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"British Knights of Engineering"

by Andrew H. Wilson
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EIC HISTORY AND ARCHIVES

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Abstract

This paper was originally presented as a talk by the author at a luncheon meeting of the Ottawa Branch of the Canadian Society for Senior Engineers on 20 May 2013. It has since been lightly edited for publication and a few photographs added.

For most of the past 200 years, engineers in Britain have been receiving the accolade of knighthood and other national awards for their services to the nation and the profession. This paper discusses the careers of six of them and draws attention briefly to several more who have been so honoured. Until 1919, Canadian engineers were eligible to receive knighthoods from the British Sovereign, and around a dozen did.

About the Series

Principally, the Cedargrove Series is intended to preserve the research, writing and oral presentations that the author has completed over the past half-century or so but has not yet published. It is, therefore, the 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 over 25 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 and has been active ever since in research, writing and editing historical material on behalf of that Society, the Engineering Institute of Canada and the Canadian Society for Senior Engineers. He has also served as president of CSME and EIC.

Introduction

Ten years ago I published a paper on Canadian engineers who had received the accolade of knighthood from British Sovereigns, mostly prior to the passage through the House of Commons of a Resolution sponsored by Bolger Nickle, M.P. in 1919 that asked Britain not to give peerages or knighthoods to Canadians living in Canada. I will mention these knights later in this talk. No Canadian engineer has been raised to the peerage.

The theme of this present paper is the identification of some of the British engineers who have received the accolade, and includes a few who became peers. But first, a brief word on the British honours system. I stress 'brief' because this paper is not about peerages or knighthoods as such, but about engineers who received them.

The British Honours System

The peerage in Britain has five levels of 'pecking order': Duke; Marquess; Earl; Viscount; and Baron. Up until 1958, all of these titles were hereditary, with the eldest male child as the heritor in most cases. However, that year the baronial rank of 'Life Peer' - available to both men and women, but with no hereditary component - was instituted. In 1963, the Peerages Act allowed peeresses in their own right to sit in the House of Lords as well as the 'disclaiming' of hereditary titles, the best-known example of which, perhaps, has been Tony Benn, who refused to become Viscount Stansgate when his elder brother died.

In Britain, the title of 'Baron' is not used and those holding it are called 'Lords' - as in Lord Strathcona or Lord Beaverbrook. However, Baronesses of the 'Life' variety tend to use it as well as using the 'Lady' title - for example, Baroness James of Holland Park, otherwise known as author P.D. James or Lady James. And, as those of us who have watched *Downton Abbey* know, the daughters (and sons) of senior members of the peerage have courtesy titles, composed of their Christian and family names - as in Lady Mary Crawley.

Under the British system, certain judges are titled as Lords, but are not normally peers. On the other hand, archbishops and bishops of the Church of England may sit in the House of Lords.

The title of Baronet is hereditary and is awarded by the Crown. It is effectively the sixth level of peerage. The recipient does not receive an accolade, although he is styled 'Sir' like a knight. Baronetcies have existed since the 1300s. The early ones could be bought. This led in the 17th century, for example, to the creation of a group known as the Baronets of Scotland and Nova Scotia. Since 1965, only one new Baronet has been created - Sir Dennis Thatcher, who died in 2003. His son is now Sir Mark.

Although non-hereditary, current British knighthoods also have a 'pecking order.' Originally

Orders of Chivalry, they now recognize services to the Crown and to society, as well as international and intellectual achievements, military service, theatrical and sporting eminence and so on. New ones are usually awarded twice a year - at New Year and on the Sovereign's official birthday - as well as on the dissolution of a Parliament.

The most senior is the Order of the Garter, established in the 14th century, which has limited membership and is awarded by the Sovereign, personally. Next comes the Order of the Thistle, which is also limited. It was established in the 17th century and has a special connection to Scotland. In recent years, both Orders have admitted women members.

There was once a third member of this group, the Order of St. Patrick, connected to Ireland, but it has been discontinued.

Next comes the Order of the Bath - established early in the 18th century. It has three levels, two of which - the Knight Grand Cross (GCB) and Knight Commander (KCB) - are knighthoods. The third, Companion (CB), is not. This Order has military and civil divisions.

The Order of St. Michael and St. George followed in the early 19th century and is awarded principally to diplomats, members of the Colonial Service, and to citizens of the Empire/Commonwealth. Again, there are three levels: Knight Grand Cross (GCMG), Knight Commander (KCMG) and Companion (CMG).

The Royal Victorian Order was established in 1896 by Queen Victoria to recognize, in particular, services to the Crown. It has five levels, two of which are knighthoods (GCVO and KCVO) and three that are not.

