

## Day 1 Monday, July 7th

### 18.00 Registration and Welcome Reception

## Day 2 Tuesday, July 8th

### 08.00 Registration Opens

### 09.00 Introduction to the workshop (Elizabeth Spelke)

### 09.15 Gergely Csibra

#### *Representing social relations by human infants*

Social interactions between individuals give evidence not only about their individual dispositions but also about their social relations. When human infants observe actions of an agent that could potentially provide benefit or incur cost for another individual (a patient), they tend to include the patient in the representation of the event. Infants are therefore concerned not only with the representing the goal of the actual action but also with inferring the relation in which agent and patient embedded. For example, in conflict situations a succeeding actor is inferred to be dominant over a failing actor, whereas a giving action may be represented as an exchange among equal peers that invites reciprocation. In addition, infants attempt to infer a broader social structure from pairwise relations, and that the roles that actors play in these relations can be labelled by words, hence form concepts in the infant's mind. Thus, human infants are well prepared to interpret social interactions in terms of the social relations they manifest.

### 10.15-10.55 Poster Group 1 & Coffee Break

### 11.00 Tetsuro Matsuzawa

#### *The evolutionary origins of human cognition viewed from the study of chimpanzees*

I have studied chimpanzees both in the wild and in the laboratory. My talk compares cognitive development in the two species, shedding light on the evolutionary origins of human cognition. An upright posture and bipedal locomotion may have been important in human evolution. However, in terms of cognitive development, the morphological feature that contributed most to making us human is the ability to remain stable in a supine posture. The human mother–infant relationship is characterized by physical separation (although remaining in close proximity), and the stable supine posture of infants; enabling face-to-face communication via facial expressions, vocal exchange, and manual gestures, and also demonstration of object manipulation. Cognitive development in chimpanzees was studied using the novel 'participant observation' method in the laboratory and through "field experiments" in their natural habitat. This research has revealed that humans and chimpanzees are largely similar at early developmental stages. However, there are several critical differences: chimpanzees lack the social referencing ability observed in human children and chimpanzees seldom engage in active teaching. Moreover, although young chimpanzees showed unique working memory capacity, often superior to that of human adults, they are less able to learning symbols. In sum, cognitive development in humans is fundamentally influenced by the manner of raising young children; characterized by collaboration among multiple adults. This aspect of human rearing may be linked to the development of empathy, altruistic behavior, reciprocity, understanding others' minds, and so on. Taken together, my talk presents evolutionary and ontogenetic explanations for the uniquely human characteristics of cognition. For further information, please visit the following web site: <http://langint.pri.kyoto-u.ac.jp/ai/>

### 12.00 Lunch Break

### 14.00 Kristin Shutts

#### *Status is socially meaningful to young children*

Social status is a common feature of human societies, but little research has probed the developmental origins of children's attention to status distinctions. Here I consider the role that one particular manifestation of status—social class—plays in guiding young children's evaluations of individuals and groups. In a series of studies, we have found that as early as the preschool years, children are more positively disposed toward people who are wealthier. Such preferences cannot be explained by similarity or familiarity biases, as children from financially disadvantaged and advantaged families and schools show similar responses. In further studies, we have shown that social class differences play a causal, and perhaps unique, role in determining young children's attitudes toward different social groups. I will conclude the talk by speculating about why children care about social class, and will also discuss possible connections between the status concerns of humans and nonhuman animals.

### 15.00-15.40 Poster Group 1 & Coffee Break

### 15.45 Per Jensen

#### *Genetics and domestication of social behaviour – examples from chickens and dogs*

Domestication can be viewed as a large-scale evolutionary experiment, where humans have drastically changed the selection pressures on animal populations during a historically short time. This has created rapid changes in various phenotypes, including behaviour, many of which can be viewed as adaptation to the new selection landscape. While the ancestor of chickens, the Red Junglefowl, live in small, territorial harem flocks, domestic birds are kept in large single-sex groups, which has called for an adaptation of social behaviour. We have used a combination of large-scale inter-crossing and quantitative trait locus (QTL)-analysis, selection of Red Junglefowl, and gene expression analysis to investigate the details of the mechanisms underlying the adaptations. For example, polymorphisms and expression of the vasopressin receptor gene *AVPR1a* seems to explain parts of the changes in aggression, and a domesticated mutation in the pigmentation related gene *PMEL17* shows pleiotropic effects on feather pecking as well as on other social behaviour.

