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Oral Presentations

Plenary Sessions

Social Learning and the Transmission of Culture in Monkeys, Apes and Ancestral Humans

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Key Words: Cognition · Evolution · Social learning · Culture

Characteristics shared by species that also share a common ancestor are likely to reflect the nature of that ancestor. So what aspects of human social learning and culture are shared with our primate relatives, and thus also our primate ancestors? We can address this question at several levels, such as just the great apes, or all primates. Rather than ask, does primate X 'have culture' I have compared primates on three main dimensions: the patterning of traditions, their behavioural contents (e.g. tool use) and the underlying social learning processes (such as imitation). In this talk, I illustrate the first of these three topics, tradition, by our work on the cultural transmission of traditions in wild and captive chimpanzees, capuchin monkeys and, most recently, wild vervet monkeys. I illustrate the third topic, of social transmission mechanisms, through our studies of these processes in children, chimpanzees and vervets, focusing on emulation and imitation of others.

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Feeling Good: Assessment and Importance of Primate Welfare in Cognitive Research

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Key Words: Cognition · Welfare · Stress · Research

We have a legal and ethical obligation to ensure good welfare of animals in our care. In this presentation, I will argue that animal welfare also has a profound effect on the scientific output of cognitive research on primates. Assessment of welfare is multi-dimensional, including physical and clinical parameters as well as those that attempt to measure the animal's affective state. Such tests of affective state include measuring anticipatory behaviour prior to delivery of known reward and judgement bias tests. Such tests reveal that captive animals living in poorer enclosures or those that have undergone an uncontrollable negative event, and hence whose welfare is likely to be poorer, are more sensitive to announced reward and to reward loss, and have 'pessimistic' judgment biases, compared to those living in better conditions who are more 'optimistic'. Given that most cognitive research is based on rewards to motivate the animals to engage in the tasks, the animal's welfare state will impact upon the scientific output, potentially introducing unwanted variation. Anxiety and stress can also have adverse effects on learning, memory and attention, and early rearing and individual differences also play a key role in engagement in cognitive tasks and performance. I shall describe ways to improve conditions for captive primates, with the goal of improving both captive primate welfare and the findings of the cognitive research we conduct upon them.

Why Do Apes Cooperate?

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Key Words: Cooperation · Great apes · Prosocial behavior

Cooperation is ubiquitous in the animal kingdom and yet humans have turned cooperation into one of their defining features. Our level of cooperation has become such that members of our species can cooperate with large numbers of genetically unrelated partners for extended periods of time, in some cases spanning generations. How did this come about over evolutionary time? In this talk, I will turn to our closest living relatives, the great apes, in an attempt to throw some light onto this question. I will explore the prosocial behaviour of the great apes defined as one individual doing something resulting in the benefit of another. In particular, I will present data on helping and collaboration in chimpanzees, bonobos and orangutans and compare it with data on children presented with comparable tasks. I will use these comparative data to uncover the socio-ecological and motivational factors that determine the emergence of cooperation in humans and non-human apes.

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Social Minds, Shared Ecologies and Evolutionary Landscapes: Niche Construction and Future of the Human – Other Primate Interface

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Key Words: Cooperation · Great apes · Prosocial behavior

The ways in which primates create, participate in and are shaped by social and ecological niches are relevant to the well-being and sustainability of many primate populations. The manner in which humans impact those niches is of central importance. Humans have a long history of influencing landscapes and shaping the ecological pressures on ourselves and other species around us: humans are consummate niche constructors. As primates, humans also share a suite of evolutionarily relevant systems with other primate species, particularly in physiology, social cognition and patterns of interaction. Examining the interface between humans and other primates via niche construction, our shared ecologies and evolutionary landscapes, offers an important assessment of human-other primate relationships. Thinking in this vein can provide innovative insight about how what we do, and what we could do, affects the other primates.