The Order of the British Empire dates from 1917. It also has five levels, of which two are knighthoods (GBE and KBE) and three are not. It recognizes both military and civilian services. This Order admits lady "knights," who become Dames Commander (DBE). There is also a more junior British Empire Medal (BEM).

Two Orders at this level are now dormant: the Order of the Star of India and the Order of the Indian Empire.

The most junior, and the most populated level of knighthood, is the Knight Bachelor (Kt). Historically, it is the oldest form of British knighthood, having been awarded since the 11th century. Knights bachelor receive the accolade and a badge, and may put 'Kt.' after their names. Nowadays, they cover all kinds of achievements and services and are quite often also holders of earlier junior awards in the Orders of the Bath, St. Michael and St. George and the British Empire.

The Distinguished Service Order (DSO) was established in 1889 to recognize military bravery, and is not a knighthood. Neither are the Order of Merit (1902) nor the Companion of Honour

(1917). The former is awarded by the Sovereign for services to the Crown, the latter for services to the arts, sciences, industry and religion. It has also been called 'the poor man's knighthood.' The Imperial Service Order has, since 1902, recognized faithful service to the Crown through public service.

The 19th Century

Now to the British engineering knights, baronets.....and peers.....of the 19th and 20th centuries. There have been so many of them - over a hundred at any one recent point in time - that I will summarize the careers of only a handful, but will list a larger number of others, and will mention in passing some well-known and distinguished engineers who have *not* become known as 'Sirs.'

For example, well-known British engineers whose careers were principally in the late 18th and early 19th centuries and who were not among those receiving knighthoods or baronetcies include: Joseph Bramah, Henry Maudslay, James Nasmyth, John Rennie the Elder, George Stephenson, Thomas Telford and James Watt.

Three of the eminent British engineers who *were* honoured later in the 19th century included Joseph Whitworth, Joseph Bazalgette and Thomas Bouch.

Whitworth has been called by a biographer "the world's best mecanician." He received a baronetcy in 1869. Born in Stockport, Lancashire, in December 1803, the elder son of Charles Whitworth, a cottonmill worker and later a Congregational minister who abandoned his family after the death of his wife several years later. Joseph was 'fostered' at the age of 12 and for the next five years. By then he had acquired an interest in machinery and machine tools, largely from reading. He found a job in Manchester as an apprentice and served three companies in this capacity. Time-served, competent and confident, he then went to London where he found employment with Henry Maudslay, who already had a great reputation for his mechanical engineering ability and leadership. Under him, Whitworth acquired great personal skills as a mechanic and machine designer. But ever a seeker after new work experience, he changed companies twice more before he left London in 1833 to return to Manchester to start his own business.

Both Whitworth and his factory, the Chorlton Street Works, became world famous for the quality, accuracy and general standards of workmanship put into the lathes, milling, boring, screw-making and other machine tools that were their principal products. Whitworth popularized the method of producing accurate flat surfaces which led to the development of more precise instruments. He devised the standard system for screw threads that bears his name, which later became the first internationally-recognized British Standard thread. He was asked to develop a replacement for the Enfield rifle currently in use in the British Army, which he did, but it was adopted by the French Army and not the British. He also designed a large rifled breech-loading artillery piece that fired a 12 pound spirally-grooved projectile a distance of six miles. This,

again, was rejected by the British Army but was used during the American Civil War. He patented a process for casting steel under pressure and built a new plant near Manchester to make it. Whitworth's strongest competitor, especially in the military equipment, was Sir William Armstrong's company. After Whitworth's death, their two companies were merged.

