Chapter 6

Sir William Thomson, Baron Kelvin of Largs and the Institution of Engineering and Technology

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Abstract

Sir William Thomson, Baron Kelvin of Largs, was a member of the Society of Telegraph Engineers and the Institution of Electrical Engineers (the precursors of the current Institution of Engineering and Technology) for 36 years. Elected as the President three times, Lord Kelvin's involvement with the institution has had a lasting effect on the Institution of Engineering and Technology (IET). His bust (Fig. 1) is displayed at the IET's London headquarters at Savoy Place and his portrait hangs in the lecture theatre alongside those of other engineering luminaries such as Alessandro Volta and Michael Faraday. Every year, the IET also hosts a lecture in memory of Kelvin. This chapter will explore the background to the IET, the history of Kelvin's relationship with the Institution and the impact that he had upon the Institution as a whole.

1 Introduction

The history of the IET dates back to the late nineteenth century. It was founded on 17 May 1871 as the Society of Telegraph Engineers (STE), in response to the rapid development of a new communications technology, electrical telegraphy.

1.1 Early days of telegraphy

Before the advent of electrical telegraphy, transmitting communications over long distances without the use of written correspondence relied on visual aids such as fire beacons, smoke signals and flags, and later, mechanised systems such as the semaphore system created by Claude Chappé in 1793 [1]. The idea of using electricity to send messages was first proposed in the 1750s [2] but it was not until the beginning of the nineteenth century that experiments began in earnest. Early electrical telegraph systems made use of the recent invention of the Voltaic pile, such as the electrochemical device invented by the German physician Samuel Thomas Sömmerring in 1809 [3], while Sir Francis Ronalds, a British inventor, used static electricity to create an electrical version of Chappé's semaphore system in his garden in 1816 [4].

In 1820, following Hans Christian Oersted's discovery that a magnetic needle will be deflected by an electric current, André-Marie Ampère proposed an electromagnetic telegraph system.

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One of the first people to successfully put this theory into practice was the Russian Baron Pawel Lwowitsch Schilling, who had previously assisted Sömmerring with his electrochemical telegraph in 1809 [5]. Schilling's operational electromagnetic telegraph was exhibited in Europe and Asia in 1832 and attracted much positive attention [6].

1.2 The growth of telegraphy

Following Schilling's achievement, the concept of electrical telegraphy as a reliable communications tool rapidly gathered pace. In 1837, the development of a commercially viable electric telegraph took place on both sides of the Atlantic almost simultaneously, with Samuel Morse in the United States and Charles Wheatstone and William Fothergill Cooke in the United Kingdom creating their own versions [7]. Various institutions in Britain picked up on the utility of the telegraph, especially the railway companies, and the industry subsequently developed rapidly. The Electric Telegraph Company, created by Cooke, was incorporated by the Act of Parliament as the first large undertaking for the electrical telegraph industry in 1846 and by 1868, there were over 4000 telegraph offices and over 22,000 miles of line in the UK [8]. By 1871, therefore, when the Society of Telegraph Engineers was founded, electrical telegraphy was a well-established method of communication.

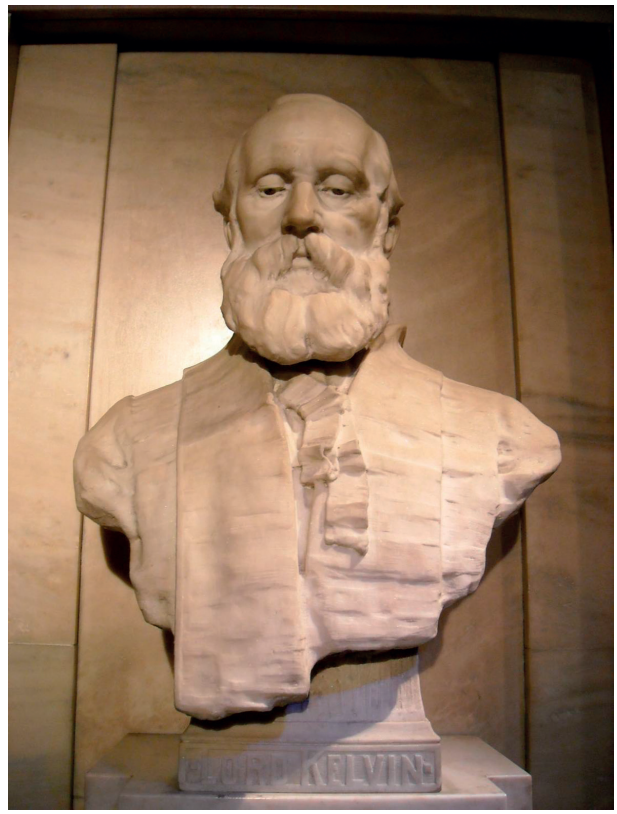


Figure 1: Bust of Lord Kelvin in the reception of Savoy Place, London (Copyright of the Institution of Engineering and Technology).

