

Talks

Consensus-decision making in chacma baboons (Talk)

Sabine Stückle, Dietmar Zinner
Research Group Cognitive Ethology, German Primate Centre, Germany;
sabstu@gmx.de

In order to keep a group cohesive, group members need to make communal decisions. Humans mainly conduct 'consensus-decisions' by making trade-offs to perform collective activities. 'Consensus decisions' are important for reaching an agreement in many situations ranging from a few people, such as in a team sport up to international agreements concerning the entire world population. Human societies would not function without 'consensus- decisions'. Despotism and democracy are two forms of dealing with the issue of reaching communal activities in humans. Studies of group decision making in non-human primates might establish a better comprehension of the basic principles and mechanisms of consensus decision-making in humans. We therefore analysed the matutinal departure process of a group of chacma baboons in De Hoop Nature Reserve, South Africa. Individuals were defined as making a start attempt, if they moved over a certain distance beyond the periphery of the group. We distinguished between successful and unsuccessful initiations, depending on the number of followers an individual recruited. Approximately 75% of the adult individuals performed a start attempt with 62 out of 92 start attempts being performed by males. Irrespective of the absolute number of attempts, on the average, two out of three attempts were successful. Lactating females initiated less start attempts than pregnant or cycling females. The group appeared not to be coordinated by an individual functioning as a despot. No behavioural patterns were observed that might have served as specialised signals leading to a more successful recruitment of other group members. The travel direction seemed to be a vote of the majority and appeared to be coordinated merely through individuals setting an example by moving off.

The evolutionary origins of human patience (Talk)

Jeffrey Stevens
Center for Adaptive Behavior and Cognition, Max Planck Institute for Human Development

Although humans account for both the immediate and future consequences of behavior when making inter-temporal decisions, animals appear to ignore rewards that are delayed even a few seconds. However, this phylogenetic conclusion depends upon two untested assumptions of uniqueness and universality: (1) great apes should make temporal decisions like other nonhumans, and (2) human patience should generalize to contexts beyond monetary rewards. Our results here lead us to reject both assumptions: bonobos and chimpanzees exhibit a degree of patience not seen in other animals, and humans are not only less patient for delayed food rewards than they are for money, but are also less patient for food than are chimpanzees.

Therefore, a basic capacity for self-control and future-oriented decisions may have evolved before the human lineage diverged, suggesting that the extreme levels of patience that humans sometimes exhibit may be driven by fundamental differences between biological and abstract rewards.

Macchiavellian Intelligence: How rhesus macaques and humans have conquered the world (Talk)

Dario Maestriperi
The University of Chicago

Humans and rhesus macaques are among the most ecologically successful primates on this planet. In part, their evolutionary success may be the result of characteristics they share with other “weed” species: an omnivorous diet, high mobility and adaptability to new environments, ability to reproduce under a wide range of environmental conditions, and resilience to adversity and stress. In part, their success may be due to their intelligence, including their social intelligence. In this presentation, I will explore the hypothesis that humans and rhesus macaques share a set of similar social tendencies, collectively referred to as Macchiavellian intelligence, characterized by a gregarious and aggressive temperament, high individualism and social opportunism, tendency to form despotic and nepotistic social systems in which individuals do not compete directly for resources but for power, strong xenophobia, and high within-group cohesiveness under conditions of external threat (Maestriperi 2007). Rhesus macaques exhibit their Macchiavellian tendencies in any environment in which they find themselves regardless of demographic variables or availability of resources, whereas humans are most likely to exhibit such tendencies in capitalistic societies or when strong cultural influences on their behavior are removed altogether. I hypothesize that the Macchiavellian intelligence of humans and rhesus macaques arose by convergent evolution during long periods of intense within- and between-group competition in the evolutionary history of these species. I also hypothesize that the Macchiavellian intelligence of humans and rhesus macaques gave these species an edge in the ecological competition with other related species, and also served as a selective engine for the further evolution of large brains and complex intelligence.

Maestriperi, D. (2007). *Macchiavellian Intelligence: How Rhesus Macaques and Humans Have Conquered the World*. Chicago: University of Chicago Press.

Variation in the strength of social bonds among paternal kin dyads (Talk)

Anja Widdig
MPI EVA, Primatology

Recent studies have demonstrated that primates are capable to recognize their paternal kin (relatedness through the father) as animals preferentially interact with their paternal half-siblings when compared to non-kin in different social context. However, identifying paternal kin is more difficult in species where females mate with multiple males during their likely conception, therefore the mechanisms underlying

paternal kin discrimination are still poorly understood. Studies of different species reporting evidence for paternal kin bias also found a high variation in social bonding among paternal kin dyads ranging from weak to strong bonds, but the variation in the strength of social bonds is less studied. Here we aim to understand the source of this variation by investigating the development of paternal kin bias in free-ranging rhesus macaques (*Macaca mulatta*). We continuously monitored individuals of both sexes of the Cayo Santiago population (Puerto Rico) starting from the day of their birth until they reached adulthood. Paternity was determined using 15 microsatellites with likelihood ratios for paternity versus non-relatedness including all potential fathers. We predict that the results of this study will explain some of the variation in social bonding among paternal kin dyads relative to the availability of other kin and the mechanism used to identify their paternal kin.

Are chimpanzees the better man? - Impact of hunting by chimpanzees on red colobus monkeys at Ngogo, Kibale NP, Uganda (Talk)

Simone Teelen
Dept of Anthropology - Yale University

Frequent hunting of red colobus monkeys takes place at all long-term chimpanzee study sites where both species are present. Red colobus are the most commonly selected prey of chimpanzees even when other monkey species are more abundant. Especially, the chimpanzee community at Ngogo, Kibale National Park, Uganda, preys heavily on red colobus monkeys: the chimpanzee hunting success rate is extremely high, and chimpanzees kill many individuals per successful hunt. Census data had suggested that the red colobus population is declining and that predation by chimpanzees may be contributing to this decline.

In this paper, I address the impact of hunting on the red colobus population at Ngogo. To test the hypothesis that chimpanzee hunting is sustainable, I am using demographic data collected on red colobus monkeys over a period of three years, as well as fecundity and mortality data from previous studies of this species. I apply matrix models and vortex analyses using a sensitivity analysis approach to project future population development. Results show that current rates of hunting are not sustainable, but that chimpanzees are neither more “noble”, nor more “savage” than humans are, but that they also hunt to ensure maximum benefit without regards to the consequences for the prey population.

Why scientists cannot agree about human behavioural universals, what animal cartoons can tell us, and some suggestions as to when and why fundamental human differences evolved. (Talk)

Charles Whitehead
Department of Anthropology, University College London

How is it possible that supposedly self-conscious behavioural scientists cannot agree on any definition of ‘modern human behaviour’ or how it differs from that of other animals? My children implicitly understand the differences because they laugh at

Bugs Bunny cartoons where much of the humour depends on animals behaving like humans and our intuitive recognition that this is absurd. The problem is not one of simple ignorance but active falsification. It is the 'job' of human culture to obfuscate our perceptions of ourselves, for political reasons. The main cultural distortions affecting the behavioural sciences are (1) egocentrism: the belief that brains are thinking organs before they are doing organs, that they work like computers, and that 'intelligence' is the major factor driving brain expansion; (2) logocentrism: the belief that everything that is interesting about humans depends on language or 'symbolism'; (3) individualism: the paradoxical belief that humans are essentially non-social moral agents; and (4) genocentrism: the belief that the prime mover in evolution is the 'selfish replicator' and the resulting failure to appreciate why brains evolved and how human cultures work.

Animal cartoons and ethnographic data implicate three behavioural differences between humans and other animals:

1. A formidable armamentarium of social displays including at least three modes of communication, play, and performance.
2. Associated elaborations of self-consciousness and social insight.
3. Economico-moral culture which turned an ancient primate order on its head, creating formal systems of exploded kinship and reciprocity, and the consequent need for collective deceptions.

I will briefly discuss archaeological, fossil, recent neuroimaging, and other evidence for social mirror theory, the co-evolution of social displays and self/other-awareness, the 'play and display' hypothesis of brain expansion, and when and why fundamental universals of human behaviour evolved.

Asymmetric Kin Investment of Grandparents, Aunts and Uncles from an Evolutionary Perspective (Talk)

Alexander Pashos

Humanbiologie und Anthropologie, Freie Universität Berlin

A prolonged childhood, long lifetime, and the necessity for intensive child-care are typical characteristics of *Homo sapiens*, making caregiving by close relatives of major importance. From an evolutionary point of view, a crucial question is which relatives have a special role as caregivers and which differences in kin caregiving exist. Recent research on kin investment has found asymmetric caregiving patterns among grandparents as well as aunts and uncles. In most societies, maternal relatives care more on average than paternal relatives for grandchildren or nieces and nephews, and female relatives care more than male. Several evolutionary theories explain the asymmetric kin caregiving as being due to paternity certainty, sex-specific reproductive strategies or matrilineal family ties. However, the proximate mechanisms underlying biased kin investment remain unclear.

In a two-generational questionnaire study, 188 subjects at the University of Pittsburgh were asked to estimate their relationship to parents, grandparents, aunts and uncles regarding received investment in childhood, emotional closeness and resemblance. In addition, the subjects' parents rated their emotional closeness to their parents (the subjects' grandparents) and to their sisters and brothers (the subjects' aunts and uncles).

The expected asymmetries in kin caregiving by grandparents and aunts and uncles (matrilaterality, higher female caregiving) were confirmed. However, among aunts and uncles, maternal aunts had a much higher rating than all other aunts and uncles. Within the maternal aunts, the mother's younger and lastborn sisters cared significantly more than older maternal aunts for nieces and nephews, and were emotionally closer to them. A key question of the two-generational study was whether the relationship of parents to grandparents and to aunts and uncles forms a connecting link in kin caregiving. In fact, the parent-kin relationship had a very strong influence on the relatives' childcare and could explain a significant part of the kin investment biases. This supports the theory of stronger matrilineal family ties.

