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PROFESSOR: What are tool activities, and why does Lorenz call them tool activities? This should be an easy question if you're doing any reading. What does he mean by tool activities? I know some of you know. Do you know? You don't remember? I guess you were doing homework instead of reading.

All right, tool activities mean multi-purpose actions. They're instinctive action patterns. They do have a motivational component, so they're classified as fixed action patterns, rather than reflexes. But they refer to multi-purpose actions that the very same-- they're components of many different fixed action patterns. But they're also fixed action patterns of their own.

Like locomotion. You know, we use locomotion as part of the appetitive behavior behind any-- very many other fixed action patterns. And the same is true of orienting movements. We make orienting movements in response to stimuli, it's true. And that makes them seem like reflexes. But in fact, they're part of many fixed action patterns.

And we don't just sit without even stimuli. You know, even if none of you were moving, I don't just stare at one place. My eyes are always roaming around. I'm making orienting movements. Grasping with the hands is the same.

So each of these major types of activities are tool activities, and there's actually many varieties of each one. For locomotion, is easiest talk about there, because we defined the various gates, especially in four-legged animals. But humans still have various types of walking and running, various speeds of running.

OK now what about the action-specific potential behind these and other fixed action patterns. We know that, if they're like most fixed action patterns, the action specific potential, meaning the level of motivation, builds up over time. Well it doesn't build up at the same rate for different fixed action patterns. It tends to build up at a rate proportional to how often the movement is needed.

And we know that many of these fixed action patterns, like predatory behavior in the cat, are actually inherited as a series of different fixed action patterns. But they become linked during development. That is, habits form depending on the experience of the animal, usually with the mother, in the case of predatory cats, and the various patterns become linked. So then they're normally doing them-- the searching, the locomotion and searching, then stalking, then pouncing, and then the killing bite, usually in that order.

So how frequently does a cat perform each of these behaviors? Well, they perform stalking a lot more than they pounce, because they have to stalk, they have to search for prey the most before they find any. So they're going to spend the most time doing that. And then when they see them, they have to stalk them. And they're going to do that a lot more than they will actually pounce, because they don't get the opportunity to pounce that often. The animals move away, the animals smell them, and run away, and so forth.

And of course the killing bite is executed the least frequently, because sometimes when they pounce on an animal the animal still escapes. When we talk about escape behavior, you'll see examples of that on videos. So that's the action that's done the least.

Well, that means that the action-specific potential, the motivation, to do those different things is building up at a different rate. They're much more motivated to do searching locomotion than they are those other things. Because they have to do it the most. We'll come back to this.

But for those frequently used action patterns, the thresholds be lowered quite frequently. Take, for example, flying in a little wren, say. And compared to flying in a goose. You know? That little wren can't stop for more than a few seconds before he's flying again. They flit around very frequently. Whereas the goose, once he flies-- I don't want to mute it, I just want to turn the amplitude down. But this isn't-- there we go.

OK, so the goose, when he flies, he won't fly again for quite awhile. Unless a stimulus, like a predator, causes a rapid rise in the motivation to fly. But in most cases, if he's not being disturbed by predators, he won't fly again for quite awhile. Whereas the wren is flying much more. So the rate of build-up is different from species to species for the very same action better. And it's different for different fixed action patterns in the same species.

Let's talk about the threshold for this responding to stimuli that elicit a fixed action pattern. As the motivation builds up, the threshold-- the amount of stimulation needed to get the action pattern-- goes down. Look at hunger and feeding. We've mentioned this before, and it's obvious when you think about it. With the hungrier the animal or person is, the less discriminating he is. Why do we have dessert at the end of the meal? We're not as hungry. So it's often the most palatable thing.

Of course, there are exceptions, but most of us like sweet things. Some countries don't even serve dessert. Like in China. It's an American habit.

OK, but of course it occurs in many countries that have it. The desert is last, because it's the most palatable thing. And they will still eat dessert, even though they're not hungry for other foods anymore.

And as I mentioned, if you have a child that's very finicky, that's because he's so well-fed. He's much less finicky if he's hungry. And if you don't like certain insert something, and all your friends do like it, well just don't eat for awhile if you want to start liking it. And then you'll get used to it.

I thought I'd never like beer. I hated beer when I was a kid. My brother would be drinking beer. Couldn't stand the stuff. But then, on a real hot day, you get really thirsty, and your thresholds are lowered, your thresholds for drinking. And so, you like it a little better. And then I got used to it, and now I can drink beer. Still don't like it as well as some people do.