1.3 The foundation of the Society of Telegraph Engineers

The society was founded at a meeting held at two Westminster Chambers, Victoria Street, London, and was established for 'the general advancement of Electrical and Telegraphic Science, and more particularly for facilitating the exchange of information and ideas among its Members' [9].

Anecdotal evidence has it that the seeds of the Society were first sown during a conversation between Edward Graves, a civil engineer, and Charles Webber, a captain involved in telegraph matters, beneath a tree on the Uxbridge-Oxford Road [10], but general consensus agrees that the main person behind the practical formation of the Society was Major Frank Bolton. Bolton had been involved in developing a form of visual telegraphy to be used at night by the Royal Artillery via adapted lights to create 'dots and dashes' [11], but by 1869, after having left the army, he became heavily involved with the preliminary work of the Society. He was one of the eight attendees at the inaugural meeting in 1871 and was appointed Honorary Secretary, a post he held until his death in 1887 [12].

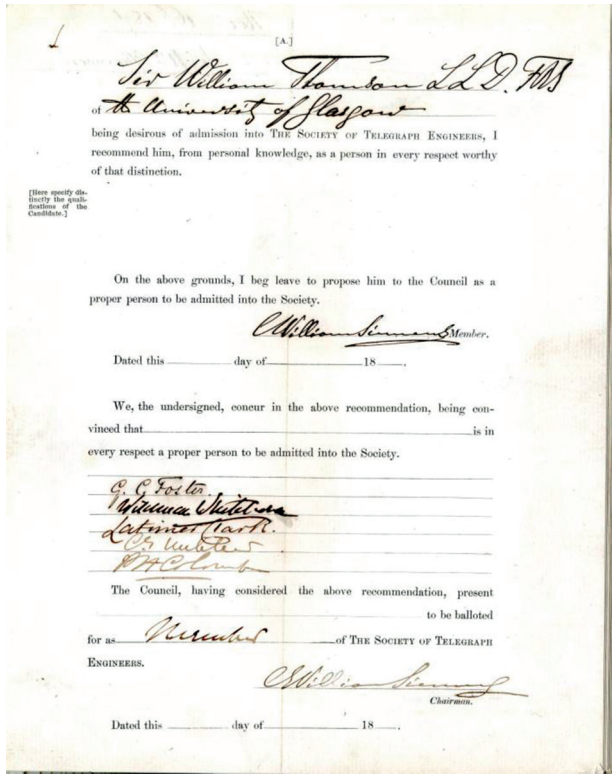
At the end of the first year of the Society's existence, there were over a hundred members [13], many of whom were significant figures in the telegraph industry, including Sir Charles Wheatstone and Charles William Siemens, who was also the Society's first President. The cost of membership was two guineas, and members were elected on the provisos that they had been educated as telegraph engineers, were employed as telegraph engineers, or had significant interest in telegraph engineering [14].

Though its name implied that it was primarily concerned with telegraphy, the Society's underlying interest in electricity in general was acknowledged in its earliest days. Cromwell Fleetwood Varley, one of the founding members, stated at the first Ordinary General Meeting held in February 1872 that 'This Society … will gradually, by natural selection, develop more into an electrical society than into a society of telegraphy proper' [15]. Accordingly, as the practical applications of electricity expanded beyond that of telegraphy, the Society widened its scope, and so in 1880 became the Society of Telegraph Engineers and Electricians and in 1888 the Institution of Electrical Engineers.

2 Lord Kelvin

One of the persons to witness the advances made within the Society was Lord Kelvin. Christened as William Thomson, he was knighted in 1866 and became known as Lord Kelvin in 1892 when he was given the title of Baron Kelvin of Largs in the County of Ayr, Scotland. As this article features his career up to his death, he will be referred to as Lord Kelvin throughout.