In dogs, the main selection pressure has been related to the ability to communicate and cooperate with humans. This has led to the development of unique abilities to interact with people, such as sensitivity to human ostensive cues and comprehension of referential gestures. We have used behavioural assessment in large populations of dogs for genetic analysis of the mechanisms underlying these effects. For example, about 500 laboratory beagles, bred and kept under strictly standardized conditions with respect to human contact, were studied in the so-called “unsolvable problem” paradigm. The behaviour of the dogs was analysed with respect to their propensity to seek human contact and help during the test. Females were keener to solicit human help, and also age had an effect. The narrow-sense heritabilities of the intensity of problem solving attempts, and the propensity of seeking contact, were estimated to 0.32 and 0.23 respectively, showing a significant genetic component behind variation in human-directed social behaviour. Genome-wide association studies are now undertaken to localize causative genes and mutations.

Studies of domestication can be helpful for different biological purposes. Firstly, they may reveal some of the genetic mechanisms involved in the evolution of social behaviour. Secondly, they may provide mechanisms behind variation in animal welfare, which can help to guide breeding and housing of farm- as well as companion-animals.

## **17.00 Lake Garda Excursion & Social Dinner (Meet in front of conference venue for bus.)**

### **Day 3 Wednesday, July 9th**

#### **09.15 Kiley Hamlin**

##### *The infantile origins of human morality: studies with preverbal infants and toddlers*

How do humans come to have a “moral sense”? Are adults’ conceptions of which actions are right and which are wrong, of who is good and who is bad, who deserves praise and who deserves blame wholly the result of experiences like observing and interacting with others in one’s cultural environment and explicit teaching from parents, teachers, and religious leaders? Do all of the complexities in adult’s moral judgments reflect hard-won developmental change coupled with the emergence of advanced reasoning skills? This talk will explore evidence that, on the contrary, infants’ and toddlers’ social behaviors and social preferences map surprisingly well onto adults’ moral ones. Within the first year of life, infants prefer those who help versus harm third parties, those who reward prosocial individuals and punish wrongdoers, and even focus on the intentions that drive others’ actions rather than the outcomes that result from them. In the second year of life, toddlers are motivated to engage in both prosocial and antisocial behaviors toward third parties; these behaviors are informed by those third parties’ past prosocial and antisocial acts. These results suggest that the human moral sense is supported, at least in part, by extremely early-developing mechanisms for social evaluation and action.

#### **10.15-10.55 Poster Group 2 & Coffee Break**

#### **11.00 Charles T. Snowdon**

##### *Cognitive Aspects of the Evolution and Development of Cooperation*

One of the most difficult and persistent problems in evolution is how cooperation evolved. If natural selection is measured by reproductive success, why should an individual cooperate to help another? Recent authors have attempted to deal with the evolution of human cooperation by suggesting that neither kin selection nor strict reciprocity can adequately describe human cooperation. These authors contrast human cooperative behavior with the relative lack of similar behavior in our closest relatives, the great apes. This has led to the conclusion that humans are special and different from other animals and that large brains are necessary to support the high level of cognitive ability needed for cooperation. Drawing upon recent work on epigenetics, evidence that general well-being predicts altruism, and cognitive and developmental research on cooperatively breeding primates, I suggest a simpler scenario for emergence of cooperation.

How genes are expressed is more important than the presence or absence of genes and gene expression is influenced in part by how developing organisms are treated. How infants are treated influences expression of key genes reacted to oxytocin. Perceived well being correlates with altruism. Thus developmental and environmental variables influence expression of cooperation.

Humans are also regarded as cooperative breeders by anthropologists. Thus, approaching the evolution of cooperation through converging evolution may be illuminating. Marmosets and tamarins display many features said to be important in evolution of cooperation in humans that are, in general, missing in great apes. They coordinate actions to solve problems

jointly and donate food and resources to others without gain for themselves. They readily share food and information, demonstrate teaching of young, show rapid social learning, long term memories for tasks and for social partners, division of labor, and joint attention. The small brain size of marmosets and tamarins suggests that these behaviors do not require large brains or complex cognition. But these behaviors do aid in survival of offspring and thus enhance reproductive success.