Reading sexual attraction, really obvious. A horse breeder, if he he's got a stallion, let's say, and he wants to breed that stallion. If the stallion is worth a lot, he gets money for that. But if he's being paid, that stallion has to perform. So what does he do? He do he does not let that stallion copulate for a long period of time. So motivation to breed builds up in the animal. And if you build it up enough, he'll breed with a mule. That's how you get donkeys.

And so that's important. And it happens in humans, too. There's an amusing story there in the Lorenz reading about a story told to Lorenz by a ship captain he knew, and how he felt after being at sea for a long time. He came back, and he said, every woman in town looks like Helen of Troy. But after I've been here a couple weeks, he said, so many ugly ones. What's happened? Threshold lowering.

And this really explains, to a large degree, the phenomenon we call in vacuo reactions, vacuum activity, another term used in ethology. It literally means an instinctive behavior pattern that occurs without any stimulus. That would be the literal meaning of vacuum activity. But in fact, it seems to be a case of extreme threshold lowering. The thresholds can get so low, that we don't even notice the stimuli the animals are responding to.

And Lorenz talks about how when he was young, he had a pet starling. And he could be eating dinner with his family, and that he would notice that the starling seemed to be catching and feeding on flies up near the ceiling. And he couldn't see the flies. So he tried getting a ladder and going up there and see if there were any flies. And he convinced himself that there were not. And yet the starling was there, showing the fixed action pattern of searching for, catching, and eating the flies. So that's called in vacuo activity or reactions.

Some of you that, if you keep rats or mice in cages, and they don't have any nesting material, they have a motivation to nest. And if they're deprived of nesting material for a long period of time, they'll try to build a nest with their own tail. Canaries will build nests with their own feathers. And mallard drakes, when they're highly motivated to mate, they're also very aggressive against other males. And they'll actually attack their own tails, because the thresholds are so low. It doesn't take much of the stimulus. They just need certain key stimuli, and if thresholds are low enough, their own tail will be enough to elicit the behavior.

Ostriches, deprived of their usual method of feeding of grass, they will pluck grass that is not even there. The same you will notice this in rodents, if you don't-- you know, we give them rat pellets, we call them. Well, why do we give them food that's so hard? In fact it's mixed with material that grinds their teeth down. Well they have to. Because, in the case of rodents, the teeth keep growing, these incisor teeth on both bottom and top. The same is true of hamsters and mice. They just keep growing.

So they're highly motivated to gnaw, and if you deprive them of things to gnaw on-- let's see, say you're feeding them wet mash or something, they can't wear their teeth down. They will chew on the metal cage. They'll chew on anything they get their teeth around. Reminds me of some dogs. I don't know what their fixed action patterns, how much of its nesting, of whatever, but some dogs also can mess up your house quite a bit because of what they do to shoes, blankets, and so forth.

So with a lot of threshold lowering, all you need is a very small stimulus. It's almost like an internal reservoir. It's sort of a metaphor for the action-specific potential. Builds up to a point it just starts spilling over.

Now we talked last time about the different components of fixed action patterns, and we'll use these terms a lot. There was a component that wasn't defined for a long time, until this guy, Wallace Craig, defined it. It corresponds to the level of the action-specific potential. But before they even used that theoretical term, this behavior had been described. What is it? What did Craig talk about?

Appetitive behavior-- it's usually the appetitive behavior of some sort, usually locomotion, searching behavior and orienting, has the lowest threshold. So when an animal gets hungry, the action, the series of actions that compose a fixed action pattern, the part with the lowest threshold is appetitive behavior, searching behavior. So they literally search for the stimulus that will lead to the rest of the behavior.

And finding appetitive behavior for some fixed action patterns, especially in humans, has led to quite a bit of controversy. And the controversy that Lorenz got into concerned what he called an appetite for aggression. For example, the second one, the gray leg gander, when he's in an aggressive mood, because he's in a mating mood, he literally looks for other ganders to fight with. And many, many animals are like this.

And so he applied this to humans. He said, think of the young men who roam the streets looking for trouble. What are they doing? It's the same thing. They have a motivation to get into fights. Maybe our aggressive video games are able to satisfy that urge for a lot of young men. But if you look at aggressive video games and see who plays them, you'll see it's much more males than females. So there are girls that do it, too.

