



**THE ENGINEERING INSTITUTE OF CANADA**

*and its member societies*

**L'Institut canadien des ingénieurs**

*et ses sociétés membres*

## **EIC's Historical Notes and Papers Collection**

(Compilation of Articles, Notes and Papers originally published as  
EIC Articles, Cedargrove Series, and EIC Working Papers)

### **ENGINEERING HISTORY PAPER #59**

#### **“The History of Engineering: What We Should Know About It”**

**by Andrew H. Wilson**

(previously produced as Cedargrove Series #32/2014 – October 2014)

\*\*\*\*\*

EIC HISTORY AND ARCHIVES

\*\*\*\*\*

© EIC 2017

## **Abstract**

This paper is yet another attempt to provide engineers (and others) with some of the 'basics' of their profession's history, with special reference to Canada. It was presented originally to a gathering of members of the Ottawa Section of IEEE Canada in late November 2014. The version that follows amplifies some of the aspects of the subject covered at that time.

Although usually taken for granted, engineered structures, machines and devices are all around us. Their history is also all around us and available for study. Unfortunately, it is not usually taught to students of engineering, business, economics, politics or even history itself at the undergraduate level in universities. The history of *science* has received much more attention.

The general public becomes aware of engineering largely as a result of its purchases, but also as a result of the disasters, whether human-caused or not, that are reported through newscasts, newspapers and electronic devices. Alas, the media are apparently prone to mis-label successful engineering as *science* and successful engineers as scientists, due in part to engineering practice having acquired an increasingly influential science base. Nor does the general public or the media recognize significant contributions to the economy and to social development made by individual engineers or groups of them. Economists and politicians often refer in passing to the value of technology and innovation when speaking about public and private activities designed for economic or social development, but they have no accurate measure of the effect of one upon the other. Engineering is not even a word they seem to know. Engineers, of course, seldom seek political office. It does not appeal to their desire to get things done.

But engineers have taken relatively little interest in their own history. When they have done so, it has often been in association with the celebration of an anniversary of significance to the profession. Also, engineers tend to communicate successfully with their peers, but much less well with non-engineers. Very few have written seriously about the *history* of engineering.

## **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. It is, therefore, a modern-day variant of the privately published books and pamphlets written by his forebears, such as his paternal grandfather and grandmother and his grandfather's brother John.

## **About the Author**

He is a graduate in mechanical engineering and the liberal arts and has held technical, administrative, research and management positions in industry in the United Kingdom and the public service of Canada, from which he retired almost 30 years ago. He has been active in the engineering history field for many years.

### **By way of introduction, some clarifications...**

Originally an engineer of the mechanical branch, my experience of the electrical branch has been quite limited. So, in what I have to say, there may be less electrical material than either mechanical or civil. For this I apologise.

I also take a fairly simple, but not uncommon, view of what engineering, science and technology are. To me, science and technology are bodies of knowledge, science being about know-*why* and technology about know-*how*. Engineering, on the other hand, is an *activity*, which makes use of both scientific and technical information, but includes other kinds of knowledge and experience. There is a verb 'to engineer.' Engineering also has a number of sub-activities, such as design, manufacturing, production, construction, operation and maintenance, research and development. R & D's functions are, of course, to augment the body of engineering knowledge and experience. That said, there is (still) nothing (except registration) to prevent scientists and technologists functioning as engineers, or engineers in the other two capacities.

You will hear a lot about *history*. You may also hear mention about *heritage*, in much the same context. Although there can be 'oral' histories, usually history refers to what has been written down about the past, based on documentation and recollection. Heritage usually refers to buildings, machines and other artifacts that have been preserved (along with their stories) and can still be seen, sometimes in museums. A nation such as Canada has both a history and a heritage.

I should acknowledge that IEEE Canada, in 1985 while still Region 7 of the international society, published a history of electrical engineering in Canada called *Electricity: The Magic Medium*. I should also acknowledge that IEEE Canada has had a History Committee, associated with such people as Ray Findlay, Dave Kemp and the late Wallace Read, with each of whom I have done history 'business' in years past. And I should acknowledge that there is an IEEE History Committee and a History Center at Rutgers University in New Jersey, as well as an IEEE Milestone program in electrical engineering and computing. Funding for these activities depends on donations from IEEE members and Friends.

Also, the Canadian Electrical Association published a centennial history in 1991.

Finally, the study of the history of engineering has two main objectives. One is to describe how a particular building, machine, component, process or device was conceived, designed, made and used. The other is to put engineering activities, collectively, into a *national* context and to estimate how they have contributed to the development of the nation. Both are needed to provide a more fully rounded picture. In this talk; however, I shall be speaking mostly to the second objective.

### **To start things off...**

As you know, in comparison with the branches of civil, mining and mechanical engineering, the electrical branch is comparatively young, beginning with the work of Faraday and Morse in the 1820s

and 1830s, but before chemical branch in the 1850s and 1860s, and aeronautical one at the turn of the 20<sup>th</sup> century.

In the *Introduction* to his centennial history of the Canadian Electrical Association, John Negru writes;

Looking around us today, it would be very difficult to find some place or aspect of our lives that is not touched by the force of electricity. It seems to be everywhere, from the plug in the wall to satellites in space. Yet we are the first generations in history to live entirely within the electrical age.

Here in Canada, *all* of the engineering branches seem to be taken for granted. Some years ago now, this was noticed by the Royal Bank of Canada and it published an article - *In Praise of Engineering* - in a 1986 newsletter. In a similar vein, Harry Prevey, the editor of *The Magic Medium*, writes in the introduction to this book:

Today we rely on, and take for granted, the silent energy of electricity for instant communication with places or people near or far, for lighting and heating our homes, driving our machines of production, transporting our people and produce, operating our office buildings, lighting our streets, controlling our traffic movements, calculating our scientific problems, doing our accounting, carrying out a great variety of medical treatments, and educating and entertaining ourselves.

Some years later, Claudette Mackay-Lassonde, a president of PEO, called engineering “the invisible profession.” Others have described engineers as “the forgotten people.” Unfortunately, some invisibility and forgetfulness has been applied by the profession to itself. It talks principally to itself and seldom blows its own horn or refers audibly and publicly to its achievements and those of individual and collections of engineers. The profession as a whole looks more readily to the present and the future. But are there not elements of the past that are relevant to the present and the future? After all, the experience upon which much engineering is based is anchored in the past, but very few engineers take much to do with the study of the *history* of engineering over the longer term.

On the other hand, in partial mitigation of what happens, the engineering profession is like no other in several ways. For example, few outside academia practice it technically for their entire working lives, like a doctor practices medicine or a lawyer the law. Many become managers of engineers and projects rather than practitioners, with or without MBA degrees. And a few forsake it altogether, using their academic training to establish such things as the ability to think clearly, apply mathematics, and solve problems.

Unless they work in some relationship to engineers and engineering, members of the general public are usually quite unaware of recent engineering achievements and their histories, let alone any older material. Nor are they curious about the origins and workings of the hand-held and other electronic

devices they now use. Not that they need acquire a deep understanding of these. Simply, they should appreciate how - and why - they are able to do what they can now do on a daily basis.

Historically speaking, the reactions of non-engineers to engineering have acquired quite a few negatives. When disaster has struck, for example, be it a railroad accident, oil spill or building collapse, engineering has been given the blame, even although the agents of the disasters may have been human, through negligence, ignorance or oversight. But even when noticeably good things happen as a result of engineering - for example, the spectacular operation of the Canadian designed and built *Canadarm* on the International Space Station - they may go relatively unnoticed. And to be noticed by the media could mean that *science* rather than engineering may be given the credit.

Speaking of disasters, much may also be made of more dangerous times over a century ago when boilers exploded, ships sank and crews and passengers lost their lives. The ASME's Boiler and Pressure Vessel Code, among other measures, has changed this, just as the Canadian Building, Fire and Electrical Codes have made buildings in Canada safer.

