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“Notes on 1969 Cdn Engineering Profession”

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**SOME NOTES ON THE ENGINEERING
PROFESSION IN CANADA: MARCH 1969**

by Andrew H. Wilson

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Abstract

This paper was first written and reproduced in March 1969 to brief members of the new Science Council of Canada (most of whose members were scientists) on the engineering profession in Canada. It is now, a unique and historic document. It might also be added to the supporting documentation for my background report (*Science, Technology and Innovation*, Special Study #8: Economic Council of Canada), published by that Council in May 1968. The original text of the paper has been very lightly edited, but no attempt has been made to update it, by over 50 years, to 2021. This has been done elsewhere.

It covers a period of four centuries of Canadian history (1600s, to 1900s). There are no illustrations.

About the Series

Principally, the Cedargrove Series is intended to preserve some of the research, writings and oral presentations that the author has completed over the past half century or so but has not yet published.

About the Author

He is a graduate in mechanical engineering (1949) and the liberal arts (1954) and has held engineering and administrative positions in industry in the United Kingdom and engineering, administrative, research and management positions in the Public Service of Canada, from which he retired over 30 years ago. He became actively interested in the history of engineering on his appointment (in 1975) to chair the first History Committee of the Canadian Society for Mechanical Engineering (CSME). He has also been president of CSME and the Engineering Institute of Canada, and chair of the Canadian Engineering Manpower Council and the Canadian Association for the Club of Rome.

In the beginning...

Whatever else they may have done for Canada, people doing engineering work have been particularly involved in work related to human survival in the Canadian environments, to the transportation of people and goods over difficult terrain and long distances, to inter-personal communications over both short and long distances, to the discovery and exploitation of remote natural resources, to the provision of plentiful but inexpensive sources of hydro-electrical energy, and to the provision of transportation, sewer, water and other services to cities and towns. While the history of Canadian science and technology is not overfilled with examples of great scientific discoveries or great technical inventions, it has provided ample evidence of the engineering work in the solution of Canadian problems, as well as in the adaptation, for domestic use, of ideas first generated abroad. And it is important to remember that the earliest 'engineers' included members of Indigenous communities.

The Canadian primary industries laid the foundations for the economic life of the country. The growth of relatively large-scale secondary manufacturing is a more recent phenomenon in comparison with the growth of these activities in the United States or in the countries of Western Europe. But Canadians have not been so far behind in the initiation of new technology in the tertiary, or service, industries.

During the first two centuries of Canadian history, engineers from France were also active and most of their efforts were directed towards the construction of fortifications, ports, domestic sites, and railway and water transportation in the eastern parts of the country. As the French engineers were augmented by British ones, in the late eighteenth and early nineteenth centuries, the engineering works were extended to canals, roads and other public works. By 1820 or so, the emphasis of the engineering was changing from military to civil, with growing amounts of mining and mechanical engineering. Blacksmiths were everywhere. By the end of the nineteenth and beginning of the twentieth centuries, Canada was keeping pace with other industrializing countries, giving birth to aeronautical, chemical and automotive engineering. And the same situation applied after World War II, when the number of engineering disciplines multiplied again. During the nineteenth century Canada 'produced' a number of engineers whose reputations travelled abroad, for example: Sandford Fleming, Casimir Gzowski, Thomas Keefer and his brother Samuel, and John Kennedy, three of the five receiving British knighthoods in recognition of their contributions.

In the early years of the 20th century, Rupert Turnbull of Saint John, New Brunswick, built Canada's first wind tunnel, and later developed a variable-pitch propeller for aircraft. Alexander Graham Bell led Canada's contribution to telephones and to the design of aeroplanes and hydrofoils. T.L. Wilson and his associates developed a process for producing acetylene, and founded the Shawinigan Chemical Company. In more recent times, leading Canadian engineering innovations have been team efforts. For example, W.B. Lewis and his AECL colleagues worked on the CANDU nuclear reactors, John Chapman and his communications team sent the Alouette and Isis earth satellites into orbit to probe secrets from the ionosphere, and Nortel and other Canadian companies contributed electronic devices.

And for the longer haul...

For the record, the first university-level course in engineering in Canada was given in 1854 at King's College, University of New Brunswick, but was also forced to terminate later that same year. Next was McGill University in 1856, followed in 1873 by Ecole Polytechnique, also in Montreal. The University of Toronto finally began its civil engineering courses in 1859. In 1878, the UofT established its School of Practical Science. The first engineering course at Queen's University was offered (but not given) in 1865. It was first given in 1872. In 1890 a School of Mines was established. The two men principally responsible for getting university education in engineering started in Canada were Governor-General Sir Edmund Head and Sir William Dawson. Principal George Grant ensured the participation of Sandford Fleming in the development of Queen's University.

