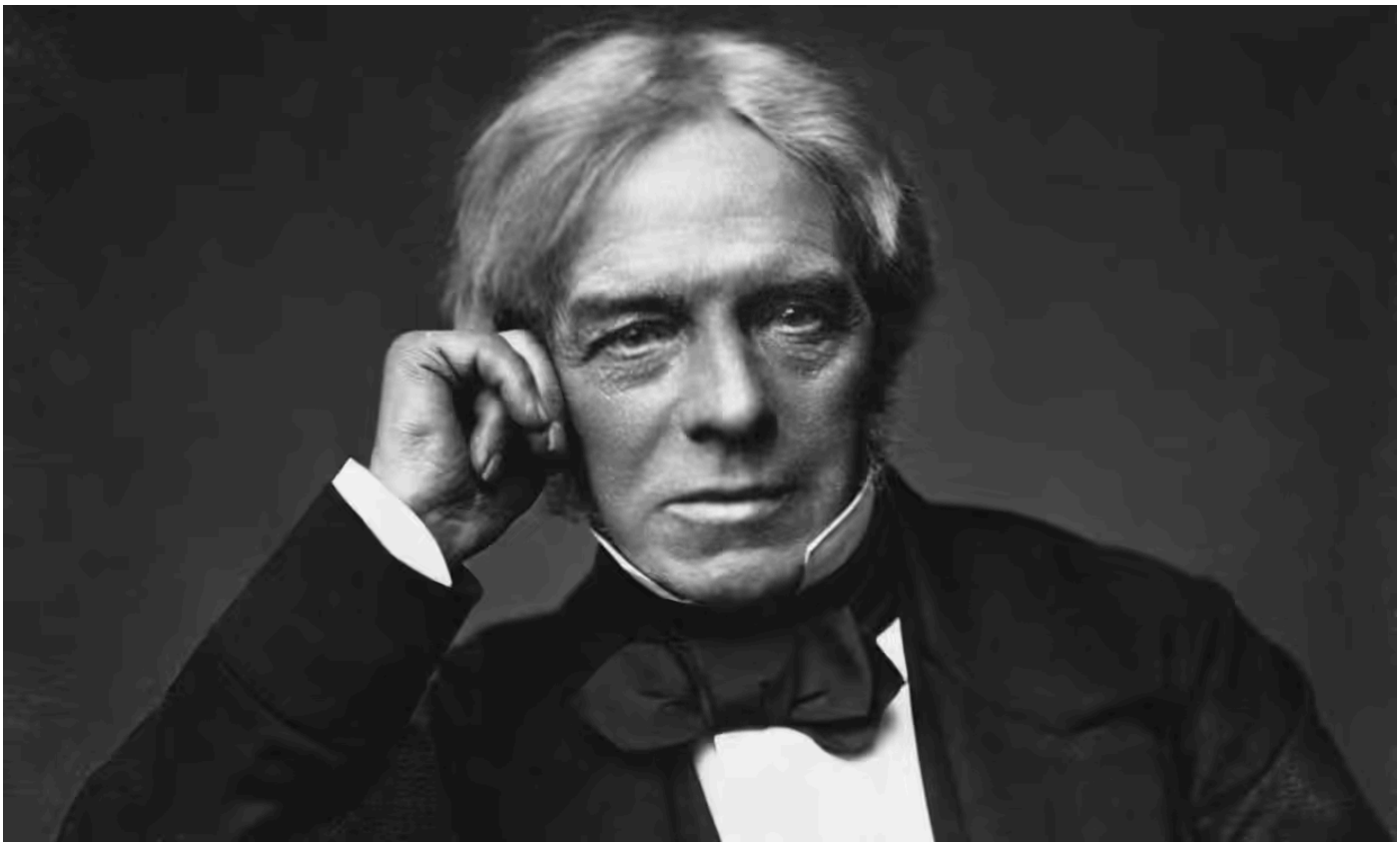
Unearthed notebooks shed light on Victorian genius who inspired Einstein

