A Busy Time in Primate Evolution: Spring 2026

Megan: Hi, you're listening to Aye-aye Pod, the official podcast of the Duke Lemur Center in Durham, North Carolina.

Matt: I'm Matt Borths, Curator of Fossils at the Duke Lemur Center.

Megan: And I'm Megan McGrath, Education Programs Manager at the Duke Lemur Center.

Matt: Hi, Megan.

Megan: Hi, Matt. So today we're doing something a little bit different. We're of course, going to be yapping about about interesting things. But instead of us interviewing someone, I'm kind of going to interview you.

Matt: Yeah, that sounds like a plan.

Megan: All right. Great.

Matt: I got some things to talk about.

Megan: Great. So you've been doing some interesting stuff, but specifically would love to chat with you about where you went last year and why you went there. So we work at the Duke Lemur Center. We are based in Durham, North Carolina. Of course, we help, work with a team that works in Madagascar, where you find lemurs in the wild. But you went to Kenya.

Matt: I did go to Kenya as a paleontologist from the Duke Lemur Center.

Megan: So can you talk to us a little bit about why? Why Kenya? Why that fits into the Lemur Center's work.

Matt: So the fossil collection that we have at the Lemur Center is obviously all about trying to figure out how you connect a lemur to a human. And that's really the story of the Lemur Center. That's why we study the biology of these animals. That's why they're fascinating all kinds of ways, because they're a little glimpse of our own story.

And so the fossil record helps us get from something looks very lemur-y to something that looks very human-y. But also along the way we have lemurs doing their own diverse thing and all kinds of other primates. And so the fossil collection we have at the Lemur Center has lemurs in it, but it also has other primates. And so the quest in Kenya is about trying to fill in the gap between lemurs and us, especially the gap that is close to where the origins of apes are.

Megan: All right. We've talked about where you physically are in this location. You're going to be in Kenya. Can you get a little more specific, like where in Kenya? What does it look like, and would it be somewhere you would visit if you weren't looking for fossils necessarily?

Matt: So the sites where we go to look for these fossils are in northern Kenya, which is on the shores of Lake Turkana, which is a great lake that is along the Great Rift Valley of eastern Africa. Eastern Africa is basically on the way to eventually breaking off from Western Africa. And there's this scar through the tectonic plates of Africa that creates these low points that are lakes. That's where Lake Victoria is. It is one of these. Lake Malawi. Lake Turkana. They are filling in this like crack in the earth, and that rifting event, the split between the two chunks of Africa, lines up really beautifully with a couple of time periods that are when primates as a group are really starting to diversify.

And especially when we are starting to diversify. Lake Turkana is probably most important for having miles and miles an outcrop that tell the story of human evolution. It's rocks that are like 4 million years and younger. And so we find walking apes, essentially. But the site that I went to, that has only been known since 2016, is important because it's even older.

It's among the oldest outcrops in Lake Turkana. It's about 29 million years old, and 29 million is a really exciting time because based on genetic evidence and some scanty fossil evidence, that is when we think the group of primates that become apes are splitting from the group of primates we call monkeys. At Old World monkeys. And so this little outcrop is this little window into a really fascinating time period. Alongside of the apes and the monkeys are also lemurs.

Lemurs, as a group, we know from the fossil record, are starting to become lemur-y at this point. The oldest toothcombs are starting to pop up in the fossil record. Very soon before this time, and so the creatures that eventually set sail from mainland Africa to Madagascar are evolving on this landscape near Lake Turkana 29 million years ago.

A Busy Time in Primate Evolution: Spring 2026

Megan: So you're in one physical location in northern Kenya along this rift, but you're kind of in three different places in time, right? Your in present day. You're also looking at fossils from two different, really important time periods in primate evolution.

Matt: Yeah, exactly. And this chunk of Africa is especially exciting because at the Lemur Center, we have probably our most researched collection - like the reason a lot of people come to the Lemur Center as paleontologists is to look at fossils from a set of sites called the Fayum Depression, which is in Egypt. Egypt is in northern Africa. So it's recording what's going on on the continent of Africa.

