

## Nicholas Joseph Callan

*b. December 22, 1799, Darver, Ireland*

*d. January 10, 1864, Maynooth (near Dublin), Ireland*



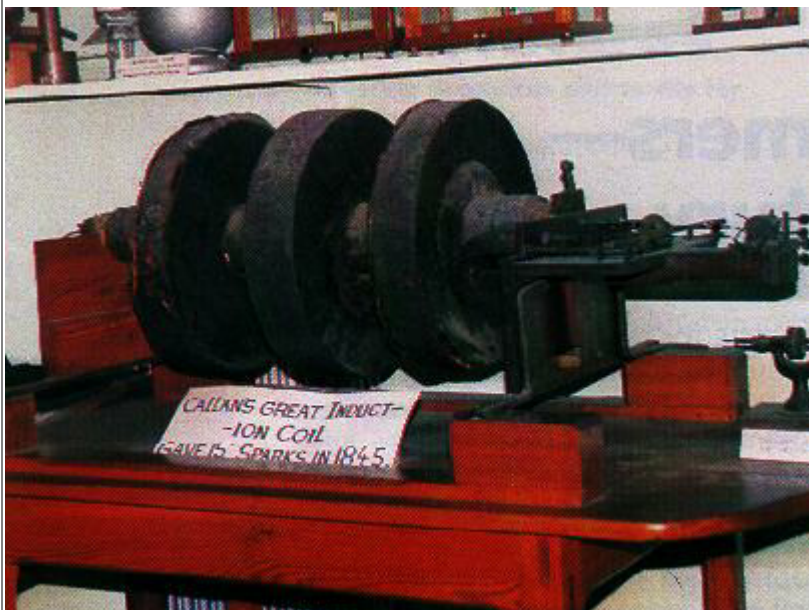
**Nicholas Joseph Callan, Irish priest, scientist, and inventor, was a pioneer in the development of electrical science; inventor of the induction coil, which led to the modern transformer. He constructed a giant battery of 577 cells, producing enormous currents of electricity, to the delight, astonishment and danger of his students. Like Cavendish before him, he made an independent discovery of Ohm's Law. In applied science he devised several types of galvanic battery and influenced the study of high-voltage electricity. He also constructed one of the first DC electro-motors and wrote a patent on the protection of iron from rusting. Unfortunately, his name was forgotten and his inventions were attributed to other scientists.**

Nicholas Joseph Callan was born on December 22, 1799, the fifth child in a family of six or seven, at Darver, between Drogheda and Dundalk, Ireland. His initial education was at an academy in Dundalk, run by a Presbyterian clergyman, William Nelson. His local parish priest, Father Andrew Levins, took him in hand as an altar boy and Mass server, and saw him start the priesthood at Navan seminary. He entered St Patrick's College Maynooth (near Dublin, Ireland) in 1816. In his third year at Maynooth, Callan studied natural and experimental philosophy under Dr. Cornelius Denvir, who was later to become Bishop of Down and Connor. Denvir introduced the experimental method into his teaching, and had an interest in electricity and magnetism. After ordination as priest in 1823, Callan went to Rome, where he studied at the Sapienza University, obtaining a doctorate in divinity in 1826. While in Rome he became acquainted with the work which had been carried out by [Luigi Galvani](#) (1737-1798), and by [Alessandro Volta](#) (1745-1827), pioneers in the study of electricity. On the resignation of Dr. Denvir, Callan was appointed to the chair of natural philosophy in Maynooth in 1826, and he remained in that post until his death in 1864.



***Callan's Laboratory***

During his life in Maynooth, with funding from friends and family, Callan began working with electricity. Electricity was still something of a toy, but he realised that with powerful batteries it could be put to practical and commercial use. The small priest must have seemed like an Irish Frankenstein - experimenting with electricity in his basement laboratory at Maynooth college, dishing out almighty electric shocks to unsuspecting volunteers, and electrocuting turkeys. Yet Reverend Nicholas Callan was one of Ireland's great inventors. He invented the induction coil, built the most powerful batteries and electromagnets of his time.



**The "Great Coil" of Nicholas Callan, 1837**

Callan's major claim to fame is as the inventor of the induction coil. Callan was influenced by the work of his friend [William Sturgeon](#) (1783-1850) who in 1825 invented the first electromagnet, and by the work of [Michael Faraday](#) and [Joseph Henry](#) with the induction coil. Working since 1834 on the idea of the induction coil, Callan developed his first induction coil in 1836. He took a horseshoe shaped iron bar and wound it with thin insulated wire and then wound thick insulated wire over the windings of the thinner wire. He discovered that, when a current sent by battery through a "primary" coil (a small number of turns of thick copper wire around a soft-iron core) was interrupted, a high voltage current was produced in an unconnected "secondary" coil (a large number of turns of fine wire). Callan's autotransformer was similar to that of Page's except that he used wires of different sizes in the windings.