Special Sessions

Tracing Back the Origin of Human Complex Cognition: The Operative Intelligence of *Homo heidelbergensis*

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Key Words: Human evolution · Cognition · *Homo heidelbergensis* · Operative intelligence

Human beings have an extraordinary cognitive potential. But how and when did this capability emerge in human evolution? Did other fossil hominins possess it? This is difficult to answer, since cognition includes all but instinctive and automatic conduct. However, the resulting massive cognitive repertoire may be shortened to few subjacent units: technological (operative) capability, consciousness, symbolic capability and socialization of knowledge. It is the combination of these four potentials that gives humans their uniqueness in the shape and degree of complexity. My talk will focus on tracing back high cognition in human evolution, particularly in one fossil species: *Homo heidelbergensis.* This species is well known in Europe, because it is the hominin that lived in this subcontinent during the Middle Pleistocene, a time ranging from 780 to 150 thousand years ago. Several caves in Sierra de Atapuerca (Burgos, Spain) contain the archaeological and paleontological remains of activities carried out by the populations of *Homo heidelbergensis* that lived there hundreds of thousands of years ago. Through the study of these assemblages we have been able to trace back the presence of language, hand laterality and other complex

behaviours in this hominin species. Also, most of the preserved bone remains of *Homo heidelbergensis* in Europe have been recovered from Sima de los Huesos cave, where we may have also the earliest mortuary behaviour in Prehistory.

Pelansi: Story of an Orangutan

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Key Words: Orangutan · Palm oil · Deforestation · Borneo

Indonesian rain forests are going through the most dramatic times ever in their history. Palm oil plantations, mining and logging industries are driving the deforestation of one of the most important biodiversity areas on Earth. Habitat loss increasingly pushes wildlife to live in smaller pieces of a disappearing forest, forcing them to be closer to humans. The consequent interactions between wildlife and humans trigger conflicts among the closest species in the area: humans and orangutans. Pelansi is the story of an orangutan who was trapped in a snare. After 10 days with neither food nor water, Pelansi was rescued by the International Animal Rescue team. Following first aid the situation was really critical, a matter of life or death. As soon as the animal was slightly better, the medical team decided to amputate his arm. It took 8 months of rehabilitation and hard work before Pelansi was ready to be released back into the wild. Unfortunately, Pelansi couldn't go back to the forest he came from: it had been destroyed by a palm oil plantation. Instead, he was released in the last remaining piece of forest in Ketapang (Borneo). Pelansi is a story about the spirit of overcoming, about the desire to live and the strength of the animal instinct. It is also a story of solidarity between species. The film shows the struggle of a group of people who are working to prevent orangutans disappearing. Pelansi's story is a wake-up call about the destructive spiral of human activities, from which humans are not exempt.

Oral Sessions

Do Chimpanzees *(Pan troglodytes)* Help Conspecifics to Obtain Food?

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Key Words: Chimpanzee · Altruism · Helping · Cooperation · *Pan troglodytes*

Studies on non-human prosociality have obtained mixed results, some suggesting that chimpanzees may be able to help conspecifics to obtain food altruistically. We investigated this possibility testing 12 pairs of chimpanzees from Leipzig Zoo, Germany. A sliding table was situ-

ated between two enclosures where two chimpanzees stood separately, but had visual access to each other and to the apparatus. The experimenter placed a piece of banana on each extreme of the table. By simultaneously pulling the two ends of a rope, subjects could slide the table to a point where the food became accessible through holes. However, the experimenter could block one, two or neither of the holes with lids, so that the movement of the table would provide food to one, neither or both subjects, respectively. In individual conditions, the two ends of the rope entered the same enclosure and therefore one subject alone could move the table. In cooperative conditions, each end entered one enclosure, so both subjects had to pull together. Subjects pulled the rope more often in those conditions in which they could obtain food compared to those conditions in which only the partner could obtain food. However, they pulled more often when only the partner could obtain food compared to when no one could. Chimpanzees were more likely to help their partner in cooperative compared to individual conditions even in the absence of overt requests by the partner. These results are similar to what has been reported in humans and indicate some other-regarding preferences in chimpanzees.

