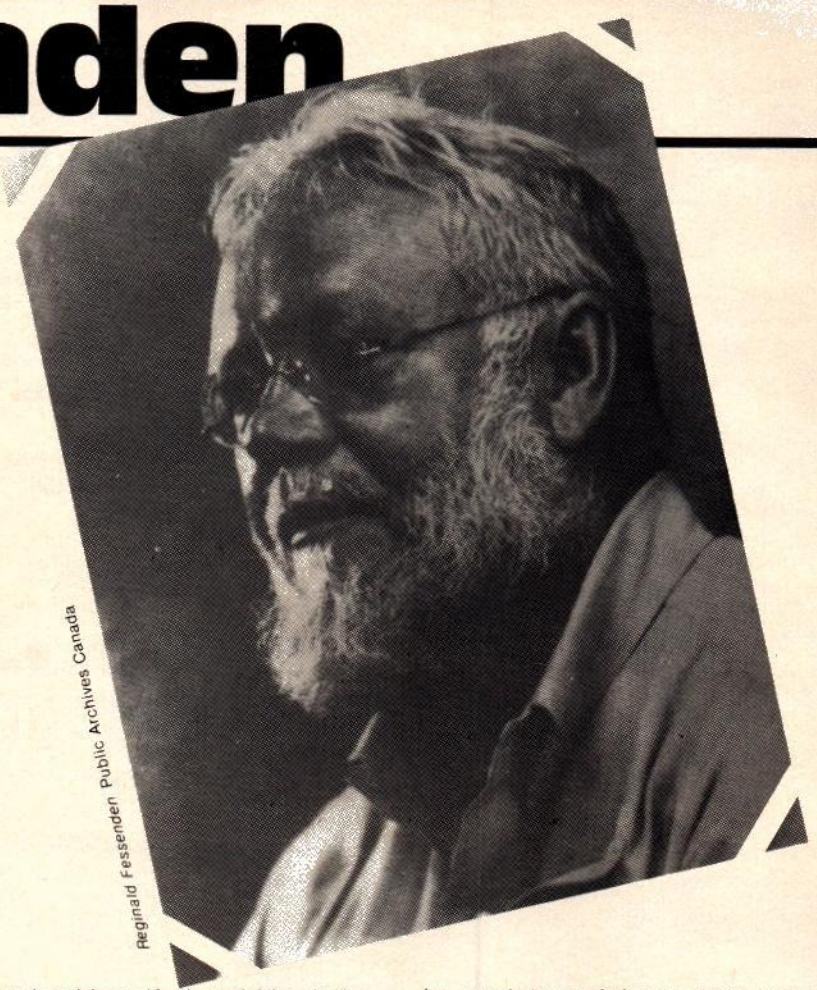
Fessenden

The father of modern radio broadcasting was not Marconi, says Jim Essex, but a little known Canadian inventor named Reginald Fessenden



Reginald Fessenden Public Archives Canada

REGINALD A. FESSENDEN first came into popular prominence with Ormond Raby's book, published in 1970 claiming Fessenden as "radio's first voice". However, the claim has forever been in doubt, and this book doesn't appear to have changed things. The name Fessenden today is not, as is Marconi's, synonymous with radio. Even his overall electrical achievements, themselves phenomenal with some 300 patents to his credit, are apparently given short shrift by an ungrateful country. For example, as Engineering Commissioner for Ontario Hydro's mammoth harnessing of Niagara, with which Fessenden was closely associated beginning in 1903, the name Fessenden is not even mentioned in today's newspaper accounts celebrating Hydro's 75th Anniversary. Sir Adam Beck, the man who hired him to harness Niagara, is remembered by a large plaque in the Kitchener school grounds; Fessenden, who spent his boyhood just east of Kitchener in the Rectory at Fergus, is not marked. Both went on to serve their country; one was knighted, the other wasn't. In fact, only a few subsequently engaged in the early halcyon years of radio itself recall his name, although he was closely associated with this period.

Yet, but for Fessenden the Canadian and not Marconi the Italian, we might all still be listening to the dot and dash of Morse rather than the radio we know today. For it was Fessenden's dream, not Marconi's, to transmit the human voice across the air waves farther than a man could shout. This included music as well as voice, and both only became possible as a result of Fessenden's long arduos search covering nearly a dozen years. From this, radio's first verified radio broadcast went out on the air waves Christmas Eve of 1906, when the pristine sounds of "Oh Holy Night" astounded a surprised public. Fessenden himself played his violin, thereby producing the first "live" radio show, unique in broadcasting. He also introduced the first use of records, a practice which provides us with broadcasting as we know it today.

Who can gauge the difficulties Fessenden must have experienced in his feat? Not only had he not the vacuum-tube to generate the basic radio frequency energy to get "on the air" later broadcasters enjoyed, but Fessenden had to rely on the miniscule amplification embodied in a crude carbon microphone for his audio. Because Fessenden decried the then prevalent carbon-arc used to generate radio waves, he insisted on continuous waves to replace the ubiquitous arc to generate his R.F. This led him to the alternator as an R.F. generator, allowing modulating of the field for transmitting the voice. As a result of this, one report had the announcer "singeing his lips" from contact with the high currents involved in the asbestos lined microphone.