Michael Faraday's illustrated notes that show how radical scientist began his theories at London's Royal Institution to go online



Faraday, self-taught and the son of a blacksmith, discovered the laws of electrolysis and electromagnetic induction. Photograph: Hulton Deutsch/Corbis/Getty Images

Donna Ferguson

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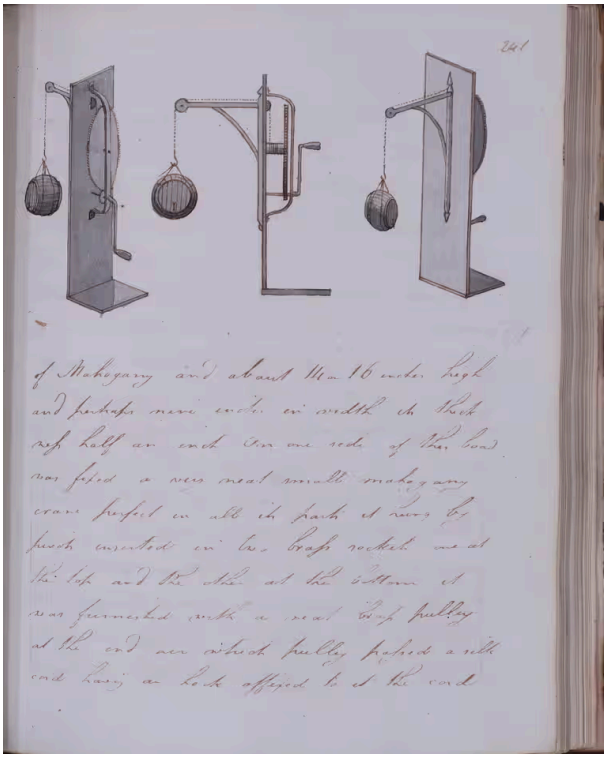
He was a self-educated genius whose groundbreaking discoveries in the fields of physics and chemistry electrified the world of science and laid the foundations for Albert Einstein's theory of relativity nearly a century later.

Now, the little-known notebooks of the Victorian scientist Michael Faraday have been unearthed from the archive of the Royal Institution and are to be digitised and made permanently accessible online for the first time.

The notebooks include Faraday's handwritten notes on a series of lectures given by the electrochemical pioneer Sir Humphry Davy at the Royal Institution in 1812. "None of these notebooks have been looked at or analysed in any great depth," said Charlotte New, head of heritage for the Royal Institution. "They're little known to the public."



A page from the notebooks showing Faraday's illustrations. Photograph: Royal Institution

Faraday, the son of a blacksmith, left school at 13 and was working as an apprentice bookbinder when he attended the lectures. He penned very careful notes and presented one of his notebooks to Davy, hoping for a job at the Royal Institution despite his working-class background and rudimentary education.

The notebooks shed light on the workings of Faraday's mind and reveal he made intricate drawings to visualise the scientific experiments and principles he was learning about at the lectures. "He's taking the time to make his own publication and grounding what's being taught to him in his own understanding," said New. "He's heavily illustrating his notes to understand the principle that's been taught to him." He even wrote an index for each notebook, she said, just for his own use and personal research. "This is at a time when paper is taxed. It shows how he's really trying to understand the science within."

When Faraday gave Davy the notebook, he expressed his "desire to escape from trade, which I thought vicious and selfish, and enter into the service of Science".

