



Center for Academic Research & Training in Anthropogeny (CARTA)

## Mind Reading: Human Origins and Theory of Mind

October 18, 2013 Public Symposium

*Chairs:*

*Donald Pfaff, Rockefeller University • Terry Sejnowski, Salk Institute*

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### ABSTRACTS

#### ***What is Theory of Mind?***

**Ralph Adolphs, California Institute of Technology**

The term “Theory of Mind” has been used interchangeably with a number of related concepts (mentalizing, mirroring, mindreading, to name a few), operationalized in a variety of ways (such as the ability to attribute false beliefs), and investigated at multiple levels (philosophical, psychological, and neurobiological). This feature, together with the explosion of research on the topic, has resulted in a rather fuzzy picture regarding how best to define Theory of Mind, how to relate it to the other terms, and how to study it. I will provide an overview aimed at isolating a few, clear paths forward; emphasize distinctions that I believe we will need to keep in mind; and provide a glimpse of current and future experiments using tools from cognitive neuroscience. I will close by speculating on what aspects of mindreading might be unique to humans: namely, the ability volitionally to use our conscious experience to explore viewpoints (in space, time, or personhood) that are decoupled from what the senses directly deliver.

#### ***“Mind Reading” in Chimpanzees***

**Tetsuro Matsuzawa, Kyoto University**

For many years, I have studied chimpanzees both in the laboratory and in the wild. The “Ai project” is a long-running laboratory study at the Primate Research Institute of Kyoto University, Japan. Findings have revealed that young chimpanzees have an extraordinary photographic memory; chimpanzees can memorize, at a glance, numerals displayed on a computer monitor. This is a cognitive task at which young chimpanzees do better than adult humans. Laboratory research has demonstrated various social aspects of cognitive performance in chimpanzees, including cooperation and altruistic behavior. How do they use this intelligence in their natural habitat? Fieldwork has been carried out on chimpanzees in Bossou, Guinea-Conakry, West Africa. Wild chimpanzees have cultural traditions, behaviors unique to each community. For example, Bossou chimpanzees use a pair of stones to crack open oil-palm nuts. Observing the behavior acquisition process showed clearly that imitation is not an easy task for them. In summary, apes do not, in fact, ape. Imitation is seemingly a unique characteristic of human behavior. However, there are several cases in which we see ‘mind-reading’ in chimpanzees. This talk will illuminate the mind of the chimpanzee, focusing in particular on their apparent capacity to ‘read’ the others minds.

#### ***Comparing Apes and Dogs***

**Juliane Kaminski, University of Portsmouth, UK**

Humans are social creatures maintaining shared complex systems of communication, skills and knowledge. Human sociality appears to be unique throughout the animal kingdom in its complexity as well as its impact on the lifestyle and environment of the species. One key feature of human social interactions is that humans have the ability in some situations to make inferences about other individuals’ mental states (e.g., others’ knowledge, beliefs and desires). One goal in comparative psychology is to investigate to which degree the cognitive capacities underlying these skills are uniquely human or shared, at least to some degree, with other species. In a series of studies, questions regarding animals’ understanding of others’ attention, visual perspective and knowledge state have been investigated. The results suggest that different animal species have a more flexible understanding of other members of their group than was formerly thought.

## ABSTRACTS (CONTINUED)

### ***The Social Brain in Adolescence***

**Sarah-Jayne Blakemore**, University College London

The human brain has evolved to understand and interact with other people. This talk focuses on how the social brain, that is the network of brain regions involved in understanding others, develops during adolescence. Adolescence is a time characterized by change - hormonally, physically, psychologically and socially. Yet until fairly recently, this period of life was neglected by neuroscience. In the past decade, research has shown that the brain develops both structurally and functionally during adolescence. Large-scale structural brain imaging studies have demonstrated development during adolescence in white matter and grey matter volumes in regions within the social brain. Activity in some social brain regions also shows changes between adolescence and adulthood during social cognition tasks. Evidence from behavioral studies suggests that the ability to take another person's perspective is still developing late in adolescence. Together, these studies reveal that the social brain undergoes profound transition during human adolescence.

### ***Reflections of Dolphin and Elephant Minds***

**Diana Reiss**, Hunter College, City University of New York

The ability to recognize oneself in a mirror, once considered a uniquely human attribute, is shared by great apes, dolphins, elephants and magpies. In our comparative studies of mirror self-recognition in dolphins and elephants, they showed striking similarities to humans and great apes in the stages of behavior that emerged and the specific types of behaviors they exhibited when exposed to a mirror. These findings provide a case for cognitive convergence in highly encephalized but phylogenetically distinct species that are behaviorally, socially and cognitively complex.

### ***Mirror Neurons and More***

**Michael Arbib**, University of Southern California

Mirror neurons were first discovered in the brain of macaque monkeys -- neurons active both when the monkey executed certain actions and when he observed others performing similar actions. Perhaps such neurons in humans could provide the key to linking our own experience to that of others. Postulating that mirror neurons existed in the last common ancestor of humans and macaques, we trace a path via facial expression and the learning of manual gestures by apes to human "theory of mind." But, crucially, we stress that this path only makes sense if we look at "mirror neurons **and more**," understanding how mirror neurons function only as part of much larger brain systems. Human social interaction is not just a matter of registering the current actions or expressions of the other. The talk will extend the mantra of "mirror neurons and more" to assess claims about the neural basis for "Theory of Mind."

### ***Brain Imaging Studies***

**Jason Mitchell**, Harvard University

Although we never directly perceive the mental states of others, humans are nevertheless proficient mind readers—we are rarely stumped by what other people are thinking or feeling. How, then, do we make sense of the goings-on inside another person's mind? Over the past two decades, a surprising answer has been suggested by research investigating the neural basis of such social abilities: the human brain appears to have dedicated systems for understanding other minds. This talk will review this brain imaging work, and discuss the implications for the unique aspects of human social cognition.

## ABSTRACTS (CONTINUED)

### ***Emergence of Theory of Mind in Human Babies***

**Jessica Sommerville**, University of Washington

Theory of mind, the ability to predict, describe and explain one's own and others' behavior with reference to mental states, plays a central role in human social cognition and behavior. Classic research suggests critical developments in children's explicit theory of mind in the preschool years. Yet well before this time, infants and young children possess sophisticated knowledge that guides their understanding of the social world. In this talk, I review evidence to suggest that, within the first year of life, infants develop an understanding of transient mental states (such as goals and desires), enduring personal dispositions (such as preferences), and socio-moral norms (such as fairness norms), that is driven by their own actions on the world, as well as their interactions with other people. These findings suggest that infants' developing social knowledge is rich, rapidly acquired, and experience-dependent.

### ***What Makes Humans Different?***

**Elizabeth Spelke**, Harvard University

Mature human cognition is complex and variable, both across contemporary cultures and over human history, but human cognitive development proceeds in a predictable and regular pattern in infants and young children. Here I ask whether studies of human infants provide insights into the origins and nature of uniquely human social cognitive capacities. Do the complex social judgments made by human adults develop from, and build on, simpler systems that are functional in infants? Do non-human animals share any of these systems, and therefore serve as models for studies of their development and functioning at multiple levels of analysis? If so, then why does human social reasoning appear to be so different from that of other animals? Recent research on human infants suggests tentative answers to these questions. Moreover, the research suggests that more definitive answers may lie within reach, through a multi-leveled, multi-species search for the core mechanisms by which humans navigate the social world.