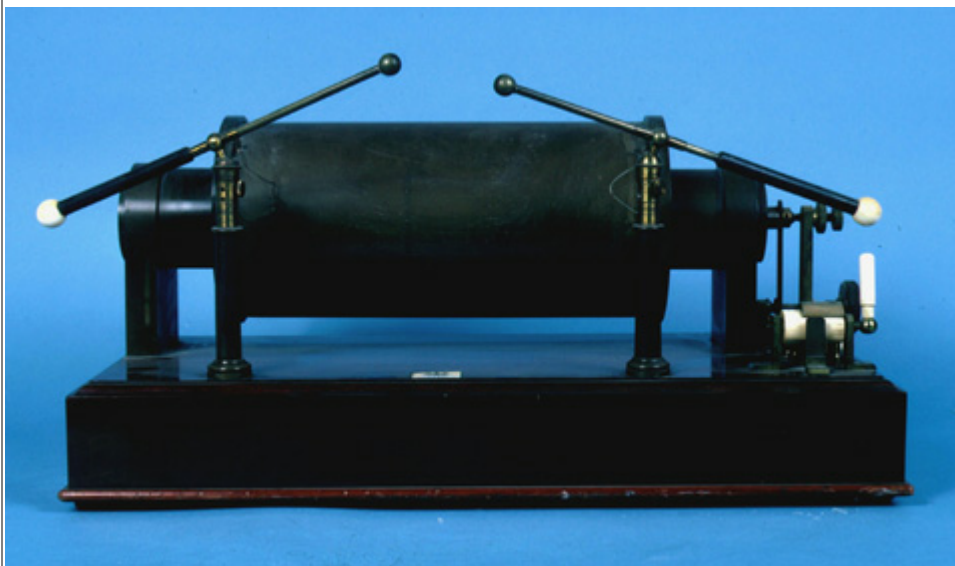


Callan's induction coil also used an interrupter that consisted of a rocking wire that repeatedly dipped into a small cup of mercury (similar to [Page](#)). Because of the action of the interrupter, which could make and break the current going into the coil, he called his device the "repeater." Actually, this device was the world's first transformer. Callan had induced a high voltage in the second wire, starting with a low voltage in the adjacent first wire. And the faster he interrupted the current, the bigger the spark. In 1837 he produced his giant induction machine: using a mechanism from a clock to interrupt the current 20 times a second, it generated 15-inch sparks, an estimated 600,000 volts and the largest artificial bolt of electricity then seen.

***At the left is the device which Callan built to make and break the primary circuit of the coil. He called it a Repeater, a usage not followed later in the century.***

Callan redesigned his induction coil in 1837 by separating the coils and making only the secondary coil deliver electrical shocks. Callan sent one of his induction coils to Sturgeon in 1837 who then

exhibited it at the meeting of the Electrical Society of London in August 1837. Sturgeon then built his own autotransformer but wound thick copper wire as a primary coil. He next wound thin wire as a secondary coil over a wooden core (bobbin), and then connected the two coils by wire. In building his coil Sturgeon in 1837 introduced a manual interrupter to control the current.



The induction coil added a sense of theatre to a great many nineteenth century scientific laboratories, not as a prop but as a principal performer. For example, without the induction coil neither radio waves, x-rays, nor the electron would have been discovered and exploited as they were. The first induction coils were developed by a now forgotten Natural Philosopher, Nicholas Callan of St. Patrick's College in Maynooth, Eire. Some impressive remains of his ventures can still be seen in Maynooth. Ruhmkorff received the pioneering credit for later work.



**Nicholas Joseph Callan,  
Professor of Natural Philosophy**

In view of the great importance of Callan's invention of the induction coil, one might wonder why he was forgotten, and his invention attributed to a German-born Parisian instrument maker, [Heinrich Ruhmkorff](#) (1803-1877). The answer is simple. Maynooth was a theological university where science was the Cinderella of the Curricula. Callan's colleagues often told him that he was wasting his time. In such an atmosphere Callan's pioneering work was simply forgotten after his death. Like all instrument makers, Ruhmkorff put his name on every instrument he made. "Ruhmkorff Coil" got into the textbooks. It was never challenged until Professor McLaughlin published his researches on Callan's publications in 1936, which incontrovertibly proved that the inventor of the induction coil was Nicholas Callan of Maynooth. The first acknowledgement of Callan as its inventor was in the 1953 edition of Gregory and Hadley's Textbook of Physics, revised by George Lodge, Senior Science Master at St. Columba's College, Rathfarnham.

