. The program was produced and directed by Ryerson." Photo courtesy of Ryerson Polytechnical Institute Archives.

A "Superior" Institute

The Lakehead Institute of Technology was established by the Ontario Provincial Government in 1946 in what was then called Port Arthur, at the head end of Lake Superior. As with the other colleges of the time, the main impetus was the retraining of returning veterans. In response to the call for a more orderly system of education for technologists, the Ontario Government re-established the college as the Lakehead College of Arts, Science and Technology in 1957, when the city of Port Arthur donated the site the college now occupies. In 1965 the school became Lakehead University, retaining its mandate for teaching an integrated technology and engineering program. Four years later, Fort William and Port Arthur combined to become the City of Thunder Bay. The complete engineering degree program produced its first graduates in 1972. This program, unique in Canada, allows students to proceed through a two year program from grade thirteen to obtain a diploma in electrical engineering technology, with the opportunity to continue on if they meet the appropriate standards, to a post-diploma program which leads to the Bachelor's degree in Electrical Engineering.

The Ontario Government's program of technology education was expanded in 1957 to include the Eastern Ontario Institute of Technology at Ottawa, now Algonquin College of Applied Arts and Technology. The Western Ontario Institute of Technology, later to become the Saint Clair College of Applied Arts and Technology, was created in 1958. The Hamilton Institute of Technology (1956) was an outgrowth of the Provincial Institute of Textiles, founded in Hamilton in 1946. Eventually, the Ontario Government's concept of universal access to higher education led to the greatly expanded programs offered in Mohawk College, the successor to the Hamilton Institute of Technology, and in Ryerson Polytechnical Institute, the successor to Ryerson Institute of Technology. Saskatchewan also began a movement towards technical education, establishing the Saskatchewan Technical Institute in 1960 at Moose Jaw. However, the universities continued to press for a more organized approach to alternative higher education. Again quoting Dr. Claude Bissell, by 1965, president of the University of Toronto:

We recommend a greatly increased expansion of institutes of technology and the development of colleges of advanced technology; we suggest the widespread development of colleges of technology and applied arts that would be geared to the needs of local communities.

The presidents (of Ontario universities) strongly believe that (these colleges) should be alternatives to universities, not parallel to them; they should have a strong vocational and technical bias, so that they are not in danger of being looked at as ersatz universities. Fortunately we have in the Ryerson Polytechnical Institute a superb model of the kind of status that an institution can quickly obtain if it formulates its goals clearly and does not succumb by degrees to a passion for superior status.

The university presidents were ably assisted by the federal government, which passed an act in 1960 to provide for the reimbursement to provincial governments for up to seventy-five percent of the costs for construction, purchase, renovation or equipping of technical training facilities.

Within a short while Ryerson Institute sought and obtained the rights of a degree-granting institution in the technology area. In 1973 the degree program in the Bachelor of Electrical Technology was added to the program structure. In the meantime, both Ryerson Polytechnical and the New Brunswick Institute of Technology became models for other schools, other provinces, to emulate. Within New Brunswick it became a model for the Saint John Institute of Technology, which opened its doors in 1963 for its first classes in Marine Electronics and in Electronic Servicing. The latter became the genesis for the trade program in electrical and electronics. The former evolved into the two year diploma program, including electronics, controls and data systems specialties. Clinton Dow, as the first principal of the New Brunswick Institute, spearheaded the efforts to organize its little sister in Saint John. In fact, he lent both his organizational skills, and on occasion, his staff, to other fledgling technical institutes across the country. Among the first such staff was Clayton Cochrane, who started with the institution as its first supervisor of the electrical program, retiring, at the same time as Clinton Dow, in 1977.