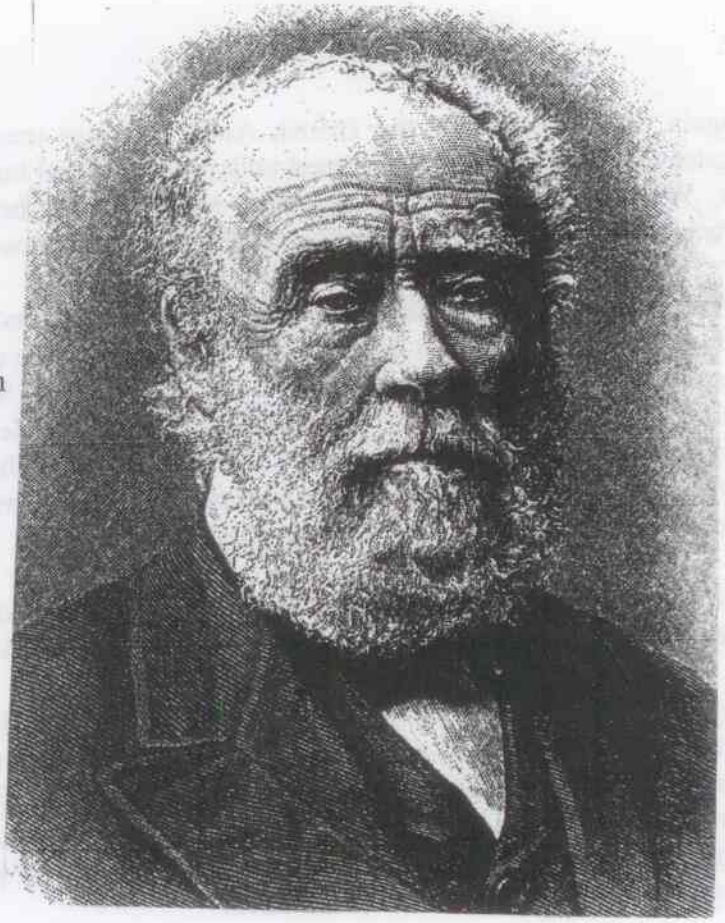
Whitworth travelled widely. For example, he toured, and reported on, American industrial sites. He took a prominent part in the affairs of the Institution of Mechanical Engineers, serving a term as president. He was elected to fellowship in the Royal Society of London. He was prominent in the promotion and support of technical education. He supported the Mechanics Institute in Manchester (which later became UMIST). In 1868 he founded the Whitworth Scholarship, which helped generations of British mechanical engineers complete their education. And he took an interest in hospitals and medical charities.

Sir Joseph Whitworth died at Monte Carlo, while abroad seeking better health, in 1887. Having no male heirs, the baronetcy died with his widow, Lady Mary, in 1896.

By the middle of the 19th century, the River Thames flowing through the English capital city was an open sewer and a dangerous health hazard to the people who lived there. The man who changed this was Joseph Bazalgette, one of the first public health engineers. Born in 1819, of French descent like his friend I.K. Brunel, he was the son of a naval officer. He learned his civil engineering in railways, land drainage and reclamation under Sir John MacNeill and set up his own practice in Central London in 1842.

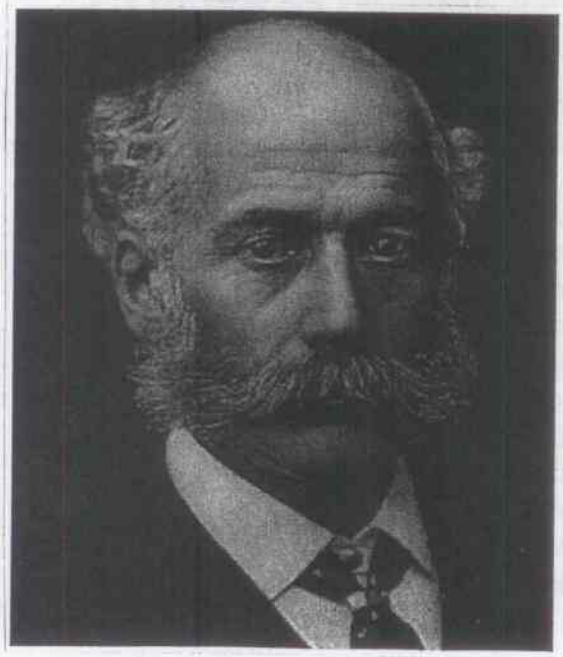
By 1848, as London's sanitary waste system was breaking down with the explosion of the city's population, as well as with the rash of newly-installed water closets, the Metropolitan Commission on Sewers ordered cesspits closed and house drains connected to open sewers that emptied into the Thames. The pollution of the river worsened dramatically and gave rise to a cholera epidemic that killed over 14,000 people in 1849, the year Bazalgette was appointed assistant surveyor to the Commission. He became chief engineer in 1852 and retained this position when the Commission became the Board of Works. However, there was a second epidemic in 1853 that killed 11,000. And 1858 became known as 'the year of the Great Stink.'

Although the theory that cholera was spread by contaminated water was not generally accepted at the time, Bazalgette's proposal to revolutionize the sewer system using enclosed sewers to remove the smell and reduce cholera was accepted. Its colossal expense was supported by Parliament. He proposed to construct hundreds of miles of underground main sewers of brick to intercept sewage outflows, as well as about the same length of street sewers to intercept raw sewage. The outflows were then to be diverted downstream of the city and dumped, with the aid of pumping stations but still untreated, into the river. Only decades later were sewage treatment facilities added to the system. It was built under Bazalgette's supervision, opened in 1865, and completed in 1875. The stink disappeared, and cholera was virtually eliminated. The most identifiable part of the system within the city was the Victoria Embankment, from Chelsea to Blackfriars. Bazalgette's foresight in its design has been evident right up to the present time.