And young men that seem to have no real desire to fight at all can get extremely involved in these games. And they can feel great triumph when they win. I remember when my son was growing up-- this is long before he came to MIT-- he went to the MIT camp. And the counselor found out that all the young men in his group, were mostly middle school age, they loved this particular video game that he also played. It's like many MIT students.

So he organized a tournament. And the kids got so involved in it. And my son, I could tell he's not aggressive, but he felt great triumph when he beat the counselor in the first part of the tournament. Of course, they continued the tournament and the customer beat him the second time. But you could tell that he had that drive.

This all happened after Lorenz, of course, had done his studies. I don't know what he would say about the motivation behind doing these video games. But I'm sure what I'm saying is some part of the explanation. There were many experiments done with jewel fish, because of their fighting behavior. And in one of the experiments, male jewel fish that wanted to fight, he could teach them a maze when the only reward was getting a visual view of another male jewel fish. Also, they changed coloration when they're in that mood. And just seeing other male and being able to attack the glass, they didn't actually fight. You didn't need to get them to fight to get that reward.

And so it might seem strange to you, but being hungry is necessary to be rewarded by food. So actually, we like to be hungry. Just not too hungry. Because without being hungry, food isn't rewarding. And it's the same for the aggressive drive.

So I just discussed briefly here the reactions people have had against that. Remember, for a long time, especially in America and in Russia, there was a pretty strong bias against any behavior that couldn't be explained in terms of a stimulus response model. People come to believe that a certain model is adequate to explain all behavior, they don't like it when there's some behavior that can't be explained. So they're going to try to find some way to explain it away.

So how could there be an appetite for aggression? Must be stimulus for it. And yes, they're always responding to some stimuli, but the stimulus can be minimal, and the thresholds can change drastically due to an internal state that's changing. And of course we know there was a bias against instinctive behavior in general, especially in humans. But not only in humans. I read studies written in the '30s, especially, before World War II, where the experimenters went to great lengths to try to prove that some behavior that appeared seemed to be innate because it appeared very early, was actually learned in utero.

It was believed that, for example, the birds that have to peck their way out of an egg, they actually learned to do that in the uterus, or in the egg before they hatched. And they went to great lengths to show that there could be such experience. Now people are not quite so extreme. Although, there are still people in the humanities, and even in sociology, that believe that unlearned behavior is not important in explaining behavior.

So let's go back to this topic of internal readiness, the action specific potential, and how it varies, just to give some examples. I mentioned how flying builds up at different rates in different birds. But take the example-- I think this is described in the Lorenz chapter-- from Paul Leyhausen's studies of cats. Leyhausen studied a number of different species of cats, found the same fixed action patterns, with slight variations, of course, in different species of cat, including the very large Asian and African cats and domestic cats in America and Europe.

And if you have a cat that's a hunter, that is he's been exposed to hunting-- he's watched his mother hunt-- he will become a hunter. And he's deprived of hunting for a long period, what does that cat do if you put him in a room full of mice? Well, he will initially attack and kill a few of those mice. Then what does he do? Does he just stop? No. He continues to stalk and pounce on mice. But he stops executing the killing bite. He will jump on them, swat them with this paws, and it looks like he's playing with them. And then eventually he will stalk them, but he won't even pounce.

And then eventually he appears to be searching for them. He's very alert, pricks up his ears, he's watching them, he's showing all the orienting movements of a searching cat. But now he's not doing any of those things. And eventually, of course, he'll go to sleep. So that's because the rate at which the action-specific potential behind each of those fixed action patterns, that have been combined in attack behavior of the cat, builds up at a different rate, depending on how frequently it's needed in natural life of these animals.

Can you answer this question for me? Is it true that cats or dogs hunt only in order to eat? And describe an experiment to test that idea. Do they hunt only in order to eat? Does a cat that's a ratter, and we know he hunts for rats and mice, does he do that just in order to eat? Does he do it because he's hungry?

Well for one thing, how can that be? People that keep pet cats are feeding them. They feed them every day. These are not hungry cats. Well, do they just go out near feeding time? No.

Well how can you prove that the motivation to eat and the motivation to hunt are quite separate? Well, you can deprive the cat of opportunities to hunt, so his eagerness to hunt builds up. And now we put him in a situation where he has to, say, cross over a dish of tuna fish, his favorite food, just in order to get out and hunt. What does he do? Does he run to the tuna fish? No, he'll leap right over it to get out there to hunt.