Technical failure within engineering may also receive media attention, and this may well be justified. But engineering will never be failure-free. As the American engineer-historian Henry Petroski has pointed out in his books and articles, failure plays a part in the evolution of successful engineering. Indeed, until 150 years ago, trial-and-error was the recognized way to advance engineering. Nowadays, it has been largely replaced by research and experimental development.

But engineering should not take *all* of the credit. Financial, entrepreneurial and management people, and even politicians, are often involved in decisions along with engineers, providing needed non-technical support for engineering projects. But the recognition problem becomes particularly acute when politicians, for example, take *all* the credit and the engineers are not even invited to the launching of the ship or the opening of the bridge! Again, the *technical* achievements of Canadian companies that fail in the marketplace are usually viewed critically and forgotten. And the bigness of some of the non-failing companies in Canada also seems to be a *political* problem. Too much success...?

In years gone by, the existence of foreign subsidiaries in Canada has been taken to mean that little or nothing of engineering value has been done here. Even books such as J.J. Brown's *Ideas in Exile*, which identify and discuss Canadian-made inventions and paint a good picture of Canadian inventiveness, bemoan the fact that some commercially successful Canadian inventions were exploited abroad, particularly in the United States. Yet if you look at the civil engineering branch, its domestic products are predominantly designed in Canada, where they are all built.

As I will demonstrate a little later, there is a great deal of material available about Canadian engineering from the historical point of view. But there is also a great deal of information that is missing, that has been destroyed, for whatever reason. For academic historians, in particular, this is a disincentive in the study of Canadian engineering since they rely on visible and quotable evidence. To take an example...

In the 1880s, Thomas Ahearn was the co-founder of Ahearn & Soper, a firm of electrical contractors in Ottawa. He was later elected president of the Ottawa Electric, Electric Railway and Gas Companies, a director of Canadian Westinghouse and the first chair of the Federal District Commission. Yet after he died, evidence of his extensive career was destroyed. As Tom Spear wrote in an article in the *Citizen*:

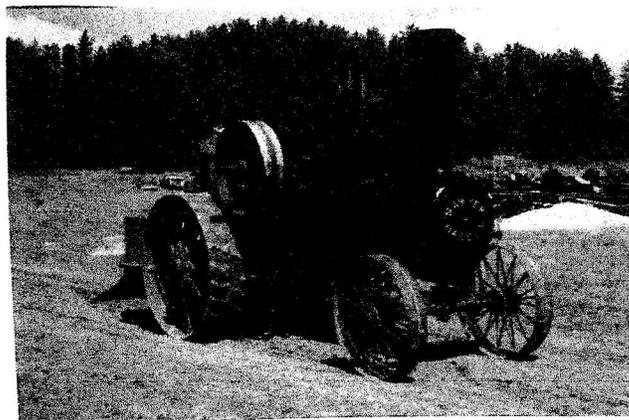
The funny thing is that while Ahearn's legacy is all around us, the records of his work are astonishingly thin... That's because his family burned them after he died. The city took over the Ahearn-Soper empire...to form Ottawa Hydro and the Transportation Commission...and didn't want to turn over the historic records...

Many company records have also disappeared to prevent competitors, or the law, knowing the whole story. To a certain extent, what is called 'reverse engineering' can be used to fill some of the gaps. But it can be expensive.

Nowadays, the ability of Canadian engineering companies to innovate comes under constant political and public scrutiny and criticism. While successful innovation also depends on entrepreneurial, financial, competitive and other non-technical factors, the apparent weakness of Canadian research and development activities has, historically, attracted most of the critical political and public attention. No one seems to suggest that more attention should have been given to *engineering* activities associated with innovation. Indeed, no one has any idea of how much, or little, has been spent historically on *engineering* in Canada or if the amounts were even appropriate.

A number of Canada's historic engineering achievements have been brought to political and public attention from time to time, as I will point out later in this paper, the CPR to the West being perhaps the most frequently mentioned. But there have been other, less spectacular but still valuable contributions that have received little or no attention. Some examples...

The Sawyer-Massey steam traction engine helped open up new Canadian farms, early in the 20<sup>th</sup> century

