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“We are trying to find out exactly how the great apes think”

Josep Call, head of the Wolfgang Köhler Primate Research Center at the Max Planck Institute for Evolutionary Anthropology (Leipzig, Germany) and lecturer at the University of Saint Andrews (United Kingdom).

Josep Call is a specialist in the cognitive processes that distinguish humans from their closest relatives, the great apes, with over three hundred articles and book chapters on this subject. A graduate in Psychology from the UAB, and a PhD from Emory University (Atlanta, USA), he delivered the lecture to mark the opening of the academic year at the Faculty of Psychology, and the faculty's 25th anniversary.

- Are the great apes intelligent?

- They are capable of thought. For many years we believed rational thinking was something only we humans were capable of. Today we know this is not the case, and that the great apes do have certain reasoning skills. For example, they can reason inferentially. Today it's not about whether they think or not: the question we are trying to answer is "How exactly do they think?"

"The boundaries of the great apes' thinking and information-processing abilities are being pushed back as we learn more about them"

"We know very little about the type of

- Why is it important to study their social and communicative behaviour?

- I can give you three reasons. First, because they are very interesting beings to study. Imagine we found an ape species on Mars, now that exploring that planet is so fashionable: the number of questions we would be asking about it and the resources we would put into answering them. Well it turns out we've got that species right here and, what is more, it's related to us. Second, because their behaviour and their makeup let us see the similarities and differences between them and humans. We often wonder what it is that makes us unique. Well to get an answer, one of the things we need to do is to see how other primates think and act. And third, because the great apes, though they are not our direct ancestors, give us very important clues about evolution and intelligence.

memory they have, especially their episodic memory: as adults, can they retrieve their childhood memories?"

- And what have we found out?

- Some of the things we thought only humans could do turn out to be characteristics that we share with them. For example, they can make tools. That has played a major role when designing and presenting the theories on human evolution. Or certain aspects of communication. We believe language to be unique to humans, and this is true, but language isn't a monolithic skill, it is made up of a series of components and it is by building up these components that our species has evolved this capacity to use language. So, by studying the great apes we can see what similarities there are between us – features that already existed in a common ancestor several millions of years ago – and what are the things we humans have come up with ourselves.

- Where would you put the limits to their way of thinking, processing information and communicating?

- I think the most interesting thing is that the more we learn about them the more those limits get pushed back. We are seeing that things we believed them incapable of achieving, once we change the conditions or ask them the questions in a different way, in fact they are able to achieve. Where are the limits? Well, one area I personally would very much like to explore and which as yet has not been tackled systematically is, for example, what kind of memories they have, especially what is known as episodic memory. Can they remember something they did years ago? We can remember our first bicycle, what we felt when we rode it for the first time, what it looked like, etc. I would like to know if the great apes, other primates or other animal species have that memory, if they formed it and if they can retrieve memories in adulthood. It's a fascinating subject that we still know very little about.

- What have you discovered by studying them in different conditions?

- That they can plan for the future. It was always held that the temporal horizon of non-humans is very restricted, that they only live in the present and are not capable of thinking about the past, and especially about what might happen tomorrow. Now, by changing the study conditions, we

have seen that they can do this. And we did it in an experiment by which we presented them with a situation in which they had to take a tool and put it away in order to get food the next day. And we saw that that is what they do.

We do all that very easily, we plan for tomorrow, for next month and beyond, like with pension plans for example. Our temporal horizon can stretch very far. From the point of view of cognitive evolution, you could think this is something that appeared very recently, perhaps in our species or slightly before, and that the great apes do not possess this ability. Or else that the great apes do have a reduced version of this ability and that our own species has been able to improve it. These new studies would appear to make this second hypothesis more plausible.

- You say the ratchet effect is the main capacity that distinguishes us from the great apes. What is this concept?

- We humans accumulate knowledge as we learn it and we store it for future generations. Our descendents enter a level of knowledge above our own and their children will have even more than them. The next generation doesn't start from zero, it builds from this knowledge, adds to it and diversifies it. That is what Michael Tomasello calls the ratchet effect. There are some very simple things in our world that a single human could not invent. A paper clip for example. It's just a bent piece of wire but a human working alone could never invent it. Because you need to know what material it is, how to obtain it, how to make the clip, what it would be used for, you need paper, etc. All of that is accumulated knowledge. And we have reached a point in which that accumulation of knowledge sets us apart.

