# Lesson: “Why is there sand at the beach?”

## VIDEO TRANSCRIPT

### EXPLORATION VIDEO 1

Hi, it's Doug! Have you been to a beach before? If you've ever been to the ocean, then you've seen a beach. People of all ages love beaches. Some people like to lay in the sand and the warm sun. Some people, like myself, love to build sandcastles. Now, I don't know how much you've thought about beaches, but it's kind of weird, isn't it? I mean very few places on Earth have so much sand like this. As soon as you walk away from a beach, there's no sand there. It's usually grassy, or there are trees. Why is there sand at the beach? That's the mystery we're going to explore today. Why do beaches have sand? Now, this is not an easy mystery to solve. So to help you out a little, let me tell you about a very special beach. It's this beach, called Pfeiffer Beach, and it's located in central California along the Pacific Ocean. It's about four hours away from where I live. Do you notice anything strange about Pfeiffer Beach? Look around. Do you see anything? You might notice that at Pfeiffer Beach, there's something special about the sand. It's purple. Pfeiffer Beach is a purple sand beach. That is truly strange. Most sand is tan or brownish in color. Why do you think the sand here is purple? Where would purple sand come from?

## EXPLORATION VIDEO 2

So how could we figure out where the purple sand comes from, or really where any sand comes from, even our common tan-colored sand? Well, what would be nice is if we could look at some sand close up, like under a magnifying lens, or even under a microscope. So let's do that. Let's get a little closer look. Here we go. It's closer. But let's get even more close. Wow, now we're really zoomed in. When you look at sand under a microscope, like you're seeing here, what do you notice? Well, you can see that sand is actually made of tiny rocks. The one you've been looking at here is more of the common sand—tan-colored sand. And you can see that there are tan-colored rocks there. But there are different colored sands. There's such a thing as green sand. Green sand is made of tiny green rocks. Purple sand, like you saw earlier, well, you can see up close it's made of tiny purple rocks. Hmm. Where could tiny purple rocks have come from? If you looked all around this beach, you'd see that there are some cliffs nearby. Now, one idea you might have had is maybe the ocean waves sometimes crash against the cliffs and make that sand. But if you go look up close at the cliffs, you'll notice that the rocks of the cliffs aren't the same color as the tiny rocks the sand is made of. The rocks of the cliffs aren't purple, so it's probably not that. Hmm, could this sand come from out in the ocean itself? That's a good idea, but a scuba diver went out into the ocean and found that the only purple sand was the sand near the beach. There were no purple rocks in the ocean out there, just very fine white sand and brown rocks. Hmm, so where could that purple sand have come from? Where is someplace that has purple rocks? For many years, no one knew. But one day, a hiker found rocks like these some distance away in some nearby mountains. Notice that the rocks look purple. Their color does look just like the color of the sand. Now on the mountain, there's a sign that tells people to be careful of falling rocks. When it rains, rocks often tumble down mountains

and bang into the side of the mountain as they do. Could it be that these purple rocks on the mountain have something to do with the purple sand at Pfeiffer Beach? But if they did, that would mean that somehow the rocks on this mountain are being broken into tiny pieces and then being moved many miles all the way to the beach. What could do that?

## EXPLORATION VIDEO 3

If you explore around the mountain to look for clues, you can notice something. All those purple rocks that tumble down the mountainside, they're tumbling into a river that starts at this mountain. Oh yeah, you know something about rivers, don't you? Rivers start in high places, like mountains. And they flow downwards towards low places, usually the ocean. Could it be that somehow these purple rocks tumble into the river by the mountain? And the river carries them all the way to the ocean? But these rocks are big. They're the size of someone's hand, or bigger. Even if these rocks got all the way to the beach, sand is really tiny rocks, not big ones. Well, there's another clue. If you look carefully at where a river starts, up in the mountains, you can notice that up here in the mountains, the river water is flowing very quickly. It's fast. The flow is so strong up here that rocks that tumble into it get pushed and carried by the water. And there are lots of other rocks in the river too. And so they crash into each other. Remember what happens when a rock crashes hard into something? Could this explain how there's sand at the beach? Why or why not?