As might be expected, the beginning of serious consideration for the establishment of a 'learned' engineering society in Canada came from civil engineers. In the mid-nineteenth century, Sandford Fleming tried, unsuccessfully as it happened, using the Canadian Institute as his vehicle. Founded on June 20, 1849 as a learned society serving surveyors, civil engineers, scientists and manufacturers, it still serves them well, and has survived to become a *Royal* Canadian Institute, for 'Science.' But it failed to fulfill the long-term hopes of its founders - engineers Fleming, Kivas Tully and H.H. Killally - as a purely 'learned' engineering organization. As a result, the Canadian Society of Civil Engineers (CSCE) was formed, officially on February 24, 1887, in Montreal, with an early membership of around 300. At that time, it was decided to apply to the Dominion Government for a Royal Charter. This was done, and the Charter dates from June 23 of that same year. The first president was Thomas Coltrin Keefer, of Ottawa and Walter Shanly of Ottawa, John Kennedy of Montreal, and Casimir Gzowski of Toronto were vice-presidents. In the year the Society was founded, the transcontinental railway had only just been completed and the settlement of the Prairies had hardly begun. The three main disciplines of the new Society were civil, mechanical and mining engineering, but membership was open to qualified engineers in all disciplines. The new Society published *Transactions* to help spread new and relevant technical information.

Sandford Fleming was never a strong supporter of the new Society, and did not join it as a founding member, or as a member at all until after he had founded a rival - the Dominion Institute of Amalgamated Engineering - around the turn of the 20th century, and it had failed.

From the start, it was obvious that, because of Canada's great size, all members of CSCE could not take advantage of its Montreal headquarters or of the activities centred there. So the establishment of local branches was authorized and provision was later made for regional and branch organizations. The first branch was formed in Toronto in 1890, and the second in Cape Breton in 1905. By 1912, there were also branches in Quebec City, Winnipeg, Ottawa, Kingston, Vancouver and Victoria. Again, not long after the founding in 1887, it became clear that the term 'civil' - if strictly applied - would become too restrictive to describe its objectives. Consequently, four separate sections were formed: general engineering, and

electrical, mechanical and mining engineering. But the view that there should be a single, named learned society embracing all disciplines gained support and, towards the end of World War I, the CSCE also wrestled with other problems affecting its membership and communications within it, such as the expanding membership of the non-civil disciplines and sub-disciplines. To advise on their solution, the Committee on Society Affairs (chaired by H.E.T. Haultain) was asked to provide advice. This had the following effects: the name of the Society was changed to the *Engineering Institute of Canada* (EIC); the Institute hired a full-time general secretary to head its staff; and the Institute published a monthly magazine to supplement the *Transactions* (and would continue to do so until 1986), which would allow the *Transactions* to publish more theoretical papers.

Meanwhile, members of CSCE, led by Alan MacDougall, were debating ways to regulate engineering practice. Some members were opposed to the idea that the CSCE should do this. But, as was also pointed out, the Society/Institute was a federally-chartered body, while the regulation of trades and professions in Canada was a provincial matter. One province, Manitoba, actually introduced legislation, but was unable to make it work. An EIC member's paper proposing a *model law* for the provinces to base their laws upon was delivered in August 1918 and started the solution process going. The law met with the members' approval in the subsequent Institute-wide vote. By 1922, seven of the (then) nine provinces had enacted laws establishing non-government associations to carry out this (and other) work. Saskatchewan's law was delayed until 1930 and PEI's until 1955, three years after new-province Newfoundland had passed its law. Two of the Territories have since passed legislation. Generally, these laws prohibit the practice of engineering by anyone not licenced to do so by his/her Provincial/Territorial Association. In other words, the profession became self-regulating and guaranteed professional competence to users of engineering services. The principal officers of the Associations were elected by their memberships, and the others appointed by the provincial/territorial governments. Generally, the provincial laws required of registering engineers that:

they hold a university degree acceptable to the Association in question; post-graduation, have had a period of practical experience acceptable to the Association; be resident in the applicable province, and be of good character; non-graduates would require a six-year period of experience.

Registration could be by examination, partial examination or full exemption. Also, the Associations could prosecute those attempting to practice engineering without a provincial licence. The examinations were uniform throughout the country. The associations were also engaged in a number of other activities covering legal, educational, and welfare aspects of the profession, including the achievement of greater uniformity in legislation, facilitating the movement of engineers within the country, and maintaining good relations with engineering organizations at home and abroad. Not all engineers in Canada are registered with the associations, although many more have belonged to them than to the EIC.

In 1922, a UofT mining engineering professor and senior member of the EIC, Herbert Haultain, felt strongly that Canadian engineers should pledge an oath of service early in their careers, as doctors did. He discussed this with seven past-presidents of the Institute, who agreed. Rudyard Kipling, known for his support of engineers and what they did, was invited to write the text for an appropriate Obligation ceremony. Hence was born the Iron Ring Ceremony - the Ritual of the Calling of an Engineer - by which, since 1925, graduating Canadian engineers and others practicing in Canada could swear the oath. The iron ring in question is worn (visibly) on the little finger of the engineer's 'writing' hand. The Ceremony is supervised by an independent Corporation of Seven Wardens and takes place at over 20 University-based "Camps" every Spring. The affairs of each Camp are in the charge of a Warden. Each inductee receives a signed copy of his/her Obligation.