When we look at the primates we don't observe any of that. What we see is that any of the things they can do – thinking of the most elaborate instrumental behaviour we can find in chimpanzees, like using stones to crack nuts or make other tools – however complex these might be, they could be thought up by a very intelligent individual without having observed the others. The chances of that happening are slight, but not quite zero. On the other hand, if we think about the paper clip and a human, that will never happen.

- Can this accumulation of knowledge be seen in other species?

- Yes, to a certain extent. Chimpanzees go to eat at the same places they went to with their mothers and that could be considered a very basic kind of ratchet effect. But if a chimpanzee didn't have that knowledge he could still get by. He would find another place to eat. So we can say that for the moment there is no proof that they have the ratchet effect. However, it is possible that one day, when we ask the question in the right way or we study another population of chimpanzees or orangutans, we will see that these individuals do indeed have it. That's possible because we must realise there are still many things we don't know about them.

- We're back to talking about limits.

- Yes, the ratchet effect is just a working hypothesis after all. We have to keep that very much in mind: our hypotheses are not insurmountable barriers. One day we could discover a particular conduct, that in order to be discovered first needs a social learning process, because otherwise it would mean it could be invented by a single individual, and could not be acquired in any other way. If we do ever find that we won't be able to say that the ratchet effect is a uniquely human

trait, as we could find a rudimentary version of it.

- What kind of consciousness do they have?

- Consciousness is a very interesting topic, but very hard to study. We don't know if they are self-aware in the same way as us humans, who know we are unique beings within a group, etc. And we don't know this partly because we can't ask them. But we do know two things: first, they know what they don't know, or what they have seen and what they haven't seen. On a certain level, they have flexible access to their memories. Second, they have a certain level of self-awareness. They know if a hand is their own or not. If they see something about to fall on their hand they move it away. When they are in the forest they know how to move so as not to touch the branches. When mothers are carrying babies on their backs through the forest their posture changes: they crouch down more, for example, so as to avoid low branches that could hit their babies. Some researchers talk about there being not just one type of self-awareness but five, and one of these would be the one I just mentioned, the ecological type: you know where your body is, when they move something they know what they are doing and that they are doing it. There are already studies indicating that chimpanzee and macaque monkeys have this. When they play with a remote control to move something on a computer screen they seem to know whether what they are seeing is being done by them or not. We could say they have, at the very least, an awareness of agency, of cause.

- How does technology help us to know them better?

- There are innovations that have allowed us to make great advances in this direction. For example, eye-tracking technology shows us that when they look at an individual's face, whether this is a human or an ape, they always process the face in the same way, looking at the eyes and the mouth, the same as humans do. And with whole-body images, we know they look at the face, again the same as humans. We could say that humans have evolved because we have refined this capacity. Humans are interested in faces, and now we know that other species are too.

We are also starting to use thermal imaging technology, to find out what happens when we present them with a stimulus – videos, photos, sound recordings – to see how they react, what parts of their face show a change in temperature that points to social activation. When humans have to give a talk in public there is a temperature drop in parts of the face: above the lip, or the tip of the nose. And in chimpanzees we have found that the tip of the nose shows the same drop in temperature. Furthermore, there are chimpanzees that even without changing their observable behaviour, fidgeting or scratching more, for example, do show temperature changes in the nose. They are like poker players, able to hide their behavioural responses but with more subtle changes that can be detected. With what we had before we didn't know if these individuals that didn't display certain behaviours were actually experiencing this social activation. Now we know they possibly were, though they don't show it. All that is only just beginning to be studied, there aren't even any published findings yet.

And a third technological innovation is GPS, which allows us to monitor individuals and groups that move around freely. This way we can study their movements and behaviour. To study apes in the wild before we had to spend years previously getting them used to the presence of humans.

No doubt the future will bring in new technologies that will let us get to know them better and make new discoveries that will modify our current perspectives on them and on ourselves. They are bound to have more surprises in store for us.

To see the whole interview (in Spanish), click here.

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