AWESOME stories

ELECTRICITY and the TORPEDO FISH

The Common Torpedo (*Torpedo torpedo*), also known as the Eyed Electric Ray, can emit an electrical shock of up to 200 volts as it pursues its prey. This image, by Roberto Pillon, depicts a Common Torpedo off the coast of Corsica. License: CC BY 3.0. Online via FishBase.org.

During the 18th century, as trade within the British empire flourished, new plants and animal specimen arrived in London. One living being was especially interesting for scientists. It was the Torpedo Fish.

The Torpedo Fish had a strong sting resembling the shock of a Leyden Jar. Could the fish's sting be electrical?

But ... the fish did not produce a spark. How could there be an electrical shock without a spark?

It was up to a very shy person, named Henry Canvendish, to solve the mystery of the torpedo fish (and the shock without a spark). His contributions led scientists to even greater discoveries.

Members of Henry's family - the Cavendishes - were unbelievably wealthy. Henry, however, turned his back on all that wealth to live in London, near the Royal Society. There he could pursue his passion of experimental science.

Canvendish knew that the sting of a torpedo fish could knock-down a grown man. How in the world did that happen?

As electricians began to investigate, they found that the fish's power was like something from a Leyden Jar. But ... they continued to ponder ... if a fish could produce electricity, how could it produce electricity without a spark?

Cavendish, carefully studying the torpedo fish, concluded:

> *This is certainly electricity. But how?*

He decided to make his own artificial fish. Both the real and the fake Torpedo Fish gave-out electric shocks, but the actual fish never emitted a spark.

In 1773, Cavendish tried to figure-out what was going on. He concluded there is a difference between the *amount* of electricity and its *intensity*. The real fish produced less-intense electricity.

"The amount of electricity" is now called the *electric charge* and its "intensity" is now known as the *potential difference*, or *voltage*.

So ... how did the Leyden jar compare to the torpedo fish?

- The Leyden-Jar shock was *high voltage* but *low charge*.
- The Torpedo-Fish charge was *low voltage* but *high charge*.

And ... those charges can be measured.

Conducting an experiment to measure the voltage emitted by the Torpedo Fish, when catching its prey,

Professor Jim Al-Khalili found that the fish emits a shock of about 240 volts. That's about ten times less than the shock from a Leyden Jar.

A fish producing its own electrical shock? What an amazing fact! However ... we need to ask ... is the electricity produced by the fish the same kind of electricity produced by an electrical machine?

In other words ... is *one* type of electricity produced naturally (by a living being such as a Torpedo Fish) and *another* type of electricity produced artificially (by an electrical machine)? Or ... is the electricity produced naturally, and artificially, the same?

The debate about *those* concepts raged for decades. From that great debate came the discovery that electricity needn't be merely produced by a spark; electricity could be continuous.

The understanding that electricity could be *continuous* propelled us into the modern age. Let's investigate how.

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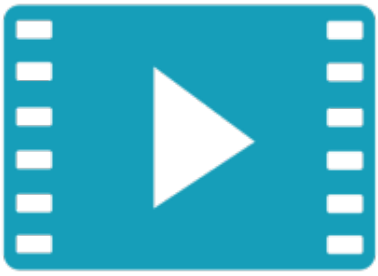

Discovering Electricity - Torpedo Fish
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