

### **1) What are your main/most important findings or conclusions?**

We found that African Grey parrots voluntarily and spontaneously help familiar parrots (to achieve a goal), without obvious immediate benefit to themselves.

In a situation in which the parrots had access to tokens, they spontaneously transferred them to their neighbour who had none, but who could exchange them for food with an experimenter. Importantly, the parrots appeared to understand when their help was needed. They distinguished between situations, in which their partner could exchange the tokens and when it could not.

Remarkably, they were intrinsically motivated to help others, even if the other individual was not their friend, so they behaved very 'prosocially'. Yet, their motivation was affected by relationship quality (friendship) in that they transferred even more tokens if their partner was a friend (i.e. they helped friends even more than non-friends).

### **2) What motivated you to study this in parrots?**

Parrots are known to have large brains with outstanding neuron density and, together with corvids (members of the crow family), they are considered to be "feathered apes" because their problem solving skills mirror those of great apes (chimpanzees, bonobos, orang-utans, and gorillas), our closest relatives. This is remarkable because birds and mammals split from their last common ancestor about 300 million years ago. It strongly suggests that primates, crows and parrots have evolved comparably advanced cognitive traits convergently (i.e. independently), probably because they have been facing similar social and ecological selection pressures/challenges to primates (i.e. life in complex individualised societies or complex foraging). Therefore, these two bird groups are very important models to understand the evolution of intelligence. While crows are renowned for their social intelligence in which they appear to mirror great apes, the social reasoning skills of parrots have hardly been studied yet.

Helping behaviours represent an exception, where great apes and crows seem to differ. While great apes, - as the only animals to date-, have been found to help one another to achieve goals, corvids failed to do so in comparable studies. Parrots had not been tested yet, so it remained an open question of whether an ability to help each other proactively may not have evolved within birds.

### **3) How did you test the willingness of these parrots to share or help each other?**

We tested parrots in a "token exchange paradigm". They were first trained to trade in food (pieces of nut) in exchange for tokens (metal rings) from an experimenter. Then we tested them in a situation, in which two parrots were placed next to each other into two adjacent test chambers. In the test condition, only one bird had tokens, but had no possibility to exchange them because the exchange hole in its chamber was blocked, whereas its neighbour faced the opposite scenario. It lacked tokens, but could have exchanged tokens for food through a hole in his chamber with the human experimenter sitting opposite. In this condition, the African grey parrots voluntarily picked up tokens and passed them over to their neighbour in need through a transfer hole connecting the chambers. Consequently, they helped the other bird to perform the exchange and obtain food for himself.

Importantly, the parrots did not transfer tokens 'by default' but understood when it would actually help their neighbour. To examine this, we implemented control conditions and tested what would happen if there was no neighbour (Non-social control) or if the neighbour could not exchange tokens because we blocked its exchange hole too (Social control), so that tokens would not be useful to him. In both cases, the partner would transfer significantly less tokens.

### **4) Did anything surprise you?**

It surprised us that 7 out of 8 African grey parrots provided their partner with tokens spontaneously, i.e. in their very first trial, thus (without having experienced the social setting of this task before and) without knowing that they would be tested in the other role later on, i.e. that there was the possibility to reciprocate received help later on. Therefore, the parrots provided help without gaining any immediate benefits and seemingly without expecting reciprocation in return.

### **5) What would you like for a general audience to take away from your work?**

African grey parrots have a remarkable social intelligence and an intrinsic motivation to help others. Helping is not restricted to great apes and humans, but found also in parrots, thus birds.

### **6) What are the implications of your findings?**

It is an important finding, because such a form of "instrumental" helping, i.e. helping another individual to achieve a goal, has previously only been shown in great apes (chimpanzees, bonobos, orang-utans, and gorillas), our closest relatives and in humans. Thus, our study provides evidence that helping is not limited

to the hominids (humans and great apes) but evolved independently also in an avian group. Further, the form of helping shown by the parrots in the current study involves an appreciation of when another individual is in need of help, thus a level of pro-sociality (willingness to help others) that had not been reported in a non-mammalian species to date.

We know that parrots in relation to their body size have a brain comparably large to primates, in which brain size is linked to sophisticated socio-cognitive abilities, yet we knew very little about their social cognition, i.e. reasoning abilities in the social domain, of parrots. The current study suggests that they not only parallel primates in their technical problem-solving skills but also exhibit similar social skills that form the basis for cooperation.

### **7) What's next for you and this line of research?**

It remains to be seen how widespread helping is across all the parrot order (= all parrot species), i.e. whether other parrot families, such as cockatoos and New Zealand parrots exhibit it too. In contrast to the African grey parrots, the other species, we tested, blue-headed macaws, failed to help their neighbours in our study. [In an attempt to find out whether this might be due to general differences in food-sharing, we presented bird dyads with a big portion of food. We observed that African grey parrots fed from the same bowl tolerantly, whereas blue-headed macaws monopolised the resource instead of sharing.] Our study indicates that differences in their foraging ecology and social organisation may account for the difference between species in prosocial tendency. Comparing many different parrot species exhibiting different ecological and social backgrounds systematically would offer an exciting possibility to verify this and examine what drives the evolution of prosociality.

Further studies are also required to investigate the underlying mechanisms of the parrots' helping behaviour. How do the parrots perceive the need of their conspecific? Is this behaviour governed by empathy for the partner? And can we observe similar behaviours in the wild under more ecologically relevant conditions?

### **8) Anything else you'd like to add?**

The tested parrots belong to the Loro Parque Foundation, based in Tenerife, Spain, a foundation that fights for the conservation of endangered parrot species and the protection of their habitats. The Max-Planck-Institute for Ornithology runs a formal collaboration with the foundation, because the LPF owns and breeds the largest collection of parrots in the world, which offers unique opportunities for comparative research, i.e. comparing the cognitive abilities of many different parrot species in a direct comparison.

### **9) Please send the best contact information for you, including a cell number if possible, so that we can be sure to get in touch with you in a timely way about media interest as needed.**

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