mystery science

Lesson: “How do we know what dinosaurs looked like?”

VIDEO TRANSCRIPT

EXPLORATION VIDEO 1

When you think of fossils, you think about dinosaurs. Dinosaurs are exciting. Some of them were huge, like this brontosaurus: a member of a sauropod family of dinosaurs. Those are the dinosaurs with the big legs, the long necks, and the long tails. It's actually one of the sauropod dinosaurs that's the largest land animal ever to walk on Earth. That's this one, called dreadnoughtus. Here's how big dreadnoughtus would have been compared to an adult human being. And you know that some dinosaurs were absolutely terrifying, like this one, the most famous dinosaur of all: Tyrannosaurus rex. Each of its ferocious teeth were as big as your hand. This is a real fossil T-Rex tooth right here. Now you might have heard that all of these great beasts died out a long time ago. We said that they went extinct. Scientists have reason for thinking that they all died out about 65 million years ago. One theory as to why they went extinct is that an asteroid, a rock from space, slammed into the Earth. Another theory is that a lot of volcanoes started erupting. Scientists aren't totally sure which theory is correct. What we do know is that the dinosaurs, these incredible animals, were all killed off, leaving behind little more than fossils of their bones. People are fascinated by the idea of dinosaurs because no one has ever seen them alive. As soon as the first dinosaur bones were discovered, we put them together, and we tried to imagine—what would these animals have looked like on the outside?

Ever since the 1800s, we've been imagining what dinosaurs must have looked like. Here's one of the earliest attempts to imagine dinosaurs. These are statues based on the fossil bones of a dinosaur called iguanodon. Now, remember, no one had ever seen a dinosaur on the outside. But this is what we imagined they looked like. In the early 1900s, the first movie projectors were invented. And one of the great things about movies is that you can create otherwise-impossible things using special effects or animations. Do you want to guess what impossible thing one of the very first cartoons tried to bring to life? You guessed it—a dinosaur walking around. It was an animation from the year 1914, one of the very first cartoons ever, called *Gertie the Dinosaur*. How did we decide to make a dinosaur look in the first movies? Well, I thought you like might like to see a short clip from *Gertie*. Here it is. Now since the time of this Gertie dinosaur cartoon, we've got a lot better at making animations and special effects for movies. By the 1990s, people were amazed at how life-like the dinosaurs looked in the movie *Jurassic Park*. Now, *Jurassic Park* is probably a movie your parents remember vividly because it's also meant to be a scary movie. Now, did you notice how whenever we've imagined what dinosaurs looked like, we make them look like giant lizards? Do you see here? We give them scales, just like a reptile. Why do we make them look like reptiles? Why do we give them scales? You might think, well, because that's how they looked, isn't it? But do you really know? I mean, what makes us think they had scales? Think about how we find dinosaurs. We find them as fossils. When we find a dinosaur fossil, it's not like there's any actual flesh. That's not left. They didn't die last week. They died 65 million years ago. Any flesh has long since rotted away. All we have of them are bones. So why assume they were scaly reptiles? How do we know they weren't more like this: furry beasts that looked like King Kong? Given that all we have of them are fossil bones, why do we think dinosaurs looked like lizards? When scientists look at the bones of a dinosaur, why do you think

they decided the outside of the dinosaur looks like a lizard rather than some kind of furry animal?

EXPLORATION VIDEO 2

When you look at the bones of an animal, that's just showing you the inside of it. Bones can't help you know what an animal looked like on the outside, you know, whether they had fur or scales or feathers. Or can they? Could you use bones to actually tell you what an animal looked like on the outside? There are some scientists who collect and study bones, bones of all kinds of animals: cow bones, chicken bones, snake bones, lion bones. Now, to you or me, these bones just look like bones. But to someone who loves bones, someone who studies them, they have noticed some very interesting clues. Take this one. To us, this is just some kind of animal skull. But to a bone expert, they look at this and say, nope, this isn't just any animal skull. This is the skull of a scaly lizard. How can they tell what kind of animal it is just from its skull? Well, I'll let you in on one of their little secrets. It's these: the openings in the skull. That's something special there. See, the furry animals, mammals—animals like horses, squirrels, cats, and gorillas—their skulls have openings where you'd expect them: the eyes, the nose, the mouth. But the scaly animals—reptiles like iguanas, geckos, and other lizards—they have openings in other places on their skull as well, places you wouldn't expect to find holes. Here's the eyes, and here's the nose. Those are places you'd expect to find holes. But see here and here. Those are extra openings in the skull, openings that mammals don't have. So just by looking at a skull, you can tell whether something is a lizard or not. The very first dinosaur bones were discovered about 200 years ago in the early 1800s. When people started finding dinosaur bones, they wanted to know—what kind of crazy animals are these? They're huge. They're unlike anything we've ever seen. But they're just bones. So can we get any idea what these animals might have

looked like? So, what do you think was one of the first things scientists looked at? They paid close attention to the skulls. So when scientists find fossil bones, they look for whether the animal has just the expected number of openings in their skull, like furry mammals, or extra openings in the skull, like scaly reptiles. I'll show you some skulls, and you decide. Are they skulls more like lizards, or skulls more like mammals?

