



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 #62

"Co-Operation in the Service of Engineering: The Case for History and Heritage

by Andrew H. Wilson

(previously produced as Cedargrove Series #36/2015 – May 2015)

EIC HISTORY AND ARCHIVES

© EIC 2017

Abstract

In many ways, engineering's history and its heritage are two sides of the same coin. Indeed, part of one is also, to a degree, part of the other. But they do not always appear to be closely linked. On balance, heritage receives more recognition than history. It is usually more visible. So museum curators may contribute more than historians or archivists. But they both should be placed on a firmer common foundation in the future.

The text of this short paper was originally written in 1998 and deals with the situation at that time. It has been minimally edited and re-ordered. The 'message' - in 2015 - is still essentially the same.

About this 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 became actively interested in the history of engineering on his appointment to chair the first history committee of the Canadian Society for Mechanical Engineering in 1975, has been active ever since in research, writing, lecturing and editing on behalf of that Society, the Engineering Institute of Canada and the Canadian Society of Senior Engineers, and has recently agreed to undertake historical work for the Canadian Academy of Engineering. He has also served as president of CSME and EIC.

Introduction

This paper was originally written in May of 1998 as a memorandum to Dr. John Plant, the executive director of the Engineering Institute of Canada. At the time, I was secretary for EIC History & Archives. I 're-discovered' it in 2014 while reviewing some past correspondence and decided that its content was still relevant and worthy of fuller exposure, with some editing and re-ordering.

To prevent any 'muddying of the chronological waters,' the material in this present paper does not include any updating information on history and heritage activities that have taken place since the writing of the original memo. And in the context of the Engineering Institute of Canada, the discussion of specific history/heritage activities includes only those societies that had become members of the Institute by 1998. There are no illustrations in this paper. It does have an 'off-the-cuff' postscript written from the perspective of 2015.

As it happens, I have no record of Dr. Plant having responded to my memo. If he did so, my apologies for not including his response in this paper.

The Message...

History and heritage are different things, although they can be closely related and overlap with one another, and they both have connections to people and what they have accomplished.

The former, in particular, embraces events, customs, precedents, laws, rules, regulations, and procedures. The recording of history, of events that have already happened, usually involves political, economic, social and technical elements, plus written, systematic, analytical and documented accounts and/or preserved photographic evidence of past events, as well as biographical material pertaining to individuals, such as kings, generals, prime ministers, engineers...and ordinary people. Some artifacts may also be involved.

A people's or a person's heritage, on the other hand, is usually dominated by artifacts, preserved as specific buildings, machines, devices and heirlooms, as well as selected certificates, archival documents, procedures and photographs, plus some written background material.

So while most history has been written down, most heritage is in physical form. But both may have common sources. Also, history can be of wider general interest. Heritage is usually much more specific to a location, group or individual. For both history and heritage, timing - in the past tense - is the common factor. And they are both usually needed to tell a complete story.

Engineering history and heritage are, mostly, about achievements in the production of end products that have been built, with reasonable certainty beforehand, and have performed

satisfactorily over a required period of time. Failures are not unknown, but are not usually preserved as heritage. In some cases, it may still be beneficial to have them recorded as history. Indeed, one American engineer-historian - Henry Petroski - has written at length about failures and their roles in the improvement of future engineering. And in spite of the pride of place given to innovations these days, most engineered products benefit from experience, on what has worked well (or not so well) in the past. Customers/clients/users appreciate certainty, as do stock markets.

I consider engineering to be an *activity* to distinguish it from science and technology, which are bodies of knowledge, each with its separate history and heritage. Again, engineering has a number of sub-activities, including design, production/manufacture, operations, research and development.

In practice, engineering is a collection of disciplines - mechanical, civil, electrical, chemical, systems, computer and so on. So it is important to recognize that certain types of plant, machinery and equipment may incorporate the work of several of these disciplines and several kinds of engineers. The design, construction and operation of hydro plants, for example, involves civil, geotechnical, mechanical as well as electrical engineering. Ships need naval architects, marine, mechanical and electrical engineers. And oil refineries need chemical, metallurgical and mechanical engineers.

