Science Forward--Animal Communication

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Summer Ash: Humans express ourselves in many ways. From our first tentative cries as newborns, and emerging speech as children, to great works of art, and literature. We have developed sophisticated ways of illustrating and explaining our life experiences, emotions, and imaginations.

In our everyday lives, we use technology that would be astonishing to people who lived just a few generations ago. We even find new ways to use our tools so that people with a range of abilities, and interests, and for many different cultures can connect to one another.

When we share our hopes, fears, and dreams with each other, it feels like we are doing something that is singularly human. What can we learn from studying and trying to understand how other animals communicate?

[music]

Diana Reiss: For so long, we thought we were the only thinking creatures on the planet. We're the ones who are writing the books and the papers, so maybe that's not surprising. Often, we say we're the only species capable of X, Y, and Z. We jump to the conclusion that other animals don't do it, because of a lack of data. To me, that's not a scientific way to respond.

Ofer Tchernichovski: The two different mistakes you can make when you are trying to study animal, one of them is treating them as a reduced version of people, maybe that animals are stupid people. The other type of mistake is the flipside of the same coin, is not realizing that animals have a very different world.

Summer Ash: Humans often explain the world around us through language, yet the origin of language is still a great mystery. Is the way humans communicate unique? Where did it come from? Language, as humans use it, is only one form of communication. Scientists are working to better understand different kinds of communication used by species other than our own.

Let's start with communication itself. What does a scientist mean when he or she says, "Communication," and what does that have to do with being social?

Diana Reiss: Ah, communication. What is communication? Communication is the exchange and sharing of information. That can be between two humans, two or more humans, it can be between humans and animals, between other animals and other animals.

Sean McKenzie: A simple social behavior and a simple communication system is just something that most organisms do. Which is, more or less, exclusively mating related, or individuals signaling aggressively to each other. A complex communications system and complex social behaviors are really more when organisms are working together for non-reproductive goals.

Ants going out and foraging together, and cooperating to bring back food, or ants defending a nest together, or building a nest together.

Diana Reiss: Communication is really critical if you're a social organism. It may be maintaining contact with your offspring, with others in your group, warning of danger, letting others know where there's food sources, communicating what you're receiving in the sensory world, so you don't have to be a big-brained organism to communicate.

Sean McKenzie: Ants are useful for studying social communication, because they have one of the most complex communication systems in one of the simplest organisms. They are very small, their brains probably only have a couple hundred thousand neurons. They're just incredibly amenable to laboratory research, while having a communication system at least as complex as most primates.

Summer Ash: Humans and a few other animals have a unique ability that ants don't, vocal learning. This means that we can learn to use our voices intentionally.

Ofer Tchernichovski: We learn to vocalize. Most animals don't. They have what we call innate or instinctive vocalization. They can learn to hear and change their behavior using auditory learning. Auditory learning is very common. Vocal learning is where we have it, obviously, that's how we talk.

Judith Spitz: We often think of human communications in terms of spoken language, but of course, there are many other forms of human communication. Everything from hieroglyphics, to facial gestures and so on, in which people can communicate their ideas. Two big categories that you can think about human communication in terms of spoken language is expressive and receptive language.

Summer Ash: Based on our current scientific knowledge, human speech and communication abilities are considered unusually sophisticated. The vocal learning that humans do is present in some other species, including zebra finches. Like ants, zebra finches lend themselves to being studied in the lab.

Ofer Tchernichovski: This is now the best model we have, the best animal model we have to understand vocal development.

[birds chirping]

We looked at how birds learn to combine syllables to each other, how to make two or three syllable go together in a certain order.

[birds chirping]

When they learn to do that, which is not easy for them, they follow very simple similar principles to the ones that we see in little babies that are doing vocal babbling before they start talking. We see that the process in those two species that are so far away from each other are amazingly similar.

[baby cooing]

Summer Ash: Animal behavior and communication, like so much of what scientists study, involves a large number of different variables. Scientists need clear definitions, clear questions and a range of different tools and methods.

Sean McKenzie: Scientists were able to take an ant, and they were able to drag the ant's abdomen along a surface in a crazy, weird, complex pattern, put another ant down on top of it, and see that the ant followed exactly the same pattern. Showing that there was a smell trail left by the first ant that demonstrated that ants use these smell messages for complex social coordination.

The more we study an ant, the more complex we discover its communication systems are. It's very easy to quantify the chemicals, and it's very easy to deal with chemicals and introduce them, and the behaviors are much more difficult to study.

You just have to be very rigorous in applying a definition to different behaviors that you see, and observing behaviors closely. We use tools like video tracking, and video recording to try to make sure that we have some form of standardizable measurement of behavior.

Diana Reiss: To understand dolphin communication, I took two paths. One is experimental, where we're manipulating something, and the other path is observational, where we simply just observe what they're doing and record their behavior and their vocalizations. They're two equally valuable paths, and reliable paths, and they give us different kinds of information.

Experimentation can happen in many different ways, to ask the same questions, but you approach it in a different way.

Ofer Tchernichovski: I used to spend many, many hours listening to songs, slowing them down, almost like falling asleep and dreaming, listening to them, looking at the birds, and try to figure them out. The analysis and the experiments comes later, what comes first is your commitment to get intimate with the world of those animals.

Diana Reiss: We barely can keep up with them. I mean, what they're doing acoustically with their behavior, people have looked for 60 years trying to decode dolphins, and we haven't scratched the surface.

Summer Ash: As we learn more about animals, we can use what we learn to protect them, and to provide the public with a greater understanding of their amazing abilities.

Diana Reiss: I think there's a growing concern about animal welfare. I think, again, this is very science-driven. Once we know things about animals, we can have the scientific

data, then we get into ethical questions. We need to start focusing on the cognitive and social prowess of these animals beyond the physical, so now we're demonstrating the things that they can do cognitively. We now have to create a new audience that wants to protect them.

[music]

Transcription by CastingWords