Sir Joseph Whitworth

Sir Joseph Bazalgette



Sir Thomas Bouch

In addition to this massive project, over his career Bazalgette was involved in several others of significance in England and abroad - for example, the Broadway Bridge over the Medway at Maidstone. He also redesigned and rebuilt London's Battersea, Hammersmith and Putney Bridges. As a younger man, Bazalgette was awarded a CB. He was knighted in 1874, retired in 1889 - still chief engineer of the Water Board - and died two years later.

The third 19th century British engineer included in this section of the paper is Thomas Bouch. He became known famously for the design and construction of Scotland's first Tay Bridge, for which he was knighted in June 1879 by Queen Victoria, who had just crossed the bridge, and infamously for the same bridge after part of it collapsed in a storm in December, with the loss of 75 lives. Six months later, and after the disaster enquiry had reported, he lost his employment with the North British Railway Company. He died in October 1880.

Born in 1822 near Carlisle in northwest England, the son of a sea captain, Bouch spent much of his life in Scotland, and in the railway engineering business. After his father died in 1838, and an abortive attempt at a mechanical engineering apprenticeship in Liverpool, he began railway work, surveying routes in Lancashire and the Lake District and, later, in Yorkshire. At the age of 26 he was appointed engineer and manager for the Edinburgh & Northern Railway, which crossed the Forth and Tay estuaries by ferries. For these, he enhanced his reputation by designing the world's first roll-on-roll-off rail ferries.

In 1851, Bouch left the company and established himself as a consultant. From his Edinburgh office, and using engineering, mathematical and economic know-how he acquired from colleagues Edward Sang and Robert Bow, he developed elegantly simple and economical plans for a whole series of railways and branch lines in Scotland and northern England, including some remarkable bridges. For example, he helped extend the famous Stockton and Darlington Railway across the Pennine chain of mountains. One of his lines included the highest viaduct of the time in England, and opened in 1857.

While his colleague and competitor, Robert Stephenson, had made solidity a watchword in his bridge construction - for example, in the Britannia Bridge in Wales and the first Victoria Bridge at Montréal - Bouch sought the same end result with greater lightness and economy. In 1870, he was given the opportunity to design a bridge for the River Tay, which would replace the train ferry and would have a high central girder section to allow for clear navigation below. However, some last-minute changes were required when the river bed was found to be unexpectedly gravelly. At first, these changes to the two-mile-long, single track bridge appeared successful, although a 25-mph speed limit was imposed on the trains, after an inspection. It was formally opened in May 1878. The *Times* of London commented that "as a triumph of engineering skill and well-directed energy and perseverance, it was worthy of, as indeed it has already attracted, very general attention." However, while train passengers appeared to marvel at the bridge's slender lines, locomotive people began to note that it swayed alarmingly on occasions. An inspection also found some loose ties.

Meanwhile, Thomas Bouch was in the planning stage of an even more ambitious project - for a

suspension bridge across the Firth of Forth, to replace yet another train ferry. Then came the December 1879 disaster, when the Tay Bridge's high girders collapsed. The subsequent inquiry blamed Bouch for inadequately designing the structure, and especially for underestimating potential wind loads. More recently, other theories about the bridge's collapse have emerged, as they have done for other disasters, but these have not seriously upset the idea that the bridge design was basically flawed. As we know, a second Tay Bridge was built right next to the first one, to a more substantial design, and with double-track capacity.

Other engineers who received knighthoods, baronetcies or peerages during the mid-to-late years of the 19th century included:

William Armstrong (1810-1900); articled as a solicitor but became a businessman/engineer; invented/developed hydraulic machinery and manufactured it in his own firm, W.G Armstrong & Company; moved into armaments and warships; semi-retired after 1863; CB 1859, Kt 1859, raised to the peerage as Baron Armstrong 1887;

Benjamin Baker (1840-1907); known principally for his participation in the design and construction of the Forth Bridge; KCMG in 1890 and KCB in 1902;

Henry Bessemer (1813-1898); developer of a process for the manufacture of steel; Kt in 1879;

William Fairbairn (1789-1874); railway and locomotive builder and shipbuilder; Baronet 1869;

John Fowler (1817-1898); railway engineer who was also a bridge-building partner of Benjamin Baker; KCMG in 1885, Baronet 1890;

Charles Parsons (1854-1931); youngest son of the 3rd Earl of Rosse; university mathematics graduate as well as apprentice with W.G. Armstrong & Company; developer of the revolutionary steam turbine and founder of a company making turbo-generators; KCB 1911, Order of Merit 1927;

John Rennie the Younger (1794-1874); second son of John Rennie the Elder, civil engineer, principally associated with bridges and naval facilities; retired 1862; Kt 1831;

William Siemens (1823-1883); born and educated in Germany, became naturalized British subject in 1859; associated principally with developments in electricity and steelmaking; Kt 1883;

William Thompson (1824-1907); Irish-born, trained in physics, to which he contributed significantly (and held the Glasgow University chair); contributed significantly also to electrical engineering and to the manufacture of electrical products; Kt 1866, raised to the peerage as Baron Kelvin of Largs 1892, GCVO 1896, Order of Merit 1902, one of seven inaugural inductees into the Scottish Engineering Hall of Fame.

