

Covariation of traits in the evolution of macaque societies

Bernard Thierry

Department of Ecology, Physiology & Ethology, IPHC, CNRS, University of Strasbourg

Macaques are characterised by both a profound unity in basic patterns of social organisation and a large range of interspecific variation in social relationships. Evolutionary thinking explains diversity by focusing on natural selection as the preeminent driving force behind adaptive processes. To make sense of variations, however, we must specify the constraints that shape social organisations and exert strong stabilising selection on their components. I will show that many behavioural traits of macaques covary, and that their societies are circumscribed to a limited number of social styles. Such cross-species contrasts are better explained by phylogeny than by ecology, meaning that the core of species-specific interconnection systems in macaque societies has undergone limited changes over several hundred thousand years or more. By limiting the changes possible to social organisations, interconnections between characters act as constraints that channel evolutionary processes and allow only a subset of organisations to arise.

Conflict resolution in macaques

Dr. Bonaventura Majolo

University of Lincoln

Conflicts between group members may generate a number of social interactions within the group, including selective avoidance between opponents, affiliation between them (i.e. reconciliation), and/or triadic and quadratic affiliation with individuals not involved in the former conflict. In this talk I will review the literature on post-conflict affiliation in non-human primates with a special focus on reconciliation and on two macaque species (i.e. *Macaca fuscata* and *M. sylvanus*). I will discuss the importance that factors such as relationship quality, context of the conflict and inter-individual distance play in determining the occurrence of post-conflict affiliation. Finally, I will evaluate whether and how socio-ecological differences among species and methodological differences across studies can affect our understanding of conflict resolution mechanisms.

Departing and stopping in the herd: from field experiments to modeling in sheep

Dr. Richard Bon

University of Toulouse

Collective movements of groups of animals involve the initiation of collective departures as well as collective stops to remain cohesive, events that are challenging social cohesion. Most studies infer local behavioural rules and influential neighbours from large moving groups and only a few ones focus on such crucial transitions. We trained sheep to move toward target in order to provoke departures at a given moment and stopping at a given location. These sheep were then introduced with naïve ones (group size of 8, 16 and 32) to study their response to the perturbations provoked by the informed sheep (departures and stops). The observed collective dynamics involves a mimetic behaviour of individuals, with departures and stops being surprisingly symmetric. A mean field model, assuming global sensitivity to all neighbours, suggests that sheep response relies on a combination of departed and non-departed group members. Whereas the model proves to be relevant in small groups as shown by a good agreement between expected and observed individual and collective measures, it fails to account for observed results in large groups where individual responses are dependent upon spatial effects. Also a novel phenomenon appears only in 32-sheep groups: 20% of trained sheep departures failed to entrain a collective following, i.e. no sheep abide by the decision of the trained sheep. These results indicate that in such experimental conditions, the stimulus triggering a following response is a sheep moving away, i.e. walking head up out of the group. Simulations considering that a distant non-walking sheep is no more a pertinent stimulus allow finding expected proportions of non-collective following similar to the observed one.

Social Organization through self-organization: model and empirical data of macaques

Ivan Puga-Gonzalez

University of Groningen

Primates societies are usually considered to be a kind of biological market where individuals trade social services: exchange grooming for the receipt of grooming, support in fights, tolerance, food, sex, etc. Further, after fights individuals seem to reconcile, console or appease former opponents, especially those opponents considered 'friends'. These behavioral patterns are usually assumed to illustrate the great intelligence of primates, i.e. that individuals are able to keep track of the records of acts given and received, estimate the value of relationships, understand the emotional state of others, etc. However, nowadays it is known that cognitive capacities of primates, especially monkeys, are limited: they lack an understanding of thoughts, beliefs, and desires of others; and are unable to plan for the future, remember long past events, or engage in causal or analogical reasoning. So, if complex cognition is unlikely to explain these seemingly intelligent behaviours, then, what is? The goal of this PhD thesis was to search alternative mechanisms that may answer this question. I extended a previous individual-based model of grouping and aggression, the Dom-World model, with grooming behavior. In the new model, GrooFiWorld, individuals group and, when nearby each other, they fight if they are likely to win; otherwise, they may groom, especially when they are anxious. These simple cognitive rules in combination with the spatial location of individuals in the group were sufficient to generate all commonly described behavioural patterns of primate societies, especially macaques. Hopefully, these findings will inspire empirical researchers to investigate the mechanisms suggested by the model.