



Episode 21 Follow the Leader

Meredith Johnson

0:00:13

This is Origin Stories, the Leakey Foundation podcast. I'm Meredith Johnson.

Margaret Crofoot

You can see some really spectacular examples of collective movement just by going outside. If you've ever watched a bird flock as they move together, they almost look choreographed. As one bird turns, the whole rest of the group turns. You see a similar thing with fish schools. The sudden flash of light at every fish, apparently, altogether—in complete synchrony—changes direction.

Meredith Johnson

People used to think movement like this was evidence of telepathy.

Margaret Crofoot

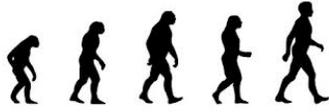
How else could these animals be moving so synchronously, making decisions so quickly to change direction, to move together? And, of course, now we know that it's not telepathy that allows them to do this. In fact, it's a really simple set of rules about how you interact with your neighbors that allow a fish school or a bird flock to behave as this cohesive coordinated unit.

Meredith Johnson

This is Margaret Crofoot. She's a scientist interested in how animals make group decisions, because it can answer a really important question about us.

Margaret Crofoot

When we think about human societies, I think we have a tendency to focus on a lot of the bad things; the competition, the aggression on war, on conflict. I think that really misses what's so special about us as a species. We would not be a species spread over every continent of the planet without our ability to work together to achieve collective goals. This question of how humans are able to harness that cooperative potential, to achieve these collective goods really is at the key to who we are as a species.



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If you're thinking about the evolution of humans and interested in these questions about how we came to be the species that we are, you really have to grapple with that question; how do we cooperate? How do we achieve collective goals, collective action?

Meredith Johnson

How did we evolve the ability to cooperate? Like bird flocks and fish schools, is there some simple rule behind this behavior? To figure out big questions like these, you have to break it down into more simple pieces. Understanding group dynamics and group decision making isn't easy. Say I asked you to grab five friends and come out for dinner with me this weekend. How long do you think it would take us to pick a place to go?

Margaret Crofoot

You know, you got a vegetarian who doesn't want to eat at the steakhouse. And you've got a friend who wants to be close to home, because she has to run out before dinner is going to be over. You've got different needs and capabilities of members of the group that put them in conflict over which is the best option for them.

Meredith Johnson

Now, imagine, we have to figure out where to go without talking about it, because we don't have language. And imagine that if we don't stick together as a group, one of us will probably get eaten by a lion. This is a situation with the animals Margaret Crofoot studies. She's a primatologist and a Leakey Foundation grantee, who's recently been working with baboons in Kenya, at a place called the "Mpala Wildlife Conservancy."

Margaret Crofoot

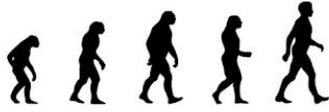
It's up on a plateau that looks out at Mount Kenya, so it's this beautiful landscape of woodland savannah, with two rivers that run on either side of the conservancy. It's a landscape teeming with animals. I usually work in tropical forest where you see lots of insects, and you see lots of birds, but you rarely see mammals. Coming at African savannah, where there are just animals everywhere, was a really amazing and really exciting experience for me.

Meredith Johnson

The Mpala Wildlife Conservancy has elephants, zebras, lions, leopards, cheetahs, hyenas, and quite a few baboon troops.

Margaret Crofoot

The troop that I study sleeps on these trees over a river. They wake-up every morning, and start the day by sunning themselves, staying in the sun, warming up, and then they're faced with a



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decision. They're getting hungry. They haven't eaten all night. They're ready for breakfast. Where are we going to go eat? Do we want to travel down river to the fig tree? Do we want to go up river to this bunch of prickly pear fruit that we know is there? Where are we going to go?

Meredith Johnson

Some of the baboons might want figs. Some might want a drink of water first. Others might really want that prickly pear fruit. But they can't just wander off on their own. Individuals can easily get picked off by all these lions and leopards. They have to stick together and make a decision about breakfast, as a group.

Margaret Crofoot

They're only going to go eat breakfast in one place. So where do they go? Because for a primate group where they travel as a unit, groups have to reach consensus. That means that even if there are conflicts of interests, there are differences of opinion over where the better place would be to go, the group has to come to a singular decision. How they do that is a really key to understanding how their society works. If a group doesn't reach consensus, it just splinters and falls apart.