And that's been seen in brain stimulation studies, where you can stimulate the mood that causes them to go into a hunting mood. They'll leap over dishes, everything, just to get at a mouse or at rat. Because the motivation to hunt is quite separate. So it's pretty easy to do an experiment to show that, and it has certainly been done.

And similarly, we can talk about species that they don't hunt and kill in the same way that the cats do, but they still hunt for insects, like Lorenz's starlings. Those starlings, normally when they feed, they are poking their bills into the bark of trees, or in leaves. They're poking, using their bills to poke.

Well, if it's a pet starling, and you're feeding him all the time so he's not hungry, that animal will feed in order to poke. Where the normal sequence would be poking in order to get food. But now, he will feed just to be able to poke. The cactus finch on the Galapagos is a very interesting bird. Here you see a finch, and it looks like he's got this long extension of his beak.

What it is, it's a cactus thorn that the bird has found. And he uses that, and all cactus finches do this, they get that thorn and they use that to poke deeper into crevices in the cactus and other places in order to get food. And if you deprive that cactus finch of opportunity to use the thorn that way, they're highly motivated to do that. Even if he's well fed, he will search for the thorn, take the thorn, and he'll be out poking. Because it's a separate motivation.

Now I want to talk specifically about the sensory side of these innate behavior patterns. We call the mechanism on that side the innate releasing mechanism. That was a theoretical term introduced by ethologists who did not actually study the nervous system. But they knew there was an innate releasing mechanism. I've seen this statement, and I want you to criticize it. "The innate releasing mechanism responds to complex stimulus configurations, and triggers a behavioral response from the organism." Sort of the definition of innate behavior, in some people's view. But what's wrong with it?

There's a couple of glaring things wrong with it. First of all, these innate releasing mechanisms are at least, at the onset when the animal is young, are not responding to complex stimulus configurations. They are responding to very simple stimuli. And if the response is, say, of the young to the mother, he doesn't respond to her as an individual. He responds to specific stimuli presented by that mother. Like the herring gulls responding to the orange spot on the mother's beak. And an orange spot on a pencil will elicit the same kind of gaping behavior for feeding.

So the stimulus is generally very simple. And they can be multiple, but they're very simple stimuli. So that's the first thing that's wrong with it. And now, what about, I say elicits the behavior? As if we're talking about a reflex? But we're not talking about reflexes. The response will not occur if the motivation level isn't high. That action specific potential. So there's no inevitable elicitation of these fixed action patterns, the fixed motor component, the fixed motor pattern component of a fixed action pattern. And that's what's wrong with the statement. We're not dealing with reflexes.

So let's just give examples of the simplicity of the key stimuli. I just mentioned the herring gull chicks. You remember the stickleback fish. Very simple stimuli in the female that the male responds to in order to initiate his specific actions, and leading the female to his nest, in order to get her to lay eggs in it. They're not complex stimuli. Just very simple shapes that resemble in some way a fish with a swollen belly. They don't even have to look much like fish to us.

Lorenz mentions the stinging response of the female common tick. This was an example he got from Jakob von Uexkull in 1909. Very simple stimuli elicit that stinging response of the tick. A body temperature of about 37 degrees, and the smell of butyric acid. That's all it takes. And we know the tick can fall from a bush onto an animal, and we don't think tick is detecting surface temperatures at a distance. It probably responds to the odor of animals passing, but then the animal bumps the bush and so forth, and the ticks fall onto them.

The stinging response, though, is triggered by those two stimuli that I mentioned, the surface temperature plus the odor. You can see the size of it. This is the tip of a ballpoint pen, this is a tick from a dog. And here are some deer ticks, which are a little smaller. Known for spreading diseases, like Lyme disease is spread by deer ticks.

So he talks about the common cricket female's response to courting males. She's responding to the specific pitch of the male's courtship song. And different species of cricket have slightly different pitches of sound. So females of their own species will respond, just if the pitch is right.

And there's something very similar in mosquitoes. The male responds to specific frequencies of the females wing beats. That buzzing sound we hear it makes, hear a female flying around. That's a very meaningful stimulus for the male looking for a female to mate with. So the stimuli are very simple.

Let's talk about the contribution of Jerry Lettvin here at MIT. He died just a couple of years ago, but that was long after his retirement from MIT. Back in 1959, he published a paper that's one of the most highly cited papers in neuroscience. And the title was pretty far out, "What the Frog's Eye Tells the Frog's Brain."