Influence of Subgroup Size and Inter-Specific Associations on Successful Access to Mineral Licks by Spider Monkeys *(Ateles belzebuth)*

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Key Words: Mineral lick · Spider monkeys · Social components · Platyrrhines

Mineral licks are important areas visited by several Neotropical birds and mammals to consume soil for mineral supplementation or as a detoxification agent. Spider monkeys and howler monkeys are the only platyrrhines that regularly visit the mineral licks, and both species visit licks together in higher frequencies than expected by chance alone. Our aim is to evaluate the influence of subgroup size and the presence of howler monkeys at the mineral lick on spider monkeys' success at consuming soil at the lick. Mineral lick visits were recorded from July 2010 through March 2013 and visits were considered successful when at least one individual ate soil at the lick. We recorded 189 visits and 56 of those were successful. We found that females with their core areas closer to the lick visited the lick more often than those with core areas further away. However, the success rate of females that ranged farther away was significantly higher (~49%) than that of other females (~33%) or males (~35%), probably due to the greater effort spent in going to the lick. We also found a significant positive relation between both subgroup size (~48% big-subgroup vs. ~11% small and ~26% medium) and the presence of howler monkeys at the lick (~67% vs. ~17% without howlers) on the success rate of lick visitation by spider monkeys. This study further supports the hypothesis that mineral licks are perceived as risky areas by spider monkeys, where higher number of individuals is probably related to the need for vigilance.

Behaviour of Chimpanzees and Bonobos in the Context of Food-Related Competition

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Key Words: Bonobo · Chimpanzee · Feeding competition · Socio-sexual behaviour · Agonism

Chimpanzees and bonobos are each other's closest living relatives. However, they have been found to be different in several ways, including their anatomy, behaviour, social system and cognition. Competition over resources is an excellent context to assess behavioural differences and similarities in the way individuals (or species) manage social conflicts. In this context, chimpanzees have been reported to be more aggressive than bonobos and the latter to display more frequent socio-sexual interactions than chimpanzees. We investigated the behaviour of 9 chimpanzees and 5 bonobos in the context of competition for food. The two study groups were housed at La Vallée des Singes (France) and their behaviour was recorded during the periods in which they were provided with food (chimpanzees, 48 h; bonobos, 18 h). We found that chimpanzees scored higher than bonobos on behavioural measures such as frequency and intensity of aggression and affiliative overtures, whereas bonobos displayed higher rates of socio-sexual interactions and play. Interestingly, bonobos appeared to be better skilled at preventing the occurrence and escalation of aggressive conflicts via socio-sexual and playful exchanges, whereas the chimpanzees' higher tendency to engage in open aggressive encounters in response to food-related competition was managed by increasing the exchange of tension-reducing affiliative interactions both during and after conflicts. These findings suggest that chimpanzees and bonobos differ in the behavioural strategies they use to cope with the strains and conflicts arising in the context of food-related competition.Supported by studentship SFRH/BD/69069/2010 from FCT (Portugal) to N.A.-V. and by project grant PSI2011-29016 from MINECO (Spain) to F.C.

Developmental Constraints on Costly Punishment in Children

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Key Words: Altruistic punishment · Behavioural performance · Psychological underpinnings · Developmental constraints · Children

Costly or altruistic punishment (AP) is a non-cooperative behaviour directed towards uncooperative partners, which is costly to the actor and which enforces cooperation. The psychological drivers underpinning this behavioural trait are diverse, though. These may include revenge or a genuine concern for the welfare of third parties. It has been argued that AP is cognitively demanding because the individual has to be able to (a) sacrifice its own resources in order to punish (not reward) others, and (b) understand negative contingency (or reciprocity). This proposal is supported by two observations, it is unique to humans and it rests on psychological