Any discussion of personnel in the Canadian world of technology must include that pioneer instructor, Eric L. Palin, for whom the IEEE Palin Award is named. Mr. Palin began his career in Hamilton at the Westdale Secondary High School, but joined the R.C.A.F. Initial Training Centre in 1944. He came with the premises when the Centre became Ryerson Institute of Technology, becoming the Director of Electrical and Electronic Technology and Radio and Television Arts, a post he held until 1958, when he was appointed executive assistant to Ryerson's first principal Howard H. Kerr. According to an article in the *Ryersonian* some six years after his death in 1971, he was, "an understanding, sympathetic, productive, intelligent man. He was a good leader, a man you could go to with your problems." He is also remembered

by hundreds of electrical technologists across Canada as the epitome of what an instructor should be.

World Wide Web Resources as of March 2000:

Lakehead University - www.lakeheadu.ca

Les Colleges d'Enseignement General et Professionel, les CEGEP

In June, 1967, the Government of Quebec undertook a complete re-organization of the educational system of the province, concentrating on the third tier, of a four tier system, the pre-university and college resources of Quebec. The initial aim of the General and Vocational Colleges Act was to make provision for the approximately quarter million students in Quebec who had the ability to complete a post secondary education outside the university system. In September of that year the first twelve colleges in the system came into being. The most unusual aspect of the system was that the initiative to establish a CEGEP came, in most cases, from the community itself. At the time of reorganization there were forty-seven institutions offering technical courses in five categories, mainly at the high-school or vocational level. The technical colleges in the initial group included College d'Ahuntsic which incorporated l'Institut de Technologie Laval, College de Chicoutimi, incorporating l'institute de Technologie, College Edouard-Montpetit, which first began operations in 1950, College de Hull, again incorporating the local College de Technologie, and the College de Jonquiere which incorporated the Institute of Technology founded there in 1946. It must be noted that Jonquiere had served as a retraining centre for veterans in the same manner as Ryerson and the New Brunswick Institute of Technology. We have already remarked that Limoilou CEGEP's incorporated the Institut de Technologie founded by the Quebec Government in 1907.

Rimouski and Rouyn-Noranda were also founded in 1967. The following year seven more CEGEP's were established in communities across the province; from the east coast (Galespie CEGEP) to the western boundary (Vieux-Montreal CEGEP). Each school has a board of directors consisting of nineteen members. Four are named by the faculty, two by the students, and four by the parents of the students. Of the remainder, five are named in consultation with other community groups in order to allow the maximum community involvement. The principal and academic dean, together with two more members appointed by the board itself comprise the remainder.

There has been one further development since 1967 which bears mention, the establishment of an alternative technology program in 1976. L'Ecole de Technologie Superieure was established as a technology degree-granting institution attached to the Université du Québec. The first two years of the program are constituted as a CEGEP program, while the third year is the specialist bachelor's degree senior year. In 1981 there were thirty-nine graduates of the institution in electrical technology.

Colleges of Applied Arts and Technology in Ontario

In October of 1965 the Ontario Legislature passed an act to establish colleges of applied arts and technology throughout the province to serve local needs for alternative forms of higher education. The act embraced most of the community college system excepting Ryerson, which had become Ryerson Polytechnical Institute in recognition of its unique status as the "mother and father of all the provincial institutes of technology except Lakehead." (Quoted in Gordon Campbell's treatise on the Community Colleges in Canada.) Consequently, in 1965 the great push to establish a more comprehensive system of technical education in Ontario came to fruition with the immediate formation of ten colleges, four of which taught electrical or

electronic technology. As in the Quebec schools these community colleges would incorporate existing schools wherever it should prove feasible. Algonquin, in Ottawa, Centennial in Scarborough, Confederation in Thunder Bay, and Niagara in Welland constituted the first group in 1966. The following year saw the formation of Cambrian, Conestoga, Durham, Fanshawe, George Brown, Humber, Loyalist (which started as a satellite campus of Sir Sandford Fleming), Northern St. Clair, St. Lawrence, Seneca, Sheridan and, of course, Sir Sandford Fleming.