Yet, despite the obvious difficulties in method, Fessenden in his day radiated a kilowatt. The commonly used turn-of-the-century antenna consisted of a copper wire strung between two poles, the "L" or Marconi antenna. Fessenden's frequency was somewhat low, however, at 50 kHz. Fessenden realized the road to obtaining continuous waves to radiate his signal wouldn't be easy. The ubiquitous arc transmitter favored by Marconi wouldn't transmit sound because of the "whip-lash" effect of the arc, which created too much noise. Fessenden persevered.

In a somewhat prophetic mood, A. Lampman, a school friend attending Trinity College with him while at Port Hope, wrote a poem that gently described Fessenden's singular pursuit. "Be strong therefore; resume thy load and forward stone by stone go singing, though the glorious road thou travellest alone". That it was glorious, there's no doubt, but singing would appear to be understating the difficulties. Lampman went on to become one of Canada's great poets, whose works are read by school children even today. Fessenden seems to have been lost in the antiquity of time. Our bland acceptance of radio today, without regard to the

difficulties in developing the art, gives the lie to Fessenden's giant leap forward with radio's first broadcast in 1906. Nor was this the only reason he should be remembered. Consider, for example, a few of his other achievements, taken at random from just two encyclopedia, the Canadian and Britannica. Here, Fessenden is credited with, to name only a few, the discovery of the heterodyne principle, whereby the incoming radio frequency is converted to a lower intermediate, or "I.F.", frequency more easily amplified with consequent greater gain and selectivity. (This, incidentally, has been wrongly credited to Armstrong.) He perfected a detector two thousand times more sensitive than the prevailing coherer common in Marconi receivers, perfected a more reliable wireless transmitter utilizing an alternator to generate continuous waves achieving frequencies of 50 kHz and higher, invented the radio compass, developed greater control for ships' propellors by coupling them to high speed Parson's turbines with a combination of electric generators and motors, developed submarine signalling devices and, more important to the successful outcome of the First World war, introduced the sonic detector allowing Allied ships to locate enemy submarines.

Fesseden was born in East Bolton, Quebec near Sherbrooke in 1866, just a year before Cyrus Field in the U.S. successfully spanned the Atlantic with undersea cable. Thus, the stage was set already for communication wonders, with a galaxy of pioneers already in the cast. Men like Galvani, Canton, Cavendish, Volta, Franklin, Oerstad, Ampere, Farady, Henry; all were contemporary with the onward rush of electrical discoveries preceding Fessenden, with many of the names now enshrined in electrical units commonly used today. Fessenden embraced all of them to push forward his idea and what eventually became an obsession; for the human voice to be made to go through the air waves.

Fessenden's circumstances were anything but auspicious, encumbered by constant moves and an education on the fly. The family's move to the Rectory in Fergus, where the Anglican Church promised an improved stipend hardly measured up to their needs. And, like many born into a theological setting, science was given short shrift (even if some will argue it's the oldest science). However, the book-lined rooms of his minister father provided ready made incentive to study, where he learned to read at three years of age. When the local school offered no more challenge, his father accepted a call to Niagara, where educational opportunities improved. Fessenden was to return to Niagara later in life and, mute witness to his success in studies, as chief Commissioner of the giant Hydro project taming Niagara at the invitation of Adam Beck, his childhood neighbour.

Fessenden already had made great strides in American industry, which was what brought him to Beck's attention in the first place, and one of these was his success working with Edison. He even educated himself in chemistry, later becoming Edison's chief chemist. However, his love was electricity and he never gave up his intent to transmit the human voice over radio waves.

James Clark Maxwell already had enunciated his famous field-force theory in 1873 using mathematics. Heinrich Hertz in Germany proved it in 1887 using what he called "ether waves" to go right through walls. With a stream of credits after his name, Fessenden, just 21, now determined to use this medium to serve his ends.

It was perhaps coincidental that Marconi already had begun experiments with this phenomenon, being awarded a grant by a grateful British Government in 1898 of nearly $100,000, who saw in this medium opportunity to communicate with her far-flung colonies. Fessenden, who had already actually succeeded in sending Morse's transmissions overland for the U.S. weather service, failed to equal Marconi's more spectacular spanning of the Atlantic in December 1901, when he transmitted merely three dots; the letter "S".

His obsession with "sound" made Fessenden overlook his many achievements now massing around him. His failure to gain the electrical engineering chair at McGill University, in his home country, was ballooned far out of proportion to his real desire. Ever since Alexander Graham Bell demonstrated that voice could be sent over wire during experiments in nearby Brantford, this dream of going Bell one better remained paramount.

