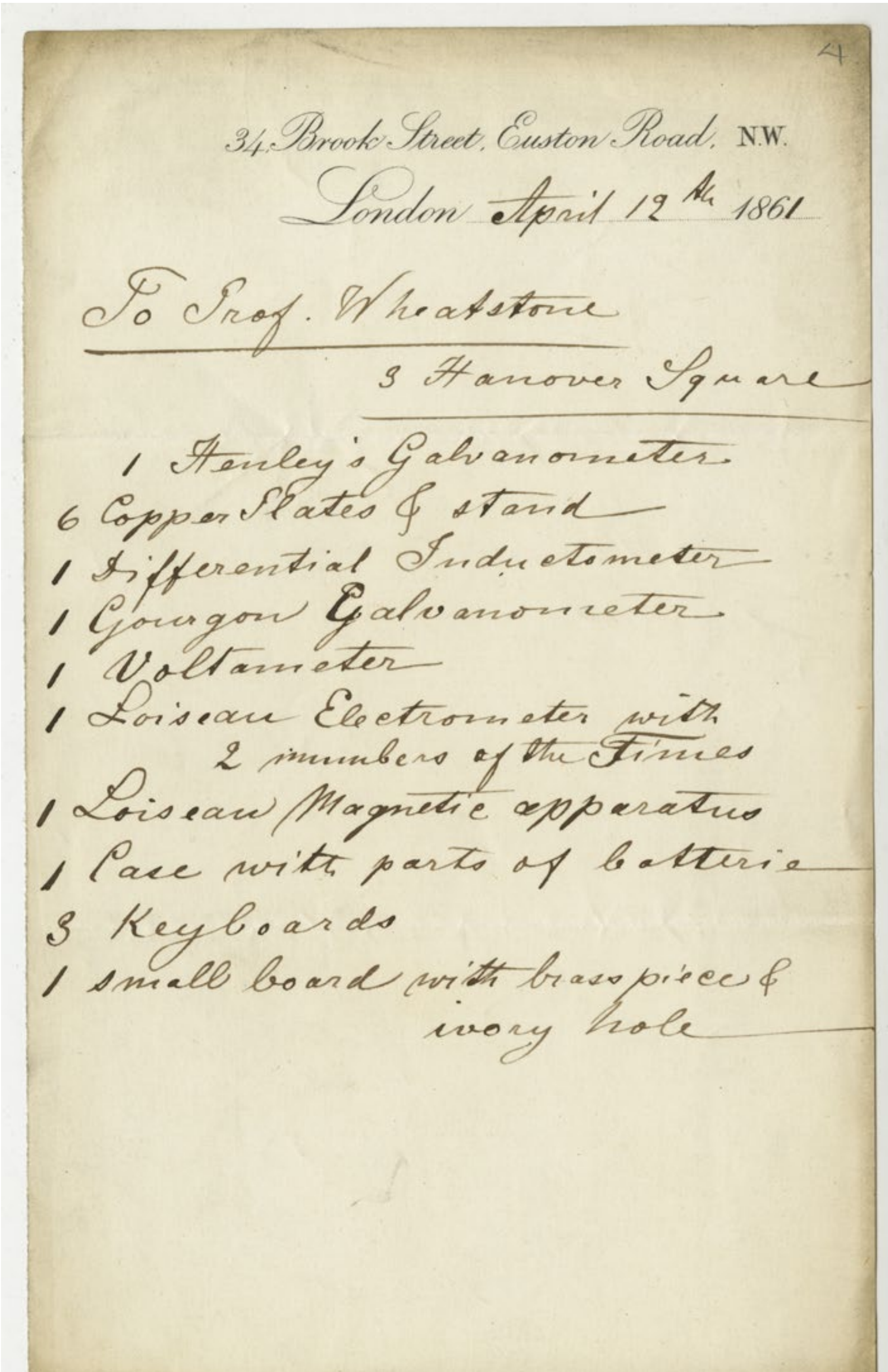
CATALOGUE ENTRY S2 | SIGNALS

SIR CHARLES WHEATSTONE'S NOTES



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34 Brook Street, Euston Road, N.W.

London April 12th 1861

To Prof. Wheatstone

3 Hanover Square

1 Henley's Galvanometer
6 Copper Plates & stand
1 Differential Inductometer
1 Gourgon Galvanometer
1 Voltameter
1 Loiseau Electrometer with
2 numbers of the Times
1 Loiseau Magnetic apparatus
1 Case with parts of batteries
3 Keyboards
1 small board with brass piece &
ivory hole

The handwritten notes, pamphlets and (the majority of) books within this exhibition are taken from the Wheatstone Collection housed at King's College, London. They span the period of Charles Wheatstone's life from 1832, when he was appointed as the first Professor of Natural Philosophy to his death in 1875. The Foyle Special Collection at the Maughan Library houses Professor Wheatstone's personal library; the books, pamphlets and papers he collected, read and wrote over an active research career spanning five decades. There are many interesting specimens, including autographed volumes, personal gifts and several entirely unique items. Many are annotated or contain personal dedications from the author. The library reflects Wheatstone's many and varied interests, just a few of which are represented in the exhibition.