The pervasiveness of engineering in the context of history and heritage makes cooperation between the disciplines advisable when attempting to write its history or preserve its artifacts. Again, engineering may be done by individuals or teams of people, usually with help from those with manual rather than professional skills. The pervasiveness factor - that the products of engineering, engineers and their technical colleagues have been all around us for so long - may also impact on the public's perception of the activity and the products. They may simply be taken for granted, and more or less ignored - except when disasters occur.

For its technical progress, engineering is dependent particularly on the physical sciences. So it is important to acknowledge that, from the historical point of view, activities that provide new additions to the stock of engineering knowledge must be added to the experience gained in the design, manufacture and operation of its products.

The history and heritage of engineering are two aspects of the past. The preparation and study of both may also be done at two levels. One - the *macro* level - is as part of the combined (political, economic, social, technical) elements within a nation, or region, and refers particularly to history. The other - the *micro* - is at the purely local and personal levels, with much less relevance for broader economic, political, economic factors.

In engineering, as in other spheres of activity, the writing of its history depends on the existence of books, papers, maps, drawings, photographs, tapes, calculation sheets, videos and other sources, both primary and secondary, and as well nowadays on material posted using electronic media. Its heritage is usually associated with still existing buildings, dams, bridges, power plants

and other constructed works, although these may be 25, 50 or even a 100 years old, as well as machines and devices that have much shorter working lives. It is also associated with statues commemorating people and plaques commemorating both people and events, and with museums and the exhibits and other inventory they collect, display, store, repair, display and generally preserve from destruction.

The 30 years or so - since Canada's Centennial in 1967 - have seen a modest increase in the amount of research, publication and exhibition of the history and heritage of engineering, and an even more modest increase in the public attention paid to it, including by members of the profession themselves. There are now, for example, a few more books and articles available to the reader, as well as a few more national and provincial museums and science centres that attract relatively large numbers of visitors each year, and hundreds of local ones. Yet the attention given to research into the history and heritage of engineering still falls far below that given to political, economic and social history. The media's main interest is still in disasters.

Unfortunately, the drawbacks particular to historical studies involving engineering and the commemoration of engineering achievements have to be noted. One is the apparent reluctance of professional historians, with the possible and occasional exception of economic/business ones, to acknowledge the pervasiveness of engineering and engineers as factors in a country's or a region's development and to concentrate attention on political, economic and social ones. An associated problem is their lack of scientific and technical training. A second is the apparent lack of preserved, original engineering source material of the kind that historians are accustomed to work with, and something that engineers themselves should worry about. The third drawback is the apparently dominant interest of many individual engineers in the future and their reluctance to consider their significant past achievements and their relationships to the achievement of economic, political and social objectives. This may be due in small part to the speed with which the technology of engineering has been changing since World War II in fields such as electronics, to changes in the governance and practices of the profession itself, and to changes in the sourcing of new engineering information that now includes electronic as well as printed ones.

Engineering's visible heritage, on the other hand, can be less easy to ignore - until it is reduced to scrap. It is *there*, large as life, in the open air or in museums collections. But first, someone has to decide to preserve it. And there is a later complication. The titles given to Canada's museums - even the national ones - embrace science and technology and ignore engineering, even although the vast majority of their visible and stored exhibits are of *engineered* products!

Most of the 'conventional' history we learn as youngsters in public and high school may have a lot to do with specific dates, battles and treaties, but may also include some facts and explanations about conditions of life in times past. *Engineering's* heritage, except perhaps when experienced during museum visits, may be of much less concern to educators. The 'history' encountered later in life is often less date-based and more concerned with experiences, facts, and explanations. Of course, what happened quite recently may be called 'history' rather than just yesterday's news. But, generally, as we grow older, we begin to realize that we have participated, as users if not creators, in the making of engineering history or have used engineered 'things'

that may eventually become part of our history and heritage. For example, the kind of automobile my father drove, and the kind my son now drives.

The information available for the study of the history and the heritage of Canadian engineering - although considerably less than that available on the history and heritage of the country's economic, political and social development - is actually quite extensive, but scattered in a wide variety of sources. So, while it may not have been completely ignored, the attention paid to it has. Sometimes the context may not have been obvious. Sometimes the material may have been difficult to identify or to find.