The impact of secondary sex characteristics (SSC) and social behavior to cortisol and sexual hormones in female primates (Talk)

Bernard Wallner
Department of Anthropology, Vienna

Primates living in multi male–female associations can develop SSC during sexual active periods. Size of SSC is dependent on fluctuating sex-steroids. Males intensify socio-sexual contact with females showing exaggerated SSC.

We investigated the socio-endocrine impact of SSC in three different species: Facial and anogenital redness in Japanese macaques (JM) during the breeding and non-breeding season, perineal swellings in Barbary macaques (BM) treated with the contraceptive levonorgestrel during non-sexual periods, and perineal swellings in chimpanzees (Ch) during intact cycle periods. Data from JM and BM were collected under semi-natural, from Ch under caged conditions. Fecal samples were used for analyses of sex steroid and cortisol (CORT) metabolites.

In BM, multiple regressions showed a negative relationship between SSC size and CORT and a positive one between swelling size and intersexual socio-positive contact. Females with enlarged SSC had lower progesterone levels and increased estradiol-progesterone ratios.

Ch females housed with males showed decreased CORT during late and decreasing tumescence of the SSC. In single housed individuals, increased CORT was related to decreased plasma FSH. Paired females had shorter cycle length.

In JM, a light and a dark group could be discerned with regard to redness. In the dark group, intensity of redness increased during the breeding season and correlated with the amount of socio-sexual behavior. These females had significantly elevated CORT and sex steroid titers.

In conclusion, reduced HPA activity in females is associated with exaggerated SSC and intensified male contact when male mating competition for females is diminished (e.g., BM, Ch).

Gaze-following around barriers in long-tailed macaques (*Macaca fascicularis*) (Talk)

Brigitte Goossens
Behavioural Biology, Utrecht University

Gaze following, the ability to track the looking direction of others, is proposed to be a key component of human and animal social cognition. Although various species attend to the gazing direction of others, it remains unclear whether animals understand the connection between gaze and object, i.e. that the demonstrator is looking at a specific target, potentially out of the subject's view. Great apes and ravens have been shown to follow the gaze of a human demonstrator around a physical obstacle. This ability indicates refined skills in determining the location of the other's gaze ("geometric gaze following") and moreover hints at a sophisticated understanding that the other's gaze is directed at something specific. In a similar approach, but with a conspecific demonstrator, we tested the ability to follow gaze around a barrier in long-tailed macaques (*Macaca fascicularis*). Comparable to great apes and ravens, subjects relocated themselves to a position from which they could see around the physical obstacle. This provides evidence that refined gaze following skills in primates are not restricted to the great apes, but also apply to monkeys. This raises the possibility that also more advanced social cognitive capacities may be present in monkeys.

Information gathering strategies in humans: How environmental variability influences our disposition to social information. (Talk)

Ulf Toelch
Department of Innovation, University Utrecht

Social transmission of information between individuals of a population represents one of the foundations of culture. Several theoretical evolutionary models predict the conditions under which the evolution of social learning may be favored. We empirically investigated the predictions of these models that identified environmental variability as a key factor for the emergence of social learning. For this, we tested human participants in a virtual 3D maze using an alternative forced choice task. In a first experiment we varied the environmental variability and found differences in participants' information gathering strategies between these treatments as predicted by the models. We then tested in additional experiments whether humans are capable of learning about individual and social learning strategies and are capable of applying this strategy in a flexible way in a novel situation.

Diet traditions and cumulative cultural change as side-effects of grouping. (Talk)

Daniel van der Post
Theoretical Biology and Bioinformatics, Utrecht University

The evolution of social learning and cognitive sophistication are often assumed to be prerequisites for the origins of culture. In contrast, we study to what extent the most simple self-organized social influences on individual learning can support cultural inheritance. We do this using a computational individual-based model where primate-like group foragers have to learn what to eat in a diverse patchy environment. Using simple population dynamics we investigate the potential of 'merely living in groups' to allow for inheritance of diet traditions.

Our results show that grouping by itself is a sufficient social influence on individual learning for supporting the inheritance of diet traditions. Unexpectedly, we find that grouping is also sufficient to generate cumulative group-level learning through which groups increase diet quality over the generations. Interestingly, individual foraging selectivity determines whether 'traditions' or 'progressive change' dominates.

Our results suggest that cultural phenomena could be quite general and show that cumulative cultural processes already occur even for the most simple social influences on learning. This has implications for how we view the evolution of culture and its dependence on sophisticated cognition.

Social diffusion of novel foraging methods in brown capuchin monkeys (*Cebus apella*) (Talk)

Marietta Dindo
School of Psychology/University of St Andrews

It has been reported that wild capuchin monkeys exhibit several group-specific behavioural 'traditions'. However, experiments have found little evidence for the observational learning required to support such traditions. The present study used a diffusion chain paradigm to investigate whether a novel foraging task could be observationally learned by capuchins (*Cebus apella*) and then transmitted along a chain of individuals. We used a two-action paradigm to control for independent learning. Either of two methods (lift or slide) could be used to open the door of a foraging apparatus to retrieve food. Two chains were tested (N1=4; N2=5), each beginning with an experimenter-trained model who demonstrated for a partner its group-specific method for opening the foraging apparatus. After the demonstration, if the observer was able to open the apparatus twenty times by either method, it then became the demonstrator for a new subject, thus simulating the spread of a foraging tradition among 'generations' of group members. Each method was transmitted along these respective chains with high fidelity. These results provide the first clear evidence for faithful diffusion of foraging methods in monkeys, consistent with claims for capuchin traditions in the wild.

Sex-biased milk production varies with life history in rhesus macaques. (Talk)

Katherine Hinde
UCLA Department of Anthropology

Mammalian females invest heavily in each of their offspring, but little is known about the factors that influence the most energetically expensive form of maternal investment; milk production. For young mammalian females, who often begin to reproduce before they are fully grown, investment in offspring competes directly with maternal growth and reproductive “decisions” may change as females mature. Here I present data from 106 macaque monkeys that demonstrate that primiparous macaque mothers produce significantly richer milk for sons than daughters; 47% higher in fat content and 16% higher in protein content, while multiparous females show no sex bias in milk composition. Associated with higher milk gross energy, first-born sons weighed 12% more than first-born daughters, but weighed the same as the sons of multiparous mothers. These data suggest that primiparous mothers invest more in sons than daughters so that their sons will be able to compete effectively with the sons of multiparous mothers. These costs may make it more difficult for primiparous mothers to sustain lactation while rearing sons compared to daughters. Archival analysis of breeding colony records from 1973-2006 reveal that sons of first-time rhesus macaque mothers are 1.6 times more likely to die during the period of lactational investment than daughters, but there is no sex-biased mortality for infants of experienced mothers. These data, the first to assess infant sex and parity biases in milk composition, indicate that sex biased investment varies with maternal life history.

The social uses of shaming in historical societies - a cross-cultural study on conflict, cooperation, and emotion. (Talk)

Joerg Wettlaufer
Akademie der Wissenschaften zu Göttingen. Residenzen-Kommission.
c/o Historisches Seminar der CAU Kiel

The adaptive advantages of prosocial emotions have recently been discussed with reference to ethnographic evidence (Fessler 1999, Fessler&Haley 2004) and public goods games (Bowles&Gintis 2002). Although shame is deeply rooted in submissive behaviour, it seems to be a relatively new adaptation in primates and is said to be one of the few distinctive features of man from higher apes. In this study, I use material from historical late medieval and early modern Western and East-Asian societies for a cross-cultural comparison of the prosocial function of shaming rituals in small and middle sized groups.

The evidence from legal sources and court records suggests a differential use of public shaming as a means for group stability and adherence to norms. The pillory and similar shaming rituals in Western legal tradition have been applied in higher and lower justice over a period of 600 years. The loss of honour and the expulsion from the community, which often followed public shaming, had an exclusive and stigmatizing consequence for delinquents. Nevertheless, the return after a temporal banishment was often possible and reintegration (sometimes at a lower level of society) after punishment was intended (DeWin 1991; Schwerhoff 1993). Parallel use

of prosocial emotions in justice can be observed in historical East-Asian societies (Botsman 2005).

Although the ethnographic evidence of traditional societies suggests that penal shaming is a widespread and effective cultural trait based on a specific physiological adaptation of the human brain, higher levels of social organisation and institutionalized use of shaming rituals seem to produce stigmatizing and exclusive effects which may hinder reformation and social reintegration of offenders at the same time.

On the harmful side of altruistic punishment in the situation of conflicts between groups (Talk)

Benedikt Herrmann
School of Economics/University of Nottingham

So far altruistic punishment has been discussed in the context of cooperation within a group where costly punishment of free-riders by cooperators induces an increase in cooperation beneficial to the group. In our study we investigate experimentally the effect of within-group punishment when two groups compete for an exogenous rent, simulating the situation of two groups in a conflict over a resource.

All group members receive identical initial endowment of tokens and have to simultaneously decide how many of these tokens to invest into the contest budget of the group and how many to keep for themselves. The size of a group's contest budget, relative to that of the opponent group, determines its chances of securing the rent. Each member of the winning group benefits equally from the rent, regardless of their individual contribution to the contest. However, all contributions, including those of the members of the losing group, are lost. In this situation, any investment by one group imposes an adverse effect on the other group and hence reduces social efficiency. When allowing for within-group punishment the punishment of low contributors by high contributors drives investments to levels, which are detrimental even for the own group, as the joint expenditures on the contest are larger than the expected return from winning the rent. We conclude that altruistic punishment in the context of a contest or conflict between groups is not any more socially efficient, but in contrast is pushing for spiteful behavior to the competing group. We discuss the possibility that such destructive competition between groups might have been an influential factor in the evolution of prosocial behavior within groups.

