

# Joseph Henry



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The practical unit of inductance was named the "henry" in 1893, in honour of the work of Professor Joseph Henry, one of the greatest American scientists of the 19th Century.

Born in 1797 to a poor family of Scottish descent, he had an indifferent education followed by an apprenticeship as a watchmaker and silversmith. His main interest in life was the theatre until, by chance, he read a popular book on science—which affected the whole course of his life.

In 1819 he enrolled at Albany Academy to study mathematics and scientific subjects, and only seven years later was appointed Professor of Mathematics at that institute. He proceeded in 1832 to the Chair of Natural Philosophy (physics) at the College of New Jersey (now Princeton University) where, at various times, he also taught chemistry, mineralogy, geology, astronomy and architecture.

## Electromagnets

His investigations and discoveries relating to electricity and magnetism were impressive, and he contributed significantly to development in this field. The earliest electromagnets had insulated cores, with bare wires wrapped round them: Henry used insulated wires and multi-layer windings, greatly increasing the power of the magnets and enabling them to be put to practical use for the first time.

He constructed the first electric motor to use electromagnets and a commutator. He and Michael Faraday, working independently, made similar discoveries concerning induction, though Faraday published his findings first. As a result, the discovery of mutual induction was credited to him, with self-induction credited to Henry. Whilst both used an early transformer arrangement for their experiments, Henry found that by varying the number of windings on each coil he could obtain a higher or lower voltage; the

laws drawn from this discovery form the basis of the modern transformer.

## Other Discoveries

His many other discoveries include non-inductive windings, the relationships of high-order induced currents, electromagnetic shielding, the action of inductance at a distance and the oscillatory nature of an electrical discharge.

He experimented with the propagation and detection of electromagnetic effects over a distance, and reported that a single spark was, "sufficient to disturb perceptibly the electricity of space throughout at least a cube of 400 000 feet capacity". In further experiments he was able to magnetise needles in his study from the effects of lightning occurring 11 to 13km away.

In 1831 he constructed an early form of telegraph which rang a bell at the end of a mile of wire, and he is generally credited with inventing the electromagnetic relay which enabled Samuel Morse's system to become a practical reality over great distances. He suggested that high intensity (i.e. voltage) could be obtained by placing many cells in series; this idea, coupled with his improved electromagnets, resulted in a substantial improvement in telegraph performance. In later years there was bitter controversy between Morse and Henry as to who had actually invented both the telegraph and the relay, and there is disagreement to this day among historians interested in the subject.

Apart from his better-known achievements, Henry also worked on capillarity, phosphorescence, radiation of heat from sun spots, atomicity, the aurora, heat, colour blindness and was

interested in anthropology, ethnology and natural history. He headed the US Lighthouse Board's committee on experiments, where his work included studies on light and sound, and was appointed Chairman of the Board in 1871. Henry was one of the original 50 scientists appointed by President Lincoln to form the National Academy of Science in 1863 and served as its president from 1868 to his death 10 years later.

## The Smithsonian Institute

When James Smithson, an Englishman, left his fortune to found the Smithsonian Institute in Washington, "for the increase and diffusion of knowledge among men", there was much debate about what that meant. Henry was asked to study the will and plan an organisation to meet its objectives. He was appointed first Secretary and Director of the Smithsonian in 1846 and devoted the remaining 32 years of his life to achieving the aims that he himself had defined, "... to assist men of science in making original researches, to publish these in a series of volumes, and to give a copy of these to every first-class library on the face of the earth".

One of his first acts was to organise a system of simultaneous meteorological observations by volunteers throughout the USA, transmitting their data via telegraph and this work eventually led to the creation of the US Weather Service.

Henry held high office in many organisations. His interests and influence were widespread, and there are in existence today some 50-60 000 documents by, or about, him, including correspondence, manuscripts, monographs, pamphlets, books and so on. It is a remarkable record of one man's contribution towards the "increase and diffusion of knowledge among men", which was so important to him for much of his life.