processes that develop with age. In the present study, 240 children aged 4.3–7 years participated in a three-partner public goods game with and without punishment, in which they played with two puppets which could act generously or selfishly. Here, we investigated the age at which children's use of punishment was strategic (i.e., directed towards the right targets) and cognitively sophisticated (i.e., the individuals experienced the right feelings and understood the contingent nature of punishment). We found that regardless of age, children's punishment was directed at selfish partners and was contingent. We also found that by 5 years of age children were able to adequately match their feelings and the targets of their punishment and to understand negative reciprocity. These results suggest that effective use of costly punishment requires cognitive skills that develop with age. Supported by studentship AP2010-2864 from ME to I.B.d.P. and project grant PSI2011-29016 from MINECO to F.C.

Local Perceptions and Attitudes towards Synanthrope Long-Tailed Macaques *(Macaca fascicularis)* Living in Padangtegal Monkey Forest, Bali (Indonesia)

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Key Words: Human-primate interaction · Synanthrope macaque · Public opinion · Management · *Macaca fascicularis*

The sympatric relationship between humans and other primates in interface zones is a contemporary widespread phenomenon. The increasing anthropization of areas leads to an intensification of human-other primate interactions ranging from conflict to co-operation scenarios. Our study investigated the commensal relationships between long-tailed macaques and humans at the tourist Padangtegal Monkey Forest. We present here results related to human-macaque interactions and local people's perceptions and attitudes towards the latter. We used ethological methods to quantify the nature of the interactions and we conducted a questionnaire survey to identify the macaques' status in local public opinion. Ninety-nine respondents (62 males and 37 females) were selected in a radius of 2 km around the Monkey Forest. Perceptions and attitudes were explicitly measured on self-reports and were attributed to a 4 point score. Macaques interacted with humans for 1.1% of their activity budget and these interactions were mostly aggressive (0.6%), food-related (0.4%) or neutral (0.1%). Most (80%) of the aggressive interactions were initiated by humans but the majority of these were aimed at protecting crops and properties from macaques' incursions. Overall, most of the respondents had positive perceptions and attitudes towards the macaques, except neighbouring landowner farmers who suffered from crop damage. Despite nuisances caused by macaques, the majority of the interviewees reported that they derived compensatory economic and cultural benefits from their relationships with macaques. The religious and economic contexts might explain the high tolerance level towards macaques that represents a source of hope for a sustainable coexistence, although some management strategies minimizing crop damage still need to be reinforced.

Dependent Stimuli on Reward Valuing in an Experimental Design of 'Uncertainty and Quantification Monitoring' on Metacognition in Chimpanzees

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Key Words: Metacognition · Uncertainty · Quantification · Response · Rewards

Metacognition has been defined as the ability to think about our own mental states. The test of 'Uncertainty with forced execution' [Hampton, 2001] is a memory discrimination task in which the subjects are given the chance to refuse to take a test before they are exposed to it. This task uses the declined response to avoid difficult problems, and the outcome is that renunciation frequency increases with the difficulty of the task, while the accuracy is higher in trials in which the subject chose to perform the test compared to a forced test. According to the 'Stimulus-Response' hypothesis, the stimulus would be dependent on associative learning. According to the hypothesis of 'Independent-Stimulus', the declined response would have a constant appeal that, together with the decreased strength of the discriminative response, would reach a threshold of independent response of the stimulus. In both hypotheses, the animals could learn to decline difficult tasks without assuming metacognitive explanations. The experimental design sought evidence that stimuli are dependent on internal stimulus evaluation measured against the difficulty of the task. This would be checked by quantifying rewards and evaluating the response in relation to the strength of the reward. The expected results are that subjects will risk more to take the test with higher rewards and with less difficult tasks, which would make less plausible the explanations of low-level against metacognition. The results obtained in our parameterization phase of rewards with chimpanzees indicate a clear preference, discrimination and transitivity.