It is difficult, but not impossible to identify more than a very small number of Canadian professional historians whose main interests lie in engineering. Names such as Robert Passfield, Norman Ball and Larry McNally come to mind. Engineer-historians have also been very few in number, the best known among them being the late Robert F. Legget, whose writings have been preserved by Library and Archives Canada and, in academia, John Abrams of Toronto, George Richardson of Queens, Hugh McQueen of Concordia and Fahti Habashi of Université Laval. On the heritage side, it is even more difficult to identify professional museum curators whose special interests are in engineering. Most have formal mandates that encompass only science and technology.

Speaking of Academia, the University of Toronto's Institute for the History and Philosophy of Science and Technology (IHPST) was established in the 1960s by industrial engineering professor, John Abrams. Unhappily, its engineering history output over the years since then has been minimal, and even its technology output scanty. Science history has been the dominant, long-term interest of the professors and students. Undergraduate courses in the history for engineering students in universities do exist, but are small in number. Perhaps the best known were at Toronto and Queens.

At least one doctoral thesis has been turned into a book about the engineering profession. Rodney Millard's thesis, at the University of Western Ontario, became *The Master Spirit of the Age, Canadian engineers and the politics of professionalism 1887-1922*, published by the University of Toronto Press in 1988. Its contents were political/social rather than technical. Of much more technical content have been the published histories of the engineering and applied science faculties at École Polytechnique (Gagnon, 1991) and Queen's (Richardson, 1992).

Beginning in the early 1970s, the Canadian Science and Technology Historical Association (CSTHA) became a forum for the presentation of papers on engineering history by both engineers and historians at its biennial conferences. It also produced a sourcebook for Canadian *science and technology* history, as well as several conference proceedings. But with time, even the 'technology' part of the Association's title seems to have become submerged by the 'science' one, and the engineering history discussions to disappear - as they also did from CSTHA's academic publication *Scientia Canadensis*.

Since its creation in 1919, the main task of the Historic Sites and Monuments Board of Canada

(HSMBC) has been to ensure national commemoration for nominated heritage sites and events and for eminent Canadians who have been dead for at least 25 years. Nominations may be made by organizations and members of the general public. The Board has set out rules and procedures that guide its decision-making. It also prepares and archives written historical material to support its selections. Board members are nominated by the provinces, and are almost always professional historians.

These rules and procedures can present problems for the nomination of *engineering* achievements, including buildings, bridges, dams etc. that have been demolished, and especially for those fields of activity in which generations of mechanical, electrical and other machines, equipment and devices have succeeded one another relatively quickly and the older models have already been consigned to scrap.

The Board's preference lies with sites, events and people with political, economic, social and warlike connections. Available figures from the Board show engineering and engineers appear to have been unfavourably considered. Some time ago I calculated that - up until 1998 - only 17% of the historic sites commemorated by the Board were directly related to engineering, as were only one-quarter of the events of national historic importance, although these percentages would be higher if buildings with no compelling engineering significance were included. However, only 13 out of a total of 557 persons of national historic significance (roughly 2%) were engineers. On the other hand, the engineering profession itself may have been judged reluctant to make nominations.

Similar provincial Boards also exist in Canada, applying their own criteria and making commemoration at both the federal and provincial levels unlikely, since the HSMBC is normally reluctant to recognize a site, event or person already commemorated by a province.

But some relief for living - as well as deceased - engineers can be found in the commemoration procedures of the Canadian Museum of Science and Technology's Science and Engineering Hall of Fame. However, the admissions to date have been small in number and scientist admissions have significantly outnumbered those for engineers, although then two communities are, and have been for some time, roughly equal in numbers. Also, contributions to research, which most engineers don't do, have been the prime factors of recognition for engineers as well as scientists, with the result that outstanding engineers in the development, design, manufacturing, management and other non-research activities of the profession are seldom recognized by the Hall. Also, few lady scientists have been inducted into this Hall and, up until 1998, no lady engineers.