One of those *not* knighted in the mid-to-late-19th century was I.K. Brunel, the son of the engineering knight, Sir Marc. The reason for this *may* have been Brunel's early death in 1859 at the age of 53. Another was Robert Stephenson, son of George, who also died relatively young, also in 1859, at the age of 56.

The 20th Century

During this century, these three eminent British engineers were among the many who were knighted. However, each one also had something unusual about their circumstances or careers.

The first of them was born in Newcastle-upon-Tyne in 1895, in England. But Ove Arup, the son of the Danish Consul, was technically Danish, not British. He was educated in Germany and Denmark. His first university degree was in mathematics and philosophy, from the University of Copenhagen, which helps explain the philosophical and mathematical expertise he later applied to many of his projects. He then thought of becoming an architect, which helps explain his lifelong interest and activity associated with this field, but decided he would make a better engineer. So he proceeded to study at, and graduate from, the Royal Technical College in Copenhagen. He then joined a Danish firm of civil engineers in their Hamburg office but, in 1923, moved to London - where he lived for the rest of his life - and where he became the chief designer. One of Ove's special projects during this time was the innovative Highpoint 1 apartment block in Highgate Village in London.

In 1938, Ove and a cousin established themselves as engineering consultants, whose projects were principally concerned with the 'marriage' of structural engineering and architecture. By 1946, Ove was the sole principal of the firm. In 1949 he, with three others, formed Ove Arup and Partners. While the name of the firm and of the individual partners changed over the years that followed, it grew significantly, expanded internationally and subsidiaries were formed. By 1965, for example, the firm had 500 permanent staff members and, by 1986, 3,000, Permeating all this growth and activity within the firm was Ove's ability to inspire those who worked for it.

The firm consulted principally in structural engineering and, within this field, developed special expertise in the design of shell structures. Its projects ranged from Coventry Cathedral, to the Bank of England Printing Works, the Trades Union Congress Memorial Building, bridges at Runnymede in Berkshire, Kylesku in Sutherland, Sapele in Nigeria, the Kingsgate Footbridge at Durham in England, the Georges Pompidou Building in Paris and, from 1957 until it was opened in 1973, the controversial, difficult but spectacular Sydney Opera House on Bennelong Point. On the (much) less spectacular side, Ove was also associated with the development of the notorious 'pre-fab' housing that appeared all over Britain in the immediate post-war years.

Ove wrote and lectured a great deal about his work and his attitude to it, and about his firm. He was honoured many times during his life. For example, he won the Gold Medals of the Institution of Structural Engineers and the Royal Institute of British Architects, was awarded a

CBE in 1953, and became a Knight Bachelor in 1971. (I.Struct.E. Gold Medals went to several of his partners and at least one was also knighted.) He held several fellowships, received a number of honorary degrees, and his achievements were recognized by Denmark. He was 'semi-retired' for several years before he died in 1988.

Another British engineer who also died "heavy with honours," as they say, was Christopher Hinton. Born in Wiltshire in 1901, the son of a schoolmaster, he spent what he called "six wearisome years" as an apprentice at the Great Western Railway's Swindon Works. At their conclusion, he was awarded a W.H. Allen Grant by the Institution of Mechanical Engineers and proceeded to the University of Cambridge and to a first class degree in mechanical sciences in 1926.

Hinton then joined the Brunner Mond Company, which became the Alkali Division of Imperial Chemical Industries, and of which he became chief engineer at the age of 29, influencing its progress in mechanical handling and process plant reconstruction. In 1940 he was seconded to the Ministry of Supply and in 1941 was appointed deputy director-general of the Royal Filling Factory Organization, overseeing nine plants and some 25,000 workers. When the War ended, he became head of the Atomic Energy Authority's production base at Risley and, by 1954, was the member for engineering of the U.K. Atomic Energy Authority. In effect, he helped build an entirely new industry. He oversaw, for example, the construction of the diffusion plant at Capenhurst, the first British nuclear power plant to provide electricity to the grid, at Calder Hall, and the breeder reactor at Dounreay. In 1957, Hinton was appointed chairman of the new Central Electricity Generating Board and managed its development as a mixture of coal, oil and nuclear power stations. He also played a part in the establishment of the new electrical 'supergrid' which included minimizing its environmental impact. He retired as CEA chairman in 1964, but continued to be associated with national and international energy agencies.