Are Primates and the Forest Forever? Perceptions of Non-Human Primates at Cantanhez Forest National Park, Guinea-Bissau

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Key Words: Primates · Human dominated landscape · Perceptions · Conservation · Guinea-Bissau

The world's natural forests, whose rich ecosystems support wildlife and human populations, are declining and facing unprecedented changes. As human population rises and globalization disrupts local and more traditional communities around the planet, biodiversity seems doomed. It is people's behaviour plus economic and political factors (ethnosphere) which will determine the survival of wildlife and forests. Perceptions and attitudes towards non-human primates (NHP) are also culturally constructed. It is important to know these perceptions so that, if necessary, change may be possible through environmental and conservation actions. We assessed how

local communities living inside the Cantanhez Forest National Park (CFNP) in Guinea-Bissau Republic (GB) perceived NHP. We provide a background context of GB and our study site. During data collection, we used both qualitative and quantitative methods. Survey questionnaires (n = 271) and interviews were conducted. While baboons are considered a 'pest', 'ugly' but 'edible' (or valued for money), chimpanzees are considered 'non-edible' and seen as the NHP most similar to humans. Many respondents could not conceive the notion of extinction (of forests and wildlife where NHP are included). This is due to the fact that human communities have been completely dependent on the forest's natural resources for centuries and thus cannot even conceive another way of living.

Environmental Enrichment for Captive Primates: Research on Primate Welfare at Maia's Zoo

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Key Words: Feeding apparatus · Behaviour opportunity · Captivity · Individuality

Many types of environmental enrichment (EE) are now used routinely around the world, in recovery centres, zoos and laboratories, as public opinion demands better conditions for animals and laws stipulate its practice. The aim of this study was to test if individuals of three non-human primate species at Maia's Zoo [gibbons (n = 2), mona monkeys (n = 2) and brown lemurs (n = 2)] needed EE (evaluating inactivity and the occurrence of abnormal behaviours) and if the devices implemented reduced boredom and apathy, symptoms that animals are more prone to in captivity. The apparatus presented here acts as a cognitive stimulus and feeding enrichment. Also, to prove its applicability, the type of enrichment device chosen must be simple and inexpensive to build. With this in mind, the feeding device in this experiment consisted of small pieces of bamboo canes and a wire box filled with fruits and straw. As predicted, inactivity decreased during the enriched periods. Brown lemurs also had a significant decrease in stereotypies during the wire box condition. Our results show that the subjects did indeed require EE intervention. It is clear that the effect of an enriching foraging strategy depends on the species and their individual personalities, important aspects which should be taken into account when designing and maintaining EE programmes. EE technique should be planned according to the desired effect and, at the same time, must provide opportunities for the animals to manipulate the devices and choose when to do such manipulation. Enrichment effect may not be immediate, so we must be patient when it is used.

Do Adult Former Laboratory Chimpanzees *(Pan troglodytes)* Develop Affiliative Networks following Resocialisation?

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Key Words: Chimpanzee · *Pan troglodytes* · Deprivation · Resocialisation · Social network analysis

In all social mammals, and especially in higher primates, early infantile deprivation within a sensitive period during ontogeny may lead to social deficiencies later in life. We investigated the affiliative networks, including social play and allo-grooming, of three social groups consisting of adult former laboratory chimpanzees which had spent up to 27 years in solitary confinement. For this we conducted 237 h of scan sampling distributed over three sample periods: subsequent to resocialisation and during the first and second year of group life. We expected individuals with the experience of an early deprivation (EDs, n = 10, mean age of 1.2 years upon arrival at the laboratory) to differ significantly in their ability to form affiliative networks from later deprived individuals (LDs, n = 8, mean age of 3.6 years upon arrival at the laboratory). Accordingly, social network analysis, based on the distribution of two weighted measures, revealed significantly less tight or even fragmented and instable affiliative networks within the two groups consisting of a majority of ED individuals compared to the tightly knit networks of the LD-majority group over a 2-year period following resocialisation. Thus, even though all three social groups developed affiliative networks subsequent to resocialisation, only the LD-majority group succeeded in the maintenance of consistent networks over the 2 years of group life. This leads to the conclusion that, in chimpanzees, early social deprivation commenced during the first 2 years of life has profound detrimental effects on social competence throughout the animal's life time.

