

# Episode 2: What Is a Lemur?

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Hi! I'm Dr. Matt Borths, and I'm the Curator of Fossils at the Duke Lemur Center. We are responsible for over 35,000 specimens that are all part of the Duke Lemur Center collection. We use these fossils to try to figure out how lemurs and humans are related to each other. In order to do that, and to tell you a little bit more about what a lemur is, I want to take you out into the fossil collection. But in order to do that, I need to put on this mask so I can keep my colleagues safe as we're working in the collection. So I'm going to put this on, and I'll meet you out there.

Welcome to the fossil collection! This collection is the result of over 40 years of research by Duke Lemur Center paleontologists going all over the world. We've worked in North America, South America, Madagascar, and Africa, all in an effort to understand the story of lemurs, from their origins all the way to the present day. That is a story that goes over 60 million years of Earth history.

Dinosaurs went extinct about 66 million years ago, and soon after that the earliest relatives of lemurs arose on the planet and started to diversify. And this is the result of us trying to figure out how they're all related to each other, where they came from, and how they eventually got to the island of Madagascar.

One of the things that I work on as a paleontologist is, I work with a team of biologists and other paleontologists to understand the relationships of lemurs to other animals. The way that we figure out how lemurs are related to other animals is by studying their anatomy: the way that they're actually put together. And that gives us lots of really important clues about where lemurs fit in the Tree of Life.

The first thing that's really obvious—so obvious you might not even think about it—is that lemurs are covered in fur. And that fur is an important clue about what lemurs are. They fit into the group of animals called **mammals**. Mammals are the group of animals that are covered in hair and fur. They also usually give live birth, and they usually provide milk to their young when they're really small. And those are things that we find in lemurs. They're covered in hair, they give live birth, and they use milk for their babies. That tells us lemurs are mammals.

When you're looking at a lemur, the place that you're most likely to see it if you're out in the wild is in a tree. And in order to live in a tree, lemurs have lots of really specialized adaptations that help them move through the trees. It's amazing to watch them move. And one of the ways that they can do that is by grasping onto trees and branches with opposable thumbs. That's these fingers that stick out to the side on a lemur's hand, and you'll notice I have them, too! That means that lemurs share their opposable thumbs with a larger group of mammals called **primates**.

Primates are the group of animals that includes lemurs, monkeys, and apes. Which means that we are primates, just like lemurs. Other clues that lemurs belong to the group called primates is they also have opposable big toes. Now, humans don't have that, but most other primates have grasping hands and toes.

When you look at the ends of my fingers, you'll notice that unlike most mammals that have claws or hooves, I have fingernails. Those fingernails are also found at the ends of the fingers of lemurs. Lemurs, monkeys, and apes all share fingernails. That's something that's shared by all primates.

Another trait that I have, that I also share with a lemur, is my forward-facing eyes. These forward-facing eyes are really important for primates that live in really complex environments where depth perception is really important.



Now there are a couple of traits when we look at a lemur that we *don't* find in all other primates. For instance, when we look that the foot of a lemur, they have nails on all of their toes, just like we do, except for one. They have one claw. And that claw is on their index toe, and it's called a grooming claw. The grooming claw does exactly what it sounds like. They use it for kind of scratching and moving through their fur. That claw is something that is found, actually, on the feet of other primates that don't live in Madagascar. Those primates include lorises and galagoes. Galagoes and lorises are found in mainland Africa and they're also found in parts of Asia. Those animals are all part of a group called **strepsirrhines**.

Strepsirrhine means "curled nose." And that's because when you look at the end of the nose of a lemur—or a galago or a loris—they all have this kind of long wet nose. It's like a dog's nose. That's something that's only found in a group of primates called strepsirrhines. And so strepsirrhines get their name from their wet noses. And also that wet nose goes with this long snout that lemurs have. That gives lemurs a really, really powerful sense of smell, and a lot of research that we've done at the Lemur Center has explored how good that sense of smell really is.