Cultural variation in alarm calls of Malagasy primates (Talk)

Claudia Fichtel
Behavioral Ecology & Sociobiology, German Primate Center

Recent research revealed increasing support for the notion of culture within animal societies. Behavioral traits are considered to vary culturally if they are acquired by social learning and are shown by individuals in at least one site, but are absent in another ecologically similar site. Anti-predator behavior is a good example to study cultural variants because it includes predator-specific alarm calls that are associated with escape strategies, which in turn are adapted to the hunting strategies of different predators. In non-human primates the usage and comprehension, i.e., the

association of alarm calls with predator-specific escape strategies, are acquired via social learning. Thus, socially learned usage and comprehension of alarm calls provide flexible behavioral mechanisms that allow animals to develop culturally based appropriate responses to locally present predators. In this study, I compared alarm calls and anti-predator strategies in two populations of *Propithecus coquereli* and *P. verreauxi* that are exposed to different predation risks. *P. coquereli* was studied in outdoor enclosures at the Duke Lemur Center and in Madagascar whereas *P. verreauxi* was studied in two populations in Madagascar. In response to playback experiments with alarm calls I scored the subjects' immediate behavioral and vocal responses from video recordings made during the experiments. Both, species were found to have a mixed alarm call system with functionally referential alarm calls for aerial predators and general alarm calls that are given in response to any predator but also in other situations associated with high arousal. However, the inter-population comparison for each species revealed that they use the same alarm call types in the same contexts, but that there are striking differences in comprehension of some of the alarm calls. These differences reflect cultural variation in comprehension of alarm calls, which might be due to different predation risks experienced by the two populations in each species.

That's what friends are for. Friendship and tolerance to underbenefiting in humans and nonhuman primates. (Talk)

Jorg J.M. Massen#†, Rita C. Smaniotto*, Elisabeth H.M. Sterck#† and Henk de Vos*

* Faculty of Behavioural and Social Sciences, University of Groningen, The Netherlands

Department of Behavioural Biology, University of Utrecht, the Netherlands;

† Ethology Research, Animal Science Department, Biomedical Research Center, Rijswijk, the Netherlands

R.C.Smaniotto@rug.nl

J.J.M.Massen@uu.nl

Concepts of friendship differ considerably in the social sciences versus biology. Whereas biologists conceive of friendship as an investment in a beneficial group member, social scientists consider it as an explicitly non-instrumental relationship, which is characterized by care for the other individual and providing help when there is a need. In a cross-species research project involving both human and non-human primate subjects, we try to find out whether this difference is empirically grounded or whether it results from a difference in theoretical concepts (e.g., proximate versus ultimate perspectives) or research methods (e.g., self-reports versus observation studies). The project is unique to the extent that it uses similar concepts, measures and research designs for both species, and in comparison to most studies on friendship it focuses primarily on the proximate mechanisms behind friendships, in stead of the ultimate reasons. We will present the first results of a longitudinal study on the acceptance of imbalance in friendships, both for humans and rhesus macaques (*Macaca mulatta*).

Tattling: pre-school children's use of language to gain third-party support in peer conflicts (Talk)

Gordon Ingram

Institute of Cognition and Culture, Queen's University, Belfast

Non-human primates show a number of social responses to intra-group conflict, including reconciliation, retaliation, and avoidance. Sometimes, conflict resolution can involve a third party, in cases of pacification by a dominant individual, triadic reconciliation by a relative of the victim, or mediation by a female who uses grooming to bring two rival males together. The evolution of language has greatly amplified the human ability to recruit third parties who can intervene in conflicts. Humans can use language not only to alert potential supporters to an ongoing conflict in the vicinity, but also to communicate information about a conflict occurring out of sight or in the past. Here we present data from an observational study of tattling – pre-school children's reporting of peers' behaviour to third parties. A mixture of participant observation and behavioural ecological techniques was used to investigate the phenomenon of tattling in two pre-schools in Belfast. Event sampling of the content and circumstances of the tattling reports revealed that the vast majority of reports were truthful; that children were biased towards reporting negative rather than positive or neutral behaviour; and that boys' reports were dominated by physical conflict, whereas girls were more likely to report property disputes. The context of tattling was investigated further using focal follows and social network analysis, in order to discover how tattling related to children's other interactions with peers. A significant correlation was found between frequency of tattling and position in the dominance hierarchy. Tattling is a strong response to aggression, in which the tattler seeks to resolve a conflict through a supportive third-party intervention. This finding is complementary to the evidence from primatology that high-ranking individuals tend to be those who can mobilize the most social support. The amplification of this tendency through language has had far-reaching consequences for human evolution.

Resting Time as an Ecological Constraint on Primate Biogeography (Talk)

Amanda Korstjens

Conservation Sciences, Bournemouth University

Time constraints can limit both an animal's potential to survive in a given habitat and the maximum size of the group it can maintain. Many studies have, therefore, investigated the ecological correlates of time allocated to travelling, foraging and vigilance. However, animals often spend more time inactive than active, and understanding the determinants of resting time may provide considerable insights into the time budgeting problems that animals face. We analysed the environmental and dietary constraints that determine the minimum amount of time an average primate has to rest. We show that total resting time is mainly determined by the percentage of leaves in the diet and average annual temperature, and correlates negatively with group size. However, total resting time consists of two components: enforced resting time, imposed on the animal by environmental variables, and uncommitted spare time. It is not the total resting time but the ecologically enforced

resting time that constrains animals. We show that the constraining variables for this component are not only diet and annual temperature but also temperature variation. Our tests of the biological significance of this relationship show that enforced resting time distinguishes between locations that are suitable for particular genera and those that are not. Furthermore, the constraints on resting time that folivores face restrict their biogeographical distribution more than that of frugivores. Finally, we use these results to show that a global temperature increase of only 4°C would greatly increase enforced resting time for all genera and, thus, may lead to further fragmentation of suitable primate habitat. These effects are especially strong for strict folivores, who need more time for digestion. Non-folivores are buffered against small increases in temperature and temperature variation, this may help us understand extinction rates and success stories of species in the future and the past.

Variation in group decision-making and its determinants in non-human Primates: insights from current baboon research. (Talk)

Andrew King

(1) Institute of Zoology, Zoological Society of London; (2) University College London

Take any human society, past or present, and you'll find some form of leadership or authority structure, located on a spectrum stretching from despotism to democracy. Such leadership is a means by which groups can gain from cooperation and achieve a common goal. But we still know surprisingly little about how social animals make decisions as a group. In response to this paucity of knowledge, there is a growing body of research examining how group-living animals coordinate their actions and achieve decisions jointly with other group members. Here, I will first examine the variation in group decision-making that exists within the order Primates, and its determinants. I will then present results from ongoing research into group-decision making and collective behaviour in chacma baboons, *Papio ursinus*. Drawing upon this previous and current research I aim to show that where groups are relatively egalitarian and have little conflict of interest, individuals negotiate and rely on information from group-mates when making group decisions. However, where groups are more complex, and competitive individualism or strict hierarchical structures exist, individuals are more likely to rely on their own information, and unshared group decisions result. Finally, given that many human behavioural adaptations are known to follow basic evolutionary principles, I will discuss the implications of these findings to understanding human behaviour, and more specifically, how large-scale biological patterns can result from the actions and interactions of the individual components of a system.

Primate models of reproductive synchrony/desynchrony can explain differences between Neanderthals and modern humans (Talk)

Camilla Power

Anthropology Programme, School of Social Sciences, University of East London

The Female Cosmetic Coalitions model is the only Darwinian explanation of why red ochre became the cultural species marker of *Homo sapiens* as we emerged in Africa and migrated throughout the Old World. It argues that, under stress of encephalization, female ancestors of modern humans used blood-red cosmetics in coalitions to confuse information about reproductive condition available to males. Since menstruation reliably cues imminent fertility, philanderer males could target menstrual females. However, non-cycling females with greater energetic burdens would lose investment if males competed only for cycling females. There are two possible counter-strategies: either females hide menstruants from males; or they join in and mimic signals cosmetically. These high-cost ritual signals were used by female coalitions (plus male kin) to motivate mates to hunt.

Since Neanderthal females endured similar pressures of encephalization, the model expects similar ritual strategies. To what extent did Neanderthals show an interest in cosmetics? If not, why not? Temperate latitude Neanderthals and equatorial modern ancestors would have experienced different environmental seasonality, affecting foraging strategies and ultimately female reproductive profiles. Neanderthals under stress of encephalization during glacial cycles of the Late Middle Pleistocene would have had markedly seasonal reproduction. Such seasonality decreases reproductive variance among males since philanderers have fewer extra mating opportunities. Female Neanderthal strategies may have responded to a 'seasonality thermostat': During glacial cycles, female seasonal synchrony gives in-built defence against male deserters; in warmer interglacials, with seasonality relaxed, females are pushed into cosmetic strategies.

The paper reviews evidence on Neanderthal pigment use, and seasonal differences of foraging/mobility between Neanderthals and moderns. Case studies of langur populations (by Heistermann et al, Sommer, Alberts) show a single primate species can vary visibility of menstruation given differing strategies of female synchrony and desynchrony. This points to two divergent strategies among descendants of *Homo heidelbergensis*. Hominins in strongly seasonal environments (Neanderthals in glacial cycles) should tend to hide or suppress menstrual signals, while those in less seasonal environments (African moderns and Neanderthals in interglacials) should cosmetically amplify them.