The Expanding Call for Technical Education

Other provinces were also responding to the call for more cohesive and comprehensive technical education beyond the high school level. Nova Scotia Technical Institute began in 1961, as did the Northern Alberta Institute of Technology. Newfoundland's College of Trades and Technology started in 1963, along with the Saint John Institute of Technology, and the Manitoba Institute of Technology, later to become Red River Community College. Schools of technology sprang up across the country: and as they increased in number, the numbers of their graduates increased like a tidal wave, to fulfill and more than surpass the expectations of even the most optimistic supporters.

While the engineering schools have been struggling to accommodate their ever increasing numbers, so too have the schools for engineering technologists. Table IV shows that, from a handful of schools across the country a few decades ago, the number of these schools had increased to seventy-three by 1980. So rapid has been the expansion that standards have been ignored by all but the schools themselves until only recently. Now there is concern to establish uniform standards across the country, much in the same manner as that process adopted by the Canadian Council of Professional Engineers, which, through its agency, the Canadian Accreditation Board, ensures that all engineering programs meet or exceed the standards established by the Council. In Ontario alone the number of students registered in three-year CAAT's electrical or electronic programs in 1975-6 was 1534, with a further 732 in the four year program at Ryerson. At the same time the number of registrants in the three-year CEGEP's program in Quebec was 3593. By 1980-1 these numbers had grown to 2082, for Ontario, with an additional 860 in Ryerson, and 7189 in Quebec. The total electrical/electronic enrollment in Canada had reached 13177.

The final note in the saga of technology schools concerns three notable military establishments: Royal Military College at Kingston, Ontario; College Militaire de Saint-Jean, Quebec; and Royal Roads Military College in Victoria, British Columbia. This last is perhaps the most interesting since it is the only college in Canada to occupy a castle. The main building was completed in 1908 as a castle by the Honourable James Dunsmuir, who was at one time the premier of British Columbia, but later served a three year term as its Lieutenant-Governor. Hatley Castle was constructed from local stone in the form of a castle as impressive on the outside as in the interior appointments. Rosewood and oak panelling, massive fireplaces, teakwood flooring and huge Victorian lighting fixtures combine to give it a sophisticated old world elegance. In 1940 the estate was sold to the Dominion Government as a Naval Training Academy, and shortly thereafter, in early 1941, it was commissioned as Royal Roads. Since then it has become a two year post high school college which also acts as a pre-engineering school, as well as a school of technology serving the armed forces.

TABLE IV
ADVANCED TECHNICAL INSTITUTES OFFERING ELECTRICAL OR
ELECTRONIC PROGRAMS

1916	1940	1948	1960	1970	1980
2	2	5	11	56	73

Technologists and Technicians: Part of the Engineering Team

In the final analysis, technicians, technologists and engineers work hand in hand. As a July headline for the Engineering Manpower News fairly screamed: "Technologists and Technicians-Part of the Engineering Team." We are all part of the same tree, as evidenced by our common roots. Hence there was little surprise to find Fred Heath, Manager for IEEE Region 7, together with Heinz Peper, who conceived the idea, assisting at the ceremonial start of construction for the Electrical Skills Development Centre at Conestoga College of Applied Arts and Technology in April, 1984. This will be our newest addition to the technical college group.