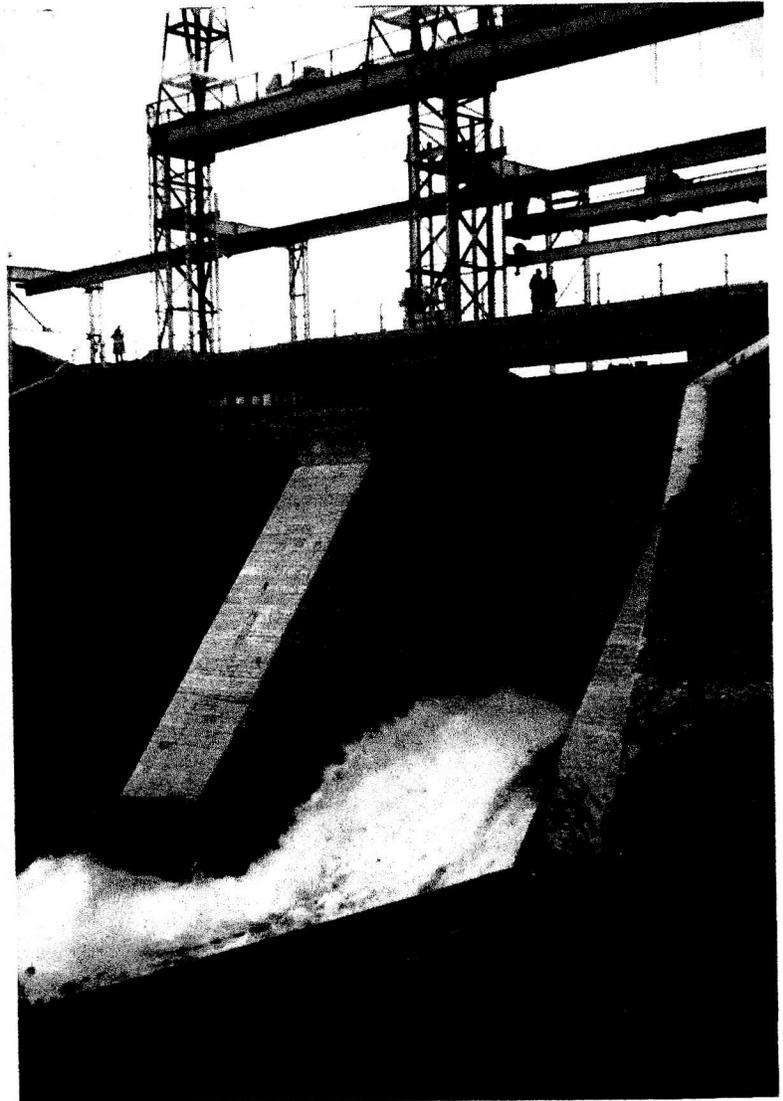


Kirkfield Lift Lock,  
Trent-Severn Waterway,  
opened 1907

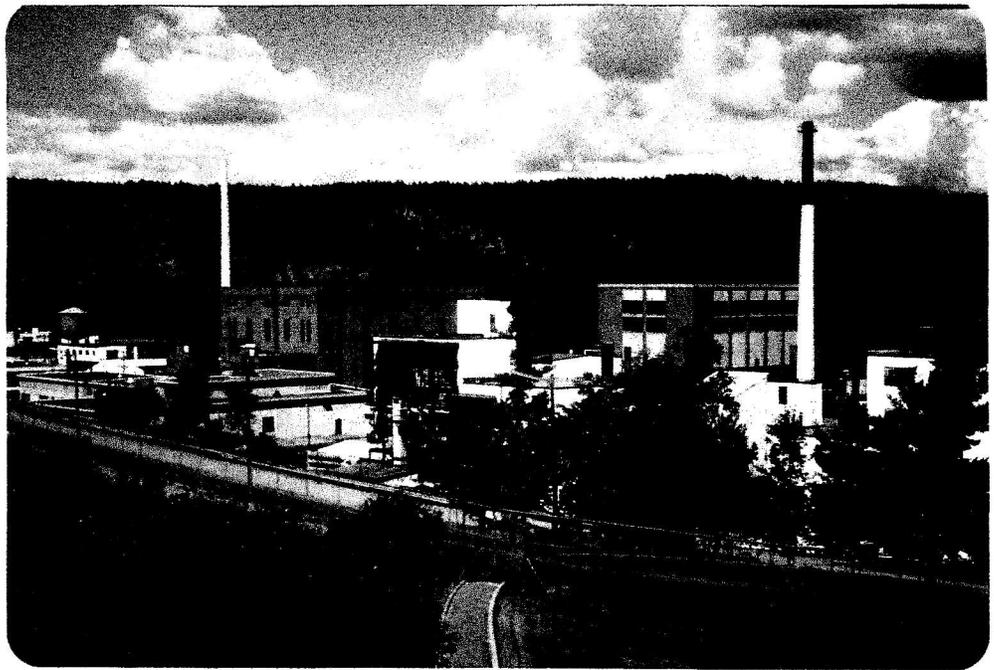


Memorial for the  
flight of the *Silver Dart*,  
Baddeck, N.S.,  
February 1909

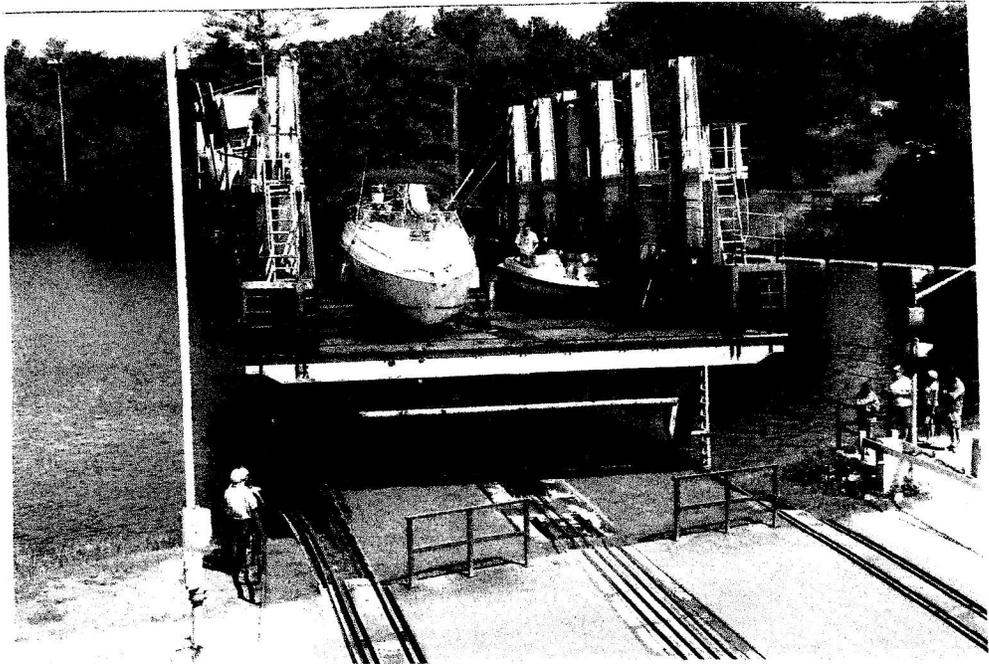
Whitehorse Rapids Dam, Y.T.,  
built with fish ladder,  
40 MW power plant, built 1950s



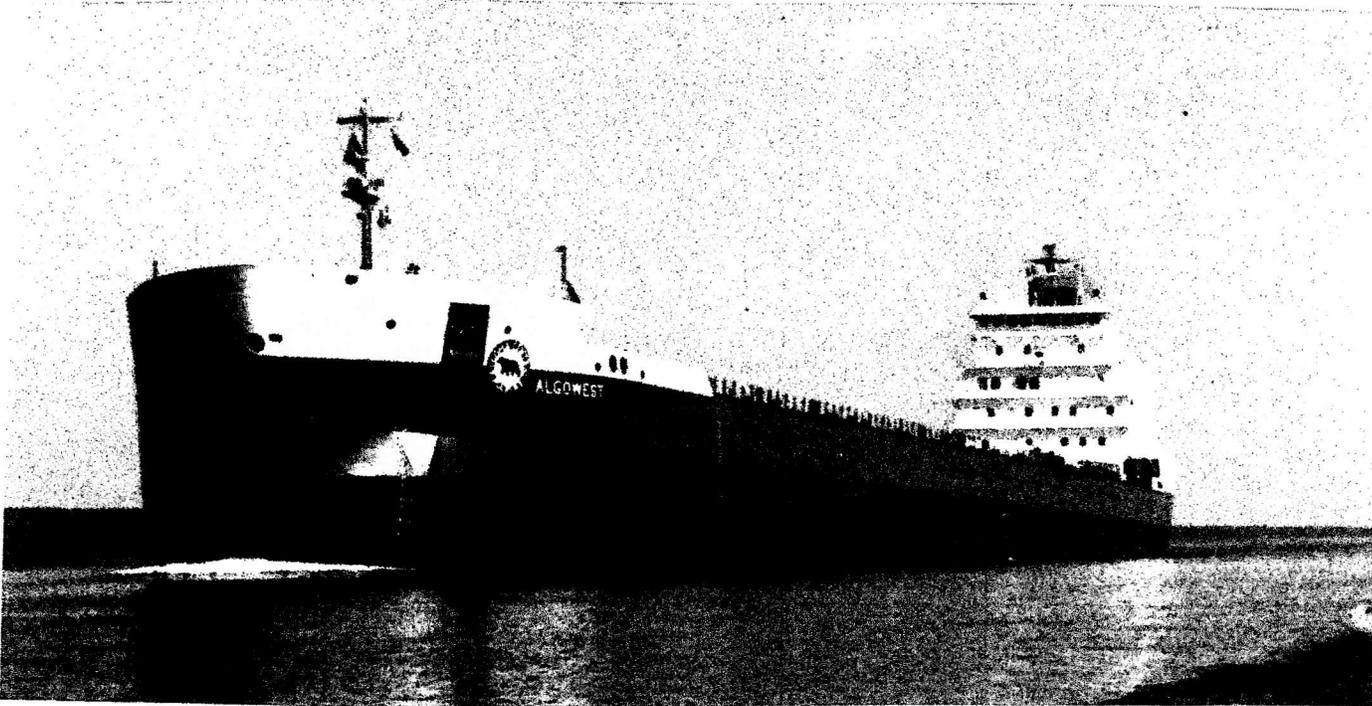
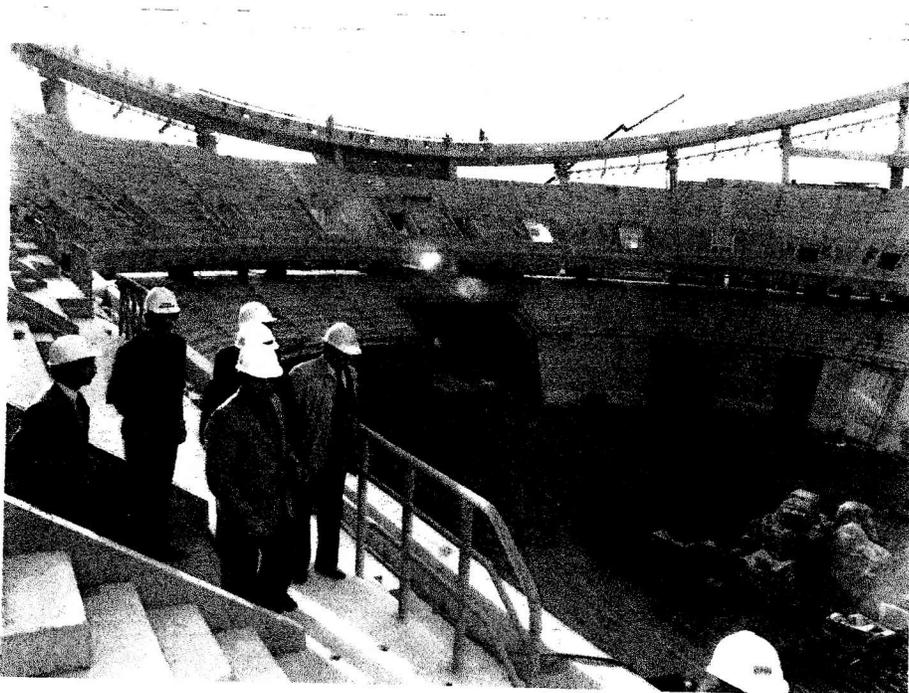
Chalk River Nuclear  
Laboratories,  
late 1960s



Boat carrier, Big Chute  
marine railway, Trent-  
Severn Waterway,  
installed 1978



Building the Saddledome,  
Calgary, 1982



MV *Algowest*, straight deck bulker, St. Lawrence and Great Lakes, Hull 226, sixth last ship built by the  
Collingwood Shipyard, launched 1982

### **Where do I go to read about Canadian engineering history...**

While there is not yet a definitive history of engineering in Canada, there is a great deal of published information. For the curious, there is indeed no real lack of visible evidence of this history and heritage, some of it dating back to the 17<sup>th</sup> century, and even earlier. The trick is to know where to find it.