Meanwhile, by 1923, the membership of the Institute in all grades had grown past 5,000, and there were 24 branches across the country. During the Depression years, the Institute offered an Employment Service and maintained a non-active list of those seeking employment.

Meanwhile, also, consulting engineering firms were being established across the country. In the early years, many of them were branches of British or American firms. Between 1919 and 1945, for example, the firms established included Swan Wooster in British Columbia, H.G.Acres and H.H.Angus in Ontario, Lalonde et Valois (which later became Lavalin) and Shawinigan Engineering in Quebec. Ed Underwood and Roy McLellan bought the consulting partnership of McArthur and Murphy (set up in Saskatoon in 1911) and formed what became UMA Limited, based in Manitoba. The National Research Council's Laboratories were also established in Ottawa in 1932. These companies grew further after World War II.

However, back in 1925, these and other consulting firms - tired of the federal government's favouring American and British consulting firms - established the Association of Consulting Engineering in Canada, (ACEC) in Ottawa, to encourage all of the governments in Canada (and other sources of consulting business) to do business with Canadian firms. Subsequently, equivalent provincial consulting engineering associations were also established. ACEC, while it would collaborate with EIC and other 'learned' associations in international conferences, was established solely for *business* reasons. It recently changed its name to the Association of Consulting Engineering Companies- Canada. Like the 'learneds,' ACEC has established a series of prestigious annual awards for excellence in consulting.

As the 1920s wore on, the EIC became increasingly concerned that many engineers were joining the provincial associations in order to practice, but were not joining the Institute. By 1935, the EIC had set up a committee under Gordon M. Pitts and Robert F. Legget to consider how the activities of the Institute and the Associations might be 'consolidated.' The committee deliberated during the following two years, but their report was not accepted by the EIC's membership (the Associations had no vote).

However, one of the positive results of this exercise was that, in 1936, the associations established the Dominion Council of Professional Engineers (DCPE), located in Ottawa, to take charge of the coordination of national matters affecting the associations and to work with other engineering organizations at home and abroad on matters of mutual interest.

In 1937, the EIC celebrated its Semicentennial. One of the celebratory events was the dinner in Montreal in June, at which the guest speaker was Honorary EIC Member (and Canadian Governor-General) Lord Tweedsmuir .

A second and very much more elaborate, committee-laden attempt at consolidation was made in the 1950s, jointly this time, by the EIC and the CCPE. After a series of votes, involving members of both organizations this time, the process was terminated, negatively, in December 1961. One further, half-hearted, attempt to solve this problem was made a few years later.

Back in 1959, the DCPE became the Canadian Council (CCPE) and, in 2007, Engineers Canada (EC). Two committees/boards established by CCPE have remained important for the profession over the years: the Canadian Accreditation Board, which maintains oversight of the university courses available in Canada; and the Canadian Engineering Manpower Council (CEMC), now EC's Human Resources Committee, which maintains oversight of the personnel 'health' of the profession in Canada.

During the late Spring of 1967, the engineering profession in Canada came together to organise an international technical conference to honour the country's Centennial, in Montreal. A special 'Engineers' Plaza' was created on the site of EXPO 67, also at Montreal, and included a memorial statue by sculptor Gerald Gladstone. The site was 'opened' by the Hon. Robert H. Winters, engineer and Cabinet Minister.

At the present time (March 1969), the EIC has upwards of 20,000 members from all disciplines and sub-disciplines within the profession. In numbers, these may have represented between one-quarter and one-third of all the professional engineers in the country. The Institute, however, must compete for members. Within Canada there is, for example, at the 'learned' level, the Chemical Institute, the Canadian Aeronautical Institute and the Canadian Institute of Mining and Metallurgy, all of which include engineers in their memberships, as well as the very much larger number of discipline-oriented learned societies headquartered in the United States, such as the American Societies of Civil, Mechanical and Chemical Engineering, and the Institute of Electrical and Electronic Engineers, as well as the learned societies (usually Institutions) in Britain and France, many of which had formed branches in Canada. At this time, The United States had a National Academy of Engineering, Canada did not, but Canada did have a Royal Society (founded in 1882) to which engineers whose main activity was research could be, and were, elected.

Finally, one post-1969 note: In 1970, the EIC ceased to operate as it had since 1918 and became a federation of a dozen or more Member Societies based of the various disciplines within the profession.

Sources...

Andrew H. Wilson (Ed.), *From Steam to Space...*, Canadian Society for Mechanical Engineering, 1996

The Engineering Journal, Engineering Institute of Canada, various monthly issues, 1918-1986

Other papers in the Cedargrove Series (see EIC List of Engineering History Papers (Internet))

...and of course rest of the Internet-----