Meredith Johnson

If only that has, perhaps, a relevance to our society today.

Margaret Crofoot

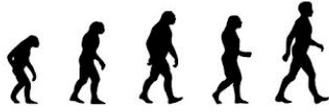
Somehow baboons are able to keep it together. This question of how baboon groups make decisions, it's been fascinating to researchers following baboons since the very beginning.

Meredith Johnson

There have been many hypotheses. Baboon troops have dominant males and females within them. It's natural to assume that they just might, somehow, coerce the others into going their way. Margaret Crofoot had her doubts that this was the real story. But to get an answer, she'd need to be able to track a whole group at once. Baboons live in big troops, sometimes with more than 100 individuals. They cover a lot of ground, which makes following the whole troop very challenging for primatologist.

Margaret Crofoot

So, the landscape of these baboons they are living on is some of parts of a relatively open grassland where you can see for quite a while. You have these glades that open up. When the baboon troop is in a glade, you can see the entire troop sitting, grooming each other, foraging, playing, fighting, whatever they happened to be doing.



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Meredith Johnson

As they move out of the glades into the trees or rocky areas, it's impossible to track the whole group by eye. Primatologists typically use a technique where they focus on one particular animal, following them all day and recording what they do. To study group dynamics, you need to track the whole group at once. That had never been done before. Meg Crofoot thought she had a good way to do it—temporary GPS trackers.

Margaret Crofoot

So, the same technology that's in your cellphone or in your GPS unit in your car, so that basically tells you where in the world you are, where in space you are located. In our case, it's packaged into a collar that we can put on an individual baboon. Once this individual is wearing a collar, we can know where it is at every second of the day.

Meredith Johnson

To get the collars on the baboons, first, they had to capture them.

Margaret Crofoot

Which really is where one of the big challenges of this project comes in. It's, perhaps, not surprisingly quite difficult to capture an entire troop of baboons.

Meredith Johnson

The GPS collars are made of soft brown leather. They look like a fancy dog collar, with a diesel battery case at the bottom. Meg and her team didn't want to harm or upset the animals in any way, so they had a big group of vets and expert researchers on hand to make sure they were doing things safely.

Margaret Crofoot

But then you're also dealing with the fact the baboons are smart animals. They figure out what's going on relatively quickly. So, our tactic was that we wanted to catch as many animals as we could on the first day before they figured out what was going on.

Meredith Johnson

They set-up twenty-four big traps that looked like large boxes made of wire fencing. They scattered dried corn around the area to attract the baboons, and they put more corn inside the traps.

Margaret Crofoot

It turns out the baboons will do just about anything for corn. And so, on the first day of trapping, we caught fourteen animals. Interestingly—I think you might think that baboons would react



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badly to being caught in a trap. And I was actually—that was one of my major concerns. But surprisingly, it turns out that baboons will sit quite happily in a trap, as long as there are still maize for them to eat. The door would come down and they sort of look around confused and puzzled, and then would just go right on eating.

Meredith Johnson

And so, after ten days, Crofoot's team were able to catch and put collars on all the adult baboons in the forty-member troop. Once all the trackers were on, Meg and her team had to wait to see if their idea would work.

Margaret Crofoot

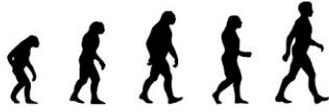
Yeah. Actually, we had programmed our collars to all turn on, on the same day, on August 1st. We didn't start getting data right away. There was this period of time where we had put collars on all the animals, but we didn't know yet if the collars were going to work. And so, it was extremely, extremely nerve-racking as you're waiting for August 1st to come. August 1st comes, and we were out there in the morning. There's a radio transmission ping that collars use when they're turned on that allows us to radio track them to find them using the antenna. We're out there in the morning just waiting at 6:00 AM. Are the collars going to turn on? They didn't. Then in the evening, we were down at their sleeping trees waiting. Do they collect data? We knew they had turned on at six in the morning, but we still didn't know if they were collecting data the way we were hoping for. It was midnight by the time we got back to camp. It was just so exciting to download the data, and then sticking the SD card in the computer, and looking at—"Yes! They're working." We can see the tracks of these animals. It was so exciting.