Interestingly, engineering societies and associations have occasionally published in their journals and conference proceedings articles that were 'historical' when written, or became historical with the passage of time.

In the first category, for example, is the EIC's *Engineering Journal* paper by J.G.G. Kerry that appeared in the August 1947 issue and discussed "The Chronology of Early Canadian Engineering Activities," Richard L. Hearn's paper on "Canadian Hydro Electric Developments" that was published in the August 1954 issue, and "Early Ottawa Engineering" by Robert F. Legget, that was in the February 1961 issue. More recently, the Canadian Institute for Mining, Metallurgy and Petroleum has published several articles by Hugh McQueen on the bridges over the St. Lawrence and on metallurgical engineering subjects.

In the 'became history' category, many more articles have appeared in the *Engineering Journal* over the years - for example, on the building of hydro power plants on the Peace, Columbia, Niagara, St. Maurice, Gatineau, and Ottawa Rivers and at Shipshaw, Kitimat and Churchill Falls, and on the building of the Alaska and Trans-Canada Highways. In the communications field, papers appeared on wireless telegraphy in the 1920s, the development of radio in the 1930s, and of colour TV and the Trans-Canada telephone system in the 1950s. Incidentally, the *Journal* ceased publication in 1987.

As I mentioned earlier in regard to Region 7 of IEEE and the Canadian Electrical Association, technical societies and engineering associations have taken advantage of anniversaries to publish books discussing the histories of the branches of engineering they cover. Examples include the 1987 Engineering Centennial's *Mind, Heart and Vision*, written by Norman Ball. The 75<sup>th</sup> anniversaries of the professional associations in Québec and Saskatchewan were celebrated in part by the publication of histories, as was the 50<sup>th</sup> anniversary of the Newfoundland and Labrador association. The Canadian Societies for Chemical, Mechanical and Civil Engineering produced books for their 25<sup>th</sup> anniversaries.

Although engineers themselves have contributed articles about their profession's history, those writing about it on a regular basis have also been few and far between. During and after his tenure as director of NRC's Division of Building Research, Robert F. Legget contributed both books and a flood of articles, mostly between 1965 and 1995 and about the civil branch, making him Canada's premier engineer-historian, recognized for his contributions in Canada, the United States and Britain. While several other Canadian engineers have written on historical subjects from time to time, only a handful have contributed recently and regularly, notably, Hugh McQueen, Fahti Habashi, Alistair MacKenzie, Mark Andrews, the late Don Lawson, and myself.

Of the 'learned' societies within the profession in Canada, the Engineering Institute, the Mining,

Metallurgy and Petroleum Institute, the Mechanical, Electrical and Civil Engineering Societies have had regular and active history committees, although others have produced historical material from time to time. Notably, the Civil Society has had a regular program of commemorative plaquing of civil sites since 1983. The main 'products' of the EIC, CSME and CIMM Committees have been specially written accounts of their own histories, specific projects, machinery, buildings and biographical material. IEEE and IEEE Canada history publication activities, you already know about. Don Lawson's chairmanship of the Canadian Society of Senior Engineers' committee was unfortunately short.

Apart from their interest in historical matters at times of anniversary, the 'professional' associations have had relatively little historical activity. The Canadian Academy of Engineering had a small committee in the 1990s, but its activity has lapsed.

Professional historians specializing in the history of engineering are few and far between. Norman Ball has been mentioned. He has published a variety of books, essays and papers, on his own account and with others. Norman has also been the science and engineering archivist at what is now Library and Archives Canada. His successor in that post was Larry McNally, another professional who has contributed material on early mechanical engineering in Canada. Both Norman and Larry are now retired, but still active. Another active retiree is Robert Passfield, who spent many years as a historian with Parks Canada and has contributed books, papers and biographical material to the literature, mainly on civil engineering subjects. Phyllis Rose and Christopher Andreae have also made important contributions. Richard White contributed books on the 19<sup>th</sup> century engineer-brothers, Walter and Francis Shanly, and on the Faculty of Applied Science and Engineering at the University of Toronto.

Some plans have been successfully made to commemorate the founding of Canadian engineering schools. Those for L'Ecole Polytechnique de Montréal began in its centennial year, 1973. They became the basis for the doctoral thesis of Robert Gagnon, which was eventually published in book form in 1991. George Richardson and Queen's University published *Queen's Engineers: A Century of Applied Science* in 1993. A celebratory 25th anniversary volume, *A Place of Ingenuity*, was written by Peter Glockner and published by the University of Calgary in 1994. And, as mentioned already, Richard White's book on the Faculty of Applied Science and Engineering at Toronto, published by the UofT Press, appeared in 2000.

Another doctoral thesis, this time by social historian Rodney Millard, was published in 1988 by the UofT Press. It was called *The Master Spirit of the Age* and discussed Canadian engineers and the politics of professionalism between 1887 and 1922 - from the founding of the EIC's predecessor, the Canadian Society of Civil Engineers, to the founding of the first provincial associations of professional engineers.

Books on engineering subjects relevant to Canada and by Canadians have appeared from time to time, not always written by engineers. Examples include: *Canada Builds, 1867-1967* by Thomas Ritchie of the NRC's Division of Building Research; *Lines of Country: An Atlas of Railway and Waterway History in Canada* by Christopher Andreae; Larry Milberry's *Aviation in Canada*; the three-volume *History of Canadian Military Engineers*; *Hamilton's Old Pumphouse*; by William and Evelyn M. James; *A Respectable*

*Ditch: A History of the Trent-Severn Waterway* by James T. Angus; three books on transportation in British Columbia by R.G. Harvey; Lydia Dotto's *Canada in Space*; historian of science W.E.K. Middleton's several books on engineering at the National Research Council; George Fischer and Mark Harris' *Ontario's Historic Mills*; *Survivals: Aspects of Industrial Archeology in Ontario*, by Diane Newell and Ralph Greenhill; and *By Design: The Role of the Engineer in the History of the Hamilton-Burlington Area*, by J.W. Disher and E.A.W. Smith, published by the Hamilton Engineering Institute.

Several engineering biographies have appeared in book form, but very few autobiographies by engineers themselves. Among the first group are those for Sandford Fleming, Casimir Gzowski, Thomas Keefer, C.D. Howe, and 'honorary engineer' Alexander Graham Bell. Principal George Grant of Queen's wrote *Ocean to Ocean*, an account of Sandford Fleming's travels through Canada in 1872 in search of railway locations for the CPR. Autobiographers include John Leslie Charles, E.V. Buchanan, John S. Bates and Reuben W. Leonard. Company histories have also appeared, including those by consulting firms Monenco, Wardrop, Underwood McLellan and SNC. Hurtig's *Canadian Encyclopaedia* includes a number of entries associated with engineering in Canada.