The other items on display are drawn from the half of the collection housed at the King's College, London, Strand-site Archive. These comprise Sir Charles' personal notes collected from his office at the time of his death and curated by the Physics department until the 1970s. The collection is best described as eclectic. There are his lecture notes on electromagnetism and optics (though he was famously shy of public speaking).[1] There are shopping lists of materials to buy to experiment with. There are sketches and diagrams of machines, both built and unbuilt. There are records of experiments, some successful, some of which are so obviously unsuccessful as to have been abandoned half way through. In short, the notes are a treasure trove, a window into the life of a Victorian inventor and academic. From this eclectic collection we selected just a handful of illustrative pieces to feature in the exhibition.

Distance

In the Distance case we selected a Letter from physicist James Clerk Maxwell to Sir Charles Wheatstone to represent the communication and collaboration between engineers and physicists which were key to telegraphic projects. We also selected a chart from Wheatstone's reference library and some of his notes on from meteorology, oceanography, mechanical properties of natural materials and battery design to demonstrate how the Atlantic telegraph cut across many different specialisms and brought together diverse research interests.

Transmission

For the theme of transmission we selected notes and pamphlets which would complement or illustrate the machines on display. For example, to accompany the galvanometer we chose an 1858 Elliot Brothers' sales pamphlet, released when they were awarded the sole contract to build and distribute Sir William Thomson's Patent Graded galvanometer. We also included some of Wheatstone's sketches for what eventually became the Alphabetical Telegraph to display alongside the exhibition's example of the final, commercially produced machine. Telegraphic engineers were constantly rethinking and redesigning the telegraph for different uses. Also on display are Wheatstone's sketches for different telegraphic circuits and sending apparatus, including what became his famous Five Needle Telegraph.

Coding

Charles Wheatstone was fascinated by ciphers and coding. He worked on many cipher systems including the 'Playfair Cipher'. Playfair was a favourite of the military as it encrypted pairs of letters at a time and took a lot longer to crack than existing systems. This small selection of his many notes on the subject shows him constantly experimenting with different ways to code and encipher telegraph messages. These including an interesting piece where he seems to be demonstrating to somebody how the Playfair cipher works, using 'Victoria' as the encryption key. It is often hard to discern the exact purpose of Wheatstone's coding the notes as – unsurprisingly – they are encrypted.

CN

1. B. Bowers, *Sir Charles Wheatstone FRS*, 1802-1875, IEE History of Technology Series, Vol. 29 (London: The Science Museum, 2001).

CATALOGUE ENTRY S3 | SIGNALS

BATTERY OF TEN DANIELL CELLS

KING'S COLLEGE LONDON ARCHIVES

In 1836 the floodgates to the future opened. It was the year in which John Frederic Daniell invented his Daniell cell. The rapid economic growth and unbridled wealth creation of the Regency had left provincial society chock-full of the well-educated sons of artisans and professionals. They came of age and were drawn to London to take up the professorships in chemistry and natural philosophy being created at the new London universities. Well-financed labs were built, patrons found, scientific societies established. Funding, excitement and a great deal of scientific brain-power were applied to the project of probing the mysteries of the universe. There was one thing limiting the breakthroughs into the unknown: power.

Daniell began his career as the first Professor of Chemistry at King's College, London. His brand-new lab included the best equipment for power generation at the time: Volta's voltaic pile, a stack of alternating zinc and copper discs, separated by discs of cardboard or felt soaked in an electrolyte (brine). Daniell was using it for his experiments in electrolysis (breaking down water into oxygen and hydrogen) and noted that the pile lost voltage because a film of hydrogen bubbles formed on the surface of the coper cathode and reduced its conductivity. It was also impossible to turn off and so ran down when not in use. Daniell designed his cell to solve these two problems. He added a second electrolyte to consume the troublesome hydrogen bubbles and kept the two electrolyte solutions separate so his cell wouldn't run down between uses.

Daniell took a zinc anode (like the negative terminal in a battery) and suspended it in a porous earthenware jar full of zinc sulphate. He initially used an ox-gullet but the earthenware jar proved nearly as good and a lot less smelly![1] The earthenware jar was then placed in a copper pot filled with a copper sulphate solution. The copper pot became the positive terminal or cathode. The porous earthenware jar kept the two solutions separate but allowed charged ions to move between them. Like in a modern battery, when the negative anode was connected to the positive cathode (the copper pot) a current flowed. When the connection was broken the porous jar kept the solutions separate so the cell did not lose charge.