Perhaps it explains, in part at least, the perils building around him in failing to protect himself. And his obsession, linked with a deep sense of patriotism for his country, was to multiply the difficulties ahead. For example, while he assembled the top brains of the day to help build an alternator which he was convinced would generate the high frequency needed for his continuous waves, he was careless about patents. The fight over the Poulsen arc patents, between the embryo International Telegraph company and RCA, were good examples of the "arc" versus the "Alexanderson Alternator", a direct outcome of Fessenden's alternator where, with Steinmetz, he suc-

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ceeded in achieving 50kHz. (Later assisted by a relative newcomer from Sweden, E.F.W. Alexanderson and working under the aegis of General Electric, this was pushed to 100,00 kHz, the frequency used eventually at Brant Rock).

Fessenden's mounting success in out-distancing even Marconi while working with the U.S. Weather Bureau in 1901 brought jaundiced eyes his way and now the Bureau itself wanted a piece of the action. Fessenden fought these encroachments on his method of sending a "clean" Morse signal, losing valuable time in advancing his dream to transmit voice via radio. In need of work after leaving the Bureau in an understandable huff, he fell in with two financiers inPittsburgh.The fact it came at the same time as a position with the university there seemed to be propitious, for the research opportunities would be tremendous. The financiers, Given and Walker, however insisted all patents become the property of their company, called the National Electric Signalling Company, and Fessenden was to receive $300 per month in salary. There are two views to this arrangement; one that the employers were selfless, generous men putting up their hard-earned money to support a dubious enterprise with apparently no compensation and the other, that the company bled Fessenden of any hope for essential control of his own work. In fact it took Fessenden the rest of his life to unravel all the claims and counter claims associated with his subsequent work.

Construction at Brant Rock accelerated and the small yet significant success of the first words uttered in that long ago Christmas Eve of 1906 have since reverberated around the world. But, thinking he had the communication's world at his feet, Fessenden understandably had already approached Canadian Government authorities to form a Canadian company under the name "Fessenden Wireless Telegraph Company of Canada". The deal hinged not on his subsequent success with voice transmission, but on reliable Morse with a station already built at Machrihanish, Scotland to Fessenden's specifications.

Oddly, the 1906 Christmas Broadcast failed to impress the National Signal Company heads, even denying Fessenden its fruits while they threw one hurdle after another in his way, finally denying it to others. When Fessenden proposed he carry on his work in Canada, a testy relationship broke into open hostility, resulting in a court settlement which gave Fessenden financial redress but forced the company into bankruptcy. The bulk of his patents went to satisfy creditors.

Brant Rock station was closed down and Fessenden and his wife (who he'd met and married while on a teaching stint in Bermuda earlier) were driven from the premises much as another little known inventor named DeForest, struggling with the vacuum tube "audion", was labelled a criminal for so-called patent infringements.

Fessenden's Alternator
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Thus, Fessenden's allegiance to Canada back-fired with his own country disavowing earlier arrangements, and he was without a job at the peak of his career. Morse code continued into ascendancy while his miracle of transmitting the human voice via the same radio waves was forgotten. Broadcasting was eclipsed, still born, while Morse flourished.

Morse offered a permanent record by which messages could later by used, ideal for the business world which as yet hadn't tumbled to the fact Edison's embryo invention, the phonograph, could do as well. (Instant recording with tape was not even envisaged). Morse served not only the business community, but proved invaluable in nabbing criminals. (The first recorded use in Canada of this occured in 1910 when, at a pilot station at Father Point near Rimouske, Quebec, an American doctor, escaping by ship, was apprehended for one of London's most grisly murders and four months later hanged for murdering his wife.) The sinking of the Titanic in 1912, two years later, proved radio Morse invaluable in saving life and radio became standard equipment not just on land, but on all ships. Fessenden's dream wasn't resurrected until 14 years later, 1920, when, in the same town that received his first honor, as head of that city's University, Pittsburgh went "on the air" with KDKA, broadcasting election returns of the Harding-Cox Presidential race. This also signalled the race for broadcast licences in North America and broadcasting was born.

Fessenden seldom returned to his native land following his second rebuff, although he did offer his services to Canada at the outbreak of war in August 1914. He later returned to the relative quiet of his adopted home in Bermuda. Ironically, his one redeeming memory of Canada was not radio, where he'd earlier first conceived the idea, but the Niagara project and the 6 million horsepower he'd help tame. He died on foreign soil trying to recover patent rights long lost. The New York Herald Tribune at the time of Fessenden's death in Bermuda said "It sometimes happens, even in science, that one man can be right against the world. Professor Fessenden was that man. He fought bitterly and alone to prove his theories. It was he who insisted, against the stormy protests of every recognized authority that what we now call radio was worked by continuous waves sent through the ether by the transmitting station as light waves are sent out by a flame. Marconi and others insisted that what was happening was a whiplash effect. The progress of radio was retarded a decade by this error. The whiplash theory passed gradually from the minds of men and was replaced by the continuous wave one with all too little credit to the who had been right."

He was buried in St. Mark's Church Cemetery July 22, 1932.