When Lord Kelvin joined the Society of Telegraph Engineers in 1871 he was known as Sir William Thomson. He had become a member of the Society within the first 6 months of its being founded; his original membership form (Fig. 2), which the IET is fortunate enough to have in their Archives, is dated 16 November 1871 (on the reverse) [16]. At this time, he was 47 years old and a well-established member of the scientific and engineering community. His addition to the membership of the Society of Telegraph Engineers undoubtedly strengthened the Society's credentials as a professional organisation.



[A.]

Sir William Thomson LL.D. FRS
of the University of Glasgow

being desirous of admission into THE SOCIETY OF TELEGRAPH ENGINEERS, I recommend him, from personal knowledge, as a person in every respect worthy of that distinction.

[Here specify distinctly the qualifications of the Candidate.]

On the above grounds, I beg leave to propose him to the Council as a proper person to be admitted into the Society.

William Siemens Member.

Dated this ____ day of ____ 18____.

We, the undersigned, coincur in the above recommendation, being convinced that ____ is in every respect a proper person to be admitted into the Society.

G. C. Foster
William Siemens
Latimer Clark.
G. Hubbard
W. H. Preece

The Council, having considered the above recommendation, present ____ to be balloted for as Member of THE SOCIETY OF TELEGRAPH ENGINEERS.

William Siemens Chairman.

Dated this ____ day of ____ 18____.

Figure 2: Lord Kelvin's application to become a Member of the Society of Telegraph Engineers, 16 November 1871 (Copyright of the Institution of Engineering and Technology).

2.1 Lord Kelvin's early life and career

Lord Kelvin was born in Belfast on 26 June 1824, but from the age of 8 was brought up in Glasgow where his father, Dr James Thomson, was a professor of mathematics at Glasgow University. Kelvin studied at the University of Cambridge, where he graduated as Second Wrangler in the Mathematics Tripos in 1845 [17]. A year later, he returned to Glasgow, where he became the chair of natural philosophy, at the prodigious age of 22, following the death of its previous incumbent, William Meikleham [18].

During the early years of his professorship, Kelvin engaged much of his attention to heat flow and thermodynamics. On realising that the theoretical frameworks of heat and energy could also be applied to electricity and magnetism, Kelvin became interested in the study and practical uses of electricity and in 1853 he formulated the equations for electrical oscillators [19].

Kelvin's burgeoning interest in electricity naturally led him to pursue telegraphy, and particularly, submarine telegraphy. In 1855, he became involved in the laying of telegraph cables across the Atlantic, where he used the inverse-square law to formulate a theory of cable transmission. On the basis of calculations made from this theory, he believed that laying a trans-Atlantic cable might be possible, but only if a heavy conductor and thick insulation was used [20]. Kelvin was invited to accompany a cable-laying expedition by the Atlantic Telegraph Company in 1857.

The cable being used did not conform to Kelvin's specifications, and duly failed, but Kelvin's observations made on this trip allowed him to develop further his ideas about cable laying and resulted in him patenting the instruments he developed to assist in this process, including the marine galvanometer and siphon recorder. Relying on Kelvin's work and inventions, the attempts made to lay the cable across the Atlantic in 1866 were ultimately successful and as a result earned him his knighthood [21].

Submarine telegraphy was not Kelvin's only venture. As a professor of natural philosophy at Glasgow, his interests encompassed a wide range of scientific topics, and it would be impossible to do justice to Kelvin's numerous achievements in this short chapter, but similarly it would be negligent not to mention the areas in which he was most prominent. Developing the first and second laws of thermodynamics was obviously one of his earliest achievements, but Kelvin was also by all accounts an esteemed authority on the science of energy, metrical conventions and electrical standards, calculating the age of the earth, deep-sea sounding and tidal prediction. Alongside all this work, however, Kelvin still found time to devote to electrical engineering, and indeed, even act as the President of the Society of Telegraph Engineers.

2.2 Lord Kelvin and the Society of Telegraph Engineers

Lord Kelvin was first elected as the President of the Society in 1874, just 3 years after becoming a member. He was to be elected twice more during his lifetime: in 1889, the year in which the Society became known as the Institution of Electrical Engineers, and in 1907, the year in which the Institution began taking steps towards making Savoy Place in London its permanent residence.