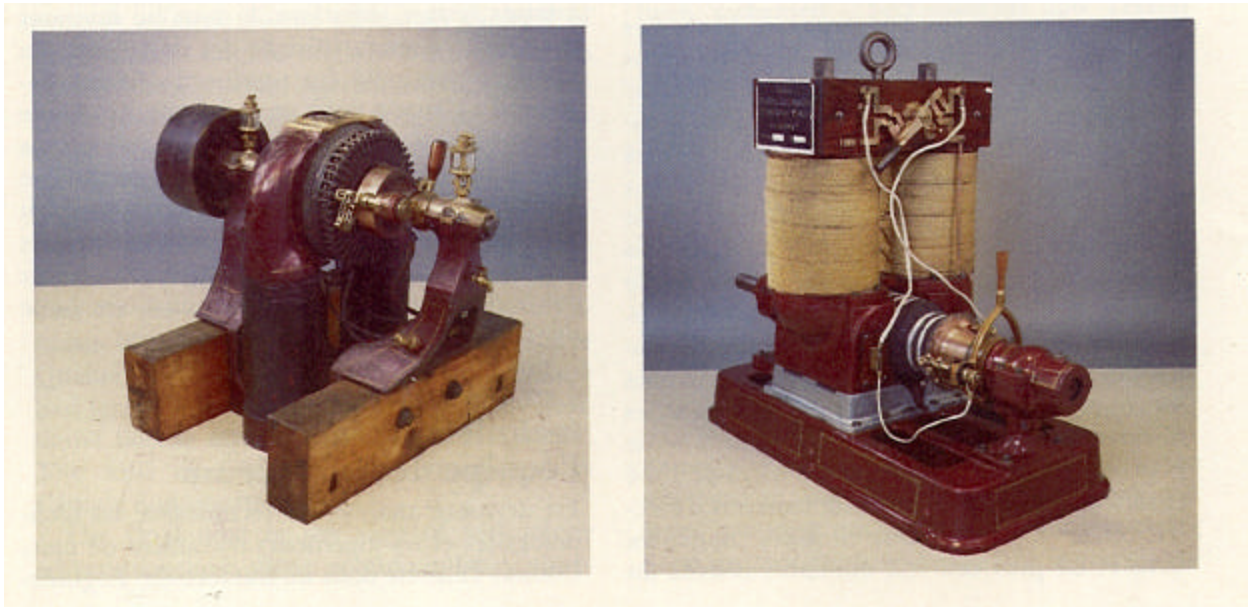
<p>World Wide Web Resources as of March 2000:</p>
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<p>Canadian Council of Technicians and Technologists - www.cctt.ca</p>

What's Coming?

Some predict that the enrollment explosion will escalate, especially in the community colleges, pointing out that there is an increasing need for more technical expertise in the micro-computer era to help adapt the machines and interface them with their polytechnic applications. Some people point to the increasing educational burden on the taxpayer, crying halt to universal access to higher education: prevent enrollments from increasing. There are some who believe the "Goals Report" of the American Society for Engineering Education, a report of the sixties era in which it was predicted that the first recognized professional degree may soon be the master's degree. There is some evidence in both industry and university that this premise is becoming fact. There is certainly a much higher proportion of our Ph.D's entering industry now than ever before. Those of us who have observed the scene for a while note some small changes in attitude amongst our incoming freshmen: no longer do they come with the same strength of purpose that they once did. They are frightened of the future and where technology is taking us. Once there was an esprit de corps unshakeable as the belief in their own destiny. Now our seniors leave with no clear destiny in mind.

As I work a problem on my pocket programmable calculator, a problem which a few years ago took an entire roomful of computer to solve, I find it quite impossible to predict what the next great technological marvel will be. It is tempting to make mundane predictions about the relative sizes of computers or their possible applications. But in the final analysis, I cannot believe that the marvel, whatever it will be, is nearly so important as giving our students and graduates back that fresh enthusiasm and optimism that they once had. And being an optimist I make that prediction for the future, that the ideals of Head and Dawson, those great visionaries of the past, who made it possible for engineering to flourish, will again surface, to help guide us through the future.



*The Photos on this page show part of the hands-on learning facilities at the Daniel B. Detweiler Electrical Skills Centre in Conestoga College, Kitchener, Ontario. These machines were originally manufactured early in the history of the electrical industry. After many years service in Canadian industrial plants they were obtained by Heinz Peper who had them restored in his shops under a federal government grant in anticipation of their use for educational purposes in the planned Detweiler Centre (which has now become a reality). One of the photos shows a 40 hp motor manufactured early in the century, alongside a present day motor of the same capacity.
Photo courtesy of Heinz Peper, Onestoga College, and Ontario Hydro.*