In the case of the Hall, as well as the Board, membership of its selection committees has been accorded principally to history professionals, few if any of whom may have had associations with, or experience in, engineering. Complaints to these committees that engineering and engineers have received less recognition than they deserved have been met by the argument that appropriate nominations from engineering sources has simply not been submitted. The counter complaint from the profession has been that, earlier nominations having been ignored, so why

bother? In the 1990s, apart from some Engineering Institute of Canada initiatives, this seems to have been the case.

Canada's honours system was extended considerably with the introduction of the Order of Canada in 1967. Since then, the induction listings for the Order have included very few engineers. Those with connections to public service, entertainment, sports, writing and education have been dominant. Again the lack of nominations by the profession are the likely cause of this.

The learned societies within the engineering profession in Canada have, in years past, been active in recording the profession's history in their published journals and transactions and in special historical articles. Such material has been of three kinds: that which was published originally as historical (few in number); that which became historical years after publication (much more plentiful); and that which will become historical some years into the future (too early to identify). As noted above, heritage commemorations have been made through the landmarking and plaquing of sites, events and people, an activity in which some of the learned societies within the profession have participated. To date (1998), among the most active have been member societies of the Engineering Institute of Canada (EIC).

On the other hand, the institutes, societies and associations within the engineering profession have frequently and readily honoured many of their members in years past for their distinguished achievements, and continue to do so. As noted above, several have been recognized by the HSMBC and inducted into the Hall of Fame and the Order of Canada. Unfortunately, few of these awards ever come to the attention of the wider public, few are ever mentioned by the media, and few appear in history books or articles.

Regarding the EIC, no definitive history of it has so far been written, although several of its branches (Ottawa, Cornwall and Niagara, for example) have written their histories and occasional articles have been published. In the 1920s, the Institute established a Biographies Committee, but its output was small and its life short. It also published two biographies of engineers (Gzowski and the Shanly brothers) in the 1950s. Material appeared in connection with its Semicentennial in 1937, its Centennial in 1987, and in the *Engineering Journal* until its demise in 1987. A particular part of the Centennial celebrations was the selection of the ten most significant Canadian engineering achievements of the century since 1887, as selected by a specially-appointed representative committee. A commemorative stamp was also issued by Canada Post. Since the birth of the Internet and the Web, additional material has been published through the Institute's website.

In the early 1980s, EIC established a History and Heritage Committee, mainly under the leadership of the Life Members' Organization (LMO), with representatives from all regions of the country. But it met only twice, becoming the victim of the inflation of the time, its effects on travel costs, and lagging enthusiasm among its members for historical research over the longer haul. This Committee did, however, spin off local committees in Montréal and Toronto, again

under the influence of the LMO, which were active for many years, principally in document and heritage artifact preservation work.

EIC has ventured only occasionally into the heritage side of the business. Over the years it has erected few memorials, cairns or commemorative plaques. One of them recognized the building of the Cariboo Road through Central B.C.. A second was erected in B.C., in Vancouver's main railway station, to honour the work of H.J. Cambie in the building of the CPR line through the mountains. In the late 1920s, the Peterborough Branch erected a plaque in memory of R.B. Rogers, the designer and builder of the famous Lift Lock. Yet another was erected by the Institute at the Petty Harbour Power Plant outside St. John's, Newfoundland, in the late 1970s.

Also on the heritage side, the Institute participated with the federal government in an activity intended to build a Canadian Engineering Heritage Record (CEHR) - a program through which engineering artifacts and sites were to be found and identified with a view to preservation and commemoration. The search work was the responsibility of the Institute and its volunteer members. Review and evaluation was the responsibility of the CEHR Committee and appropriate federal departments. This program began quite well, issued one annual report but, unfortunately, ran out of enthusiasts on both sides and was terminated.

The first of the EIC's member societies to establish formal history activities was the Canadian Society for Mechanical Engineering, in late 1975. I was appointed founding chair of the committee, and led the committee again during the 1990s. By this time, it included representatives from across the country. It contributed regular articles and other items to the *CSME Bulletin*, sponsored a Working Paper Series, in which 14 papers had been published by 1998, organized history seminars at the Society's Annual Meetings, made co-operation agreements with non-EIC organizations having similar interests, and took steps to secure as much as possible of the Society's archival material. It also had a landmarking/plaquing program through which it recognized institutions that had served mechanical engineering well in Canada as well as specific engineering achievements.