Childhood Stress but not Parent-Child Relationships are Consistently Associated with Reproductive Development and Timing in Women (Talk)

David Coall

Department of Psychology, University of Basel

Life history theory proposes that 1) childhood psychosocial stress and 2) poor early parent-child relationships accelerate reproductive development in humans. A large body of research has shown that various forms of childhood stress are associated with earlier sexual maturity, initiation of sexual intercourse and first childbirth. However, there is a paucity of research examining the impact of early parent-child relationships on a woman's reproductive strategy, whether children's relationships with their mother and father have different consequences, and whether these relationships account for the influence of childhood psychosocial stress on the development of a woman's reproductive strategy. The impact both of childhood stress in the form of stressful life events, and of parent-child relationships (as

measured by the Parental Bonding Instrument) on women's reproductive development and timing were examined in a sample of 663 first-time mothers. Women who reported more stressful life events during early (0-8 years of age) or late childhood (9-15 years of age) consistently showed earlier age at menarche, sexual debut, first pregnancy and first childbirth. However, the influences of early parent-child relationships were inconsistent. Women who recalled their relationships with their mother as warmer and more loving, more protective and controlling, and more autonomous and independent had earlier first pregnancy and first childbirth. A similar though non-significant pattern existed for relationships with their fathers, except with regard to paternal warmth, which was associated with later rather than earlier reproduction. There was no evidence that early parent-child relationships mediated the association between childhood stress and a woman's reproductive strategy. Higher childhood socio-economic status and having more siblings were associated with later reproductive development and timing. In this sample childhood stress, early parent-child relationships, childhood socio-economic status, and family size were all independently associated with a woman's reproductive strategy.

Ecological constraints, functional benefits and the evolution of sleep architecture in mammals (Talk)

Isabella Capellini, Robert A. Barton, Patrick McNamara, Brian Preston & Charles, L. Nunn
Department of Anthropology, Durham University

Why we sleep, why sleep is organized into two distinct states alternated in cycles, why total daily sleep varies across species, and what cognitive functions sleep has, are still open questions. Previous comparative studies of sleep evolution suggested functional benefits associated with each sleep state (e.g. REM sleep increases in species with higher cognitive abilities), while the role of ecology was limited to predation risk constraining REM sleep duration. However, these studies did not account for differences in the laboratory conditions under which sleep data were collected and frequently ignored phylogenetic similarity between taxa. We show that laboratory conditions affect sleep duration estimates and that all sleep traits exhibit a strong phylogenetic signal. Using phylogenetic comparative methods and sleep data collected under comparable conditions, REM sleep is unrelated to brain mass, undermining the idea of a greater need for REM sleep in more encephalized species. Ecological factors linked to tradeoffs between foraging and sleep time, impact both REM and NREM sleep equally, suggesting that ecological constraints act on total sleep time. Contrary to previous studies, predation risk does not impact the evolution of sleep time and sleep cycle length. We suggest that sleep cycle length is a byproduct of sleep physiology indicating sleep debt and intensity of sleep. In support of this hypothesis, monophasic sleep is associated with longer sleep cycle length. In addition, sleep time and sleep cycle length are negatively correlated, indicating tradeoffs between sleep quantity and quality. Collectively, our results indicate that variation in sleep architecture among mammals is mostly determined by ecological constraints on total sleep time. We suggest that future studies on the function of sleep will benefit by an approach that integrates sleep duration and intensity.

General intelligence in non-human primates (Talk)

Simon M. Reader
Behavioural Biology, Utrecht University

Psychometric analyses of human mental ability consistently find that diverse intelligence tests show positive associations, with substantial variation between individuals' performance attributable to a single 'general intelligence' factor, or *g*. Here, we provide evidence for a parallel general intelligence in nonhuman primates. We gathered five ecologically relevant measures of cognitive performance in primates from the published literature, namely the reported incidences of behavioural innovation, social learning, tool use, extractive foraging, and tactical deception for each species. All five cognitive measures exhibit strong positive associations with one another, after controlling for phylogeny, research effort, brain volume, body mass and other potential confounds. Principal component analysis extracted a 'primate *g*' measure, which co-varied with diet breadth, learning performance in captivity, and measures of relative brain volume. On average, the Hominoidea (apes, but excluding humans) had higher primate *g* scores than other primate taxa, but no significant mean differences were found between Cercopithecoidea, Ceboidea and Prosimii. The considerable overlap in *g* scores between primate superfamilies, and the phylogenetic distribution of *g* scores, suggests multiple convergent evolutionary events favouring enhanced cognitive performance across primate lineages.

Social networks in monkeys, apes and humans (Talk)

Julia Lehmann, Robin Dunbar

Most primates are intensely social and spend a large amount of time servicing social relationships. The social brain hypothesis suggests that the evolution of the primate brain has been driven by the necessity to deal with increased social complexity. Although numerous studies support this idea, most of them have used group size as a proxy for social complexity, assuming that social complexity increases when group size increases. In this study we use modern social network analysis to i) analyse the relationship between primate group size, neocortex ratio and measures of social complexity and ii) to investigate if and how networks differ depending on the behavioural measures used. Comparing female grooming networks across several Old World monkeys we found that most network measures were correlated with group size, although the extent to which this is a causal relationship remains unclear. More importantly, we found that, when we controlled for group size, neocortex ratio was negatively correlated with subgroup size and subgroup membership, suggesting that social complexity derives from managing indirect social relationships, which may pose high cognitive demands on primates. Using data on apes, we further found that network characteristics differed depending on the behaviours analysed - while association networks were stable and long-lasting, grooming networks were found to be much more fluid and flexible. Thus, apes use different socio-positive behaviours to establish graded relationships with other individuals. These findings on primate social networks are then compared to human networks to find possible evolutionary universals.

Temporal distribution of estrous days and mating strategies in female chimpanzees (Talk)

Akiko Matsumoto
Okinawa University

From the biological view of societies, reproduction is important. A group of animals is formed for breeding (e.g., Alexander 1974) as well as for finding foods or for defense to predators. When individuals in estrus gather specially and the opposite sex' reproductive success rises by surrounding them, a group is formed. Group constitution (ex., number of males and females, actual sex ratio), mating system and mating strategy have changed with sexual characteristics of a species. The characteristics of Homo sapiens are long-term sexual relationships between two sex, cooperation for child care, proximity with the other couples, secret sex acts, concealment of the ovulations, extension for the sexual receptive period of women, enjoy of sex, and the menopause of women (Diamond 1997). Chimpanzees are the most closely related to Homo sapiens genealogically and genetically, and their sexual characteristics are frequent copulation, male big testicles, female sexual swelling, and longer mating periods than they are needed. The purpose of this presentation is to clarify group constitution, mating system and strategy of chimpanzees, then examine what kind of selective pressures have worked to evolve the sexual characteristics of them.

Similar processes underlie aberrant conflict management in aggressive primates and humans (Talk)

M.M. Kempes, B. Orobio de Castro & E.H.M. Sterck

Post-conflict friendly behaviour between two former opponents, also called reconciliation, is expected in animals that have valuable social relationships that may be disrupted by a conflict. Such valuable social relationships are found in animals that live in stable social groups, such as rhesus monkeys (*Macaca mulatta*) and humans. Reconciliation allows primates and children to stave off the disruptive effects of aggression and enables former opponents to remain in the same group. Since highly aggressive individuals in both rhesus monkeys and humans experience difficulties with these two aspects, we were interested in the process of reconciliation in these individuals. In the present study we examined reconciliatory behaviour in both normal and highly aggressive rhesus monkeys and children. In both species aggressive individuals show aberrant aggressive behaviour and are socially incompetent when interacting with group members. In addition, although rates of aggressive and affiliative behaviour were found to be similar between aggressive and normal subjects, both aggressive rhesus monkeys and children do not reconcile. We hypothesize that aberrant social information processing underlies their inability to reconcile. Overall, our results indicate that similar processes are at the basis of conflict management in primates and humans.

Causes and consequences of reproductive skew in primates (Talk)

Julia Ostner^{1*}, *Charles Nunn*² & *Oliver Schülke*¹

¹Integrative Primate Socio-Ecology Group, ²Department of Primatology, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany

A number of studies have uncovered remarkable variation in paternity within and across primate groups. To date, however, we lack an understanding of the factors that drive variation in paternity distribution across species. Here we address this fundamental gap by providing the first phylogenetic comparative study of reproductive skew in primates. We focus on hypotheses from reproductive skew theory involving limited control and the use of concessions by investigating how paternity skew covaries with the number of males in the group, female estrous synchrony, and rates of extra-group paternity. Data on within-group paternity were obtained from 27 studies on 19 primate species living in multimale groups. Our multivariate and phylogenetically controlled analyses provide strong support for limited control skew models, with reproductive skew within groups declining as female reproductive synchrony and the number of males per group increase. Of these two variables, female reproductive synchrony explained more of the variation in paternity distributions. To test whether dominant males provide incentives (i.e., concessions) to reduce the risk of paternity loss to outside males, we investigated the association between extra-group paternity and within-group skew. For this we derived a novel prediction that skew is lower within groups when threat from outside the group exists. This prediction was not supported as a primary factor underlying patterns of reproductive skew among primate species. Collectively, our analyses provide new insights to the evolution of reproductive skew in primates. The results point clearly to male competition, determined by female synchrony, as more important than concessions for understanding differences in paternity skew across primates, and they identify species in which concessions might occur. To explore the consequences of reproductive skew, we investigate its influence on female social relationships in macaques.

