# Lesson: “What materials might be invented in the future?”

## VIDEO TRANSCRIPT

### EXPLORATION VIDEO 1

Hi, it's Doug! In the last few Mysteries, you've been learning about the different properties that materials have. But who comes up with materials? How do new materials get invented? Well, to give you a sense of this, let me tell you a true story about one material invention. This is a story about a scientist who worked at one of the greatest material invention laboratories in the world. It's a company called 3M. The scientists who work here have invented a lot of materials you know, some of which might even be sitting there in the room with you. Like this one, scotch tape. One of the 3M company specialties, one of the things that they're best at, is making what we call "adhesives," or sticky materials. It was in the 1960s that a scientist named Dr. Spencer Silver was attempting to make a stronger, super sticky kind of glue. But as he worked on this, he failed. And the glue he made was instead, mm, only sort of sticky. Now, for most people, it would have been tempting to throw your failed experiment into the garbage can and just call it a mistake. But that's not what this scientist did. Instead, Dr. Silver didn't give up on it right away. He played around with it a bit, and he noticed something interesting. Even though it would just kind of stick to one thing and not stick strongly, when he peeled it off, it was still kind of sticky. It kept its stickiness, even if it wasn't super strong. He found this unusual and interesting, so he showed it to other people in his laboratory. No one really knew what to do with it, and most people in the lab didn't care to think about it much more. Yet Dr. Silver felt sure there was some

kind of problem that this sort of sticky glue could solve, even if no one could think of any ideas. Luckily, one day, he found at least one scientist in the lab who agreed that he was onto something. And it was this guy: his name was Art Fry. Let me borrow some of that stuff, he said. I'll see if it gives me any ideas. Now, one thing you need to know about Art is that he had a hobby on the side. He loved to sing in a choir on the weekends. He and the choir would have songbooks in front of them to help them remember the words to sing, and they'd quickly switch between songs. So Art would use little pieces of paper as bookmarks to mark each song. But see, the bookmarks were always falling out. That's when Art had that classic moment for any great inventor. Ah ha, he said. In that moment of inspiration, he realized that by putting some of the kind of sticky glue on the back of the paper, he could stick the bookmarks onto the page without permanently gluing them down. And since this kind of sticky glue would stay sticky over and over, he could just keep taking these bookmarks off and reapplying them as much as he wanted. Can you guess what this invention became? When Art took the idea back to the lab at 3M, they decided to try it out on some paper. But of all the different color papers they usually had available, that day, there was only yellow paper left. And so these became the famous little yellow pads of paper with kind of sticky glue on the back. They called them Post-It notes. Post-It notes went on to become one of the most popular items in any office or school. Today, they sell them in lots of different colors. So that's the story of one famous material and how it got invented.

## EXPLORATION VIDEO 2

So the invention of a new material, a glue that had the property of just being sort of sticky, made it possible to solve a problem—a problem no one had even thought to solve before. Post-it notes are an example of a recently invented material that you've actually seen. But now let me

show you some new material inventions, some inventions you might not have seen before—invented materials that we might use in the future, like this stuff. It looks like a sheet of glass, maybe the glass for a window or something. Now when you think of glass, you think of its property of being see-through, or transparent. But this is no ordinary glass—it's different. It's called electrochromic glass, and watch what it can do. Inside the glass is a material that can switch from being clear to white, depending on whether electricity runs through it. So all you have to do is plug this kind of glass into an electrical switch and then you can choose when it's see-through and when it's not. Think of the situations where we use ordinary glass and what you could do instead with this new electrochromic class. Like instead of having curtains to cover your windows, you could just flip a switch and make the glass white when you want privacy. Or instead of having to cover your car windows when you park your car—you know your car gets really hot on the inside—well, now you could just turn the windows white to keep out the hot sun. Right now it's really expensive to make electrochromic glass, which is why you probably haven't seen it yet. But if someone figures out a way to make this more cheaply, in the future we might just use this kind of glass all the time. Here's another material we might use in the future. When you get it really cold, it has this amazing property of being able to float or hover when held near a magnet. It's a special kind of material that scientists call a superconductor. Now, just like electrochromic glass, it's really expensive to make this stuff. But you can probably come up with some ideas of awesome things we'll be able to do if scientists discover a way to make superconductors more cheaply. One example is to use it as a new type of sports equipment. Can you imagine skateboarding, but instead of having wheels, it hovers on the ground instead? A hoverboard. Incredibly, there are already companies working on this. Check this out—a company called Lexus has made one of the very first hoverboards, which they showed off in this commercial using trained professional skateboarders. You can see it's pretty hard to maneuver.