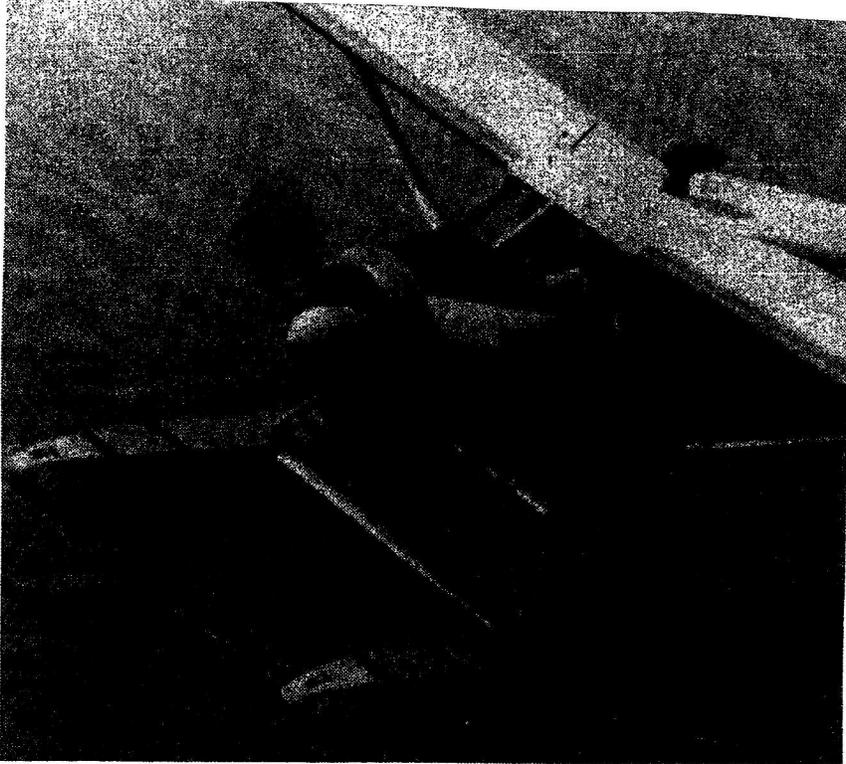
Other sources of written material on Canadian engineering are the museums, which are spread throughout the country, and particularly the larger ones that have full-time research staffs and publication budgets. Their emphasis, however, is more often on technology rather than on engineering. University libraries may also be useful. In particular, the University of Ontario Institute of Technology (UOIT) at Oshawa has the archives of CSME and the most recent archival material of the EIC. The older EIC material is in Library and Archives Canada at Gatineau, Québec.

Finally, local historical societies, of which there are many across the country, have published engineering-related material. Let me draw your attention to just one of them. As will be mentioned again later, the Lethbridge Viaduct (or High Level Bridge) over the Oldman River in Southern Alberta was formally recognized as a site of 'national historic significance' in 2008. To mark this event and celebrate the centennial of its construction, the Lethbridge Historical Society - led by history buff Carlton R. Stewart - published a book the following year, *The Lethbridge Viaduct: 100 Years Later and Still an Engineering Marvel*. It included the entire original paper by designer C.N. Monsarrat that had appeared in the *Proceedings* of the Canadian Society of Civil Engineers (predecessor of the EIC) in December 1909 as well as the speeches made at the plaquing ceremony. By a strange coincidence, as the platform party was approaching the platform for this ceremony, a freight train slowly crossed the bridge above them...

### **Recognition of Achievements...**

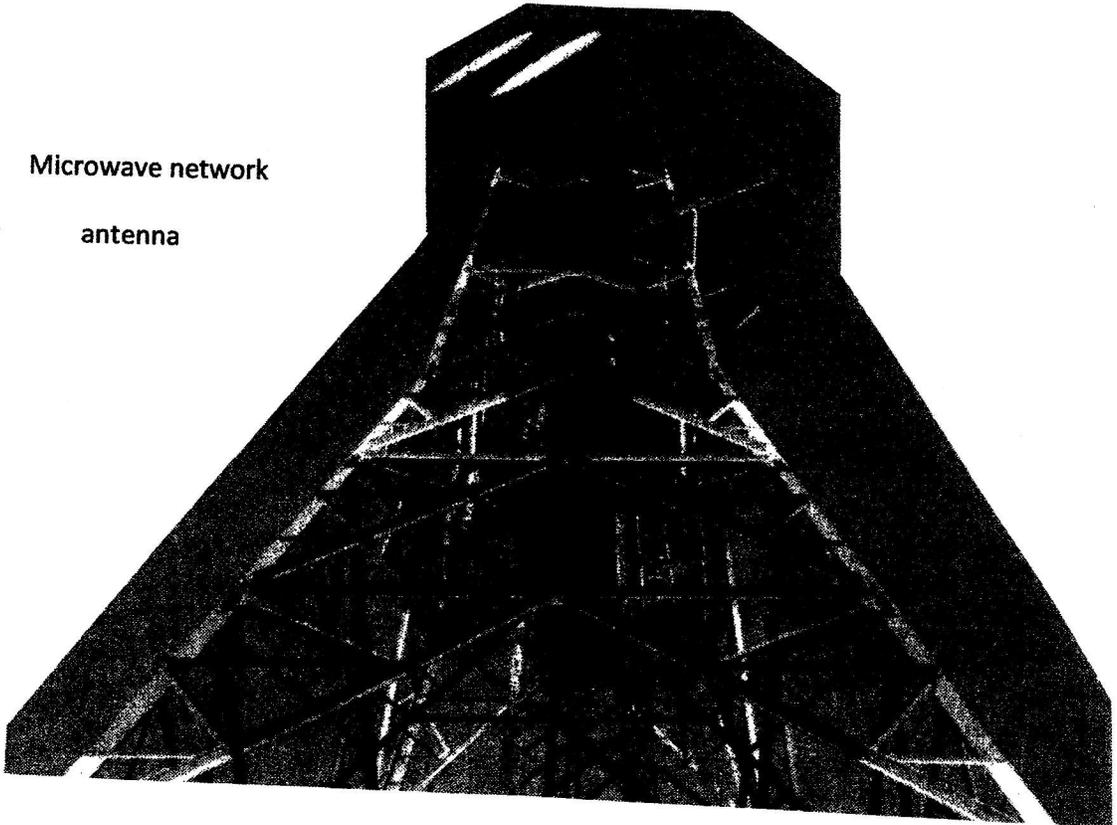
Speaking of anniversaries, for the Centennial of Engineering as a Profession in Canada in 1987, the directing board established a representative committee to choose ten outstanding engineering achievements during the century. These included the CPR to the West, the Polymer Plant at Sarnia, the St. Lawrence Seaway, the Trans-Canada Microwave Network, the 735 KV Power Transmission Line, the

de Havilland Beaver Aircraft, the CANDU Nuclear Reactor, the Alouette I Satellite, the Bombardier Skidoo, and the Syncrude Oil Sands Plant.



de Havilland  
*Beaver*

Microwave network  
antenna



More recently, several other achievements have been recognized: the Confederation Bridge between PEI and New Brunswick; the CN Tower and the Skydome; the TRUIMF particle accelerator; the *Canadarms*; Radarsat I and II; the Churchill Falls and James Bay hydro-electric plants; RIM's *Blackberry*; and the pacemaker invented by the late Jack Hopps.

### **Archives...**

For many years, the National Archives of Canada, now Library and Archives Canada (LAC), accepted material from organizations and companies within the engineering orbit. No longer...

Some of the material originating with the Canadian Society of Civil Engineers and the Engineering Institute of Canada - from the 'early' years - can be found in LAC, along information originating with Engineers Canada (formerly the Canadian Council of professional Engineers) and the Association of Consulting Engineers of Canada, plus the archives of individual engineers such as Fleming, Gzowski, Keefer and C.D. Howe from years gone by and, more recently, Robert F. Legget.

As mentioned above, the more recent EIC material is now archived at the Library of the University of Ontario Institute of Technology (UOIT) at Oshawa, along with material from CSME and the Senior Engineers' Society. UOIT will also accept material from individuals engineers. IEEE Canada material is at Queen's University.

Material related to engineering can also be found in the provincial archives.