Grooming reciprocity and the effect of markets in wild West African chimpanzees (*Pan troglodytes verus*) (Talk)

Cristina Gomes

Max Planck Institute for Evolutionary Anthropology

Many studies on primates have focused on grooming reciprocity and on the effect that dominance rank has on grooming, and have found contrasting results. While in some species or populations grooming reciprocity is very symmetrical in others very little of the variation of grooming given is explained by grooming received. A biological markets approach to these findings would suggest them to result from differences in the level of competition between groups. In those where competition is high and the difference in the resource holding potential between individuals is large grooming relationships would tend to be more asymmetric and have a strong relation with rank. This because lower ranking individuals would tend to base their grooming relationships with higher ranking ones on interchange and direct grooming up the dominance hierarchy. We investigated if grooming is reciprocated in both sexes in

two groups of wild chimpanzees (*Pan troglodytes verus*) in the Taï National Park, Côte d'Ivoire. In addition, we examined (via steepness of dominance hierarchy) whether the symmetry in grooming reciprocity and the effect of rank on grooming patterns was dependant on the level of competition in two groups of wild chimpanzees. We found that grooming in chimpanzees was reciprocated very symmetrically in both the dispersing (females) and the resident sex (males), indicating that grooming was mainly exchanged for itself and was as well an important commodity for the less social sex. Furthermore, our finding that a group with a stronger steepness of dominance hierarchy had more asymmetric grooming patterns which tended to be more affected by rank, than one with a lower steepness, is supportive of the biological markets approach to social interactions.

Seeing red: the effects of colour on agonistic interactions in humans (Talk)

Robert Barton

Evolutionary Anthropology Research Group, Durham University

Recent evidence suggests that colour is an important component of social communication in both humans and non-human primates. The colour red appears to have particular salience in the context of mating competition. Red ornaments are sexually-selected, testosterone-dependent signals of mate quality in a variety of animals, and in zebra finches a male's dominance can be increased simply by the attachment of artificial red stimuli. We show that a similar effect can be demonstrated in humans. Analysis of data on the outcomes of a variety of sporting contests shows that wearing red increases the probability of winning. Experiments on the proximate basis of these effects reveal that images of people wearing red are perceived as significantly more aggressive and more dominant than images of people wearing other colours. Preliminary data from a brain imaging study further support the idea of reactivity to red in socially agonistic interactions. It is proposed that the effects of red stimuli on behaviour and social perceptions reflect an unconscious bias to associate redness with dominance.

Chimpanzee empathy, pro-sociality and consolation- what is chimpanzee empathy like? (Talk)

Sonja Koski

Leverhulme Centre for Human Evolution, Dept. of Biological Anthropology, Univ. of Cambridge

Humans are extensively pro-social. Pro-sociality is rooted in empathy, in which an individual matches to another's emotional state. Empathy usually involves some cognitive processing. While very young children with limited cognitive abilities show empathic orientation to other's emotions, adult empathy operates via a cognitive understanding of other's internal states, that is, adults empathise using a Theory of Mind.

Whether chimpanzees are also able feel empathy, is a contentious question. Behavioural descriptions of wild and captive chimpanzees suggest frequent pro-

social, potentially empathic behaviour. The most acclaimed example of chimpanzee empathy is 'consolation' given to victims of aggression. On the other hand, experimental evidence on chimpanzee pro-sociality (or other-regard) is ambivalent; chimpanzees often appear as predominantly self-regarding, while some cases for spontaneous other-regard have also been reported. Therefore, it is currently unclear to what extent chimpanzees empathise with other's emotions, what level of cognitive processing is involved with chimpanzee empathy, and whether other-regarding behaviour, when present, is based on empathy.

We have studied the possibility of empathy underlying consolatory behaviour in captive chimpanzees. Our results suggest that empathy may be only one of the mechanisms of 'consolation', in addition to self-regard. Further, we have hypothesised on the level of cognitive processing in chimpanzee empathy by paralleling chimpanzees' cognitive skills to those of human children and using that as a yard stick to estimate cognitive processing in chimpanzee empathy. We propose that chimpanzee empathy may operate on the level of secondary representations, comparably to children of 1-2 years of age. Our hypothesis assumes similarities between chimpanzee and human empathy, while it stresses the need for detailed information on chimpanzees' empathic, and cognitive, abilities.

Understanding others' relationships - social intelligence in monkeys and apes (Talk)

(by Roman M Wittig & Catherine Crockford)
Department of Biology, University of Pennsylvania

Knowing the relationships among others appears to be beneficial to group living animals. The presence of an opponent's friend, for example, can decide about the outcome of a conflict. Fish and birds are able to infer others' dominance relationships, and social mammals seem able to understand others' kin relationships. However, the understanding of others' non-kin affiliative 'friendships' may be a feature solely present in primates. We investigated further attributes of what primates understand of others' 'friendships', and what the consequences of this might be. We will present data from two studies on reconciliation mediated by kin or 'friends', whereby affiliative post-conflict interactions were initiated by an individual closely bonded to the former opponent instead of by the opponent itself. Firstly, we conducted playback experiments with wild female baboons in the Okavango Delta, Botswana, mimicking a kin-mediated reconciliation. Female baboons were more attentive to a friendly grunt of their former opponents' close relative and showed less submissive behaviour to the presence of the former opponent than after grunts from a dominant female who was unrelated to the former opponent. Secondly, we examined the natural occurrence of 'friend'-mediated reconciliation in wild chimpanzees of the Tai National Park, Cote d'Ivoire. We found that subjects were more likely to engage in friendly interactions with the former opponents and at rates prior to aggression after affiliative post-conflict interactions by opponents' friends compared to non-friends. We concluded that both monkeys and apes not only understand other group members' affiliative bonds but also react to a post-conflict affiliation by an opponent's friend as a substitute for direct reconciliation. Similar testing of other species is required to determine if this is an ability unique to primates, or other species living in complex social groups, and thus whether these results provide support for the social intelligence hypothesis.

Evolution of human social monogamy by maximisation of inclusive fitness (Talk)

Laura Fortunato, Department of Anthropology, University College London
Marco Archetti, Department of Zoology, University of Oxford

Monogamous marriage is prescribed in approximately 15% of human societies, and its current distribution is usually viewed as a consequence of the diffusion of Christianity. The significance of this practice is however poorly understood: ethnographic evidence shows that monogamous marriage rarely, if ever, corresponds to monogamous mating; further, legally required limitations on number of spouses appear in the earliest written records, long predating the advent of Christianity.

We present a game theory model incorporating assumptions about the effect of inherited resources on individual fitness. Results indicate that, depending on the nature of the resources, monogamous marriage may maximise inclusive fitness. We suggest that human social monogamy represents an adaptive strategy that evolved where females grant monogamous males a high probability of paternity, in exchange for exclusive investment of heritable resources in their offspring, as opposed to the males' own kin. We discuss this model in light of the historical and ethnographic evidence, and test its predictions with comparative analyses of cross-cultural data.

Primate brain architecture and selection in relation to sex (Talk)

Patrik Lindenfors
Department of Zoology/Stockholm University

Social and competitive demands often differ between the sexes in mammals. These differing demands should be expected to produce variation in the relative sizes of various brain structures. Sexual selection on males can be predicted to influence brain components handling sensory-motor skills important for physical competition or neural pathways involving aggression. Conversely, because female fitness is more closely linked to ecological factors and social interactions that enable better acquisition of resources, social selection on females should select for brain components important for navigating social networks. Sexual and social selection acting on one sex could produce sexual dimorphism in brain structures that as a consequence would result in larger species averages for those same brain structures. Alternatively, sex specific selection pressures could produce correlated effects in the other sex, resulting in larger brain structures for both males and females of a species. Data are presently unavailable on sex-specific sizes of brain structures for anthropoid primates, but under either scenario, effects of sexual and social selection should leave a detectable signal in average sizes of brain structures for different species.

Social learning among wild orangutans (Talk)

Adrian Jaeggi & Carel van Schaik
Anthropological Institute & Museum, University of Zurich
jaeggi@aim.uzh.ch, vschaik@aim.uzh.ch

Given reports about local traditions and cultures in orangutans and other species, it is important to know how skills and knowledge are transmitted in the wild. In an observational study on female orangutans with offspring at Tuanan, Borneo, we sought to describe the mechanisms by which immatures acquire adult diet and foraging skills. It was found that offspring hardly ever tried novel food but instead tended to follow the mother while foraging and selected the same food items. Offspring were likely to solicit food items requiring some extractive processing from the mother, if they were unable to process it independently. Furthermore, offspring selectively watched the mother without soliciting food when she was processing some more complex food items. Such observation significantly increased the offspring's own processing attempts. Hence, it appears that social inputs by the mother aided young orangutans to acquire knowledge about the affordances and composition of most food items. The amount of socially acquired information increased with processing complexity and while simple mechanisms such as enhancement and food transfer may suffice to learn most food procuring skills, observational learning may be required for more complex food items. We suggest that the mechanisms involved in vertical learning also play a role in population-wide skill transmission, if social tolerance allows observation of other models. Increasing diet complexity and gregariousness should therefore be good predictors for the existence and variety of local traditions and thus culture.

Prosociality in Common Marmosets: Explaining Systematic Variation (Talk)

Judith Burkart & Carel van Schaik

Recent results demonstrate that cooperatively breeding common marmosets show an intrinsic concern for the well-fare of others. These findings contrast with attempts to demonstrate prosocial preferences in chimpanzees, and suggest a crucial role of the cooperative breeding system for the evolution of prosociality. In this talk, we will explore the influence of social status, relatedness, and dyad characteristics on the expression of prosociality in common marmosets. While prosocial preferences were expressed both towards related and nonrelated partners, social status significantly affected prosociality, with female helpers as a group lacking this motivational predisposition altogether. This finding is consistent with reports from both the wild and captivity that suggest a less important role of female helpers in infant care compared to male helpers, and may be because female helpers need to prepare energetically highly costly future reproductive carriers. Intriguingly, from the recipients' perspective, infants did not necessarily obtain more prosocial food donations than adult group members, and in bonded pairs, the amount of prosociality was directly related to pair duration and the number of offspring produced together. We therefore propose that prosociality in common marmosets is not limited to the

reproductive context, but also plays a crucial role in achieving group cohesion and group-level cooperation.

fehler:

Gustl Anzenberger (s.u.)

