

Report of the Joint Forces project

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Naam Projectleider: Charlotte K Hemelrijk

Titel: Information Attribution in Humans and Other Animals

Scientific organizers

- Prof. dr. Charlotte Hemelrijk (Applicant)
Theoretical Biology Group, Centre for Ecological and Evolutionary Studies (CEES)
University of Groningen
- Prof. dr. Rineke Verbrugge (co-applicant)
Department of Artificial Intelligence (ALICE)
University of Groningen
- Drs. Elske van der Vaart (CEES and ALICE)
- Drs Ivan Puga (CEES)

Summary

Over the past decade, experimental research has produced many examples of animal behavior that seem to require complex social cognition. Yet, how complex this cognition really is remains hotly debated. In our Joint Forces workshop, entitled '*Social cognition in animals: Is it as smart as it looks?*', we have aimed to stimulate productive discussion on this topic by bringing together empirical scientists with theoretical modelers, and by focusing on two very specific research paradigms.

The first of these is coalition formation, which concerns how animals decide when to join each other in fights; the second is visual perspective taking, which concerns whether animals understand what others can and cannot see. Both of these topics have been extensively studied in primates and birds, both have invoked explanations of varying cognitive complexity, and both are the subject of theoretical models.

Even though many animals seem to be attributing information to other animals or taking the other's perspective, they often lack an understanding of the underlying concepts. Similarly, it is controversial how much cognition is really needed for the seemingly complex social process of coalition formation. In our workshop, we brought together scientists from different disciplines to study coalition formation and perspective taking, their causes and consequences. The two-day workshop has led to many fruitful discussions and to plans for a project proposal.

The workshop Social cognition in animals: Is it as smart as it looks?

Our two-day workshop was held In the Biological Centre of the University of Groningen in Haren on October 26-27, 2009. It was a very lively and successful event, drawing a public of around 55 participants.

Program Monday 26th October: Coalition formation

Charlotte Hemelrijk (Groningen)	Opening remarks
Joan Silk (UCLA)	How do monkeys choose allies and exchange partners?
Bonaventura Majolo (Lincoln)	Coalition formation in primates
Nicola Koyama (Liverpool)	Coalition formation in Japanese macaques and chimpanzees
Annie Bissonnette (Zürich)	Coalition formation in Barbary macaques
Julia Ostner (Göttingen)	Coalition formation in male assamese macaques in Phu Khieo Wildlife Sanctuary in Thailand
Orlaith Fraser (Vienna)	Coalition formation in ravens
Carel van Schaik (Zürich)	Models of coalition formation
Ellen Evers (Utrecht)	Models of spatial effects in social primate cognition
Ivan Puga-Gonzalez (Groningen)	Emergent coalition formation

Program Tuesday 27th October: Perspective Taking

Rineke Verbrugge (Groningen)	Opening remarks
Kurt Kotrschal (Vienna)	Lessons from the cognitive ontogeny of ravens
Nicola Clayton (Cambridge)	Social cognition in corvids and children
Juliane Kaminski (Leipzig)	The evolutionary roots of human social cognition
Judith Burkart (Zürich)	Perspective taking in marmosets: with or without theory of mind?
Jennifer Vonk (S. Mississippi)	Whose perspective is being taken? A critical look at experiments on perspective-taking in non-humans
All participants	Discussion session (led by organizers)
Bernard Thierry (Strasbourg)	Withholding information in semifree-ranging Tonkean macaques: a reappraisal of conclusions
Elske van der Vaart (Groningen)	Computational models for perspective taking in corvids
Charlotte Hemelrijk (Groningen)	Closing remarks

Participants

In addition to the 14 invited speakers and 4 organizers, there were 37 subscriptions through the website of the workshop. These involved many PhD students and postdocs and master students. Participants came from several disciplines: from biology, artificial intelligence, cognitive psychology and also from the Zoo (Emmen). Most participants were from the University Groningen and Utrecht, but a few came also from the University of Maastrigt, Leipzig and Göttingen.

Themes and scientific results of the workshop

As humans, we live in a remarkably complex social environment. One cognitive tool which helps us manage all this complexity is our *theory*

of mind, our ability to reason about the mental states of others. By deducing what other people want, feel and think, we can predict how our actions will influence them, and how we should behave to be successful.

However, members of many other social species, both mammals and birds, must also deal with a continuously changing set of allies and enemies, dominants and subordinates. Does this mean that they, too, have a 'theory of mind'? After decades of research, the answer seems to be, 'with the possible exception of apes and corvids, probably not'.

Nevertheless, to us as observers, it often *seems* as if other animals, too, are acting in ways that require them to think about the beliefs, desires, and intentions of others.

At the workshop, Joan Silk presented a clear overview of the literature on coalition formation and the cognition that has been supposed to underlie its different aspects, such as apparent in the selection of the partner and the opponent. In subsequent talks by empirical scientists, such as by Bonaventura Majolo and Julia Ostner, we received more information on all kinds of patterns in several species of primates that correlated with aspects of coalition formation. However, the specific patterns of coalition that were discussed appeared not to be limited to primates. Orlaith Fraser showed that the same patterns were also observed in colonies of ravens. This suggests that these patterns do not depend on the specifics of primate cognition.

The second day, Kurt Kotrschal and Nicola Clayton told impressive accounts of the cognitive feats of ravens and scrub-jays. Only in carefully designed experiments do the limitations of these animals become apparent. In other words, although they may *behave* as if they have 'theory of mind', they seem to lack the underlying concepts. Judith Burkart powerfully illustrated these issues, and explained marmosets' impressive behavior in social tasks not by recourse to theory of mind, but by their social upbringing in families where older siblings take care of the younger ones. Jennifer Vonk, on the basis of a theoretical analysis and experiments with chimpanzees, also put into question any overly optimistic conclusions about primates' social cognition.

Thus, the field of animal cognition faces a challenge: that subjects may use 'non theory of mind solutions' to what researchers think are 'theory of mind problems'. This common difficulty was not yet explicitly recognized in the literature, and by making it an explicit topic of our workshop, the participants have gained many new insight

To a mix of empirical biologists, we have added expertise in theoretical biology and artificial intelligence. Using a variety of techniques, such as computer models and logic, speakers like Ivan Puga and Elske van der Vaart aimed to demonstrate how little cognition is necessary to generate seemingly complex behaviour, and to exactly formalize the assumptions that are required to explain the performance of animals.

At the workshop, there were very lively interactions between researchers from different disciplines about the question how much higher cognition actually takes place in animals when they perform seemingly complex social tasks. At the end of the workshop, quite a few empiricists said that they looked forward to improving and refining their experimental designs using the inspiration of the computational models. A most hopeful conclusion was that experiments and theoretical models in combination shed much more light on the important questions about social cognition in animals than either of the two strands on its own.

Resulting project proposal

During the workshop a small group of people gathered in a separate meeting. They comprised of Joan Silk, Julia Ostner, Carel van Schaik, Ivan Puga, Daniel van de Post and Charlotte Hemelrijk. They brainstormed about a project proposal in relation to the workshop to be submitted. It is intended to be a research proposal on the evolution of cognition behind complex social behaviour, such as coalition formation in primates. The proposal that is inspired by this meeting and also by the rest of the workshop will be written up by Daniel van de Post and Charlotte Hemelrijk. Because Daniel van de Post is also submitting independently an VENI proposal to NWO, NWO gave Charlotte Hemelrijk and Daniel van de Post permission to submit the proposal by the end of April 2010.