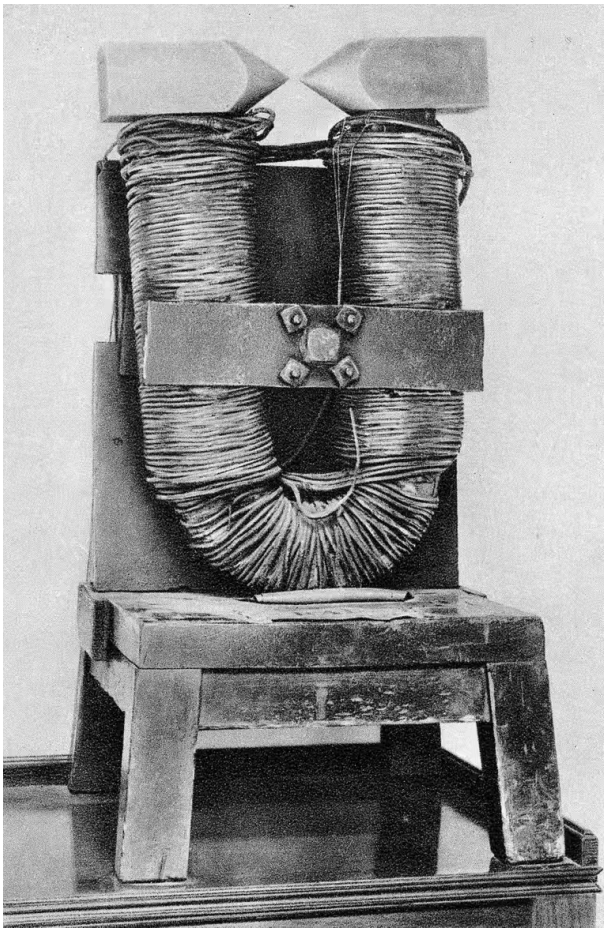
Although Davy initially declined to help him, the notebooks - and Faraday himself - seemed to make a good impression. Davy wrote to Faraday soon afterwards to say that he was "far from displeased with the proof you have given me of your confidence, which displays great zeal, power of memory and attention".

When a lab assistant at the Institution got into a brawl and was fired in February 1813, Davy remembered the 22-year-old Faraday and offered him

the job - which involved taking a pay cut, but gave the young man access to the laboratory, free coal, candles and two attic rooms.

Faraday later gave an account of this job offer: “At the same time that he [Davy] gratified my desires as to scientific employment, he advised me to remain a bookbinder, telling me that Science was a harsh mistress... poorly rewarding those who devoted themselves to her service.”

Despite Davy’s advice, Faraday accepted the job. It was a decision that would prove to be seminal for science. Over the next 55 years, while working for the Royal Institution, Faraday discovered several fundamental laws of physics and chemistry - including his law of electromagnetic induction in 1831, which illuminated the relative motion of charged particles.



One of Faraday's inventions, used in electromagnetic field experiments. Photograph: Apic/Getty Images

It was thanks to Faraday’s trailblazing experiments at the institution that he discovered electromagnetic rotation in 1821, a breakthrough that led to the development of the electric motor and benzene, a hydrocarbon derived from benzoic acid, in 1825. He became the first scientist to liquefy gas in 1823, invented the electric generator in 1831 and discovered the laws of electrolysis in the early 1830s, helping to coin terms such as electrode, cathode and ion. In 1845, after finding the first experimental evidence that a magnetic field could influence polarised light - a phenomenon that became known as the Faraday effect - he proved light and electromagnetism are interconnected.

Today, Faraday’s law of induction is widely credited as enabling Einstein, who kept a framed picture of Faraday on his wall, to develop his theory of relativity.

Throughout his career Faraday continued to draw his apparatus in his notebooks when making these groundbreaking discoveries. “It’s something

that he starts here, with these illustrations, and carries on through," New said.

A curated selection of key pages from the notebooks will be launched online for the first time on the Royal Institution website on 24 March, to mark 200 years since Faraday founded the annual Royal Institution Christmas lectures.

Inspired by Davy's talks to pursue a career in science, Faraday established these lectures in 1825 in the hope of encouraging others in the same way. "He was very strong on educating yourself, but also on educating everyone," New said. "That principle remains fundamental to everything that the Royal Institution does today - we're still hoping to inspire the next generation of scientists from all walks of life and backgrounds."

Eventually, every page of Faraday's notebooks will be digitised and made searchable online, she added.