But Africa is huge. It's a just a massive chunk of land. And so we know from modern Africa that if you just went to Egypt today and said, like, tell me about the biodiversity of the continent of Africa, you're just getting a little bit of the story. If you went to South Africa. You also are only getting a little bit of the story.

We want to kind of have a survey across the continent. But until very recently, this window, when Old World monkeys and apes are starting to kind of appear in the fossil record, the Fayum was basically our best window. And honestly, our only good window into good fossils from this time period. So we only have, a Northern African perspective on the story of primate evolution across the entire continent.

And we know that that was a really busy time in primate evolution. So finding this site that's close to the equator in Kenya offers this chance to look at like, what is what's going on in the core of the continent that we can compare to other sites that might be around that time from southern Africa. It helps to string together a full perspective on what's going on in the continent.

And I should say that being on the equator creates kind of, I don't know, for me, it evokes jungles and kind of lush settings like the Central African Republic, these kinds of places that are forested. Northern Kenya is desert. It is it is a very dry place today and super hot. It is a very normal place to find fossils in that way, because we find fossils in places where there's not a lot of other stuff covering the surface of the rock, and there's a bunch of exposure in Turkana because there's not a lot growing there.

There's a lot of acacia and there's patchy plants that are really making a go of it, but it is a tough landscape for the creatures that live there today. It was probably more densely forested 29 million years ago when the fossils were being deposited.

A Busy Time in Primate Evolution: Spring 2026

Megan: So you've mentioned that this site holds like kind of two different storylines in primate evolution. Is this a site that has previously been well-studied in all areas, or are you following in the footsteps of folks who have already done some work on the lemur side of things, or have things really been focused on the human side of things up until this point?

Matt: That's part of what's so exciting about this fossil site. I talk a lot to young people who are interested in paleontology, and I try to emphasize that we're not done yet. We haven't found all the sites, we haven't found all the fossils. But sometimes it can feel like I'm not being entirely honest because when we go out to field sites in Wyoming every year, I'm going to field sites that people have been visiting for like 150 years, like there's still fossils coming out there.

Still interesting information, but they're not kind of brand new. What's really exciting about this site, which is called Topernwai, is it was only discovered in 2016 as a place that had fossils. So that's ten years ago. When they first found it, they thought, well, this is old stuff. It's not part of this time period when we find human ancestors and their relatives walking around.

So it's probably older than our 4 million year old rocks. But let's not get crazy here. Like it probably is about maybe eight, maybe ten, maybe 12 million. So it's classified in a time period called the Miocene. The Miocene is a really exciting time in the African story. But they then took a huge chunk of rock that when you go to the site, the Topernawi outcrop is mostly evidence this would have been a terrifying place to be.

There is this huge lava flow that was part of this early rifting. As Africa is cracking in half, the guts of the planet are gushing out into eastern Africa and causing these hundreds-of-meter-thick, like, lava flows. Some animals happen to be around, and some of them get preserved in the rocks that are created from the weathering of these ashes and these lava flows.

Those lava flows are how we date a site. Basically, a fresh rock creates like a fresh clock for us to go to and sample the minerals within it to figure out how old the rock might be. And when they got the dates back from the rocks they collected soon after they discovered the site in 2016, they discovered, “Oh my gosh, it's 29 million years old!”

This is the oldest stuff in Turkana. And so that causes everyone to kind of run back and reassess and look for more fossils. Problem is that there aren't a lot of fossils at the site. They're really scrappy and far between. But because we get this 29 million year old date, the first kind of large scale exploration of the site starts in 2019, which unfortunately is right before 2020, which is when a lot of stuff shuts down.

A Busy Time in Primate Evolution: Spring 2026

And so really, we're just starting to collect the first couple of hundred fossils from this site to put together what is the world of equatorial Africa like 29 million years ago, when lemurs are starting to diversify, apes are starting diversify – or really originate – not diversify. They're just getting their grasping feet under them. And what other creatures are they sharing the landscape with at that time?

Megan: It sounds like you're looking for scrappy little things. I think a lot of us, when we think about fossil digs, we think about like gigantic skulls and gigantic femur bones, like, what's the scale of what you're looking for? And what's been found from which creatures?