### **Teaching engineering history...**

I have been unable to put together a comprehensive view of the teaching of engineering history in post-secondary institutions in Canada. There does not appear to be much of it!

However, mention should be made of the Institute for the History and Philosophy of Science and Technology (IHPST) at the University of Toronto. This graduate studies and research Institute was founded by engineering professor John Abrams in 1967. Its early years were the best for *Canadian* science and technology. Currently it concentrates on the medical, biological and physical sciences, mathematics and technology, internationally - no mention of engineering! It has a dozen core faculty and two dozen affiliated faculty, and around 40 graduate students. It is located in Victoria College and makes use of the resources of the university as a whole. Among the first directors was an American, Bruce Sinclair, who wrote the centennial history of the ASME in 1980. No Canadian at IHPST has since done a similar study of any of the Canadian societies! IHPST graduate Norman Ball has perhaps come closest with his *Mind, Heart and Vision* for the Centennial of Engineering in 1987.

There are similar institutes/groups associated with Université de Québec à Montréal, McGill University, the University of Calgary and King's College, Halifax. Individual HPS academics work in other universities. Again, the foci of historical attention are the sciences, technology and mathematics, internationally. Not long ago, Queen's and Carleton Universities also had related courses.

The King's course was on the history of science and technology with some reference to engineering and innovation. Having been put in touch with the teacher, I offered to help, but received no encouragement.

The Carleton course was titled *Ancient Science and Technology* and was taught by the late Professor Trevor Hodge, a renowned scholar of Greek and Roman times, and has presumably been discontinued.

The Queen's course was on the history of engineering, for undergraduate engineers. It was taught by Professor George Richardson, whose own history activities extended beyond the University, and ended when he retired. Apparently, George found considerable interest among his students for the subject, but apparently this waned quickly as their careers began.

I should also mention the work done in the late 1970s by engineering students at Memorial University in Newfoundland under the leadership of Professor John Molgaard of the Department of Mechanical Engineering. Groups of students researched and wrote, and the University published, histories of two hydro-electric power plants in the province - at Petty Harbour, near St. John's, and Victoria, some 75 miles away, both of which were built over a hundred years ago.

I have concluded that university departments of history, generally, have no special interest in the history of engineering, either for itself or as part of the nation's history. I suspect that to have such an interest is not a good career move!

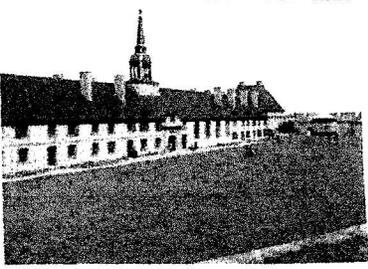
### **National Programs that recognize Achievements...**

Governments at all three levels have engineering activities in their departments and agencies and maintain records of them, some of which are published or are recorded permanently in another way. From the historical point of view, these are publicly available unless placed in a security classification. Suffice it to say that these departments and agencies are significant contributors to engineering in Canada.

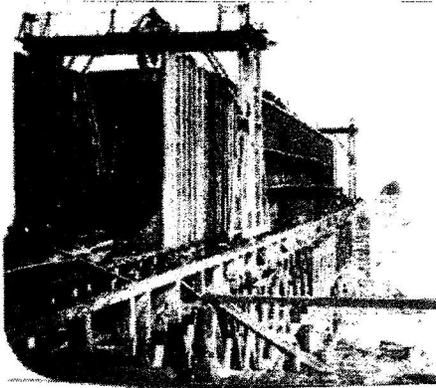
Let me say something about four national programs that have recognized engineers and their achievements.

For over 90 years, the Historic Sites and Monuments Board (HSMBC) - currently a responsibility of Parks Canada - has designated sites, events and persons as having 'national historic significance.' Among the sites and events have been quite a few associated with engineering - for example, the fortress at Louisbourg, the Lachine and Rideau Canals, the Victoria Bridge across the St. Lawrence, the invention of the telephone, the completion of the CPR, the flight of the *Silver Dart*, the Peterborough Lift Lock, the Lethbridge Viaduct, the Diefenbunker at Carp, Ontario, the de Havilland *Beaver*, and the development of the Cobalt-60 'bomb.' Among the 'persons' have been a dozen or so engineers, including Sandford Fleming, John Kennedy, C.D. Howe and Elsie Gregory MacGill.

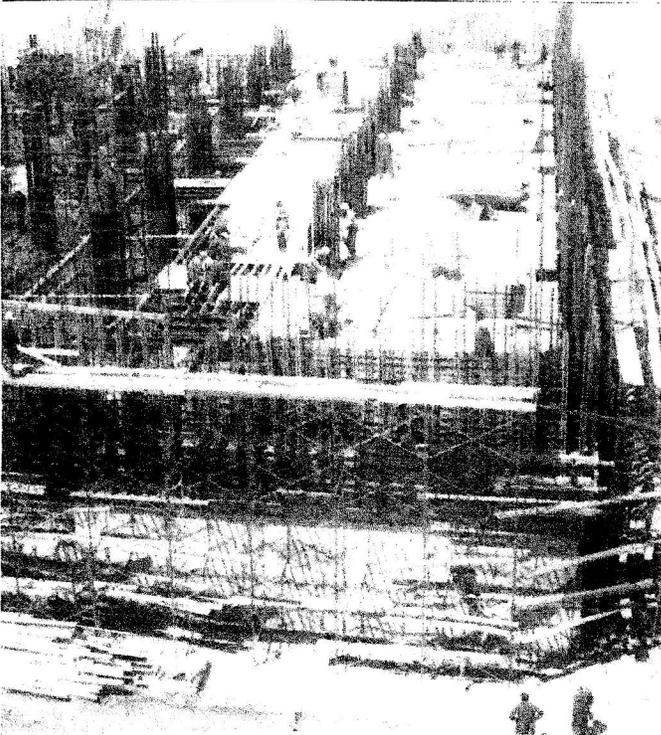
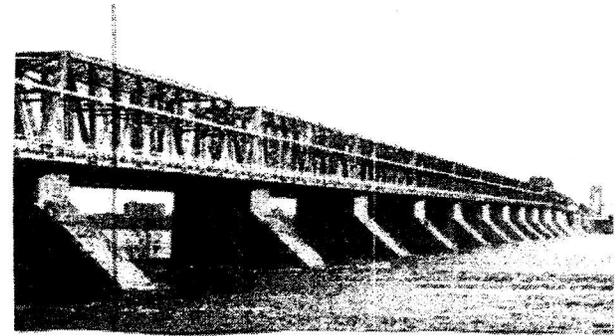
Unfortunately, such designations receive little public exposure when they are made and, although most



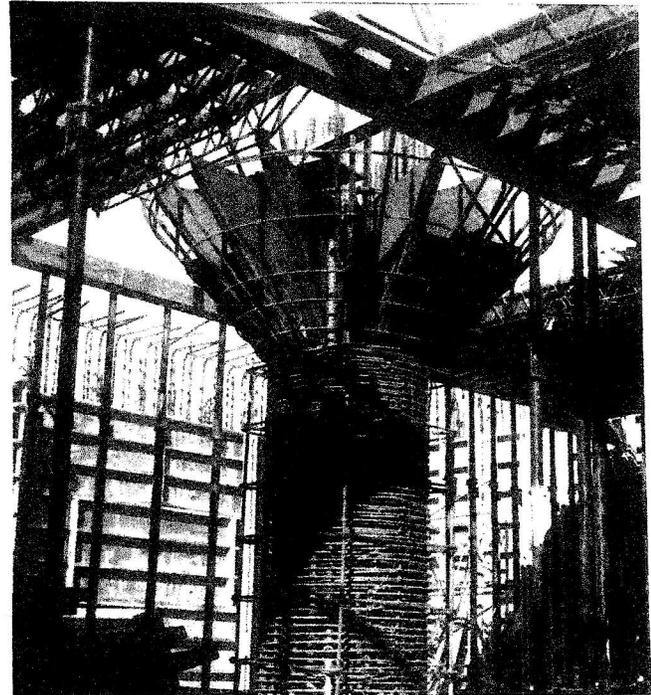
Fortress of Louisbourg-  
reconstruction

