



Stories of Science: Humphry Davy's Discovery of Seven New Elements

The story about how the Cornishman discovered new elements using Electrolysis.

Humphry Davy was born in Penzance, Cornwall on 17 December 1778. At the age of six, Davy was sent to the grammar school at Penzance. At the age of 9, his family moved 3 miles away so he boarded during the week with his godfather. After Davy's father died in 1794, Davy was apprenticed to a surgeon in Penzance, where he worked in the apothecary's dispensary. Davy wrote poetry and despite no specific training carried out scientific experiments using stock borrowed from the dispensary. This brought him into contact with Thomas Beddoes (1760-1808), a doctor and former Professor of Chemistry at Oxford University who was on holiday in Cornwall. Davy went to work for Beddoes at the Pneumatic Institute in Bristol, where he carried out experiments on the properties of nitrous oxide, with a hope that it would cure a range of diseases including tuberculosis. This also introduced him to the romantic poets including William Wordsworth (1770-1850), whose poetry Davy edited. Although the work in Bristol was ill thought out and brought ridicule to Beddoes, it also brought Davy to the attention of the Royal Institution and he was appointed as an assistant lecturer in 1801.

Scientific Work at the Royal Institution

Davy was a hugely popular lecturer, using spectacular demonstrations to attract fashionable society (the A-List celebrities of the early 19th Century). As a result, Davy was appointed Professor of Chemistry at the Royal Institution in 1802. Initially he worked on practical science, looking into tanning and agriculture.

In 1806 he began electrical research. This was made possible by the invention of the voltaic pile (a type of early battery) by Alessandro Volta (1745-1827) in 1800. Davy acquired several huge voltaic piles, which he joined together in a series, to carry out electrolysis experiments. He isolated potassium from potash (potassium hydroxide) in 1807 and shortly afterwards, sodium from sodium hydroxide. Following this he also isolated and identified barium, calcium, magnesium, strontium and boron.

Davy reached the conclusion that electrical attraction holds elements together in compounds. Later he proved that Chlorine and Iodine, which were already known to exist, were elements when they were thought to be compounds. Davy also showed that acids did not need to contain oxygen, as had been stated by the French father of Chemistry, Antoine Lavoisier (1743-1794). He used electrolysis of muriatic acid (hydrochloric acid, HCl) to show that it only contained hydrogen and chlorine.



Humphry Davy using voltaic piles to isolate elements at the Royal Institution.



A satirical cartoon of Humphry Davy demonstrating the actions of nitrous oxide. His assistant Michael Faraday is holding the bellows.

Recognition and Legacy

Davy's scientific work led to him being awarded the Copley Medal by the Royal Society, a knighthood, a baronetcy and a medal from Napoleon despite England being at war with France at the time.

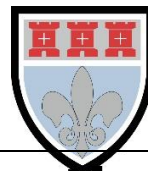
Davy's later career was less spectacular although he is remembered for his development of a miner's safety lamp (The Davy Lamp). The most significant step in his later career was perhaps the hiring of Michael Faraday (1791-1867) as his assistant, who became one of the greatest scientific discoverers in both Chemistry and Physics, and who Davy sometimes joked was his greatest discovery. Following a stroke, Davy died in Geneva on 29 May 1829. A book of his writing, *Consolations in Travel*, was published after his death. It was an immensely popular, somewhat freeform compendium of poetry, thoughts on science and philosophy.

Glossary

Apothecary – someone who distributed materials to surgeons and physicians (an early version of a pharmacist).

Electrolysis – the splitting of an electrolyte (ionic compound) into elements using electricity.

Voltaic pile – an early version of a battery invented by Alessandro Volta made from alternating pieces of zinc and copper separated by cloth soaked in a brine electrolyte.



Comprehension and Reflection Questions

1. Why did Davy have to board with his godfather when attending school after the age of 9?

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2. Why did Davy leave his school to become an apprentice to a surgeon?

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3. Apart from Science, what else was Davy famous for?

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4. What gas did Davy work on at the Pneumatic Institute?

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5. Why did Davy get promoted to Professor of Chemistry despite having little formal education?

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6. What invention was key to Davy's success at isolating elements?

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7. Which elements did Davy discover?

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8. How did Davy show that Chlorine and Iodine were elements, not compounds?

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9. What did Davy believe held the elements together in compounds?

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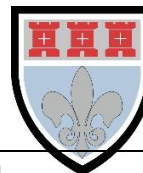
10. How did Davy show that oxygen was not needed for a substance to be acidic?

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Extension Activities

Ideas for things to do next:

Find out why Davy's idea of using sacrificial pieces of iron and zinc metal to protect copper on Royal Navy ships wasn't used.

Explain why safety lamps were needed in mines and find out why they were often unreliable

Further Reading

Ideas for things to read next:

<https://pubs.acs.org/subscribe/archive/tcaw/13/i04/pdf/404chronicles.pdf>

<http://www.rigb.org/our-history/people/d/humphry-davy>

<http://www.rigb.org/our-history/humphry-davy>

http://www.bbc.co.uk/history/historic_figures/davy_humphrey.shtml

<https://www.sciencehistory.org/historical-profile/humphry-davy>

<https://www.sciencehistory.org/distillations/magazine/science-and-celebrity-humphry-davys-rising-star>

Richard Holmes The Age of Wonder Harper Collins ISBN: 9780007441358