Matt: So a lot of the fossils that we find in this site seem to come from what we call mass flow deposits. Animals died and rotted away. And then there's this big chunk that kind of moved all the sediment on the surface. That means things were exposed on the surface for a while, or have been tumbling around in a river channel for a while.

So what we mostly find are teeth and ankle bones and the really, really dense parts of skeletons. The things that can survive all the tumbling and rotting and just kind of churning that happens when things are exposed on the surface. So honestly, almost everything that we have that we can identify are teeth, and that is kind of a bummer when it comes to wanting to understand, like the skeletons and anatomy of these creatures.

But fortunately, teeth, especially teeth of mammals... mammals have the superpower of being able to chew really efficiently, our teeth lock together, and that means our locking teeth have lots of bumps and crests and grooves. Those bumps and crescent grooves are shared among related animals. So just with an isolated tooth, you can figure out pretty quickly, “Do I have an ape or lemur or a rodent or an elephant?” The elephant is pretty obvious because those are big.

And so we have some relatively large teeth and some large chunks of bone. But they're pretty scrappy and churned up. As far as the creatures that we find that are represented in this kind of flood deposit 29 million years ago is a really fascinating time in African history, because it's when Africa is an island continent.

It's been cut off for millions of years. Before the extinction of the dinosaurs, Africa and South America have already disconnected. The continent of Madagascar+India has broken off millions of years ago. Europe and Asia are like on the horizon. Currently, Africa is sliding north and that's the reason why the Alps exist. But Africa before, if you like rewind, the clock is floating by itself.

A Busy Time in Primate Evolution: Spring 2026

And so while it's floating by itself, it has a bunch of creatures living on the continent that are what we call endemic or local, just in Africa. Elephants are a group of animals that are only found in Africa. If you could time travel back, you wouldn't find elephants in Asia. You wouldn't find wooly mammoths in Siberia. At this time. Elephants are just an African group at this time.

You also find things called anthracotheres, which are kind of hippo-pig creatures that ultimately we think are closely related to whales, which is kind of a fun story, but they're very terrestrial at this point. They have like long legs and hooves. We find African rodents, we find primates, and we find hyraxes, tons of hyraxes. Hyraxes are like 90% of the fossils that are found at Topernawi. Hyraxes, today, are like little fuzzy footballs.

They are kind of like short eared rabbits that are only found in Africa. And they've gotten into places like the Arabian Peninsula, and they've even kind of made their way into parts of Asia during part of the recent history for this group. But they originate in Africa. And today, small creatures, they always look a little grumpy because they these pointy little fangs that are sticking out of their mouths and those pointy little fangs are actually tusks. And the tusks connect them to their close relatives: the elephants.

Hyraxes, which look like little Rabbits, are most closely related to things like elephants and manatees, which is another fun, weird group of animals that comes from this African origin. But the hyraxes, at the time, 29 million years ago, aren't little football things.

There are some little football things, but there's also goat sized things and antelope sized things and tapier sized things. And rhino sized hyraxes. There are giant hyraxes that are filling in all of those niches that we think of for plant eating animals in Africa during this time period, because we don't have rhinos, they're evolving in North America. We don't have antelope. They're evolving in Asia and North America.

Those animals can't get to Africa because it's an island. And the hyraxes are like, “We got free reign. We are going to diversify like crazy!” And so they seem to be like the dominant herbivorous group of animals on the landscape at the time. They're kind of tromping through the forest while the lemur relatives and the ape and monkey relatives are starting to diversify in the trees.

Megan: Okay, so we've got hyraxes galore. We've got hyraxes of varying sizes. What do the primates look like in this landscape 29 million years ago? Like what kinds of species or adaptations

or specific things are you maybe hoping to find, or basically knowing that you'll find, given the fossil evidence you have elsewhere in the World

Matt: Based on what we have from Egypt – the Egyptian fossils we have at the Lemur Center and also in Cairo, and there's some Fayum fossils scattered in collections around the world – we know that there is a wide diversity of primates that existed 29 million years ago. The Fayum record goes from 37 million to about 29 million. And the largest primates that we find are a group of animals called Aegyptopithecus.

