Plenary Talks
Abstracts

Come Together: Sociality, Heterogeneity, Organisation and Leadership in Animal Societies

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I will give an overview of the research my team conducts on the social behaviour of animals. I will likely include interesting findings on the social behaviour of fish, birds, ungulates, and primates.
I will explain how technological advances are providing us with the opportunity to quantify and model the heterogeneity that exists within the groups we study, and within the environments in which these groups live. My aim is to provide a perspective that can steer us towards answering fundamental and outstanding behavioural and ecological questions, while also tackling pertinent conservation challenges.

Animal affect and decision-making

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There is growing interest in the study of animal emotion (affect) in animal welfare science, behavioural biology, neuroscience, and psychopharmacology. In order to study animal emotion scientifically, and in the absence of definitive knowledge about whether such states are consciously experienced in other species, we use an operational definition of emotions as states elicited by rewarding or punishing events, where a reward is anything that the animal will work for and a punisher is anything that it will work to avoid (Rolls 2005). The evolutionary function of affective states has been the subject of much speculation and one common proposal is that they play a key role in guiding behaviour and decision-making in order to obtain rewards, avoid harm, and maximize survival chances. In this talk we consider how affective information may influence decision-making processes. We take a dimensional core-affect view of emotions as being characterised by valence (positivity/negativity) and arousal and integrate this with a reinforcement learning perspective on decision-making. Within this framework we discuss the putative role of both short-term ('emotions') and longer-term affective states ('moods'). A pragmatic outcome of these considerations is the suggestion that alterations in decision-making can themselves be used as objectively measurable indicators of an animal's affective state, with cross-species applicability.

Bayesian Development for Empiricists

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In recent years, theoreticians have demonstrated that information about the environment can come from many different sources (e.g. genes, inherited epigenetic factors, parental effects, personal experiences), and that Bayesian models of development can be used to predict how information from different sources and different

times should be combined within lifetimes and lineages to affect the development of phenotypic traits. Bayesian models of development provide general explanations for several widely-observed empirical phenomena, e.g. why sensitive periods often occur early in life. More important, they make specific predictions about individual or genotypic differences in developmental trajectories. For instance, Bayesian models predict that if different genotypes express a wide range of scores when naive, their scores will converge on a similar score following exposure to the same informative cue. This prediction of GxE is supported by results from a recent study of the responses of wild-derived genotypes of Drosophila melanogaster larvae to aversive olfactory conditioning. The same models show why indices often used to measure individual differences in learning ability will produce erroneous results if the subjects began with different initial scores. Bayesian models also make predictions about relationships across genotypes between within-individual and trans-generational plasticity, some of which are supported by data on responses of Daphnia clones to exposure to cues from predators in the parental and offspring generation. These and other recent studies suggest that Bayesian models of development have much to offer empiricists in search of testable predictions about individual and genotypic differences in within- and trans-generational developmental plasticity.

Social evolution: accounting for plasticity can reverse theoretical predictions

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In cooperative breeders, young decide whether to stay in the natal territory and provide alloparental care or to disperse and breed independently. To understand the evolutionary mechanisms underlying this decision researchers have focussed mainly on the role of dispersal for the kin structure of populations. Theory unanimously predicts a negative relationship between cooperative behaviour and dispersal tendencies, which seems to match empirical observations. This negative relationship is usually explained by the fact that philopatric, cooperative individuals accrue indirect fitness benefits through interactions with relatives, whereas 'selfish' dispersers are more likely to interact with unrelated individuals. However, all these models assume a heritable basis of dispersal and cooperation, and an important role of indirect fitness benefits through interactions with relatives.
Using highly social cichlid fish as model, I will present evidence that if the assumptions of high within-group relatedness and genetic determination of behaviour do not hold, the relationship between cooperation and dispersal may go into reverse and become positive. If behavioural strategies are determined plastically, divergent life history trajectories resulting in distinct social types can emerge, where cooperative helpers disperse early whereas less helpful individuals stay as subordinates in the group. Which of these alternative social trajectories is pursued is determined by social and ecological contexts early in life. At the neural level, these behavioural differences go along with differential gene expression and stress axis programming in the brain. I will discuss alternative explanations for the emergence of social types that do not require within-group relatedness and narrow-defined inheritance of behaviour.

Seeking the Origins of Inquiring Minds - Studies of Causality and Control in Primates and Children

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A suite of cognitive skills have been suggested to be unique to humans, such as representing the thoughts of others (theory of mind); remembering the past and planning for the future (episodic thinking); or drawing inferences about invisible causes from the pattern of relationships between events (causal cognition). All of these skills rely on a rich mental life, requiring not only abstract representations with specific content (e.g. beliefs, future times, causation), but also the ability to control and manipulate that content (executive functions). With so many seemingly unique characteristics, disentangling how cognition evolved since the split from our ape ancestry has proved to be extremely difficult. Interpreting adult human success and animal failure on any test is problematic – because there can be many explanations for the cognitive difference. Some of the previous negative results from apes may have revealed more about differences in executive function than differences in representation between humans and other apes. It is possible that commonalities in causal cognition may have been obscured – and that our inquiring minds may owe more to the legacy of our primate ancestry than has been suggested by some authors (e.g. Penn & Povinelli, 2007). However, it also implicates interesting differences in executive function that should be further explored. This talk describes new experiments on causal cognition and executive function in human children, apes and monkeys, to better understand how their cognition may be similar in some respects, and different in others.