Lord Kelvin did not limit his association with the Institution to acting as President. His first tenure as President entitled him to be a life-long member of the Council, and he is listed as such in the Institution's journal. In the years between his presidencies, Kelvin was a fully active and committed member of the Institution. Though his home and work life in Glasgow made it difficult for him to attend meetings of the Council and the Ordinary General Meetings of the Institution, which were always held in London, he invariably made the effort to be present. Indeed, while he was President in 1889, some members deemed his ability to seemingly be in two places at once positively miraculous. William Edward Ayrton, during a meeting held 9 January 1890, remarked that 'When one felt certainly that Sir William must be in Glasgow, on entering the Council room at 7 O'clock, one saw him take his seat exactly as if he lived somewhere near Westminster or St. James's Park' [22].

When circumstances permitted him to attend meetings, he often took the opportunity to present his ideas on the papers that had been given. In 1884, William Henry Preece talked to the attendees of the 136th Ordinary General Meeting of the Society about the Electrical Congresses that had been held in Paris since 1881 and the importance of a system of units of measurement for the electrical engineering industry. Kelvin accordingly contributed to the discussion his views on this subject, on which he was a great authority. His presence in turn was regarded as an immense honour to those at the meeting, and President William Grylls Adams expressed his 'great pleasure at having Sir William Thomson with us this evening, and to thank him for his valuable contribution to the discussion' [23]. On the occasions when he was not able to attend, Kelvin often forwarded a note or letter with his comments on a particular issue to the Secretary, to be read out at the meeting in his absence. Thus, in 1903, he communicated a comment on

Alexander Siemens' paper 'Notes on the Metrical System of Weight and Measures', commenting that 'the universal adoption of the French metrical system by electrical engineers and engineers of all classes … will be a great blessing to every individual person concerned' [24].

The institution frequently followed Kelvin's lead. In the early days, meetings often featured papers by members concerned with practical applications of Kelvin's ideas and inventions regarding submarine telegraphy. Thus, the 1876 volume of the *Journal of the Society of Telegraph Engineers* contains several papers devoted to Kelvin's work, including 'Thomson's Siphon Recorder', by J. A. Ewing, and 'The use of soft iron core in Sir William Thomson's Mirror Galvanometer' by Walter Judd. In later years, as the Institution of Electrical Engineers, the Society became involved in the International Electrical Exhibition at Paris during 1881, in which the latest advances in electrical technology from around the world were presented, as a direct result of Kelvin's association with the International Congress of Electricians [25]. As William Preece put it, in this respect Kelvin 'took us and led us like a gentle shepherd to Paris, and there made us shine before the whole world' [26].

His opinion and approval were also often sought by the institution. In 1896, the newly elected President John Hopkinson implored his fellow electrical engineers to contribute to military service (Britain was involved in the Boer War in the Crimea at the time) and gained Kelvin's support of this cause, who stated 'I cordially approve of your movement to promote the utilisation of the patriotism and abilities of electrical engineers for national defence' [27]. Kelvin's approval clearly held weight, for a year later the Electrical Engineers, Royal Engineers, Volunteers (E.E.R.E.V) was founded.

2.3 Lord Kelvin's later years

In 1899, Lord Kelvin retired from his position as a professor of natural history at the University of Glasgow, having worked there for 53 years. He diligently continued his other work and interests, however, including his involvement with the institution. He continued to attend meetings whenever he could and was delighted to be elected as the President for the third time in November 1907 at the age of 83. Unfortunately, he was unable to give his inaugural address due to his wife being seriously ill, but he sent the institution a letter intimating his gratitude: 'Give the members of the institution my best wishes for all their work, both in the institution and in carrying out its practical objects, and tell them that I hope to be with them before the end of the present Session, and that in the meantime I thank them warmly for their great kindness in allowing me to be their President' [28].

Sadly, this would be the last time Kelvin addressed the Institution. The stress of his wife's illness took a great toll on Kelvin's health, and his own condition rapidly declined: 'Lord Kelvin's misery at her helpless condition was intense … He wandered distractedly about the corridors of his house unable at last to concentrate his mind on work in hand. A chill seized him and after about a fortnight of prostration he sank slowly and quietly away' [29]. Kelvin died on 14 December 1907, at his house Netherhall in Largs, Ayrshire, in the presence of his wife (who survived her illness), physician and several close friends and relatives [30]. He was buried in the nave of Westminster Abbey on 23 December, next to the tomb of Sir Isaac Newton.

3 The institution after Lord Kelvin

3.1 Public reaction

The public reaction to his death was one of intense mourning, and the national press was flooded with poignant and fond memories of a gentleman who had contributed so much to the development of science and engineering.