And it's kind of a like a small baboon sized creature. We also find small kind of marmoset sized things. There's an animal called Catopithecus that's a very cute, tiny little monkey. And we also find lemur like primates. We even find aye-aye like creatures. The animal called Plesiopithecus that we've discussed before, is from the Fayum.

So we know that there's this huge diversity of primates that exist. But again, that's like in the northern part of Africa. So it's far from where we think the core biodiversity should be. We also know that at 29 million, that is not too long after a big extinction event that happens during the age of mammals at the Eocene-Oligocene boundary.

From what we can tell, the Eocene-Oligocene boundary is marked by an extinction of a whole bunch of animals, and it seems to be connected to a big change in the climate system. And we think that one of the factors that contributed to this change in the climate is Antarctica finally breaks away from Australia and South America, and is an island continent on the bottom of the planet that is causing cold water to kind of cycle around the bottom of the planet in a way that it hadn't ever cycled before, because it would get blocked by all these other continents.

And so as glaciers start to form in Antarctica and trigger glaciers in the North Pole, you're getting lots of water zapped up into these miles of ice that are starting to form. And we basically enter the modern climate system. This is the birth of the glacial cycle that we start to see now, like we're living between glacial cycles as ice forms and develops and more water is pumped to the surface and ice is zapping it all up and dries out the planet and extinctions happen.

And in that world, the question is, what primates are adapting to this world that suddenly is drier, more open than it had been for the previous tens of millions of years? And so the question has always been how much the northern Egyptian animals are being shaped by this change, but they're kind of at the edge, they're being more exposed to a lot of these climate changes. Whereas we think of the equator as being a little better buffered.

A Busy Time in Primate Evolution: Spring 2026

It's warmer. It's basically getting the same amount of light. There's less seasonality that we have at the equator. And so the question has always been, is there this refuge of primate diversity near

the equator. And so far there doesn't seem to be. We find a lot of similar groups of primates at Topernawi, as we find in Kenya. It seems like we haven't quite found this like flourishing of diversity quite yet. We might still be dealing with the repercussions of this extinction, which may be then pushing us towards things like apes starting to emerge. So there's some evidence of things that we might be able to connect to it apes, so stay tuned as we start to describe some of the primate material.

And when I say we, I should also mention that this is part of a huge project and huge team that I was invited to be a part of because of the Fayum collections and the research that I've done in the Fayum at the Lemur Center, but it also involves researchers from the State University of New York or The State University of New York at Stony Brook,

It also has researchers from Kenya and Harvard, the Turkana Basin Institute and the National Museums of Kenya. So it's a really international effort that has a lot of Kenyan and American collaborators working together.

We're rounding the corner. We're getting ready for spring. What's going on in the colony right now?

Megan: So right now we're recording this in the beginning of February, which means that we are now officially in baby season, which is a very cute, but also kind of stressful time of year for everyone. And our first babies up for the season are always our Coquerel's sifaka. They are the earliest breeders in the season, and so they usually give birth between like December and February-ish.

But we had an earlier baby this year. If you follow us on social media you have already heard about, baby Junius. He was born in October, October 12th. He's actually, as of this recording, a week away from being four months old. And I got some updates from his primary caretakers, Sarah M, just before we recorded.

And Junius is doing extremely well and entering a very brave era for a baby sifaka. He is starting to spend more and more time off of his mom because normally lemur babies are clinging to mom,

most of them. And so he's being very brave. He's hopping off of mom more often. He's kind of climbing, practicing his primate skills with his grasping hands and grasping feet and kind of dangling, probably at odd angles while he's figuring out how to balance and move around.

He also is starting to learn about positive reinforcement training. So if you remember that from past episodes, we talk about how we introduced training really early with our animals and in his case, his mom, Francesca, when she's doing training sessions, Junius is now kind of leaning over and maybe snacking a little bit on some of her training session snacks and kind of learning, “what is mom doing?”