In contrast to the important role of punishment said to be necessary to sustain human cooperation, tamarins and marmosets are noteworthy in providing rewards rather than punishments to social partners. Grooming and non-conceptive sexual behavior induce physiological processes that reward partners and lead to trust. They show turn-taking and tolerance of others making tolerance and reward the hallmark of social life rather than punishment. Rather than looking at our nearest primate relatives to discover the origins of cooperation, we may find better answers through phylogenetically more distant species where cooperative behavior is critical to survival.

## **12.00 Lunch Break**

## **14.00 Rui F. Oliveira**

### *Simple minds living in complex social worlds: Zebrafish as a model to study social cognition and behavior*

The complexity of the social system is considered to be a major selective force in brain evolution. This major impact of the social realm on the nervous system seems to be due to the need that social living animals have to continuously adjust the expression of their social behavior to a changing social environment. For doing this they need not only to respond to sensory information about the social world, but also to emotional cues from conspecifics and to social context. Thus, some kind of general appraisal mechanism that allows organisms to evaluate the valence and salience of stimuli in order to determine the appropriate affective state and behavioral output (e.g. approach vs. withdrawal) must have evolved. Furthermore, opportunities to use public sources of information (i.e. social learning), at lower costs than through asocial private sources (i.e. trial-and-error learning), is also ubiquitous in social environments. Therefore, cognitive appraisal of socially relevant information that elicits functional affective states and social learning seem to be cognitive abilities that must have been prompted by social complexity, and that may have had an impact on the evolution of nervous systems. In contrast to this rationale most research in this area has focused on comparative work in humans and non-human primates, and to some extent in rodents and corvids, on what are considered to be highly complex cognitive abilities (i.e. not explainable by associative learning rules, that therefore would implicate the occurrence of Human-like mental processes; e.g. theory of mind, imitation). This path of research has been prompted by an ongoing debate in contemporary psychology between associative and rational explanations of animal behavior. We propose that a more profitable way to address the evolution of social cognition is to identify what are the elementary cognitive processes particularly needed for the development of social skills, to assess if they have differentiated neural modules in the nervous system, and then to search for their presence in different animal groups. In this talk I will address two basic aspects of social cognition, cognitive appraisal of social information and social learning, using the zebrafish as a model of a social teleost fish. This approach will help to develop a neurobehavioural comparative framework to search for common elementary modules of social cognition within vertebrates, and it will also further support the use of zebrafish as a vertebrate model organism for translational research in social and affective neuroscience.

## **15.00-15.40 Poster Group 2 & Coffee Break**

## **15.45 Pier Francesco Ferrari**

### *Understanding the mirror mechanism during development – implications for brain plasticity and early social intervention*

Mirror neurons (MN) have been originally found, and investigated for years, in macaque monkeys. Their pattern of activity and the anatomical connections with the descending corticospinal pathway prompted the idea that they are involved in several behavioral and cognitive processes, such as imitation and action recognition. The existence of a similar mechanism in other primate species and in birds points to a common evolutionary pathway in which action and perception became critically coupled in order to support important cognitive functions in social cognition and communication. More recent studies expanded our knowledge on the mirror mechanism and of MN functional role. By recording these neurons during the observation of complex action sequences (e.g. reach-grasp an object to eat it, to place it into a container or to give it to another individual) it has been shown that their discharge is modulated by the end-goal of the action, the observed agent's gaze direction and the social context in which an action is observed. These data suggest that mirror neurons are part of a network involved in decoding others' intentions. Moreover, the variation of mirror neurons activity under different experimental conditions suggest that environmental factors and experience can induce critical changes on how this mechanism respond to and decode social stimuli. In the last decade the mirror mechanism has been investigated in early development to understand its potential implication in the emergence of key social behaviors. Several behavioral phenomena, already present in the early stages of development (neonatal imitation, facial mimicry), seem to involve a mirror mechanism. Electroencephalographic findings in newborn macaques support the hypothesis that a mirror mechanism operates in the early stages of postnatal development and that early adverse social experiences affect its functioning. This mechanism therefore could be used as a marker of social skills in postnatal development with critical implications for psychopathologies where social competence is compromised. MN thus may provide an original and unitary account of basic aspects of social cognition and behavior, and offer new insights on the interactions between brain plasticity and early experience.

## **17.00 Closing (Giorgio Vallortigara)**