Some of these reminiscences were collected in the form of press cuttings by Helen G. Thompson, daughter of Silvanus Phillip Thompson (himself a past president of the IEE and the future biographer of Kelvin) and were pasted into a large scrapbook. This book was later donated to the IET Archives, and it remains an insightful record of how Kelvin was viewed by the public. There are many accounts of his life works, and images abound of a staid old gentleman with an impressive beard, but one cutting, apparently written by an old student of Kelvin's classes in Glasgow, paints a refreshingly endearing portrait of the eminent Victorian scientist. In it, the anonymous student describes how Kelvin used to entertain his students with his ability to contrive a melody using only a piece of wire and a cello bow. The student continues: 'But his greatest feat was the playing of a simple tune on a huge trombone! Conceive, if you can, a learned professor of silvered locks and beard, dressed in the black robes of his office and surrounded by scientific instruments, slowly squeezing from a giant trombone some familiar air, and you will understand why I have said that Lord Kelvin often made too strong appeal to our sense of the humorous' [31].

3.2 The institution's reaction

The institution's reaction to Kelvin's death was no less ardent than that of the general public. The Ordinary General Meeting of the Council, scheduled for 19 December, just 2 days after Kelvin died, was suspended and instead devoted entirely to discussing the ramifications of his death for the institution. He had been a much-loved figure within the institution, and members lamented his death keenly, with Sir William Preece undoubtedly encompassing the feelings of many others when he declared 'I will simply say that, as a man, while he lived I loved him, and now that he is dead I revere him. During the short remainder of my very long experience as an electrical engineer I will take every chance and opportunity of glorifying [him]' [32]. Accordingly, the rest of the Council were adamant that his legacy should be appropriately remembered, and so a Kelvin Memorial Committee was set up to investigate the ways to honour his memory. On 20 February 1908, they submitted a report recommending that the Council 'establish a Kelvin Lectureship, and that a Kelvin Lecture be delivered annually' [33].

3.3 The Kelvin Lecture

Thus, the first Kelvin Lecture was delivered by the past President Silvanus P. Thompson on 30 April 1908, on 'The Life and Work of Lord Kelvin'. In this, he gave an eloquent discourse on Kelvin's long and productive career, as well as some interesting anecdotes that revealed the personal side of his life. This obituary would later become the basis of Thompson's two volume biography of Kelvin. The Kelvin lectures that followed this focused almost exclusively

on aspects of Kelvin's work, though from the 1920s onwards the subjects of the lectures became more wide ranging, reflecting the broad scope of Kelvin's own interests.

3.4 Further developments

With the death of Lord Kelvin in 1907, the institution had lost one of their most revered members; but rather than see this as a reason to falter, the Institution entered a new phase in its development. Thus, just a year after Kelvin's death, the IEE purchased the lease on a building in central London that is now the central residence of the institution in the UK, Savoy Place. Originally built in 1889 as a joint Examination Hall for the Royal College of Physicians and the Royal College of Surgeons, and on the site of the ancient manor of the Savoy, Savoy Place became the London home of the institution.

The Institution spent £20,000 to adapt and extend its new residences [34]. The original work can still be seen today, although many rooms have since been updated for modern use. With this prestigious new base to work from, the institution set about establishing themselves as one of the Britain's foremost engineering organisations. This was fulfilled when the institution was granted a Royal Charter of Incorporation in August 1921 [35].

The institution's development continued throughout the twentieth century, achieving charitable status in 1963, and going on to merge and join with a number of similar institutions, such as the Institution of Electronics and Radio Engineers, and the Institution of Manufacturing Engineers. The most recent joining was in 2006 with the Institution of Incorporated Engineers, which led to the creation of a new body, the current Institution of Engineering and Technology.

Conclusion

Despite the numerous institutional changes that have taken place over the years, the IET remains proud of its history and connections to Lord Kelvin. It is perhaps fitting that an organisation which has grown from being a small specialist society to one of the largest engineering institutions in the world, should have such strong links with a man whose interests in engineering ranged far beyond that of electrical telegraphy. The Kelvin lecture is still held annually and is part of the IET's Prestige Lecture series, which includes talks and events named in memory of such esteemed scientists as Sir Edward Appleton and Alan Turing. The legacy of Kelvin's association with the institution, however, can perhaps best be summed up by quoting Silvanus P. Thompson, who concluded the first Kelvin lecture thus: 'We of this Institution may well be proud of him – proud that he was one of our first members, that he was thrice our President, and that as our President he died. We shall not look upon his like again' [36].

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