Miki WADA

Poster

Information encoding mating outcome in Barbary macaque copulation calls is salient to male listeners: a playback study (Poster)

Dana Pfefferle^{1,2}, Michael Heistermann², J. Keith Hodges² & Julia Fischer¹

Research Group Cognitive Ethology¹ & Department of Reproductive Biology², German Primate Center, Kellnerweg 4, 37077 Göttingen, Germany

Numerous hypotheses have been put forward to explain the functional significance of primate female copulation calls, the most prominent of which are (i) that calls are addressed to the mating partner to promote synchronization of male and female orgasm and induce mate guarding by the preferred male (the 'sexual selection hypothesis'); or (ii) that they are addressed to other males to induce male-male competition and incite multiple matings in order to achieve paternity uncertainty. In a previous study on Barbary macaques, a seasonally breeding species with a high degree of promiscuity, we showed that the timing and acoustic characteristics of female copulation calls influence the likelihood of male ejaculation. Correspondingly, calls carry information about mating outcome. We here present the results of a playback study designed to test whether this information is salient to males. We presented males with copulation calls given during ejaculatory and non-ejaculatory copulations, while controlling for female cycle phase. Males' reactions were analysed with regard to the strength of response, latency to respond, duration of the first response and total response duration. In addition, after playback, we conducted focal animal observations of the behaviour of the test subject for 30 min. We found that males looked longer towards the loudspeaker after playbacks of ejaculatory than after non-ejaculatory copulation calls. In addition, males were more active and spent more time in close proximity to adult females after the presentation of ejaculatory calls. This result lends further support to the notion that in this species, calls function to increase male competition for access to females, and hence augment sperm competition. More importantly, males appear to be sensitive to information about ongoing matings, which they can use to regulate their own mating effort.

Mother's rearing behavior and infant chimpanzee's use of tools: how earlier exploration experiences influence the acquisition of tool use for zoo chimpanzees (Poster)

Miki Kakinuma

Div. of Comparative Dev. Psych, School of Veterinary Medicine, Nippon Veterinary and Life Science University

Zoo reared chimpanzees live in stable conditions in terms of food supply and safe habituation. Therefore, once the mother chimpanzee is able to raise the infant, the survival rate is higher than those in the wild. Despite all the setbacks for the captivities, zoos with good social groups and enriched environment would provide a good observation field for child rearing behavior. We have been observing infant chimpanzees and mothers at Tama Zoo, Japan where more than 20 chimpanzees live in a community since 2000.

In this study, we compared mother's rearing behavior and the infant's tool use development of 6 pairs. Mother-infant pairs are taped at the zoo field for 30 minutes every month. Tapes were analyzed for mother's rearing behavior such as cradling, retrieving, and reassuring behavior, and infants' activities such as locomotor play, peering, object play, social play and tool use. Various enrichment objects such as artificial termite mounds with fruit juices are available.

Four of the mothers allowed infants to explore the environment at 1, 3, and 10 months and the two kept them in seclusion. Infants' content of activities, both physical and social differed much at 18 months between those with social mothers and isolated mothers. As for the termite fishing tool use skill, however, the differences were not as clear. Most of them learned to use it at about the same time, around 30 mos. The differences between the social and isolated groups were the onset of the attempts. The onset for the social group was much earlier, while the isolated group started late, but then showed rapid increase in the development.

Further investigation is needed to determine the meaning of the time lag in the social group before the acquisition of the tool use and its implication to the chimpanzees living in the wild.

Démographie, modifications des habitats et impact sur les groupes du magot *Macaca sylvanus* en Algérie. (Poster)

Par M. AMROUN.

Dépt. de Biologie, Faculté des Sciences Biologiques et Sciences Agronomiques, Université Mouloud MAMMERI 15000 Tizi ouzou Algérie. e mail : Man_amroun@yahoo.fr

Several troops of *Macaca sylvanus* were followed on the scale of the area of the Kabylie. The vegetable covering of the various prospected zones is very heterogeneous and varies forest with holm oak *Quercus ilex* mixed with cedar *Cedrus atlantica* (Djurdjura) with forests with predominance oak cork *Quercus suber* (Yakouren) and pine forests mixed with the olive-tree and the kermes oak or pine forest *Pinus halepensis* (Park of Gouraya).

A comparison of the population balances is made. It arises from the demographic study of the various troops a strong rate of births and a good survival in 6 months.

Certain troops show a renovation of their manpower illustrating once more the good health of the forest populations. A strong rate of meetings inter troops was observed in particular on the level of Yakouren, they are capital in the transfers genic. They were already observed at many species and the *Macaca sylvanus* (Deag, 1974 in Morocco; Amroun, 1989 and Amroun, 2003). The food seems to represent a limiting factor since it acts directly on the rate of the births (Tikjda, 1985/86; 2002/03).

During the last decades certain species such *Macaca sylvanus* saw their reduced habitats, parcelled out and isolated the ones from the others. Our results show that the *Macaca sylvanus* has great capacities of adaptations but nevertheless management and the transformation (fires, human overpopulation, construction, clearing...) of these natural habitats are likely to cause a fragmentation of these original habitats. The example of this monkey in Djurdjura is very illustrative; indeed of other modifications of its habitat due to fire and with the food availabilities in particular have constrained it to attack itself in 2005 /06 with the neighbouring orchards (case of the troops overhanging the village of Darna (Tassaft)). However the insulation of the troops could possibly compromise their survival and this while acting on the transfers genic between populations.

The exit of this work, we show that the populations of *Macaca sylvanus* (in particular those located in very tourist zones) must be followed in order to account for impact very important modifications undergone by the original habitats following the increase in the human activities.

Key words: *Macaca sylvanus*, démography, meetings intertroops, anthropisation, habitats, Algérie.

Distribution spatiale des individus chez le singe magot (*Macaca sylvanus*) à Tikjda (Parc national du Djurdjura). Algérie. (Poster)

MOHAMED OUDAHMANE

Département de Biologie- Faculté des Sciences Biologiques et agronomiques.
Université MOULOUD MAMMERI. TIZI-OUZOU. ALGERIE

L'étude de la distribution spatiale des individus au sein du groupe permet d'apporter des informations sur les affinités existantes entre eux.

Cette étude a été réalisée à Tikjda, dans la Wilaya de Bouira (4°8'E, 36°27'N), distante de 150 Km du sud-est d'Alger. La zone d'étude est située dans le territoire du Parc National du Djurdjura à une altitude de 1400 m en moyenne. La végétation rencontrée appartient au type forêt montagnarde et formation arbustive méditerranéenne d'altitude. La faune mammalienne sauvage peuplant encore la région d'étude est représentée par 18 espèces. Nous citerons parmi elles : *Canis aureus algirensis*, *Lepus kabylicus* et *Sus scrofa*.

Lors du recueil de données par la méthode SCAN, nous avons relevé les trois premiers voisins d'un individu adulte dans un rayon de 3 mètres.

- L'analyse de la distribution du voisinage pour chaque période montre que durant la phase de naissances, le taux d'association le plus élevé enregistré concerne les femelles entre elles, alors que les mâles se retrouvent moins souvent ensemble. Pendant la phase de pré-copulations, les femelles se rencontrent souvent à proximité des mâles. Au cours de la période de copulations, nous observons que

les femelles se retrouvent particulièrement proches des femelles. Enfin, durant la phase de post-copulations et contrairement à la phase précédente, ce sont les mâles qui se rapprochent plus des femelles.

- L'analyse par classe de sexe du plus proche voisin révèle chez les mâles, des différences individuelles dans le choix des associations, alors que chez les femelles nous avons remarqué que 2 femelles s'associent préférentiellement avec les mâles

En conclusion, cette étude nous renseigne sur l'importance de l'analyse des plus proches voisins au sein d'un groupe de singe. L'analyse globale des sociogrammes révèle des variations dans la composition du voisinage.

Can altruists assess other persons' altruism level more accurately than non-altruists? (Poster)

RYO ODA

Graduate School of Engineering, Nagoya Institute of Technology
Gokiso-cho, Showa-ku

Altruism to non-kin is one of the human universal traits. To maintain altruism in a population, detecting altruists and engaging in social exchange with them, as well as detecting cheaters and eliminating them from a social exchange, is needed. Therefore, it is hypothesized that people can predict others' attitude in social exchange by his/her nonverbal behavior, and several previous studies show evidences to support this. We used the zero-acquaintance video presentation paradigm to examine whether Japanese raters can assess altruism of other Japanese. Although previous studies focused on altruism level of stimulus persons, they did not care altruism level of raters. We focused on altruism of the raters and examined whether altruists can assess others' altruism more accurately than non-altruists.

Episodic-like memory in primates (Poster)

Marusha Dekleva

Utrecht University, Behavioural Biology

Episodic memory, the ability to form and recall specific personal events has until recently been reserved for humans. Food caching birds are however able to form integrated memories of how long ago they hid which food where. As this cognitive capacity is essentially similar to that demonstrated in humans, these birds are said to have episodic-like memory. We investigate whether chimpanzees (*Pan troglodytes*) can form integrated memories of how long ago which food was placed in which containers. We use 3 differentially preferred foods (most, middle and least preferred) and manipulate the foods to be either always present (control group) or to disappear in 3 different time intervals (test group). When tested, the animals must choose between two of the foods that were previously placed in the presented containers. We expect the individuals to either chose the preferred food (control group) or the food still present at the given time interval (test group). If successful they are demonstrating the ability to form and recall integrated memories composed of what-where-when.