In 1838 this intrepid priest stumbled on the principle of the self-exciting dynamo. Simply by moving his electromagnet in Earth's magnetic field, he found he could produce electricity without a battery. In his words, he found that "by moving with the hand some of the electromagnets, sparks are obtained from the wires coiled around them, even when the engine is no way



connected to the voltaic battery". The effect was feeble so he never pursued it, and the discovery is generally credited to Werner Siemens in 1866.



Callan Cast Iron Battery



Callan Single Fluid Cell

With the need to produce reliable batteries for his researches in electromagnetism, Callan carried out important work in this area, inventing the "Maynooth" battery in 1854, and a single fluid cell in 1855. Previous batteries had used expensive platinum, or unsatisfactory carbon, for one of their plates, and zinc for the other. Callan found that he could use inexpensive cast-iron instead of platinum or carbon. In the Maynooth battery, the outer casing was of suitably treated cast iron, and the zinc plate was immersed in a porous pot in the centre. This required two different fluids, on the inside and outside of the porous pot. But he found also that he could make a simple and useful battery by dispensing with the porous pot and the two fluids, using a single solution. Callan would connect large numbers of these battery cells, and once joined 577 together, using 30 gallons of acid, to make what was then the world's largest battery. Since there were no instruments yet to measure current or voltage, Callan assessed his batteries by the weight they could lift when connected to an electromagnet. His best effort lifted two tons. When Callan reported it in the *Annals of Electricity*, a London professor came over to witness the spectacle, and was said to be incredulous.



**Callan's patent on the protection of iron from rusting**

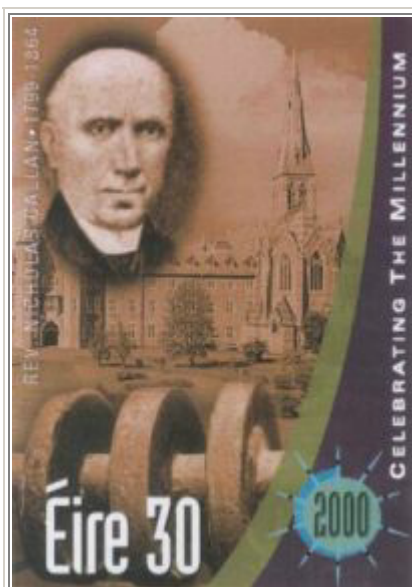
Callan's ingenuity knew no bounds and in 1853 he patented an early form of galvanisation using a lead-tin mix to protect iron from rusting, something he discovered when he was experimenting with various battery designs. His 1853 patent document, complete with an enormous royal seal from Queen Victoria, is displayed at Maynooth's new museum.

He also constructed electric motors. Callan probably also had one of the world's first electric vehicles, because in 1837 he was using a primitive electric motor to drive a small trolley around his lab. He even proposed using batteries instead of steam locomotives on the new-fangled railways. Callan later realised his batteries were not powerful enough, and indeed, it took another hundred years before battery-powered trains invented by another Irishman, [James Drumm](#), were used on Dublin railways. With great foresight he also predicted electric lighting, at a time when oil was still widely used and gas was the next new thing.

He was a contemporary of Charles Parsons' father, the Third Earl of Rosse, who had a position on the Board of Visitors to Maynooth College. A student yarn relates how Callan called to Birr to see

the telescopes, but for some reason was not admitted. When the Third Earl later visited Maynooth to see the induction coil, Callan sent his respects, but suggested that the noble lord should return to Birr to view the coil through his giant telescope! He was an eccentric character who was said to have used his students in his experiments to test the strength of electric voltage. Fortunately, there were no fatalities but he did manage to render a future Archbishop of Dublin unconscious. After this mishap he experimented with chickens. Maynooth College has a museum dedicated to the work and life of this priest scientist.

Nicholas Callan was a notable writer and translator of theological and ascetical works, he wrote about twenty religious books, one of which influenced the conversion of Newman. Nicholas Callan, holy priest and scientist died from natural causes at Maynooth on January 10th 1864.



As part of the Millenium celebrations An Post launched the 'Discovery' series of stamps to celebrate major scientific achievements in the second millenium. Included in the series is a stamp commemorating Reverend Nicholas Callan. Others featured in the series include Gallileo, Einstein, Marie Curie, and Thomas Edison.



*This text has been compiled from the biographies of Callan available in the Internet:  
( [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#) ).*

**HOME**

**(updated & corrected on May 17, 2003)**