Space Use as an Indicator of Animal Welfare: A 7-Year Long-Term Study with the Chimpanzees from the Fundació Mona

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Key Words: Space use · Welfare · Chimpanzees · Socialisation · Long-term study

Chimpanzees are a complex species. Their social structure, social dynamics, development, cognitive capabilities and cultural behaviours reflect this complexity for animals in the wild. Knowing how this species behaves in the wild is therefore fundamental for correctly managing such a species in captivity and for improving its overall well-being and welfare. Objective measures of animal welfare within captive environments can provide useful information about animal requirements and welfare. Although several behavioural and physiological measures have been used with this aim, few studies have attempted to use animal welfare indicators taken from how the species behaves in a spatial context. Our objective has been to discover whether spatial behaviour informs us about welfare and also if it is related to other welfare indicators. The study

was carried out at the Fundació Mona with a sample of 15 chimpanzees *(Pan troglodytes)*. Data were collected over 7 years (2007 to 2013). Behavioural (n = 20) and spatial data were recorded using a scan sampling technique. We measured: (1) spatial welfare indicators: weighted exploration index, core activity field and isolation field index; and (2) behavioural welfare indicators: rehabilitation index and resocialization index. Overall results indicate: (1) a significant correlation between behavioural and spatial welfare indexes; (2) changes over the years in spatial welfare indicators; (3) despite some fluctuations, an overall improvement of welfare based on spatial indicators. We conclude that including spatial information, in a longitudinal manner, is useful for understanding how captive primates improve their welfare and interact with their environments.

Relationship between Tooth Wear and Ecology in Mandrills and Baboons

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Key Words: Tooth wear · Dental ecology · *Mandrillus sphinx* · *Papio cynocephalus*

Tooth wear in primates is caused primarily by dietary and aging factors and can influence reproduction and survival. However, there is limited information on the effect of ecology and feeding behaviour on tooth-use wear, making it necessary to analyse the variability between known diet species that occupy different ecological niches. We developed an approach using dentine exposure of molar teeth in two in vivo African papionin species to test if habitat and diet affect age related tooth wear. Mandibular and maxillary tooth moulds (M1 and M2 teeth) were obtained by anaesthetizing the individuals and applying dental impression material in forest-dwelling mandrills (*Mandrillus sphinx*; n = 38) from Gabon and savannah-living yellow baboons (*Papio cynocephalus*; n = 95) from Kenya. Occlusal digital images were taken from positive high-resolution replicas and the percent of dentine exposure (PDE) recorded. Uni- and multivariate statistics ($p < 0.05$) were used to examine PDE interaction on age and sex. Results showed no sex related differences, nor any differences between captive-born and wild-born animals. Moreover, when tooth wear on age was compared, we found that mandrills exhibited significantly higher PDE than baboons in M1 and M2. Our findings confirm that tooth wear is a cumulative process and establish different tooth wear models among primates, which are directly related to diet and habitat. Although baboons ingest large quantities of underground storage organs with adhered abrasive grit particles, mandrills mainly feed on fruits that have hard shells and seeds. Furthermore, baboons live in an environment that has a higher proportion of extrinsic abrasive particles, such as quartz, which causes higher tooth wear rates.