Third party punishment in nonhuman primates (Poster)

Katrin Riedl

Max-Planck-Institute for Evolutionary Anthropology

The present study aimed at the experimental examination of the existence of third party punishment in the behavioral repertoire of chimpanzees (*Pan troglodytes*). The central question was whether chimpanzees would punish unfair behavior of a conspecific that was not directed towards them but to a third party. Results of prior studies indicated that chimpanzees were able to perceive and punish unfair intentions of conspecifics that affected them directly.

The results of two experimental studies could not prove third party punishment. Chimpanzees punished conspecifics regardless of the cause of the unfair outcome for a third individual. However, it seemed that kinship and rank between the actor and the other individuals influenced the punitive behavior.

In general, results suggest that chimpanzees could have a sense of fairness based on intentions. However, they did not appear to discriminate between unfair intentions directed towards them versus towards another individual.

Lemurs follow conspecifics' direction of visual attention (Poster)

April Ruiz

Psychology / University of St Andrews

The ability to co-orient visually with other individuals is potentially adaptive, allowing detection of food and predators [1-3]. In humans, the ability to co-orient visually is recognised as a crucial component of language learning [4, 5] and is also thought to be related to acquisition of theory of mind. Visual co-orientation in primates has typically been investigated by asking whether subjects follow the direction of attention of a human experimenter. Apes follow human gaze [1, 6-9] but prosimian species do not [1, 10], while results have been mixed for monkey species [1, 8, 10-12]. However, requiring gaze following of another species might underestimate abilities. Fewer studies have investigated visual co-orientation with conspecifics, but these reported successful gaze following with apes and Old World monkeys [13], and possibly also New World monkeys [14], even when using photographs rather than live models [15-17]. We presented two species of lemur (*Eulemur fulvus*, $n=6$, and *Eulemur macaco*, $n=2$) with conspecific models (photographs) whose head and eyes were oriented to the right or left. By analysing the subjects' first visual inspection upon seeing the model we show that lemurs are able to co-orient visually with conspecifics (binomial probability: subjects Hy, Hu, Ho, Ru $p < 0.01$, subjects He, Ro $p < 0.05$). Further, like Old World monkeys and apes, lemurs are able to co-orient with a static image of a conspecific, indicating that properties of the face, rather than merely cues to motion, are important in visual co-orientation.

1. Itakura, S. (1996). An exploratory study of gaze-monitoring in nonhuman primates. *Japanese Psychological Research* 38, 174-180.
2. Emery, N.J. (2000). The eyes have it: the neuroethology, function and evolution of social gaze. *Neuroscience and Biobehavioral Reviews* 24, 581-604.
3. Itakura, S. (2004). Gaze-following and joint visual attention in nonhuman animals. *Japanese Psychological Research* 46, 216-226.

4. Bruner, J. (1983). Play, Thought, and Language. *Peabody Journal of Education* 60, 60-69.
5. Dunham, P.J., Dunham, F., and Curwin, A. (1993). Joint-Attentional States and Lexical Acquisition at 18 Months. *Developmental Psychology* 29, 827-831.
6. Povinelli, D.J., and Eddy, T.J. (1996). Factors influencing young chimpanzees' (Pan troglodytes) recognition of attention. *Journal of Comparative Psychology* 110, 336-345.
7. Tomasello, M., Hare, B., and Agnetta, B. (1999). Chimpanzees, Pan troglodytes, follow gaze direction geometrically. *Animal Behaviour* 58, 769-777.
8. Tomasello, M., Hare, B., and Fogleman, T. (2001). The ontogeny of gaze following in chimpanzees, Pan troglodytes, and rhesus macaques, Macaca mulatta. *Animal Behaviour* 61, 335-343.
9. Brauer, J., Call, J., and Tomasello, M. (2005). All great ape species follow gaze to distant locations and around barriers. *Journal of Comparative Psychology* 119, 145-154.
10. Anderson, J.R., and Mitchell, R.W. (1999). Macaques but not lemurs co-orient visually with humans. *Folia Primatologica* 70, 17-22.
11. Burkart, J., and Heschl, A. (2006). Geometrical gaze following in common marmosets (*Callithrix jacchus*). *Journal of Comparative Psychology* 120, 120-130.
12. Ferrari, P.F., Kohler, E., Fogassi, L., and Gallese, V. (2000). The ability to follow eye gaze and its emergence during development in macaque monkeys. *Proceedings of the National Academy of Sciences of the United States of America* 97, 13997-14002.
13. Tomasello, M., Call, J., and Hare, B. (1998). Five primate species follow the visual gaze of conspecifics. *Animal Behaviour* 55, 1063-1069.
14. Burkart, J.M., and Heschl, A. (2007). Understanding visual access in common marmosets, *Callithrix jacchus*: perspective taking or behaviour reading? *Animal Behaviour* 73, 457-469.
15. Lorincz, E.N., Baker, C.I., and Perrett, D.I. (1999). Visual cues for attention following in rhesus monkeys. *Cahiers De Psychologie Cognitive-Current Psychology of Cognition* 18, 973-1003.
16. Scerif, G., Gomez, J.C., and Byrne, R.W. (2004). What do Diana monkeys know about the focus of attention of a conspecific? *Animal Behaviour* 68, 1239-1247.
17. Horton, K.E., and Caldwell, C.A. (2006). Visual co-orientation and expectations about attentional orientation in pileated gibbons (*Hylobates pileatus*). *Behavioural Processes* 72, 65-73.

The efficacy of female mate choice in captive bonobos (*Pan paniscus*) (Poster)

Jeroen Stevens
Center for Research and Conservation

Within the primate order there is increasing evidence that male mating success is influenced by female mate choice, even in promiscuous species, such as chimpanzees. In the closely related bonobos, ovulation is concealed and females can occupy high ranking positions in the group. Therefore, the effects of female mate choice on male mating success are expected to be even greater, but this has not yet been studied.

We investigated female mate choice in three captive groups of bonobos (Apenheul

Primate Park, Twycross Zoo and Planckendael Wild Animal Park) for a total of over 1400 hours. Data were gathered on the sexual behaviour of 9 sexually mature males and 9 females that showed regular swelling cycles. We used the methodology developed by Stumpf & Boesch (2005, BES 57 : 511-524) to evaluate female mate choice, based on female proceptive behavior. In this way, males can be classified as 'preferred', 'neutral' or 'eschewed'. We measured the efficacy of female choice, by comparing the duration of copulations between preferred, neutral or eschewed males.

We found that females did not behave significantly more proceptive towards males when they had a maximal swelling. Based on female proceptivity rates, we found that females showed preferences to particular males. Female preference was highly individualistic. Alpha males were preferred by some females, but not by all. We found a significant effect of female preference on duration of copulations: copulations with preferred males were significantly longer than those with eschewed males. We conclude that, like in chimpanzees, female bonobos can influence the outcome of male mating strategies by choosing particular males. Future studies will include urine sampling to determine more precisely whether female bonobos vary their strategy around the period of ovulation.

GESTURAL COMMUNICATION IN EAST AFRICAN CHIMPANZEES OF BUDONGO FOREST, UGANDA (Poster)

Anna Roberts

Department of Psychology, University of Stirling

One important mode of communication is that of gestural signalling defined as voluntary movements of the limbs or head and body postures, transmitted through visual, tactile or auditory channels, which appear to initiate a desired action. Gestural communication is important because it is a potential evolutionary precursor to a spoken language and operates in a complementary fashion with a vocal mode of communication. Many acts, which are communicative to perceivers, do not necessarily involve complex cognitive processes since they are involuntary expressions of the signaller's internal emotional state. However, gestural communication may involve complex cognitive processes because signallers use gestures intentionally which suggests that they may make informed choices which may be based on mental representations.

While intentionality of gestures using criteria such as signaller's responses to attentional state of recipients has been relatively well established, gestural flexibility in response to social and ecological factors has received limited research attention and the degree to which individuals can take into account socio-ecological conditions when communicating gesturally is poorly understood. East African chimpanzees (*Pan troglodytes schweinfurthii*) are among our closest living relatives and they show important behavioural responses to the effects of social and ecological factors in various aspects of their social behaviour. To what extent the social and environmental constraints will be reflected in flexibility of gestures in East African chimpanzees is thus of particular interest.

In this presentation, we will give first systematic insight into the gestural communication of wild East African chimpanzees in Budongo Forest Reserve in Uganda. First, we will describe repertoire and contextual usage of gestures focusing

on meaning of gestures, compositional utterances and intentionality. Secondly, we will discuss flexibility in use of gestural communication in East African chimpanzees in relation to social and ecological factors.

Twins versus singletons: Litter size and reproductive strategies in males and females of small New World monkeys (talk)

Anzenberger Gustl, Falk Barbara und Mattle Franziska; Anthropologisches Institut und Museum, Universität Zürich, Zürich, Schweiz. E-mail: anze@aim.uzh.ch

Male care is rare in mammals but must have been pivotal at some stage of human evolution because our closest relatives, the great apes, show virtually none. Several taxa of New World monkeys exhibit high levels of male care and high female reproductive output as derived features, similar to the situation in humans relative to great apes. This convergence makes the neotropical callitrichids valuable model species to examine the evolution of male involvement in infant care, esp. when comparing the twinning marmoset *Callithrix jacchus* and the Goeldi's monkey *Callimico goeldii*, which has only single births.