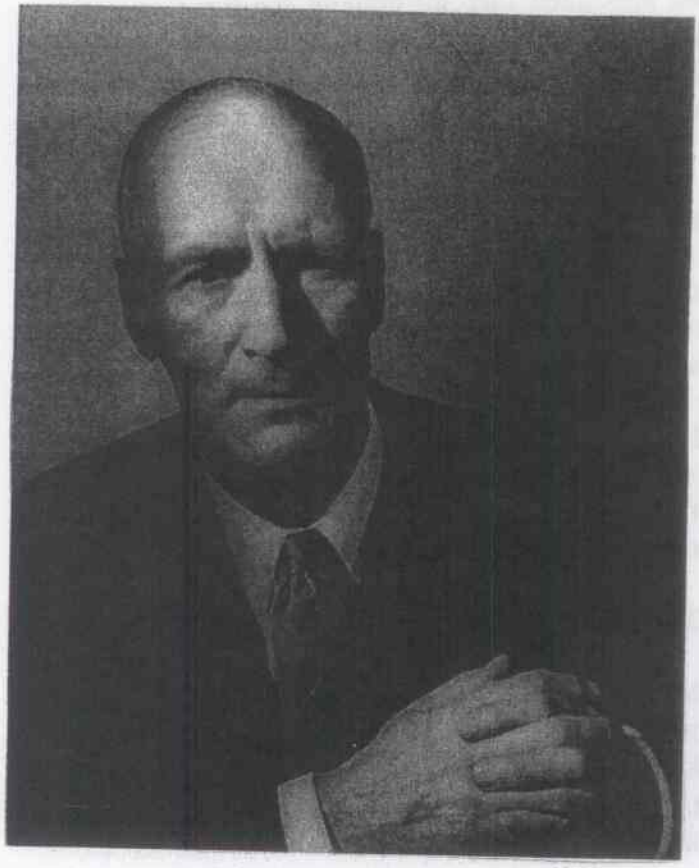
Christopher Hinton was made a Knight Bachelor in 1951 and a KBE in 1957. In 1965 he became a life peer, as Baron Hinton of Bankside, and was active politically as a member of the House of Lords. In 1976 he was appointed to the Order of Merit.

In 1954 Hinton was elected to the Royal Society of London. In 1966 he was president of the Institution of Mechanical Engineers and won its highest award, the James Watt International Medal. In 1976, He was elected president of the Council of Engineering Institutions and the newly-formed Fellowship of Engineering (now the Royal Academy). He was also the first chancellor of the University of Bath and received honorary degrees from a number of academic institutions. Lord Hinton was one of two international keynote speakers at the 1967 Centennial Conference of Engineers in Montréal, in which the profession as a whole participated.

The third of the 20th century engineer-knights whose careers I want to summarize is James Arnot Hamilton.

Scottish-born in 1923, Hamilton received a wartime degree in civil engineering from the University of Edinburgh in 1943. Because of his high standing in the class, he was not

Sir Ove Arup



Lord Hinton

(formerly Sir Christopher)

Sir James Hamilton

conscripted into the armed services but was sent by the government to do research in anti-submarine weapons at a shipyard on Scotland's west coast. From this work, he was transferred to the Marine Aircraft Experimental Establishment to do seaplane testing, first at the same location and later at Felixtowe, in Suffolk, on England's North Sea coast, where he became head of flight research. One aircraft type he had a great deal to do with was the *Sunderland*, then and for some years after the War, the work-horse of RAF Coastal Command.

Hamilton remained at Felixtowe as head of flight research until 1952, when he was appointed a project director at the Royal Aeronautical Establishment at Farnborough. In 1964 he was appointed to head the Projects Division and the following year, the director of the Anglo-French *Jaguar* fighter aircraft project at the Ministry of Aviation. The success of this joint effort led to another - the *Concorde*. In 1966 Hamilton was appointed director-general for the *Concorde* project at the Ministry of Technology, a position that made use of his special knowledge and experience of the complexities of wing design which, in the *Concorde's* case, has been described as a "hugely advanced piece of aeronautical engineering." To the project as a whole, Hamilton added his calm style of management.