## ACTIVITY INTRODUCTION VIDEO

In today's activity, you're going to be a river. You're a river that starts high in the mountains and ends down low in the ocean. This river roars, and pours, and rumbles. It knocks big rocks loose

and sends them tumbling. You're the kind of river that makes big rocks bash into each other and break. Now since we don't want bits of rock flying all over the place, the rocks you'll be breaking are made of paper. You'll start with some great big boulders at the top of a mountain. When a rainstorm comes that makes those big rocks roll, you'll tear your paper rocks, ripping them in half and sending them down the river. You'll have to act quickly. The rainstorm doesn't last long. So a timer will let you know when to stop. Then you'll move downstream, tearing the rocks in half whenever the river makes them crash together. And all the way at the end of your river is the ocean beach. How small do you think your rocks will be when they reach the beach? Let's find out.

## ACTIVITY STEP 1

If you're in a class, form a team of four. Together, you'll be a river. If you're working alone, you'll be a river by yourself. When you're done with this step, click the arrow on the right.

## ACTIVITY STEP 2

Get your supplies. Each team needs one set of these things.

## ACTIVITY STEP 3

Notice the number on the top of each page. Put the pages in order from one to five. Then you'll have your river.

## ACTIVITY STEP 4

Put all your boulders at the top of the mountain, like this.

## ACTIVITY STEP 5

Get ready, a rainstorm is on the way. Rain will wash the boulders into the river. When the timer starts, everyone is going to grab a boulder, rip it in half, and send the pieces downstream to the next page. Keep breaking boulders until the timer stops. You might not get all the boulders, and that's okay. Are you ready? Set, go! Five, four, three, two, one, stop! If some boulders didn't get ripped, that's okay. Leave them behind.

## ACTIVITY STEP 6

The broken boulders are on the rocky slope, ready for the river to break them again. When the timer starts, pick up the broken boulders and tear them in half, and send the pieces downstream to the next page. Okay, are you ready? Set. Go! Five, four, three, two, one, stop! If some rocks didn't get ripped, that's okay. Leave them behind.

## ACTIVITY STEP 7

I think you know what happens next. When the timer starts, you're going to tear those rocks in half and send them downstream to the next page. You're making pebbles now. Okay, are you ready? Get set, go! Five, four, three, two, one, stop! If some rocks didn't get ripped, that's okay. Leave them behind.

## ACTIVITY STEP 8

The river rolls those pebbles along and they break again. So tear each pebble in half and send the pieces to the ocean beach. Are you ready? Get set, go! Five, four, three, two, one, stop! If some pebbles didn't get ripped, that's okay. Leave them behind.

## ACTIVITY STEP 9

On the beach, the waves crash and break the pebbles again. If you can tear them smaller, now's the time. Are you ready? Get set, go! Five, four, three, two, one, stop! Okay, move on to the next step.

## ACTIVITY STEP 10

Get a "Draw the River Rocks" handout and draw rocks in your river. Be sure to show where they're biggest and where they're smallest.

## ACTIVITY STEP 11

Discuss. After you're done discussing, advance the slide to watch the final video.

## WRAP-UP VIDEO

So why is there sand at the beach? Well, now you've seen all the clues, and it makes sense, whether it's a purple sand beach or a normal tan-colored sand beach. The same thing happens. A river starts up in the mountains and because mountains are steep, the water flows fast and has lots of energy. It moves like a skier coming down the mountain. The water is strong enough

to carry rocks down from the mountain. The rocks crash into each other along the way, breaking up, and creating smaller and smaller bits each time they crash. That's what sand is, tiny bits of rock that have been carried to the end of the river. Now, some of that sand goes into the ocean. But some of it, the ocean waves push up along the shore creating beaches. That's why there are beaches. Now it might have surprised you that the flow of water can be so powerful that it can move rocks and slam them into each other, creating sand. This power that water has, this ability to actually move rocks and sand and carry them somewhere, we give this its own name, erosion. We'll see other examples of erosion in future Mysteries. Now, I mentioned that there are different colored beaches because there are rocks of different colors that the sand comes from. There are green rocks. There are blue rocks. You know there are purple rocks. Many rocks are tan or light brown, so beach sand tends to be the same color. But what if a mountain had rocks of more than one color, rainbow colors even? There are a few places on Earth that have mountains like this. Like these are called the Hornocal Mountains located in the country of Argentina. If you found a river that started here, imagine what kind of sand you might find if you followed the river towards the ocean. That be fun to explore, wouldn't it? And there are rainbow-colored sands out there in the world. They're hard to find, but here's a close-up view of the sand at a place called Rainbow Beach in Australia. So in summary, if you ever go to a sandy beach, look for the end of the river nearby. Sometimes, you'll notice one right away. Other times you might need a map to find where it is. But wherever there's a sandy beach, you'll almost always find a river nearby that's bringing the sand. Have fun and stay curious!