This is a skate park that has magnets underneath the concrete so that this new hoverboard can actually be used. Look at that hovering. I thought you might want to see a little bit more from this commercial, so I'll show you another clip. Isn't it fun to think about what new materials might make possible? What problems will they solve? What kinds of new tools and devices will we create using newly invented materials, whether it's windows that can turn on or off or skateboards that can hover? Or maybe you can think of some ideas. What would you do with materials like these?

## ACTIVITY INTRODUCTION VIDEO

In this activity, you're going to become an inventor. You'll come up with inventions that use a brand-new material. Then you'll make a poster that explains how your invention will make life better or easier. Let's say that you and your class have been asked for help by her, Marsha. She's a scientist who works at Marvelous Materials Laboratory. Now this example is imaginary, but let's say that Marsha has created a new kind of glass that's really different from the glass we use today. It's different even from electrochromic glass. Now, you know that glass has these properties: you can see through it, and it's hard and stiff. And if you drop it or you hit it, it breaks, shattering into lots of sharp pieces. But Marsha figured out a way to change glass so that it isn't hard and it doesn't break. Instead, this new kind of glass is stretchy and bouncy like rubber. She invented rubbery glass. It still has the property of being see-through, but it also stretches out and then snaps back like a rubber band. And if you drop something made of rubbery glass, it bounces like a rubber ball. So Marsha has made this brand new material, rubbery glass. But she can't think of a cool way to use it. You and your class are going to help her. What could you invent using rubbery glass? What problems can this new material solve? To come up with ideas, let's start by thinking of all the different ways that we use regular glass today. What things are

made out of regular glass? Make as long a list as you can. Your teacher will write them down on the board. We'll pause while you do that. Press play on this video when you're ready to keep going. How many things could you think of? Well, here's what Marsha could think of. She thought of jars that you can store things in. She thought of windows. She thought of eyeglasses, light bulbs, phone and computer screens, and car windshields. Are there any things on your list that Marsha left out? We'll pause while you check and read those out loud too. Now that you have your list, you're ready to think about rubbery glass. Imagine if all of these things weren't made out of normal glass. Imagine if instead, they were bouncy or stretchy or both. Could being bouncy and stretchy make any of these things better than they are now? Thinking up new ideas takes practice. So let's consider the bottle first. Imagine a bottle that bounces. What ideas does that give you? Does that solve any problems? What could you use a bouncy jar for? We'll pause while your class discusses your ideas. Your teacher will write them down on the board. Now imagine a bottle that could stretch into all sorts of different shapes, like these. What could you use a stretchy jar for? We'll pause again while your class discusses your ideas and your teacher writes them down on the board. Now your class is going to go through the rest on your own. What ideas do you have about the other objects on your list? Imagine all of these things being bouncy and stretchy. Does it give you any ideas? We'll pause now so you can come up with ideas and your teacher can write them on the board. I'm guessing you have lots of ideas by now. Marsha is thrilled you guys came up with so many things. Maybe you thought about how a rubbery glass water bottle would stretch like a water balloon to hold lots and lots of water. At Mystery Science, we know that birds sometimes fly into windows. With normal glass, they hurt themselves because the glass is hard. But with rubbery glass, the bird would bounce off without getting hurt. We also thought it would be great to have a smartphone with a rubbery glass screen. That way, if we dropped the phone, it would bounce instead of breaking. Or if we wanted

a bigger screen, we could stretch it and make it bigger. Now it's time to decide on the idea you like best. It can be any idea that Marsha or your class came up with. You will turn the idea into an invention and create a poster about it. Your teacher will hand out invention sheets that you'll use to make your poster. We'll pause while your teacher hands those out. Now that you have your sheet, you need to come up with a name for your invention. Our favorite idea was the stretchy window that saved birds, and we're calling it the Bird Bouncer. You also need to write a reason that people want your invention. People want the Bird Bouncer because it saves the birds. At the bottom, you'll draw a picture of your invention. And then you'll decide how much it costs and write the price right here. Good luck inventing!