Changes in Juveniles' Allogrooming after the Birth of Siblings in Common Marmosets *(Callithrix jacchus)*

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Key Words: Juveniles · Siblings' birth · Allogrooming · *Callithrix jacchus*

It has been observed in some species that the birth of siblings is potentially a major event in a juvenile's life that may lead to changes in behaviour and social relationships. The aim of this study is to analyse changes in affiliative behaviours in juveniles after the birth of siblings in the common marmoset *(Callithrix jacchus)*, a co-operative breeding, New World primate. If the birth of siblings represents a change in the distribution of alloparental care, there may be a change in the juveniles' affiliative interactions with alloparents (parents and helpers). Therefore, a decrease in allogrooming and contact with parents and/or helpers soon after the birth of siblings is expected. An alternative hypothesis is that changes in juvenile affiliative interactions are due to changes as a result of maturation. In that case, changes in affiliative behaviour should be expected later. Nine captive juveniles belonging to UAM were observed 3 days a week using focal-animal scan sampling from one month before (–1) to 3 months (1, 2 and 3) after the birth of siblings. There were no differences in the total allogrooming before the birth or during any month afterwards but the proportion of allogrooming with the father decreased after the birth of the infant (month 2). Although grooming performed by juveniles on the father increased after the birth (months 2 and 3), juveniles received less grooming by the fathers (month 2 and 3). In conclusion, such changes could be linked with the rise of locomotor independence of the siblings (month 2) rather than their birth. PSI2012-30744.

Observational Learning in Chimpanzees *(Pan troglodytes)*: Experimental Evaluation Through Multiple Tasks

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Key Words: Imitation · Emulation · Social learning · Multiple Tasks · Chimpanzees

There is currently a controversy about the nature of chimpanzees' social learning. One of the main issues is focused on chimpanzees' learning abilities and whether this species is able to learn directly from a model's behaviour (action copy) or otherwise learns indirectly through the consequences of the model's actions (results copy). The aim of this study was to evaluate the ability to copy actions and/or results on a sample of 13 chimpanzees *(Pan troglodytes)* from Fundació Mona, through a two-target puzzle box. The individuals witnessed different sets of demonstrations under three conditions. Firstly, a control group, where individuals did not receive any kind of information. Secondly, two experimental groups, where individuals were shown (1) results only, without actions (non-social information) and (2) both actions and results (social information). Each participant received eight trials divided into two testing sessions in which they were given access to the puzzle box for manipulation. The subjects' behaviour in each condition was assessed for (1) type of manipulations, (2) how often they copied the demonstrator's actions, (3) latency and (4) success.

An overall effect on social learning was detected in the latency and the type of manipulations. Individuals in the control group were less efficient and made more mistakes than individuals in the experimental groups. However, there were no significant differences between experimental groups in any of the measurements including action copy, where individuals used the same method despite the kind of information they witnessed (social or non-social). In conclusion, individuals do not benefit from social demonstrations. They show no evidence of imitative learning. Instead they extract information mainly through the consequences of the model's actions or individually.

Primatology on Neuroethics: Opportunities and Limits of Primatology Research on Neuroethic Studies

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Key Words: Moral content · Moral structure · Neuroethics · Neuroscience · Primatology

Neuroscience research has a great potential in the field of ethics, nevertheless, it has some insurmountable limits. Insofar as primatology can contribute to neuroethics research, it will be a participant in these possibilities as well as in these limitations. We must pay attention to the distinction between moral as structure and moral as content. Moral structures are given by the cerebral constitution, that conditions, but does not determine, what moral content may settle on those structures and how. Neuroscience can provide valuable data about moral structures, both in our species and in others, but cannot offer some moral contents as the most suitable. Primatology presents the same opportunities and the same limits. Some of the issues in neuroscience that primatology may be able to contribute to are: what kind of social organization the different species of primates have, including our ancestors and our species; what evolutionary processes accompanied and configured the Order; how certain social behaviours, such as cooperation, altruism or manipulation, emerged; what biological predisposition we have to assume certain rules or social order and how it emerged; all this paying attention to the brain changes that accompanied the modification processes and to the present cerebral settings. We will briefly put forward some of the major ethical problems of neuroscience research in primatology, proposing alternatives to ensure the welfare of the study animals.

