Grades K-5
Mini-Lesson: “How do things glow in the dark?”

VIDEO TRANSCRIPT

Hi, it's Doug! This is one of my favorite things. When I was about 12 years old, I was visiting a toy store, when all of a sudden, the power went out. Everything went black, except for this. There it was, hanging on the wall, glowing in the dark. I had to have it. I spent my allowance to get it. And I've had it ever since. I still love things that glow in the dark.

Someone named Sylee has a question about things that glow in the dark. Let's give her a call now.

[Video Call]
- Hi, Doug!
- Hi, Sylee!
- I have a question. How do things glow in the dark?
- That's a great question.

Glow-in-the-dark things are so fun to stare at and play with, like these glow sticks that people are wearing, or this glow-in-the-dark goo that people are playing with. But maybe part of why we like them so much is that they're weird. Most things we see that glow are glowing because they're hot. Things like lava or those hot coils you see inside of a toaster oven. Even the part inside of a light bulb glows because it's hot.

But glow-in-the-dark materials, like glow-in-the-dark stars and glow sticks, they're different. They're not glowing because they're hot. And you don't have to plug them into anything. So how do glow-in-the-dark things work? What is it about them that makes them glow?

Before I say anything more, what do you think?

Now would be a good time to pause the video and discuss.

Okay. You ready?

Well, you might have noticed before that the material in glow-in-the-dark stars acts differently than the stuff that's inside of glow sticks. There are different ways these two things work. With glow-in-the-dark stars, first, you have to shine a light on them in order to get them to glow. That's not true with glow sticks.

If you've ever seen a glow stick when you first buy it, it's not glowing. To get the glow stick to start glowing, you have to gently bend it. Listen, you hear that snapping sound? That's actually a clue about what's happening inside of a glow stick. You see, inside a glow stick are two different liquids, two substances. One substance is floating around inside the stick. The other is inside a container located inside the stick.

When you gently bend the glow stick to get it started, you're actually breaking that small container open, causing the two substances to get mixed together. Mixing the two substances together is what makes the glow stick glow. It's so amazing and seems totally weird that mixing

two substances together could make something that glows. But around a hundred years ago, scientists discovered how to make these substances. They can prepare them in a laboratory.

Look at that. There are actually a few different substances that can do this. Each of them glows in different colors. Some of them glow red, yellow, and so on. We call these luminescent substances, from the ancient Roman word *lumen*, which means light. They seem amazing, but maybe it's not as strange as you think.

Scientists have figured out that the reason fireflies glow is that they have these substances inside their bodies, which they can mix together. So fireflies glow for similar reasons as glow sticks. They both contain special substances that glow when mixed together.

And it's not just fireflies, either. This is the underside of a jellyfish that pulses blue light to warn its predators. Even some living things other than animals can do this, like these mushrooms found in many forests in Asia. There's even a type of mushroom in North America, called the Jack O'Lantern, that glows on its underside.

But maybe the most spectacular of all are these. They're tiny microscopic organisms found in the ocean and they sometimes wash up on shore. They're called sea sparkles and they glow when the water around them gets disturbed. Isn't this amazing? Look as this person runs their hand through the water.

So all of these living things glow for similar reasons as a glow stick.

But what about glow-in-the-dark stars? I mentioned before that glow-in-the-dark stars only glow once you shine light on them. Like glow sticks, though, they do contain a special kind of

substance or material that's been prepared in a laboratory. Because this material doesn't work exactly like the stuff in glow sticks, scientists give it a different name.

They call these materials *phosphorescent*, from *phosphor*, an ancient Greek word for light. Phosphorescent materials store the light that you shine on them, then they give that light off very slowly. And unlike with glow sticks, you can do it again, over and over.

There are very few materials like this found in nature. But for a long time, one of the greatest mysteries of science was the discovery of the Bologna stones. Stones like this—found near a mountain near the town of Bologna, Italy. Each night, after the sun goes down, the Bologna stones would start to glow, but only if the sun had shone on them all day.

At first, it was thought that these stones might have some kind of magic powers, powers that could make someone rich or live forever. But today, we know that the Bologna stones are just stones that happen to be made of a phosphorescent material, just like the kind later invented by scientists that we put in glow-in-the-dark stars. This material may not make you rich and it won't make you live forever—but it is fun to look at.

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