And it's a very scholarly paper that reports systematically the experiments that he did with Maturana, a South American scientist, and Warren McCulloch, and Pitts, who was another MIT scientist, an engineer, actually. And this is what they were studying. They were studying-- basically they were inspired by the behavior of the frog.

This frog is responding to the visual stimulus of that bug on the leaf. The bug was flying, landed on the leaf. The frog waited. He might have made an orienting movement towards that bug, and then he simply waits until the bug is still. And then, out comes his tongue, it's sticky on the end. And normally they're pretty accurate. They only flick their tongue out when they're close enough to the bug.

What Lettvin did, he's recording electrically, he used tiny electrodes in the frog's brain. Sometimes he did it just from the stump of the optic nerve. Because he was really recording from the axons coming from the retina. So it was the activity of retinal ganglian cells. This was the information that reached the midbrain tectum, the roof of the midbrain, where orienting movements are caused. And only after the animal orients, brings it to the stimulus to a certain part of the tectum, that then you get the tongue-flick response.

So he was recording from the terminal arbors of axons coming from the retina. There was argument about that for awhile, but he knew when he wrote that paper what he must be recording from, because he had recorded even from axons in the nerve. And he showed four, actually there were five types of axons, but four major ones, that he described in great detail.

The one that's the most well known, we call bug detectors. He didn't call it that in the paper, he called them net convexity detectors. But he did in his discussion, with these other scientists. He did talk about that what he had given was a detailed scientific description of a bug. The kind of stimulus that the bug presented to the frog. Those axons were part of what we call an innate releasing mechanism for detecting and orienting towards prey.

He found another major type that has an easily discerned function was he called a dimming detector. And it's interesting that the dimming detectors were the activity of much larger axons. The most rapidly conducting axon in the optic nerve. And that's interesting because these are responding to sudden dimming of the field of the sort that occurs when there's approaching predator. And so the frog's responds in a completely different way.

And note that it's very fast. Because speed is always at a premium when it concerns escape from predators. So the fastest conducting ones were responding to the dimming, which would be a visual stimulus very likely indicating a predator.

Now because the key stimuli are so simple, you can get very maladaptive responses, in some cases. And these are a couple that he describes. First of all turkey chicks-- I'll say a little more about turkey chicks' responses to predators-- but first, what Lorenz says, they respond the very same way to a fat fly crawling across the ceiling as they do a hawk flying overhead. They don't discriminate. So they make maladaptive escape responses.

And he says that young kestrels hand an innate response to water, they'll make bathing movements, but they'll do the same thing, they'll respond to the stimuli from a marble table top, because of the glassy surface. That's the only stimulus needed to elicit the bathing response. So it's obviously not very adaptive. These are just showing older kestrels. There's the turkey baby.

Now a little more about that. This is an experiment done not too long ago, 2001, in the Journal of Behavior, where some nice experiments were done on turkey chicks. Why did they use this particular turkey chick? Because it was hatched slightly below ground, the ground warms, and the egg hatches. No parents around.

They just hatch, and the eggs are deposited separately, so there's no siblings around, either. So they're not exposed to any social cues that could teach them anything about predators. So they're going to be able to escape from predators when they're first hatched, and the response has to be innate. And that's why they picked this little chick.

They live solitarily, of course, except when they need to mate. They kept them in a large outdoor aviary, set in a natural rainforest habitat, similar to where they would normally be found. Now in these graphs, each black bar shows the amount of a certain kind of behavior they saw. In this case, running behavior.

So the animal is running in response to the stimuli listed here. The first bars there, are response to a live cat walking through the aviary. The second one to a live dog. The third one to a snake model. They didn't use a live snake, but they had a model of a snake. OK and as models of snakes can look exactly like a snake.

Those are the three stimuli that caused the most running. The stimuli that corresponded to a model of a raptor, so it was a hawk model, looked like a hawk shape gliding overhead, didn't cause the running. What it did what cause was the second response here, crouching. More crouching in response to that overhead stimulus than any of the other stimuli. A little more to cats than to dogs, but mostly to the raptors.

But now notice another-- oh, this one here, when they suddenly appear very vigilant, with their head up, and the search mostly with their eyes. That response was elicited most by recordings not of turkey sounds, but of alarm calls of song birds that live in that forest. Indicating that these birds, as soon as they're hatched, respond to those alarms calls. Not to turkey calls, but to alarm calls of other birds that live in the same place.