Hamilton changed careers, however, before this aircraft's maiden flight, becoming in 1971 one of Whitehall's senior civil servants, as deputy secretary (effectively, assistant deputy minister) for aerospace in the Department of Trade and Industry. From 1973 until 1976 he was - unusually for an engineer - the deputy secretary to the Cabinet, under Prime Ministers Heath and Wilson. From 1976 and until 1983, when he retired, he was permanent head (deputy minister) of the Department of Education and Science, serving under P.M.'s Callaghan and Thatcher. He then joined the boards of engineering companies and served on academic and other councils, as well as authoring special reports on engineering and education. He received two honorary doctorates, was elected to fellowship in the Royal Society of Edinburgh, the Royal Academy of Engineering, the Royal Aeronautical Society, and the Institution of Mechanical Engineers.

Hamilton became an MBE in 1952, a CB in 1972 and a KCB in 1978.

The unusual thing about Hamilton - apart from his professional record - is that, for four years in the mid-1930s, we were students at the same Scottish school - although he was a few years ahead of me - and our homes were 50 yards apart on the same street. Also, in 1950, during my service in the RAF, I paid an official visit to him at Felixtowe. At that time, we were both in the seaplane business. Sir James died in May 2012 at the age of 89.

During the 20th century, the following have been among the British engineers who have received the accolade or become baronets or peers:

John Browne (born 1948); originally a physicist, with a master's degree in business; joined BP in 1966 as an apprentice and remained with the company until his retirement as chief executive in 2007; became president of the Royal Academy of Engineering in 2006; Kt in 1998, raised to the peerage in 2001 as Baron Browne of Madingley;

Sydney Camm (1893-1966); aeronautical engineer who began as a carpenter's apprentice; joined the Hawker Aircraft Company in 1923 as draftsman and became chief designer in 1925; was responsible for World War II's Hawker *Hurricane, Typhoon* and *Tempest* aircraft; CBE 1941, and Kt in 1953;

(R.J. Mitchell, who began as an engineering apprentice building locomotives and learned his theory at night school, designed Britain's *other* leading World War II fighter, the Supermarine *Spitfire*. He was born two years after Camm, but died in 1937 at the age of 42, while the prototype of his aircraft was still being tested. Had he lived, he too might have been knighted.)

Harold Roxbee Cox (1902-1997), aeronautical engineer who began his career with the airship R.101 project and later served in senior positions with British industry. He became a Kt in 1953 and was granted a life peerage, as Baron Kings Norton, in 1965;

Alexander Gibb (1872-1958); Scottish-born civil engineer who joined his father's company and became managing partner in 1900; active during World War I in building dockyards and ports; civil-engineer-in-chief to the Admiralty in 1918, after which he formed his own consulting company which specialized in hydro-electric projects; Kt 1918;

Lord Dudley Gordon (1883-1972); second son of the Marquess of Aberdeen, with courtesy title; began engineering training at the Hall, Russell shipyard, with evening classes at Robert Gordon's College; specialist in refrigeration; president of IMechE in 1947; DSO in 1917;

William Halcrow (1883-1958); civil engineer and head of an international consulting partnership; specialized in hydro-electric and other water supply projects; Kt 1944;

Willis Jackson (1904-1970); graduated in electrical engineering from Manchester University in 1925; graduate apprentice Metropolitan-Vickers 1925-26; DPhil Oxford 1936; career spent mostly in academia, but devoted much time to public service; Kt 1958, Life Peerage 1967 as Baron Jackson of Burnley;

George Nelson (1887-1962); electrical and mechanical engineer; trained at the City and Guilds College, London, then joined, successively, the Brush Engineering Company, Loughborough, British Westinghouse, and Metropolitan Vickers; in 1930 joined the English Electric Company, becoming chairman in 1933, massively developing the company, and building aircraft and tanks during World War II; Kt 1943, Baronet 1955 and raised to a hereditary peerage in 1966 as Baron Nelson of Stafford;

Harry Ricardo (1885-1974); his maternal grandfather was civil engineer Sir Alexander Rendel, whose company he joined in 1906 on graduation from Cambridge University in engineering; later employed at the Royal Aircraft Establishment; in 1927 formed Ricardo Consulting Engineers; retired 1964; one of the foremost researchers and designers of internal combustion engines for cars, tanks and aircraft whose influence was felt world-wide; Kt 1948;

Alliott Verdon Roe (1877-1958); Manchester-born son of a doctor; apprenticed in locomotive engineering but became fascinated in the early 1900s by the new and growing field of aviation, in which he made his principal engineering contributions, not only with the design and piloting of some of Britain's earliest aircraft, but also with the co-founding of the A.V. Roe Company in 1910 and Saunders-Roe in 1928; OBE, Kt 1929;

