mystery science

Grades K-5
Mini-Lesson: “How do batteries work?”

VIDEO TRANSCRIPT

VIDEO 1

[Video Call]

- Hi, Doug!
- Hi, Waylon!
- I have a question for you. How do batteries work?
- That's a great question.

Before I say anything more, I'm curious, how do you think batteries work?

VIDEO 2

Well, believe it or not, the answer to this question involves a story about frog legs. Yeah, you heard me right—frog legs. Now, some people prepare and eat the legs of frogs, just like some people eat chicken legs. But one scientist by the last name of Galvani had a dead frog in his laboratory one day—not because he was going to eat it, but because he was getting ready to study it.

Galvani was really interested in figuring out how people's bodies work—things like muscles and organs. At that time—this was a few hundred years ago—nobody knew yet how exactly people or animals moved their muscles. It's hard to see how muscles work from the outside of an

animal's body, so it can help to look inside. If an animal dies, scientists can do an operation, like a doctor. This is what's called a *dissection*.

So Galvani had prepared the frog legs so that he could dissect them and study the muscles. Because he didn't want the frog legs to rot, he had soaked them in some saltwater overnight. He got one out, put it in his dissection pan, and then as he started to cut it with his scalpel, something amazing happened. The leg suddenly began to twitch and jump.

Now, obviously this was extremely surprising. The frog, after all, was dead. Its leg shouldn't have been able to move. Galvani got so excited. He felt that he had discovered some kind of special power within the frog's muscles. He thought he must be so close to unlocking the secret of how animals move their muscles.

Well, news of Galvani's discovery spread fast among all the scientists living at that time. Lots of them were excited to see if they could unlock the secret of how animals move. One of those scientists, a scientist by the last name of Volta, found something even more surprising than Galvani. As Volta tried to repeat Galvani's experiment, he became convinced that the twitching of the frog's leg actually had almost nothing to do with the frog—and everything to do with the metal tools that Galvani was using.

For example, Volta found out that in one of Galvani's experiments, the frog's leg would only twitch when it was being touched by two different metals. You see Galvani had used a tool containing the metal copper to hold the frog’s leg in place. And Galvani's knife was made of a different kind of metal, a metal containing iron.

Volta wondered, what if this special power that Galvani discovered was actually something contained not in the frog's muscles but in the two different metals. Using no frog legs at all, Volta took two pieces of metal, one of copper and one of iron, just like the metals used in Galvani's experiment. Then he connected a piece of wire to each metal disc. When he touched the two wires together, well at first nothing happened.

But that's when Volta remembered there was one other substance involved in Galvani's experiments: saltwater. Volta added a little disc of cardboard soaked in salt water between the pieces of metal. Suddenly, now when he connected these together, he could feel a slight shock. By stacking up little sandwiches of each metal separated by discs of saltwater-soaked cardboard Volta discovered that he could increase the strength of the shock. With enough of these little disks all piled up, he could even create a spark. It looked just like he was making a little lightning bolt.

What Volta had just invented was the very first battery. In fact, to this day in some languages—like in French—a battery still goes by the name of “Volta's pile.”

At the time that the battery was invented, Volta and others didn't actually know what kinds of things they'd be useful for. No one had invented anything powered by electricity yet. But over time, as you can guess, that all changed. Today, batteries are one of the most useful inventions ever.

Since batteries are a portable form of electricity, they allow us to power things without having to be anywhere near an electrical outlet. Without batteries, we'd have no ability to use smartphones, electric cars—not even flashlights.

Today's batteries may look different from the first battery ever invented, although some look incredibly similar on the inside. Either way, all batteries still work the same basic way. They all use Volta's amazing discovery—that when you sandwich together two different metals between some kind of liquidy solution like saltwater or acid, electricity is produced.

That's all for this week's question. Thanks, Waylon, for asking it!