SCIENCE AND TECHNOLOGY

Taming electricity, connecting the world

The nineteenth century was the age of electricity. In 1800, it was still a great puzzle to most people: they were baffled and literally shocked by electrical sparks. Mary Shelley's *Frankenstein* (1818) captured widespread beliefs that it could bring the dead back to life.

By 1900, much of this mystery had been removed with the establishment of scientific laws of electrical phenomena and the invention of numerous applications of electricity. Communication, lighting, power generation, industry and other aspects of life were being rapidly electrified.

In one hundred years electricity had transformed workplaces, homes, cities, towns and the country. It had "annihilated space" between distant countries via the telegraph and changed landscapes with networks, machines and buildings of electrical communication and power. Electricity had been truly tamed.

Research and Development: Decline of the industrial spirit?

We tend to think that having established itself as the world's leading industrial nation, Britain became complacent and spent very little on developing new products. This alleged underinvestment in scientific research and technical development has been blamed for the 'decline' of British industry from the 1870s. It has been suggested by historian Bernard Finn that there was little interest in the development of cable telegraphy between the late nineteenth and early twentieth century. This was due to the belief that submarine telegraph technologies — whether the material or theoretical — were relatively stable. However, this needs to be questioned and we need to ask; to what extent was the ETC content to rest on tried and tested methods? Did it encourage technical research, invention and innovation, and

Commented [RJN1]: Colon not semi-colon if so, how? And how did research figure in the complex relationship between the local and global spheres of operation of the company? By asking such questions historians have recently shown that British manufacturers did encourage research and development more than previously thought. The Eastern Telegraph Company was one such company and although it was a service provider rather than a manufacturer, it still supported research.

Eastern Telegraph Company: Supporting the Future of Submarine Telegraphy.

The company supported research and development through investment in buildings, departments and people. In 1901, ETC electricians changed from being mere support staff, to staff who were fully integrated into the corporate structure and who enjoyed status and salaries on par with that of clerical and other grades of employee. A year later, rather than experiments conducted on ships and cable stations, senior management approved funds to furnish a room in the firm's head office in London for "electrical experiments and the testing of new methods and inventions". This was also followed with the creation of a separate "experimental" room at the firm's largest cable station at Porthcurno. This was cemented by the creation of the "Investigation Branch" of the Electrical Department was created.

Another step change in the ETC's attitude to research and development was its recruitment of "outside advisors". In many ways, this was nothing new in the manufacturing, service or utility sectors. In June 1903, the ETC agreed to hire British physicist Oliver Lodge as a scientific adviser to the company and he was the first of many such advisers that the firm would have on its payroll. Lodge's long-time laboratory assistant Benjamin Davies did much of the work and in 1908 Davies resigned his position with Lodge and accepted an offer to work full-time for the ETC and form the core of a team of "researchers" who had served the company a good deal longer than him.

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It is clear that the ETC fostered a culture of corporate research much stronger than might be inferred from standard company histories or from "declinist" histories of British science and industry. Certainly, this culture was nowhere near as strong — in terms of expenditure, personnel, size of premises, equipment and resources — as that established by such firms as Bell, Western Union, and Siemens but showed that the submarine telegraphy industry was far from stagnant and it is important to look at the small changes made in this industry. This can be seen in cable design and telegraphic instruments.

Cable Design: "If it ain't broke, don't fix it".

The submarine cable design used in the first successful transatlantic cable of 1866 was more or less standard until the early twentieth century. However, small changes were made to insulation and armouring and after 1894 many firms used cables with wider copper conductors which gave greater capacity. The most significant change did not occur until the early 1900s when American, British and Danish manufacturers introduced 'inductively loaded' submarine cable designs that could handle very high speed telegraphy and telephony across distances of tens of kilometres.

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While submarine cable operators were reluctant to change cable design, they actively encouraged the invention of instruments for improving signalling speed and capacity. Until the early 1870s the standard instrument was the mirror galvanometer designed by William Thomson between1857 - 1858. It could handle up to seven words a minute through long submarine cables, but it could not meet the ongoing demands for faster signalling. This demand was met, until the early 1900s, by Thomson's siphon recorder (1872).

From the 1870s, electrical engineers provided cable firms with a string of other instruments that gave ten-fold increases in transmission speeds. They invented electromechanical instruments that enabled the simultaneous transmission and reception of signals, machines that automatically sent on messages without human intervention, and apparatus for sharpening, repeating and amplifying signals. It was not until the introduction of electronic valve technology in the late 1920s that transmission speeds could be pushed significantly higher.

A NEW COMPETITION: From Cables *versus* Wireless to Cable *and* Wireless

For some, Guglielmo Marconi's 1901 successful transmission of wireless signals across the Atlantic seemed to anticipate the demise of submarine cables.

Directors of cable companies reassured investors that wireless could never compete with long distance submarine cables in terms of cost, reliability, and speed of signalling. In fact, wireless was used to improve the cable service. Experimental wireless masts were built at Porthcurno in 1902 and at other cable stations to communicate with cable ships and boost cable traffic.

In fact, Porthcurno was also the one of the first sites where the ETC decided to build wireless stations. ETC directors may not have perceived wireless as a real commercial threat, but they recognised the need to monitor its development and moreover, exploit it to their advantage. One of their most significant actions occurred in 1902 when they gave inventor and stage magician Nevil Maskelyne permission to build a wireless mast near Porthcurno station to spy on Marconi's operations around the coast at Poldhu. Few traces of this covert business activity remain in the company records. Much easier to trace is the agreement that the ETC struck with the British Post Office in 1905 to use Maskelyne's wireless system in a Porthcurno station for communicating with company cable ships up to fifty miles from the shore.

W ireless telegraphy grew rapidly, especially in marine communication, and by the 1920s, wireless represented approximately half the market of global telecommunications. The crippling blow to cable firms was short wave or ‘beam’ radio. Invented in 1923-1924 and quickly adopted around the world, this made long-distance wireless telegraphy and telephony cheaper and more efficient than ever before. The leading operator of short-wave, Marconi Wireless, took over so much of the Eastern Telegraph Company’s business that in 1928 the British government was forced to step in to save the old cable firm. Their solution was to amalgamate the companies. Cable and Wireless was born.

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