The Daniell cell was a massive improvement and the first really practical power source. Several cells could be connected together to form a battery and provide any required voltage. The cells were robust, portable and sufficiently simple to be assembled onsite by engineers. It was an immediate success, not only for lab experiments but also a myriad of industrial applications. Technologies, which had been limited for decades by a lack of power suddenly had access to the reliable, long-lasting, cheap and scalable Daniell cell. The greatest among these new technologies and the most transformative was Charles Wheatstone's telegraph through which - with now ample power - 'dense flocks of ideas… [started] to fly, like starlings, across the globe'.[2]

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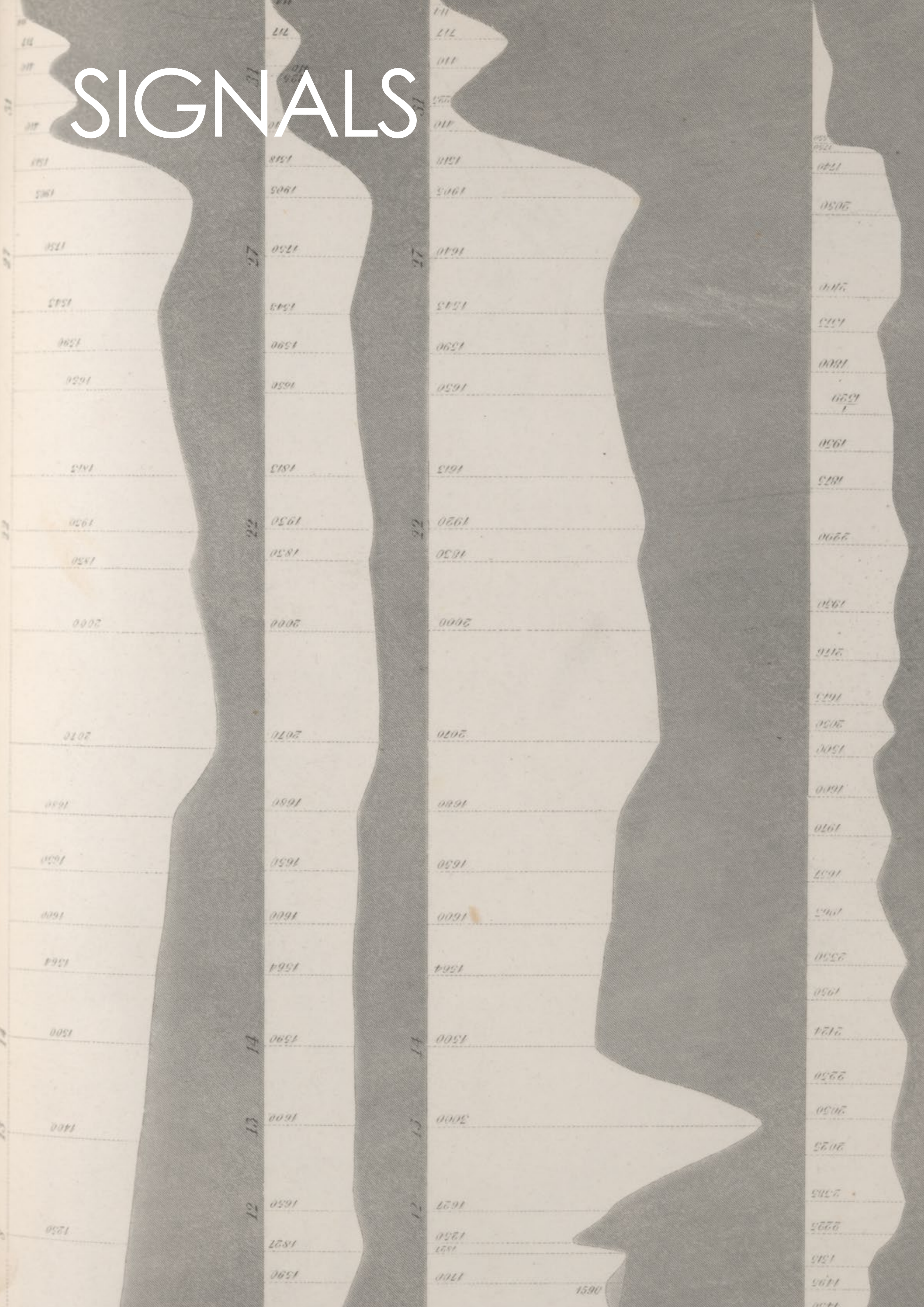
1. Andrea Sella, 'Daniell's cell', *Chemistry World*, Royal Society of Chemistry (2012), http://tinyurl.com/zuu67c4 (consulted 5 September 2016).

2. Ibid..

SIGNALS



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