And kind of starting to understand there's a connection between mom and doing some things and getting some snacks and kind of getting used to being a little closer to our animal care team as well, in that kind of trusting training set up, which is all very exciting. Lots of learning, lots of exploring, lots of bravery happening. And one of my favorite things is that Junius’s dad, Remus, is very well known at the Lemur Center for a particularly endearing behavior where he will sit, facing the opposite direction. And if he wants to look at something behind him, he will flip his head completely backwards. So his chin is on top of his head, basically. And it's a very impressive display of neck flexibility. So he completely flips his head backwards, and it's very unique to Remus. And little Junius is now doing the same behavior. So like father, like son.

Matt: I saw that behavior because I clocked that because my daughter who just turned one is a real head swiveler and she’ll kind of like get her head around to see whatever’s going on. She always wants to be... we say she wants to be in the mix. And so when I first saw Junius, he did the head flip and it's like, “Awww, my little girl.”

Megan: Yeah. Little primates learning how to view the world.

Now let's do some fun facts. Matt, what have you learned?

Matt: And in my case, literally dig in. This is connected to, the Turkana Basin, which is where Topernawi, the field site, is. Topernwai, like I said, is very exciting because the site itself was discovered to have fossils only ten years ago. But Turkana has been explored for decades because of the important human fossils that come from these sites.

And you'd think people have been looking for human fossils along the shores of Lake Turkana for decades now. And so we basically found most of what we're going to get from some of these sites.

But there was a research study published in The Anatomical Record that described new fossils that have been discovered from rocks that we've known about for a long time.

And it's an important one because it's one of the oldest things that we call Homo. The group that is older is an animal called Australopithecus, and Australopithecus includes Lucy, who is a more complete skeleton from Ethiopia. And she has lots of skeleton that goes with her. And we know a lot about how she moved, and she moved in a weird way.

Her like lower body is not modern. She couldn't have run or thrown things or used her hands in exactly the way that we can. She is something that is on the way to something that looks like Homo sapiens, but it's not us. And so the question has always been, Is Homo habilis something that's more Lucy-like or more modern human-like?

And so with the skeleton finally being associated with, Homo habilis, it's a little over 2 million years old. It's more like Lucy. Honestly. It's an older looking skeleton. It's not a comfortable, direct ancestor to Homo erectus, which is the group that comes right before us. And so we think Homo sapiens kind of comes from some branches of Homo erectus.

And that's like, where did Homo erectus come from. Homo erectus is the first bipedal ape that could run. And the first one, it could throw stuff like it's something that looked pretty modern but had smaller brain size than we do. And so Homo habilis is now like the ancestor – like, what do we have here? And so finding more of the skeleton just makes it more complicated to figure out where we came from, which is very exciting.

And again, it comes from sites that people have known about for a long time. So there's still a lot to discover, even from sites that we've known about for a long time.

Megan: That is very exciting news because it feels like this stuff is old, right? We know about it. But that that could not be further from the truth.

Matt: Yeah, and they're really scrappy skeleton bits that they have too. It's like there is more Homo habilis to be found. So Megan, what are your fun facts for this episode?

Megan: We are currently working on a wild workshop called Love and Lemurs that dives deep into lemur reproduction and the fascinating ways it is very different than human reproduction. And so part of my work week was getting in touch with the research team to see if we can borrow a

particular sample from their, freezer collection. And so my fun fact is one that has to do with lemur reproduction.

They produce something called a sperm plug. And a sperm plug is something that some mammals will use as a method of reproduction to try to ensure that I am the father of this female's offspring, and no other male is going to be able to father offspring with this female, so it can often be a sign that we are looking at not completely monogamous pairings in reproduction.

And, lemurs do produce sperm plugs. So, that was inspired by the fact that I am currently sourcing a frozen sperm plug to use as a demonstration while we talk about lemur reproduction and the science behind all of it. But also, I think maybe this can inspire a future discussion of just all the really interesting ways that lemur reproduction looks a lot different than what we might expect.

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Matt: Or the fossils!

Megan: ... or the fossils in Durham, North Carolina, go to lemur.duke.edu.

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Megan: And Megan...

Matt: And all the primates at the Duke Lemur Center!