Meredith Johnson

They collected one GPS data point every second of the day, for every baboon in the troop with a collar. Every night—when the baboons went to sleep in their trees by the river—Margaret Crofoot would sit in the dark on top of her car, holding up an antenna to download the data. All the movement information was then uploaded to a database, which could superimpose it onto satellite maps of the nature preserve. Crofoot said, she and her team could then watch what the troop had been doing all day, just like it was a movie.

Margaret Crofoot

You could see not only the tracks of these animals, but how they are moving in relation to these environmental features, so how they are moving across the river and around the village that's on the other side of the river, and how they were interacting with features of the landscape, like



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ridges and rocky outcroppings where they oftentimes like to rest in the middle of the day. Because we could visualize this on top of the satellite imagery so quickly, you just got this really immediate sense of both of how they were interacting with each other within the group, but also with their habitat. That was really exciting.

Meredith Johnson

The collars had been programmed to pop open and fall off after thirty days of tracking, so they wouldn't have to capture the baboons again. What they did have to do was dig through twenty million data points and figure out what was going on.

People have been studying baboons for decades, and we know a lot about baboon society. Like humans, baboons have complicated social lives and close relationships with family and friends. They also have strong dominance hierarchies, with a big dominant male and a dominant female.

Margaret Crofoot

And so, what we were really interested in was this question of how are these groups making decisions, given that they have a very hierarchical social structure. Dominance is really important in organizing the ways that members of baboon troop interact. The dominant male only has to look at or just start moving towards subordinates for them to get up and see their place. The alpha male baboon has priority access. He gets to mate with whichever females he wants, and is able to exclude other males.

Meredith Johnson

The alpha female gets the best feeding locations for herself, and her friends and relatives. In a society like that, you might think a high-ranking alpha male might use his status to push everyone around and bully them into making decisions that are better for him and that might, in fact, be bad for everyone else. You might think the alpha always gets to pick where the group goes for breakfast. But Margaret Crofoot and her team found out that's not how it works at all. She says, when it comes to group decisions, it makes more sense to think of the process in terms of a spectrum.

Margaret Crofoot

From decisions that are completely democratic on one end to the spectrum where every individual in the group has a completely equal say. You can think of it as having an equal voice or an equal vote, all the way to the far other end of the spectrum completely despotic decision, where a single animal—it might be the alpha, it might be the leader, it might be the biggest animal, whoever it is—a single animal decides for the entire group. You have one animal who has all the power and all the voice, and the whole rest of the group was none of the voice.



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Most animals really fall somewhere along that continuum between completely democratic and completely despotic. We might have expected based on the structure of baboon societies the despotic decision-making was going to be important, because dominance relationships are so important in the species.

But actually, what we found was really strong evidence from majority rule, something much more can devoting.

Meredith Johnson

Baboons don't go to the pulse. They vote by deciding how and when they move—exactly the information Crofoot was collecting with all those GPS collars.

Margaret Crofoot

So, what we came up with for extracting meaningful patters out of this quantity that you could almost drown under, was looking at the interactions between pairs of animals. If I move way, do you follow me? If I move away and you don't follow, do I come back to you? So, the first of those we called the “pull.” I move away and you follow. The second we just thought of as an anchor, or a failed pull. I move away. You didn't follow me. I came back. We mind this huge data set, these twenty million data points for all of the instances of pulling and anchoring within the data set. And we found some really interesting things.

Meredith Johnson

They looked at how group decisions are made from an individual's perspective. Am I going to follow you or not?

Margaret Crofoot

What really seems to make a difference is how many individuals are moving in that direction. So if I'm being pulled, how many individuals are pulling me? How much are they agreeing with each other on which direction we should go? When there are a lot of animals pulling and they all agree, not surprisingly. There's a high probability that I'm going to follow.

Meredith Johnson

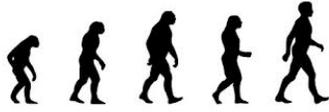
But when you have a lot of individuals pulling in different directions and disagreeing—

Margaret Crofoot

There's a high probability I'm not going to make a decision at all. I'm just going to sit and wait.

Meredith Johnson

Basically, not vote.