EXPLORATION VIDEO 3

The word *dinosaur* itself comes from something you've just learned about. It's actually a combination of two words, both from the Greek language. Those words are *dino*, which means *terrifying*, and *saur*, which means *lizard*. So *dinosaur* means *terrifying lizard*. *Dino*, the terrifying part, is because the bones were clearly from gigantic creatures. And, you know, some of them have some pretty ferocious looking teeth and claws. The *saur* part of *dinosaur*, now you can understand, is because when scientists looked at the bones, such as the skull, they thought, hey, this looks a lot like a lizard. But are you convinced dinosaurs were scaly lizards? I mean, the skulls are just one clue. That's one piece of evidence. How do you know dinosaurs weren't the one kind of animal that had skulls like a lizard, but, instead, maybe fur like a mammal? It would be nice if there were more evidence than just the skulls. Well, there is. A few decades after the first fossil dinosaur bones were found, someone found these. Can you tell what these are? It turns out it's not true that fossils are always just bones. Sometimes we get fossils of other parts of animals besides just their skeletons, besides the bones. Any idea yet what these round lumps are? If it helps, these were found next to a dinosaur skeleton. Let me show you a different one of these round lumps, cracked open, and close up. That's a tiny dinosaur skeleton inside. This round thing surrounding it is a fossil dinosaur eggshell. So you see, this is a fossil nest of dinosaur eggs. Isn't that amazing? Here we have proof from fossils that dinosaurs were a kind

of animal that laid eggs. Now think about what kinds of animals today lay eggs. Do mammals lay eggs? Horses, dogs, cats, chimpanzees—the animals with fur? No. These animals don't lay eggs. But do reptiles lay eggs? Oh, you bet! See, here's a picture of a baby gecko hatching—a baby lizard, baby crocodiles, a baby snake. Here you can see some baby iguanas actually coming out of their eggs. So, if there's any chance that dinosaurs might have been giant furry mammals, it's looking less likely now, isn't it? The fact that dinosaurs have skulls more like lizards and the fact that they laid eggs, which lizards do as well, makes it seem like they must have been reptiles. Still though, you could be unsure about how much they were really like reptiles. But then, finally, nearly 100 years after the first dinosaur fossils were discovered, some scientists discovered this while digging up some dinosaur bones. What part of the dinosaur's body do you think this might have been? Look closely.

ACTIVITY INTRODUCTION VIDEO

So all of these clues—the bones, the eggs, the skin—these are the reasons why we think dinosaurs look like reptiles on the outside, even though we don't have any photos or videos of what dinosaurs looked like when they were alive. This is why in movies and paintings and sculptures, artists always depict dinosaurs as looking like giant lizards. It's exciting we're able to figure out what they look like. But there's still so much more that would be great to know about dinosaurs, like: how do we know what they ate? In all these pictures or movies, we seem to like to show Tyrannosaurus rex attacking things. Or we show sauropods munching on plants. Unfortunately, we can't watch them eat, because, well, they've all been dead for millions of years. We can't look in their stomachs, because the stomachs rotted away never having turned into fossils. So is there a way we can tell what dinosaurs ate? Yes, there is. It's the teeth. Just like we can compare the dinosaur skulls with the skulls of animals today, we can also compare

dinosaur teeth with the teeth of animals alive today. Animals that eat mostly meat, called carnivores, have sharp, pointed teeth, which helped them grab and hold their prey, the animals that they eat. Here's a lion's skull, another great example of a carnivore. You can see, it's not just their front teeth that are sharp. Their back teeth, called the molars, are sharp and pointed as well. That's great for cutting and tearing meat off the bone. But with all these sharp teeth, they don't really have any easy way to chew and grind up their food. So carnivores usually bite, and tear, and then just gulp down their food without chewing it much. They have terrible table manners. Animals that eat mostly plants, called herbivores, have teeth that look like this. The front teeth are big and flat. That's good for cutting leaves or grass. And then their back teeth are big and pretty flat as well, which is useful for grinding up the plants as they chew from side to side. What about animals that eat both plants and meat? Well, they're called omnivores. And, just like you might expect, they have some teeth that are like those of plant eaters and some teeth that are like those of meat eaters. Their front teeth are large and flat for chopping through plants. And then behind those, they have these sharp teeth, called canines, which are pointy for catching prey. So even though dinosaurs are long since dead, we could look at their teeth and figure out what kinds of food they ate. Practice a little bit here. See if you can figure out whether each of these animals we're going to show you are meat eaters, plant eaters, or omnivores just by looking at its teeth.

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