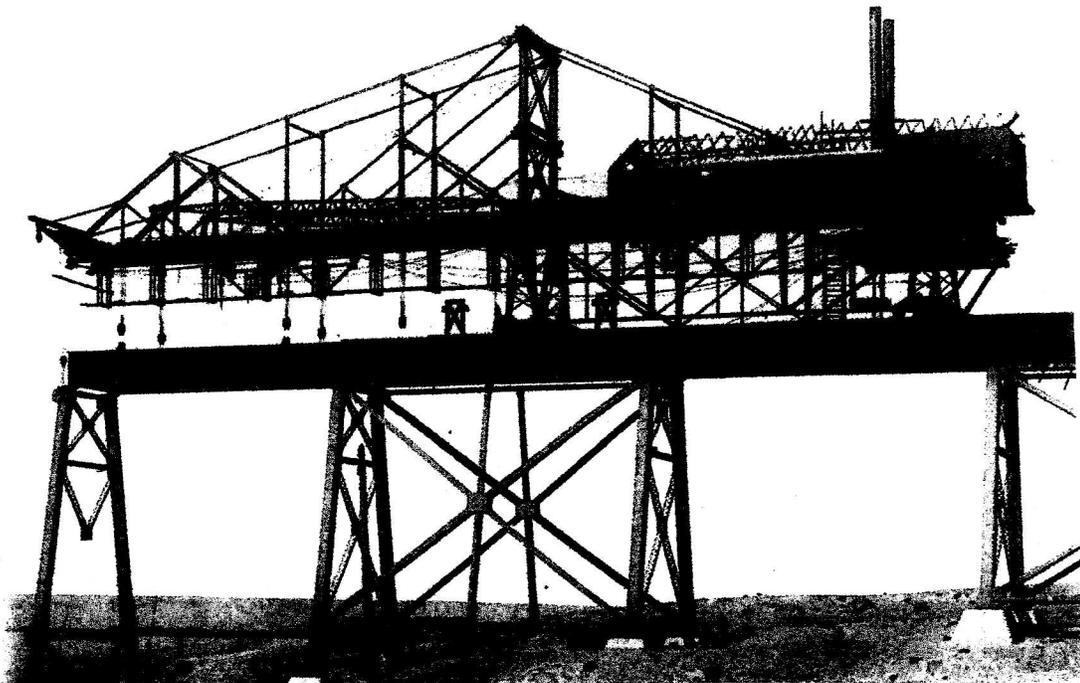


Victoria Bridge  
Montréal -  
original and present

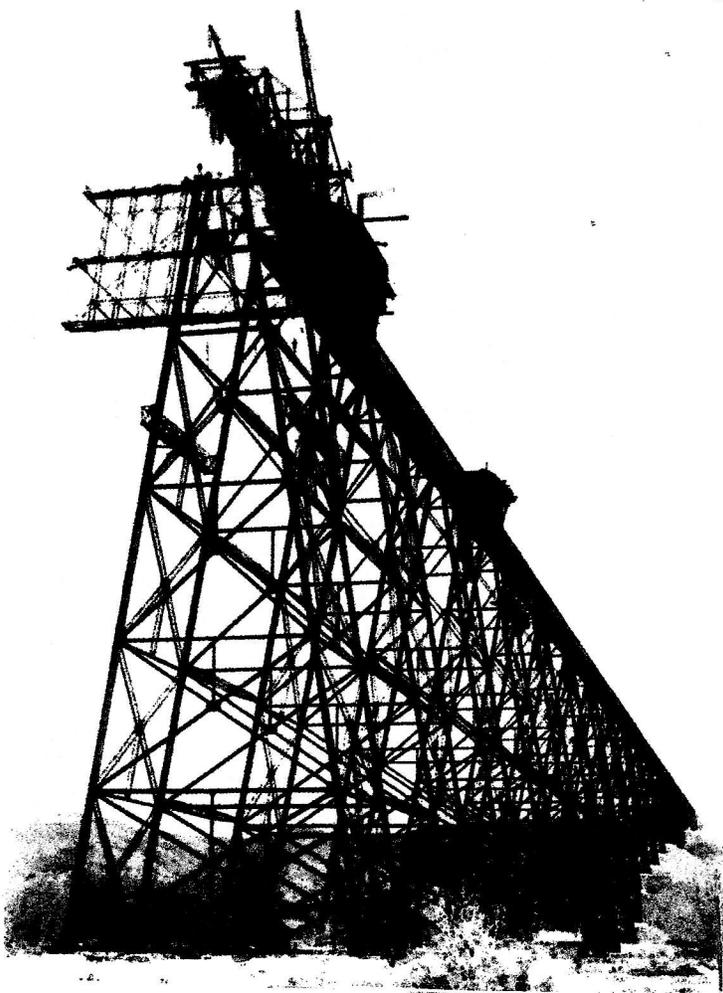


Building the  
Diefenbunker

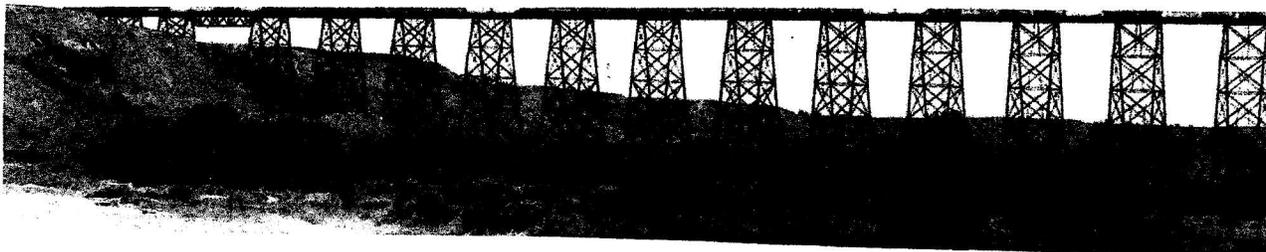




Lethbridge Viaduct -  
under construction



C.N. Monsarrat

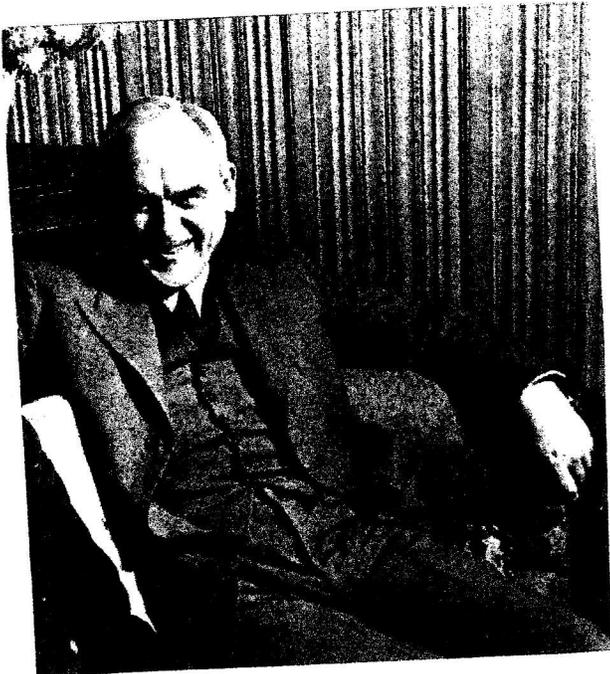




Sandford Fleming



John Kennedy



C.D. Howe



Elsie Gregory MacGill

are eventually plaqued with some ceremony, attract little on-site interest afterwards. And while the engineering sites and events have received fair enough treatment at the hands of the Board, the engineers have been seriously outnumbered by political, social and military people.

Partly as a result of pressure from the chairs of the EIC and the Civil Engineering Society History Committees, the HSMBC commissioned through Parks Canada the Historic Engineering Landmarks Project in late 1994 to help identify significant architectural and engineering structures and facilities that might achieve commemoration in the future. The report was published in July 1997. A 'short list' of 55 landmarks was identified. Both the Institute and the Society participated in consultations that followed publication.