Lemurs have what's called a toothcomb. A toothcomb is really just the front teeth in the lemur: The incisors and the canine on their lower teeth are all kind of smashed together into this thing that they use to actually groom their fur. So "toothcomb" is a really good name for this structure, which they use to kind of fluff their fur and clean themselves. That toothcomb is also found in galagoes and lorises. So, it's another strepsirrhine trait that tells us that lemurs are part of this larger group of primates.

One of the things that you can do during your tour is to pay attention to the traits that you can see that identify lemurs as strepsirrhines, as primates, and as mammals. If you make those kinds of observations, then you are a lemur scientist and a paleontologist.

Because we find lemurs in Madagascar, you might wonder how they got there. Madagascar is an island—the fourth largest island in the world—that's off the coast of Africa. The relatives of lemurs are found in mainland Africa, and they are descended from primates that go all the way back to the beginning of the Age of Mammals, soon after the extinction of dinosaurs.

The earliest lemur-like primates are found, actually, in North America, and in Europe, and in Asia. Eventually those lemur-like primates got to Africa and then from Africa they crossed the Mozambique Channel to Madagascar.

A long, long time ago, Madagascar was actually connected to mainland Africa, but that was back during the time of the dinosaurs—long before lemurs and other primates arrived on the scene. So the ancestors of lemurs had to cross that gap. The way that we think they did that is by rafting on **natural rafts**.

A natural raft is something that we still observe in the oceans today. People out in the middle of the Atlantic Ocean or the Indian Ocean will notice these big rafts that are basically made out of trees and branches and soil that have ripped off the banks, usually of rivers during high storm or flooding events. And those have actually been observed with animals drifting on these natural rafts. These animals, things like rodents and even primates, have been observed in these natural rafts in the middle of the ocean.

What scientists think happened is, tens of millions of years ago, a group of primates from mainland Africa that were probably—that were related—to things like galagoes and lorises, so some kind of strepsirrhine, was on a natural raft. That natural raft drifted across the Mozambique Channel, and eventually those poor strepsirrhines got off of the raft and colonized Madagascar. We don't know how often that happened, but it wasn't a very common event—it doesn't happen very often today—but over the course of millions of years, eventually there was a group of primates large enough to kind of radiate; and that radiation, or diversification, on the island has given us the spectacular diversity of lemurs that we see in Madagascar today. Over 100 species of lemur live in Madagascar.



What's really amazing to me as a paleontologist is that that's not even the full diversity of lemurs that we had. Only a few thousand years ago, we know that there were at least 17 more species of lemur that were living on the island of Madagascar. Those lemurs include animals like *Megaladapis*. *Megaladapis* was a lemur the size of a gorilla. That giant lemur is now extinct, but we know that it was a really important part of Malagasy ecosystems because we find them in the recent fossil record there.

We also know that there were lemurs like *Palaeopropithecus*, the sloth lemur. Sloth lemurs have long arms and hands that let them hook onto branches and walk through the trees of Madagascar. Other animals include *Archaeolemur*. *Archaeolemur* means "the ancient lemur," and *Archaeolemur* was a lemur that liked to live on the ground. It probably behaved a little bit like a baboon, so it's gotten the nickname "the monkey lemur."

All of these extinct lemurs were big. They were larger than any lemur that lives in Madagascar today. One of the things that we're working on at the Lemur Center is trying to understand this extinction event. How do we go from an island that has lemurs the size of gorillas all the way down to lemurs the size of tiny little mouse lemurs, and then for some reason we lose the big ones?

One hypothesis is, humans around 1,000 years ago started to really get good at agriculture in Madagascar. That meant that their populations started to expand, and those populations expanded into the forests where lemurs were living. That's still happening today. People still need to grow food for their families, and they do that by using agriculture.

One of the things that we do at the Lemur Center is, we work with people who grow things in Madagascar to figure out ways that they can grow them without putting a lot pressure on lemurs that are still living in the forests. In that way, we can use the fossil record to understand the extinctions in the past to try to prevent the extinctions that are happening right now.

It was wonderful getting to introduce you to these creatures. Have a wonderful time on your virtual tour, and I hope that we can bring you into the collection someday to show you more of the fossils that tell the lemur story. And with that, have a great time, and thanks for stopping by with two lemur thumbs up... or primate thumbs up... but not mammal thumbs up. Bye!

