Davy, Humphry (1778-1829)

**Definition:** DAVID, Sir Humphry, 1778-1829 from *A Biographical Dictionary of People in Engineering: From Earliest Records to 2000*

British chemist and inventor; electrochemistry, electrolysis, physiological effects of gases, arc lamp (1808), Davy miners safety lamp (1816), work led to electric welding. FRS (1801) (ASAI EE EIH EOWB GEAPIT GI MMAH MWBD NYPL SAI SAI-MP S:TLAW TBDOS TEIH TGE:B WA WWWIS: see References.)

**Summary Article:** Davy, Humphry (1778-1829) from *The Hutchinson Dictionary of Scientific Biography*

Place: United States of America

Subject: biography, chemistry

English chemist who is best known for his discovery of the elements sodium and potassium and for inventing a safety lamp for use in mines.

Davy was born on 17 December 1778 at Penzance, Cornwall, the son of well-to-do parents. He was educated in Penzance and, from 1793, in Truro, where he studied classics. But his father died a year later and, to help to support the family, the young Davy became apprenticed to a Penzance surgeon-apothecary, J Bingham Borlase. His interest in chemistry began in 1797 through reading Antoine Lavoisier's *Traité élémentaire*, and by 1799 he was working on the therapeutic uses of gases as an assistant at the Pneumatic Institute in Bristol.

Following Alessandro Volta's announcement in 1800 of the voltaic cell, Davy began his researches in electrochemistry. He moved to the Royal Institution in London in 1801, where he was influenced by Count Rumford and Henry Cavendish. He was knighted by the Prince Regent in 1812 and three days later married a wealthy widow named Jane Apreece. In 1813 he took on Michael Faraday as a laboratory assistant, who accompanied him on a tour of Europe. When he returned in 1815 Davy designed his miner's safety lamp, which would burn safely even in an explosive mixture of air and fire damp (methane). He did not patent the lamp, a fact that was to lead to an acrimonious claim to priority by the steam locomotive engineer George Stephenson. Davy was created a baronet in 1818 and two years later he succeeded the botanist Joseph Banks as president of the Royal Society. He became seriously ill in 1827 and went abroad in 1828 to try to improve his health. He settled in Rome in early 1829 but suffered a heart attack and died in Geneva, Switzerland, on 29 May of that year.

While Davy was working in Bristol (1799) he prepared nitrous oxide (dinitrogen monoxide) by heating ammonium nitrate. He investigated the effects of breathing the gas, showing that it causes intoxication (although it was to be another 45 years before the gas was used as a dental anaesthetic). His early experiments on electrolysis of aqueous solutions (from 1800) led Davy to suggest its large-scale use in the alkali industry. He theorized that the mechanism of electrolysis could be explained in terms of species that have opposite electric charges, which could be arranged on a scale of relative affinities - the foundation of the modern electrochemical series. The climax of this work came in 1807 with the isolation of sodium and potassium metal by the electrolysis of their fused salts. Later, after consultation with Jöns Berzelius, he also isolated calcium, strontium, barium, and magnesium. His intensive study of the alkali metals provided proof of Antoine Lavoisier's idea that all alkalis contain oxygen. In 1808 he first...
isolated boron, by heating borax with potassium.

Davy also initially supported Lavoisier's contention that oxygen is present in all acids. But in 1810, after doing quantitative analytical work with muriatic acid (hydrochloric acid) he disproved this hypothesis. He went on to show that its oxidation product, oxymuriatic acid (discovered in 1774 by Karl Scheele), is an element, which he named chlorine. He explained its bleaching action and later prepared two of its oxides and chlorides of sulphur and phosphorus. He also suggested that the element common to all acids is hydrogen not oxygen.

Davy was reluctant to accept the atomic theory of his contemporary John Dalton, but in the face of mounting evidence finally concurred and attempted to apply the laws of definite and multiple proportions to various compounds. He determined the ‘proportional weights’ (relative atomic masses), of various elements, including chlorine at 33.9 (actual value 35.5), oxygen 15 (16), potassium 40.5 (39.1), and sulphur 30 (32).

The safety lamp of 1815 was designed after a series of laboratory experiments on explosive mixtures. Davy showed that a flame continues to burn safely in such a mixture if it is surrounded by a fine metal mesh to dissipate heat, if only a narrow air inlet is used, and if the air inside the lamp is diluted with an unreactive gas such as carbon dioxide.

Numerous other achievements can be attributed to this great scientist. Davy introduced a chemical approach to agriculture, the tanning industry, and mineralogy; he designed an arc lamp for illumination, an electrolytic process for the desalination of sea water, and a method of cathodic protection for the copper-clad ships of the day by connecting them to zinc plates. But his genius has been described as erratic. At his best he was a scientist of great perception, a prolific laboratory worker, and a brilliant lecturer. At other times he was unsystematic, readily distracted, and prone to hasty decisions. He was never trained as a chemist, and consequently his excellence in qualitative work was not always matched by quantitative skills. He sought and won many scientific honours, which he then jealously guarded, even going so far in 1824 as trying to oppose the election of his protégé Michael Faraday to the Royal Society.
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