This was actually the second heritage-type collaboration between a federal agency and the Institute that was intended to identify engineering sites for commemoration. The first, the Canadian Engineering Heritage Record, was a joint program in the 1970s involving the Institute and the federal Department of Indian Affairs and Northern Development, then the 'home' of the government's heritage activities. Its objective was to identify and record surviving tangible remains of Canadian engineering achievements and to recommend those that should be preserved. The Institute and its members would be responsible for identifying the artifacts and the Department for the funding and for reviewing the results. A joint committee was struck to manage the project. Work proceeded for a few years and a first report was issued. But a lack of enthusiasm among Institute members, combined with differences of opinion between members of the Committee, the Institute and the Department led to the project being abandoned.

The Canadian Science and Engineering Hall of Fame was established in 1991 by the Canadian Science and Technology Museum in association with the National Research Council, Industry Canada and the Association of Partners in Education to mark the 75<sup>th</sup> anniversary of the founding of NRC. At first, NRC took responsibility for the nomination, selection and induction process for new members of the Hall, but in 1996 the Museum and its Selection Committee took over. However, over the years, the number of scientists inducted has outnumbered the engineers two-to-one and, even among the engineers, the majority have been concerned with research rather than the practice and management of engineering. Among the engineering inductees: Sandford Fleming, Elsie Gregory MacGill, Reginald Fessenden, Jack Hopps, Armand Bombardier and Alphonse Ouimet. 'Honorary engineer' Alexander Graham Bell has also been inducted.

Finally, the Order of Canada - established in 1967 - now has three grades, all of which include (very few) engineers, the dominant groups of inductees coming from sports, the performing and literary arts, voluntary activities, politics and public service. Engineer-Companions in the Order include Alphonse Ouimet, Camille Dagenais, Robert F. Shaw and Robert F. Legget.

The relative lack of formal recognition for engineers by the HSMBC, the CSTM Hall of Fame and the

Order has been attributed in part to the lack of nominees proposed by the profession and its organizations. At the same time, the Hall and the Board, especially, should be concerned about the lack of long-term visibility for their inductees. To be on permanent display as panels within the Museum, for example, is not enough.

### **CSTHA...**

I should mention the Canadian Science and Technology Historical Association (CSTHA) which, since 1981 has held biennial conferences, produced a journal and, unusually, has allowed interested scientists, engineers and technologists to participate in its affairs along with professional historians, museum curators and archivists.

This story begins in 1972 when the Canadian Historical Society held a special session on the history of science in recognition of the recent increase in the numbers of graduate students entering IHPST and a special institute at the Université de Montréal. As a result, a separate Canadian Society for the History and Philosophy of Science (CSHPS) was established, but its focus on international science led to the separate publication in 1974 of two books - edited by members of IHPST - that put emphasis on *Canadian* science and technology. Further discussions among 'Canadianist' members of CHA and CSHPS led to the establishment in 1976 of what became the Canadian Science and Technology Historical Association (CSTHA) and the publication of a quarterly *HSTC Bulletin*. Non-historians were encouraged to support the Society and the *Bulletin*. At this time, and for some years to come, the history of medicine was included in the purview of the CSTHA. After many more discussions, a strongly sponsored and well-attended conference on the history of Canadian science and technology was held at Queen's University in November 1978, and its proceedings published. In June 1980, the *HSTC Bulletin* became the learned journal *Scientia Canadensis*, and the series of biennial conferences began in 1981. Recently, however, interest in the Association has gradually waned, with professors and graduate students in the history of science now dominating the membership and the elected Board's activities becoming more or less invisible. The history of technology is relatively rarely discussed, engineering not at all. The pages of the journal are not open to lay contributors. The number of CSTHA engineer members, once a relatively healthy number, no longer needs a full hand of fingers to be counted.

### **A few conclusions...**

The products of engineering, as well as its practice, have changed more rapidly in the years since World War II than during any other similar period in human history. This makes life more difficult for the historian of engineering, in at least three ways. The first is the increase in the sheer volume of information that needs to be examined. The second is the increase in its complexity. The third is the relevance of the lessons learned from pre-1945 periods for the ones post-1945 - up until now, and into the future, and especially if the pace of change quickens still further.

The American engineer-historian Henry Petroski has written:

...20<sup>th</sup> century engineers pushed the limits of technology to accomplish things that were not even dreamed of in the 19<sup>th</sup> century. And so it will be in the 21<sup>st</sup> century, with the contents of any list of engineering achievements that will be compiled in the late 2090s being virtually impossible today.

Also...

engineering is an integral part of the nation's economic, social and political history and its own history should be examined in these contexts;

individual engineering projects also have their lessons to teach and these should also be studied;

the study of engineering history should lead to better engineering results in the future; it should also lead to improved economic, social and political decisions;

the profession's public contacts should be improved;

it has been my experience that retired engineers are more likely to take an interest in the history of their profession than those who are still actively employed but, unfortunately, the numbers of such retirees doing so are distressingly small;

and great stories of Canadian engineering achievements and of individual and groups of engineers should be told over and over again.

\*\*\*\*\*

### **Acknowledgements**

To the Ottawa Section of IEEE Canada for giving me the opportunity for further 'missionary work,' and especially to Branislav Djokic for making the arrangements and guiding the selection of the topic.

### **Sources**

*From Steam to Space*, Canadian Society for Mechanical Engineering, 1996

Parks Canada: List of designations of National Historic Significance, 2008

Parks Canada: Commonwealth Historic Resource Management Limited/Norman R. Ball & Associates, Historic Engineering Landmarks Project, 1997

Henry Petroski: *Pushing the Limits: New Adventures in Engineering*, Alfred A. Knopf, New York, 2004

J.J. Brown: *Ideas in Exile*, McClelland and Stewart, 1967

Skip Gillman: *The Ships of Collingwood*, Riverbank Traders, 1992

Larry McNally: *Jacks of All Trades*, see CSME *From Steam to Space*

Hugh McQueen: *Quebec Cultural Heritage: St. Lawrence Valley Bridges*, Proceedings, 9<sup>th</sup> International Conference on the Geosciences etc., Laval University, 2008

Fahi Habashi (Ed.): *A History of Metallurgy*, OUP, 1994

Robert Passfield: *Building the Rideau Canal*, Fitzhenry & Whiteside, 2003

John Leslie Charles: *Westward Go Young Man*, privately published, 1978

E.V. Buchanan: *Roses in December*, Galt House, London, Ontario, 1986

John S. Bates: *By the Way: 1888-1983*, Lancelot Press, Hantsport, N.S., 1983

Memorial University of Newfoundland, Faculty of Engineering and Applied Science: *The Petty Harbour Power Station*, 1977, and *The History of the Victoria Power Station*, 1979

Tom Spears: *Ottawa Citizen*, August 1, 2014

Andrew H. Wilson: *Rolt, Petroski and Legget: Engineer-Historians*, Cedargrove Series, #22/2011

Andrew H. Wilson: *Engineering History: Recognize It?*, Cedargrove Series, #20/2012

Wikipedia: IEEE International and History Center, New Jersey; IHPST, University of Toronto

Sources that can be identified from the text have not been included

#### **Photo Credits**

Saddledome: EIC Calgary Branch, 1982

MV *Algowest*: see above, Skip Gillham

de Havilland *Beaver* and Microwave Network Antenna: *Engineering Journal*, Vol. 70, No 3, 1987

Louisbourg, Victoria Bridge and Fleming: Wikipedia

Diefenbunker: Diefenbunker Anniversary Calendar, 1990-2008

Lethbridge Viaduct: *The Lethbridge Viaduct*, Lethbridge Historical Society, 2009

Kennedy: *Transactions*, Canadian Society of Civil Engineers, 1892

Howe: Bothwell and Kilbourn, *C.D. Howe: a biography*, McClelland and Stewart, 1979

MacGill: *Globe & Mail*, June 12, 1978

All other photographs: the Author

\*\*\*\*\*