In 1996, in commemoration of the 25th anniversary of the founding of CSME, a book of essays - *From Steam to Space* - was published, and which I edited. It had two parts, the first of which described historical events in Canadian mechanical engineering, and the second the history and development of the Society. This book was modelled on the earlier commemorative one, edited by Leslie W. Shemilt and published by the Canadian Society for Chemical Engineering in 1991.

In 1982 the Society for Civil Engineering (CSCE) established a National History Committee, which included representatives of the Society's five regions, as well as members with special interests in engineering history. Elements in its program have included: the presentation of papers at the Society's annual, regional and local meetings, and the publication in *The Canadian Civil Engineer* of historical articles. Since 1983, the committee has pursued a vigorous program of commemorative landmarking of civil engineering sites in Canada, sometimes internationally in collaboration with the American Society. It has also taped the experiences of senior civil engineers and preserved the cairns erected by Harry F. McLean, an engineering contractor, at

the sites of some of his major projects. It also established an award (named after the founding chair, W. Gordon Plewes) for contributions to the recording of civil engineering history in Canada and worked towards the preservation of the Society's archives; and the compiling of an inventory of historic civil engineering works. The Society's own history, *A Civil Society: A Brief Personal History of the Canadian Society for Civil Engineering*, was written and published by Peter R. Hart.

In 1982, members of the Canadian Geotechnical Society (CGS - an EIC society) conceived the idea of recording the development of geotechnical engineering in Canada. An editorial committee was set up and a series of 88 interviews tape-recorded and transcribed. However, the project faded and was abandoned. An attempt to revive it in 1992 also failed. However, in September 1995, with the 50th anniversary of the first Canadian Geotechnical Conference only two years away, the Vancouver Branch of the Society undertook to revive the project. The CGS Board concurred. The result has been that, edited by Cyril E. Leonoff, Volume 15, Number 4 of the *Geotechnical News*, published in October 1997, became the permanent record of geotechnical engineering and its history in this country, including the history of the Society itself.

The Canadian Society for Electrical Engineering was established in 1976 as an EIC member society. In 1990 it changed its name to include Computer Engineering, becoming CSECE. In 1994, after extended talks lasting several years, CSECE merged with IEEE Region 7 to form IEEE Canada, retaining its membership in EIC. However, in 1985, before the merger, a history book, *Electricity: The Magic Medium*, was published by IEEE Region 7 to commemorate the Centennial of the founding of IEEE. Edited by W. Harry Prevey, its principal contents were essays on the development of electrical engineering in Canada, professional education, and the history of the Canadian Region.

In 1991 the Council of the Institute agreed that there should be a Secretary for Public Awareness, History and Archives with a mandate to devise means for increasing the public's awareness of the contributions of engineering and engineers to Canada's development. I was appointed to this position, and retained it beyond 1998. The work involved, principally, research and writing with regard to the 'old' CSCE (1887-1918) and the Institute, preserving as much as possible of the remaining archival material associated with the Institute's activities over the years and across the country, and searching for new public awareness techniques. However, by 1994 it had become obvious that, without considerably more EIC and other resources, the public awareness part of the mandate was only marginally useful and it was dropped. At the same time, the Secretary's responsibilities for history were given a broader focus to include the work of Canadian engineers, generally, at home and abroad. In 1995, the Council agreed that a series of Working Papers should be written by a variety of authors on historical subjects related to engineering, modelled on the series already begun by the CSME History Committee, and this was done. Seven such papers were published by 1998. By the mid-1990s, work was well under way to secure the collection and safe-keeping of the Institute's surviving archives.

