Henry Cavendish - Discoveries on Torpedo Fish and Water Formation

Henry Cavendish was from a very wealthy and aristocratic family. He was born in France, during 1731, and both of his grandfathers were titled: the Duke of Devonshire and the Duke of Kent.

When he was around 40 years old, Henry inherited a huge fortune, but he did not spend money on himself. Historical records tell us that he wore the same rumpled suit and the same three-cornered hat for many years.

A shy and eccentric man, Cavendish was also a brilliant scientist (or, as such people were known at the time, a brilliant "natural philosopher").

Although he worked very hard on his experiments, he spoke very little. Sir Joseph Banks, President of the Royal Society and a man who knew Cavendish, said of him:

> *He probably uttered fewer words in the course of his life than any man who ever lived to four score years.*

Without ever seeing or touching a "Torpedo Fish," Cavendish created an artificial one. He wanted to investigate how such a fish could emit such a powerful electric shock without first emitting a spark. He published his findings in 1776:

> *...Cavendish noted that the length of spark from a battery of Leyden jars varies inversely as the number of jars in the battery. He believed that the electric organs of the torpedo are equivalent to a great number of Leyden jars connected like a battery: these living jars are weakly electrified, but because of their great number, they can store a large quantity of electricity.* (*Cavendish*, by Christa Jungnickel and Russell McCormmach, at page 189.)

Cavendish also posed this theory:

> *...the discharge of the torpedo is completed so quickly that a pair of pith balls in contact with the animal does not have time to separate.* (See *Cavendish*, at page 189.)

With his work on Torpedo Fish, Cavendish wasn't merely examining how it was that a fish could shock its prey to death:

> *This application, the torpedo, was, in fact, ideal for laying out the science. The question of the nature of the torpedo was tantamount to a series of related, fundamental questions: what is electricity, how is it produced, how is it stored, how is it conducted, how is it manifested, and how is it conceived, manipulated, and measured?* (See *Cavendish*, at page 190.)

Henry Cavendish was also the first person to discover what *he* called "inflammable air" and *we* call "hydrogen" (observing that a type of gas was produced when he dropped zinc or iron into acid). He was also first to prove that water is a combination of hydrogen and oxygen. (The word "hydrogen" literally means "water former.")

Because he refused to sit for a portrait, no formal likeness of him survives except for a quick sketch which someone drew, without Henry's knowledge, while he attended a Royal Society dinner.

Although he documented his experiments and theories in personal notes, and released a paper (in 1766) about his "inflammable air" findings, Cavendish did not publish much of what he had discovered during his scientific inquiries. Decades after Henry died, James Clerk Maxwell studied, edited and published Cavendish's papers.

Maxwell found that the quiet man "had anticipated a number of later theories but had not felt the need to tell anyone else about them."

Cavendish *did* collaborate with Joseph Priestley (an Englishman who invented soda water and discovered properties of oxygen), finding that their experiments with “inflammable air” produced water:

- Priestly used an electrostatic machine to spark ordinary air, finding that water resulted from his experiment.
- Cavendish repeated this experiment, but he used oxygen (instead of ordinary air) to produce water.

Cavendish and Priestly called oxygen “dephlogisticated air,” and Cavendish eventually published his theories on the formation of water in 1784.

Apparently by choice, Cavendish lived a solitary life. Always a humble man, he died in 1810 at a villa on Clapham Common which he’d built to house his books and his lab.

Credits:

Image of a sketch of Henry Cavendish, online via Wikimedia Commons.

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