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Margaret Crofoot

The number of animals and the agreement amongst them is key to the overall group decision. That's really consistent sort of voting-like process.

Meredith Johnson

Was it the alpha who always won the popular vote? Did some baboons have more influence than others?

Margaret Crofoot

I think one of the most surprising things—at least, initially for us—was when we looked at the effect of dominance on the ability of an individual to lead, we didn't find any relationship. High-ranking animals were no more likely to be followed than low-ranking animals, which was sort of surprising, because we might have expected that high rank would have given you the social power to have an outsized influence on these group decisions, these group movement decisions. When you actually stop and think about baboon societies, maybe it makes sense.

Meredith Johnson

Because in Baboons, the females live in the same area their entire lives, and the males switch groups. So, the females know more about their habitat.

Margaret Crofoot

It may not be males who are best suited to make good decisions about where to go at any particular moment in time. In addition, we know that social relationships are really important to baboons, and can be as important as dominance for their effect on certain fitness measures.

Meredith Johnson

It turns out what did make a difference, what made more other baboons likely to follow was the way a baboon moved.

Margaret Crofoot

Individuals who tended to be followed with a high probability were individuals who moved in a very directed manner at a fast, but not super-fast speed, which you can imagine might be correlated with their certainty about where they're going. So, it's almost as if individuals who moved with confidence were the ones who are followed.

Meredith Johnson

Think back to the scenario at the beginning of our story. A group of friends trying to decide where to go for dinner. What can we take from this research that can help make things like



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picking restaurants less of a pain? Should we just walk real fast towards the place we want to go and hope our friends follow? Unfortunately, it's more complicated than that.

Margaret Crofoot

Well, what's interesting is that you might think that with baboons you needed complex rules, that it's a complex species, they have complex social relationships. But majority rule, which is what we found is actually an example of a relatively simple rule. They're basically following the majority. It's an example of a relatively simple rule leading to complex outcomes.

So, what does this tell us about humans? Well, there's really good evidence from theoretical models that, in a lot of ways, democratic decisions, decision that are shared amongst multiple individuals or many individuals have voice are actually better on average than despotic decisions where a single individual decides. And this is in part, because more information can be pulled. In part, there's this thing called the "many wrongs principle" where a whole bunch of little misjudgments get averaged out when you have a lot of people contributing data.

And so, what our results suggest is that we would expect to see democratic decision-making rules being highly applicable across a wide range of animal species, including in humans. And importantly, that the kind of social structuring that we have in our societies, as well as in primate societies, doesn't somehow impede the ability to make these democratic decisions, so that it's possible to have all individual sharing in decision-making, despite having strong hierarchies within a group, just by having strong differentiation of social relationships and social power.

Meredith Johnson

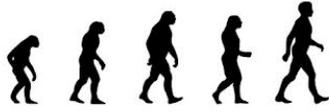
For her next project, Crofoot wants to better understand how leaders and groups interact in decision-making.

Margaret Crofoot

Maybe it's social relationships that make a good leader versus a bad leader. We have a lot more to investigate and to really start testing hypotheses about the ways in which social relationships and position within this complex social network are impacting individual's ability to shape the decisions their group makes.

Meredith Johnson

Like baboons and other primates, human society also has individuals who become more dominant. Crofoot's research may point us to how important it can be to have the consent to the govern—so to speak—even if it's just about where to grab a bite to eat.



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Thanks to Margaret Crofoot for sharing her work. Check the show notes for links to her research paper on the study from the Journal Science, and a really cool video of the baboon GPS data.

Margaret Crofoot is the recipient of the Leakey Foundation's 2016 Gordon P. Getty Grant for interdisciplinary research.

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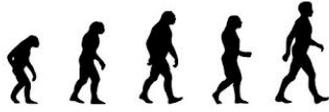
This episode was produced by me, Meredith Johnson. And I'm thrilled to welcome our new editor, Julia Barton, who edited this story. Our theme music is by Henry Nagel. Additional music credits are in the show notes.

Support for this episode comes from the Being Human Initiative, a joint initiative of the Leakey Foundation and the Bowman Foundation, dedicated to understanding modern life from an evolutionary perspective. We'll be back with the "Being Human" segment for this episode in a few weeks, and we'll have our final "Being Human" story at the end of March.

Thanks for listening.

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