From a series of ongoing experiments testing several hypotheses for the intensity of male infant care results of two experiments will be presented. (1) In a male-swap experiment, marmoset males (N=6) were introduced to a female with newborn twins. There was no difference in male infant-carrying behaviour, i.e. the males treated these non-related infants as their own infants. This extreme tolerance indicates that males care for infants mainly in order to rear the next generation of helpers. (2) In an experiment mimicking twin births in *Callimico*, females (N=5) have been equipped with additional weights upon delivery of their singletons. When compared to previous births of these multiparous females, females transferred their infants earlier after this experimental manipulation. This indicates that it is primarily the physical burden experienced by the female, which causes the onset of male help in infant-rearing.

Dual Process Theories of Moral Judgment and the Evolution of Morality (talk)

Luke Glowacki, University of Utah, Cognitive Evolution Lab, Harvard University

Currently, there is much discussion about the evolution of morality and the extent to which non-human primates possess cognitive precursors involved in moral judgment. In spite of this research in the evolutionary origins of morality and primate behavior, many claim that only humans have a moral sense. Some scholars have gone so far as to argue that morality is an exclusively human domain because it is necessarily restricted to linguistically competent entities. I think there are reasons to be doubtful about such claims.

Current research in moral psychology gives reason to question this paradigm, especially arguments that exclude non-linguistic entities from possessing a moral sense. Dual process theories of moral judgment indicate that multiple cognitive processing systems are involved in producing moral judgments. Sometimes the outputs of these systems conflict and the output of one system may override another in producing a judgment. If we look at the computations these systems perform, they do not look exclusively human and there may be reason to believe that certain

nonhuman primates possess similar systems. For instance, one dual process theory maintains that moral judgments are the result of two systems: one that evaluates intentions and another that evaluates causal chains. Either can produce a moral judgment. Other studies have shown autistics that fail standard theory of mind tests can make simple moral judgments. One way to interpret these results together is that judgments issued by autistics are driven largely by the causal processing system rather than the intention based processing system because of the lack of a theory of mind. If moral judgments can be driven largely by a processing system representing causal chains, they begin to look less uniquely human as there are reasons to think that some non-human primates have similar processing systems.

I am not arguing that non-human primates do in fact have a moral sense; rather, my claim is that some of the crucial systems involved in moral judgment do not appear to be distinctively human. If this is the case, then arguments that restrict morality only to linguistic entities may be mistaken and research into the evolutionary origins of morality should be concerned with the extent to which non-human primates share cognitive systems that are crucially implicated in moral judgment.

Information Can Be Free: Implications of Recent Developments in the Evolution of Altruism (talk)

Joanna Bryson

Konrad Lorenz Institute for Evolution and Cognition Research

Current research in primatology and anthropology often fails to take account of recent findings in theoretical biology concerning the evolution of altruism. Little more than the spatial distribution of kin common for any large terrestrial mammal is necessary for altruistic behaviour to be adaptive. This result requires no elaborate mechanisms of punishment or kin recognition. Explaining primate cultural transmission then is not a question of why it exists, but rather of what holds it back.

Here I present an intuitively-clear agent-based model demonstrating the adaptive advantage and limits of cultural transmission. In the model there are a variety of food types, each of which requires certain skills for food processing which can either be discovered or socially transmitted. Initially two species exist in this environment: altruists that give away its knowledge of food processing to any nearby agent, and freeriders that transmits nothing. The model demonstrates that for a large range of conditions, a freerider with a particular level of knowledge will accumulate greater feeding opportunities and therefore reproductive advantage than an altruist with that same level of knowledge. However, the average level of knowledge for altruists is higher, because they have a greater tendency to live near other altruists. In many conditions this advantage is sufficient for the altruistic trait to achieve fixation.

The model is simple enough that it can be presented and understood quite quickly. If time permits, I will talk about further findings, including:

- * Randomly mutated altruists (with no kin to teach them) tend to be out-competed, unless both species have populations below the carrying capacity of the environment. Fortunately, ordinary predator/prey boom/bust population oscillations provide just such an opportunity.

* The average amount of knowledge in the population is determined by population density, knowledge transmission rate and individual lifespan. Knowledge communities form regionally where altruists transmit and maintain a particular subset of available knowledge. When two knowledge communities meet, interesting dynamics ensue.

Chimpanzees are rational maximizers in an ultimatum game (talk)

Keith Jensen* Josep Call and Michael Tomasello
Department of Developmental and Comparative Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany
jensen@eva.mpg.de

Contrary to expectations of traditional economic models, people do not behave in a completely self-interested, rational manner. Instead, people show a sensitivity to fairness and to norms of cooperation. These sensitivities have been hypothesized to allow humans to engage in cooperative acts with unrelated individuals on a scale not seen in other animal societies. Some recent research has attempted to challenge the claim that sensitivity to fairness is unique to humans, but a number of other studies have failed to support this claim. An important contribution to this debate would be to have nonhuman animals play the ultimatum game. The ultimatum game is one of the most widely used and robust tests to examine other-regarding preferences. In this game, one individual receives a cash windfall that he can share with a second person. In the dictator game, this would be the end of the interaction, but in the ultimatum game, the second player is not powerless. He can accept the proposed division, allowing both individuals to take home their share of the money, or he can reject it, resulting in both individuals receiving nothing. While details vary, people in all cultures tested show a sensitivity to norms of fairness and will pay a cost to punish individuals who violate those norms. Here we report a study in which chimpanzees (*Pan troglodytes*) played a mini-ultimatum game. Chimpanzees, unlike humans, behaved like rational maximizers. They did not make fair offers and they accepted any non-zero offer, regardless of the options available. The absence of other-regarding preferences in this study, combined with prior research, support the hypothesis that an aversion to inequity and a willingness to inflict a cost on those better off may be unique to human social organization.

Adaptation to forest life of ex-captive juvenile Sumatra Orangutans (*Pongo abelii*) (poster)

Barbara Riedler¹, Eva Millesi¹, Peter H. Pratje²

¹ Department of Behavioural Biology, University of Vienna, Austria,

² Frankfurt Zoological Society, Sumatra, Indonesia, barbara.riedler@gmx.at

Sumatra Orangutans are facing a high risk of extinction. Therefore, re-introduction programs can be an important tool to conserve the species, if suitable, protected areas are available. To evaluate the potential success of such programs, post-release monitoring is necessary. In this study, food choice, habitat use and daily activity patterns of eight juvenile Orangutans at a reintroduction-station in Sumatra

were investigated. Diet composition and activity patterns of the study animals resembled that of wild Orangutans. However, we found differences within the group, in that the behaviour of animals which were habituated to close contact to humans differed from those that avoided human contact in several aspects. Human-bonded animals stayed at low altitudes, and were frequently observed feeding on the ground. This could severely increase the risk of predation. They also chose fewer food items and preferred leaves to fruits indicating a less efficient foraging behaviour compared to the individuals with low human contact. The latter showed more social interactions and spatial cohesion with conspecifics, especially to more experienced ones, which may facilitate social learning. Nevertheless, during the observation period a trend towards an adult-like foraging strategy could be determined in all individuals. We conclude that not only age, but also social interactions with conspecifics and humans, especially during an early developmental period can affect the course and probably the success of Orangutan re-introduction programs.

Social learning strategies in theory, animals and humans (poster)

Jeremy Kendal, Dept. of Anthropology, University of Durham, U.K.
Rachel Kendal, Dept. of Anthropology, University of Durham, U.K.
Luke Rendell, School of Biology, University of St Andrews, U.K.
Kevin N. Laland, School of Biology, University of St Andrews, U.K.

Social learning can be a good way for individuals to get cheap information about their environment. However, indiscriminate, universal copying is very unlikely to be adaptive because socially acquired information may be inappropriate to the copier, and can become outdated. Game-theoretical analyses suggest that individuals should use social information on a selective basis by employing 'social learning strategies' – sets of evolved rules on when and whom to copy. In humans, these strategies probably play an important role in cultural evolution. There is little theoretical or empirical understanding, however, of which strategies non-human animals should use. We present results from ongoing theoretical and empirical studies which currently suggest that callitrichid monkeys use a 'copy when asocial learning is costly' rule strategy and that stickleback fish use a 'copy if better' strategy. We also describe individual-based simulation models, wherein individuals employing various strategies compete in a stochastically varying environment, to further understand which strategies should be favoured by natural selection. Finally, we will give details of a computer-based open tournament that we hope will stimulate research in this area by inviting individuals to submit social learning strategies that will then be pitted against each other, similarly to the contest held by Axelrod & Hamilton for the iterated prisoner's dilemma.

Only Peanuts? Costly Punishment in Chimpanzees

Martin Schmelz^{1,2}, Keith Jensen¹, Josep Call¹ & Michael Tomasello¹

¹ Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

² Department of Animal Behaviour, University of Bielefeld, Germany

e-mail: martin_schmelz@eva.mpg.de

One prominent feature of human cooperation is that people will punish cheaters and other norm violators. Such punishment can serve to stabilize cooperation, and may be motivated by a sensitivity to unfair intentions as well as unfair outcomes. In a previous study, chimpanzees (*Pan troglodytes*), our closest living relatives, punished conspecifics based on unfair actions but not unfair outcomes, suggesting an absence of spitefulness. However, the punishing action was not personally costly for the subjects and therefore we added an element of cost in this study. Twelve captive chimpanzees had the opportunity to punish conspecifics who had actively taken away valued food by collapsing the food table so that the "thieves" could not eat. In half of the trials the apes had to pay the price of one peanut to collapse the table and in the other half the punishment was cost-free. To measure frustration simply due to loss, there was also a control condition in which the experimenter took the food away and no conspecific was present. No significant differences could be found between conditions and the percentage of trials in which punishment occurred was very low compared to the original study. The apes were more aroused (i.e. angry) when conspecifics took the food away than in the loss condition. Due to the low punishment rate it cannot be concluded whether or not chimpanzees are willing to punish conspecifics at a personal cost. Prior habituation in a previous study may have made the apes indifferent to the unfair actions.