Between 1991 and 1995 the Secretary worked essentially alone, but with the support of the EIC

Life Members' Organization, the extant History Committees of the member societies, and similar interested organizations in the field, with whose activities he was familiar. However, one of the drawbacks was that the EIC and the Secretary lacked an appropriate mechanism for making nominations to the HSMBC and for induction into the Hall of Fame and the Order of Canada. This need became startlingly evident after the chairs of the history committees of the CSCE (Crysler) and CSME (Wilson) attended the 75th Anniversary Seminar of the HSMBC in late 1994. So an advisory committee to the Secretary was established by the Institute to make these nominations. By 1998, it included representatives of EIC and its civil, mechanical, electrical, geotechnical and chemical engineering societies plus - in order to complete the coverage of the engineering disciplines more effectively - CIMM and the Canadian Academy of Engineering. In addition to providing nominations, some of which were successful, this committee assisted the HSMBC with its Historic Engineering Landmarks Project (1994-1997), which was done by consultants and was designed to bring to light the kinds of sites and events that the earlier CEHR, as well as the Board, had failed to do.

Beginning in the 1960s, the Canadian Military Engineers' Association and the Military Engineering Institute of Canada published the first three volumes of a history of the Corps of Royal Canadian Engineers and the Canadian Military Engineers. In 1997, a volume commemorating the 50th Anniversary of the formation of the Royal Canadian Electrical and Mechanical Engineers was published.

The Canadian Academy of Engineering was founded in 1987 during the Centennial of Engineering in Canada as a 'learned' rather than a 'professional' society. Unsuccessful attempts were made during the 1990s to establish a History & Archives Committee within its membership.

Neither of the national professional engineering associations - the Canadian Council of Professional Engineers and the Association of Consulting Engineers of Canada (as they then were) - were active 'historically' during the 1990s. However, the professional association in Québec published *Le Génie Québécois*, written by Georges-Hébert Germain in 1996.

Whereas professional economists may choose to ignore engineering's contributions to economies in favour of those by politicians, industry/business leaders, financiers and others, professional museum (and science centre) curators may not since the majority of the artifacts they collect or reconstruct or simply save for their institutions have been *engineered* to a significant degree. While few of the curators are trained engineers, the quality of their judgement is closely associated with heritage and historical significance of engineering and their role in promoting both is crucial since they (almost certainly) have neither the budget nor the space to accept every artefact they are offered. Some museums, and especially the larger ones, do have research staffs, whose main task is to research and publish information on their respective collections or on specific areas of engineering, science and technology. Not all of these efforts receive the public exposure they should enjoy. The question has already been put: why, if its exhibits are principally engineered, is it that the national museum in Ottawa is called the Canadian Science and Technology Museum? Why no *Engineering* in the title? Putting it there would do much to

emphasise the importance of engineering for Canada's history and heritage.

This pervasiveness of engineering in the context of history and heritage makes cooperation between them advisable when attempting to tell the history of engineering in Canada or to preserve artifacts that illustrate the development of the nation's heritage. Again, engineering may be done by individuals or by small or large groups of them, with or without appropriate help from those with manual rather than professional skills. And of course, a country's history and heritage will have regional and local elements, some of which are also of national importance.

Postscript...

from the perspective of 2015...and applicable to Canada...

History and heritage activities are mutually reinforcing and should both be encouraged.

Even although engineering history has been written up, there's still plenty more to research and write about, especially regarding recent years. There's much more heritage worth preserving.

Engineering history material, while widely available, is not widely enough read. Its heritage, again while widely visible, is not 'seen' as much as it should be.

Both its history and its heritage should no longer be ignored by political and media people. and professional historians need to study engineering achievements more frequently and more deeply as parts of their normal research. Engineering history and heritage should be considered as essential parts of 'macro' as well as 'micro' historical analyses. The media are attracted by engineering disasters. They should stop ignoring engineering achievements.

Engineering companies, government agencies, learned societies and associations need to take a greater, more active interest in their history and heritage. Engineers, themselves, need to take a lot more interest, too,

More Canadian engineers deserve national recognition for their achievements.

Professional historians with an interest in engineering history, as well as engineer-historians, need to multiply in numbers.

Let's get 'Engineering' into the titles of more museums.

If historians, economists, politicians and the media don't or can't understand the importance of engineering, then engineers should enlighten them. The same goes for the more general public.