William Stanier (1876-1965); apprenticed at the Great Western Railway in 1891, he rose through the Company until 1932, when he was appointed chief mechanical engineer of the LMS Railway, where he designed and built increasingly powerful locomotive engines; retired as a consultant in 1944; the only railway locomotive engineer besides George Stephenson to be elected to the Royal Society of London; Kt 1943;

John Edward Thornycroft (1872-1960); eldest son of Sir John Isaac Thornycroft, the founder of the shipbuilding company that bears his name; trained for engineering at the Central Technical College, London, after which he joined his father's company, becoming managing director in 1901 and, later, chairman; worked on the design and construction of ships and road vehicles; KBE 1918;

Barnes Wallis (1887-1979); an engineer who worked mostly for Vickers Armstrong Aircraft, he was involved with the design of the structure of the R.100 airship, the Wellington bomber …and the bouncing bomb of 'Dambusters' fame; CBE 1943, Kt 1969;

Frank Whittle (1907-1996); Cambridge graduate and RAF engineer officer credited with independently inventing the turbojet engine; formed Power Jets Ltd. to build his engine; retired from RAF in 1948 with the rank of Air Commodore and undertook consulting and other assignments; recipient of a variety of awards; CBE 1944, CB 1947, KBE 1948, Order of Merit 1986.

Now to the Canadian Knights of Engineering….

They were usually admitted to the Order of St. Michael and St. George or as Knights Bachelor. Among the former are Casimir Gzowski, Sandford Fleming, Collingwood Schreiber, and Percy Girouard, although Henry Japp was created a KBE, as was Henry W. Thornton.

Among the Knights Bachelor were John Kennedy, Herbert Holt, Alexander Bertram, and Godfrey Rhodes.

All of the above were full members of the Canadian Society of Civil Engineers and, if alive in 1918 and 1919, of the Engineering Institute. As well, two non-engineer associates of CSCE were knighted: Cornelius Van Horne of CPR fame and Robert G. Reid, who helped build both the CPR and the railways in Newfoundland.

One non-member of CSCE/EIC - Jean-Georges Garneau - trained as an engineer but soon moved into the family's dry goods business. He was later knighted for non-engineering services.

Interestingly, one of Canada's best known 19th century engineers, Thomas Coltrin Keefer, was never knighted, although he did receive a CMG.

In my paper, I suggested that, for the post-Nickle years, there was no continuing means for recognizing distinguished services to engineering in Canada - except through honorary doctorates and institute, society and association awards - until the establishment of the Order of Canada in 1967. I went on to suggest that the Companion level of the Order might well have yielded a number of Canadian knights.

However, Canada's post-Nickle story is somewhat murky. Three Canadians have been raised to the peerage. More than 20 have received the accolade, but only two of them were engineers.

The peers were former prime minister R.B. Bennett, Roy Thompson and Conrad Black, all of whom became British residents.

One of those who became a knight, in 1922, was a British resident and deemed exempt from Nickle. But in 1934 and 1935, Prime Minister Bennett chose to ignore Nickle. Among the 15 or so Canadians who were knighted at that time were scientists Frederick Banting, Charles Saunders and J.C. McLennan, musician Ernest McMillan, and writer Charles G.D. Roberts. In 1945, William Stephenson, an engineer, otherwise known as the spymaster *Intrepid,* was knighted for his wartime services. Another end-of-war knighthood was awarded to Charles F. Goodeve, a Canadian-born, long-time British-resident research chemist whose wartime engineering activities included the development of anti-mine degaussing for ships and the anti-submarine weapon, the *Hedgehog*. He later directed the British Iron and Steel Research Association.

Four others, including Graham Day and Neil Shaw, were knighted between 1986 and 1995. In Canada today we have an active, knighted engineer, known in the U.K. as Sir Terence Matthews but here as Terry Matthews. A high-tech entrepreneur, he was born in Wales in 1943 and graduated in electronics from the University of Swansea in 1969. He has dual citizenship, has founded or funded many companies, and spreads his enterprise between both sides of the Atlantic.

To conclude, briefly....

British engineers have been more frequently recognized with senior awards such as titles than have Canadian engineers; this has something to do with there being more of them, as well as the effects of the Nickle Resolution;

…the same most likely goes for lesser awards, although I have not examined these for either country;

…peerages and knighthoods for engineers in Britain are usually announced (as they are similarly for other people) as being 'for services to engineering, industry or to science' and the public, generally, is given little else by way of achievement information;

…in spite of the relatively large number of knighted engineers, the profession in Britain still complains (as does the one in Canada) about its lack of social status;

…to raise the profile of engineering in this country, it is up to Canadian engineers to ensure that more of their colleagues are nominated for the Order of Canada and for other 'visible' awards in recognition of their contributions to the country and to the profession.

Thank you for your attention.

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