And they're responding mostly by that vigilance behavior. What they're looking for, of course, is predators. But now, there's a black bar and a white bar. The black bar is to the live cat and mouse, or their realistic models. The white bars are the response to control stimuli. The control stimuli were, in the case of the cat, dog, and the raptor, they're just cardboard boxes. They colored the cardboard boxes, so they controlled for the color, but not details and shape. And you can see they're usually respond the same way to the boxes.

In the case of the snake, they used just a simple cardboard cylinder. That was very effective. But there were exceptions to that. In other words, the only thing about this one that made it a raptor was that it was up here. And it was about the right speed of movement, and the right size. That's all that was required.

But notice here, this is the recordings of sound. Here there was a significant difference between the experimental sounds, the recording the actual alarm calls, and just quite white noise, because white noise was the control here. So there they have a specific response, specific differences.

And perhaps in the case of the raptor, there, as I mentioned once before in the class, there is some evidence that they have some specificity of response. But you can see here, they couldn't confirm it. That it had anything to do with the hawk shape. That doesn't mean that later on it doesn't. Because they can habituate to other shapes, and not to the hawk, if their experience is teaching them something else.

But it's interesting how nonspecific some of these fixed actions, the key stimuli can be. They're very, very simple. What we see as the hawk, what they see as just something up there that's about the size a hawk, and moving in a certain way.

Do humans show maladaptive responses to key stimuli, too? They certainly do. We eat too much sugar, we eat high-fat foods because it tastes better. And the restaurants always add extra sugar and fat. Restaurants are a horror for diabetics. I've learned that. I always have trouble with my blood sugar after eating at a restaurant. So I choose my restaurants very, very carefully. And generally won't go to them at all.

What about other things? I picked this quote from the internet, and I found this just last year. "Like all animals, humans have instincts. Genetically hardwired behaviors that enhance our ability to cope with vital, environmental contingencies. Our innate fear of snakes is an example. Other instincts, including denial, revenge, tribal loyalty, greed, and our urge to procreate now threaten our very existence." In other words, it's important we come to understand our own fixed action patterns.

Let's talk about one more thing here. Lorenz's discussion of the transposability of key stimuli. All he means is that animals are responding, not the exact size of the stimuli usually doesn't matter, but if it's the configuration at all-- this is unlike in most turkeys where the size and movement where it seemed to be critical. But in most cases, it's the relationship between stimuli. Just like the relationship between sounds in a song-- we recognize the song even though the pitch may vary a lot, and the loudness may vary a lot, we can still recognize it.

And you can use dummy stimuli. I just drew some of these. Most little birds, nesting thrushes, they respond to any stimulus that's even remotely similar to a bird. All it has to have is a top part that's about one third the size the bottom part, and they will show gaping. That's about all they require. Seems very stupid, what they're doing. But that's all that's required.

And if you have two sticks like this, that are presented like this, they'll always respond to the upper one. If they're presented, one's much closer, than they will respond-- if it's presented horizontally, anyway-- they'll respond to the nearer one. But if they're presented like this, even though this is nearer, they'll still go for the upper one. Because it's just a matter probabilities. What they're likely to encounter in that nest when they're feeding.

And these simple stimulus properties have been exploited by other birds. Birds like the cuckoo that lay their nests in other bird's nests. Because those other birds respond to the egg, in fact if it's a little larger, they might respond better to it. Often the eggs, depending on the parasitic bird, resembles their egg. In the case of the cuckoo, it doesn't always. In the case of the whydah bird, the egg mimics the egg of the species there. They're fooling, and getting to raise their young. And even their babies look like the other species for awhile.

Whydahs are much more innocuous, in that they don't destroy the other birds in the next. But the cuckoo is horrible. It puts its egg in there, and it hatches, at least one of those eggs won't even survive. The chick won't even survive. In many cases, no other little birds will survive. Just the cuckoo.

So why did they do it? Lorenz says it's their vice. You know a vice, you're following an instinct that's bad for you. He says the vice of these birds is they respond to the gaping response of these-- Look at the gape here of the cuckoo. There's this enormous chick with this huge gape, and there's the reed warbler feeding him. That's his vice. He can't resist.

So think about, why don't the birds evolve some way to avoid this being taken advantage of? And having their own reproduction go down? Because they're raising other birds' chicks. We'll talk about that next time.