Responsiveness to Infants' Cues by Experienced Fathers and Mothers of Common Marmosets *(Callithrix jacchus)*

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Key Words: Responsiveness · Infant-cues · Parental-care · Co-operative breeder · Common marmoset

Expectant males of the co-operative breeding *Callithrix jacchus* experience hormonal priming during females' pregnancies that prepare them to care for the infants. Responsiveness of experienced fathers to infants' cues has shown that when infants are dependent, fathers do not be-

haviourally discriminate between own-infant and unrelated-infant distress cries. However fathers respond hormonally, showing a decrease in serum testosterone levels towards own-infant but not unrelated infant odours, but only when infants are dependent and pre weaned and not when infants are independent. We studied the behavioural responsiveness of 6 experienced current-breeders (6 males: 6 females) to distress cries and scent odours of dependent own- and unrelated infants, when infants were totally dependent on parental care and when those infants were mostly independent. As a control sample, we used 6 experienced non-current breeders (6 males: 6 females). Common marmosets were socially housed at the Wisconsin National Primate Research Center. Results indicate no difference in the behavioural responsiveness between males and females to any stimulus and in any breeding-condition. Current breeders were more responsive to infant cues during the period in which infants were totally dependent than when infants were mostly independent and no difference was found in the responsiveness between non-current breeders and current breeders with independent infants. No behavioural discrimination related to infant odour was found across stimulus tests. These results indicate that further away from infants' birth, responsiveness of experienced breeders decreases. Offspring signals themselves were not sufficient to elicit the behaviour interest of experienced parents once the infants were mostly independent. Therefore, the continuous behavioural interaction with dependent infants must play a major role in parental responses. PSI2009-08581PSIC-PR2011-0256PSI2012-30744 (SMS); Hilldale Professorship (CTS); NIHRR000167 (WNPRC).

Do Chimpanzees Like Videos and Music? Sensorial Stimulation and Its Impact on the Welfare of Chimpanzees at the Fundació Mona (Girona, Spain)

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Key Words: Environmental enrichment · Sensorial enrichment · Welfare · Chimpanzees

Animals are exposed to a wide range of sensory stimuli into the wild. By contrast, in captivity sensory inputs are reduced. Sensory stimulation is, therefore, a potential method of environmental enrichment for captive subjects. The aim of this study was to evaluate the differences (in terms of interest, effects on behaviour and impact on welfare) between two treatments of auditory and visual stimulation in a group of three chimpanzees *(Pan troglodytes)* at the Fundació Mona. Audio treatment (nature sounds vs. classical music) was structured in three phases: pretest (before music), test (with music) and post-test (after music). Baseline data were collected 10 days before the treatment and 10 days after. Video treatment consisted of 4 different videos (insects, conspecifics, known and unknown people). Baseline data were collected before each type of video and afterwards. Each video (test) was shown over 5 days (15 min test). Results revealed that: (1) chimpanzees were more interested in video than in audio stimuli; (2) we found behavioural changes in both treatments (at social and non-social levels); (3) audio treatment effects persisted longer than video effects; (4) video effects were more effective during the treatment; (5) we detected significant differences in the rehabilitation index for both treatments, but not significant differences in the resocialisation index. We conclude that both enrichment strategies had a positive effect on welfare, although their effects over time and the interest in them during treatment differed.

Behaviour across the Menstrual Cycle of Captive Female Chimpanzees *(Pan troglodytes)* Taking a Combined Oral Contraceptive Pill

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Key Words: Menstrual cycle · Chimpanzee · Pill · Contraception · Social behaviour

Female chimpanzees *(Pan troglodytes)* exhibit a menstrual cycle of 36 days. In naturally cycling chimpanzees there are changes in behavioural expression throughout the cycle, which may be associated with fluctuating levels of endogenous ovarian hormones. Because of their physiological similarity to humans, female chimpanzees can be administered the same hormonal contraceptive methods. Various studies have indicated that hormonally mediated contraception can have an inhibitory effect on socio-sexual behavioural expression. The aim of this study was to determine if female chimpanzees maintained on a combined oral contraceptive pill (Ovoplex 30/150) exhibited changes in behavioural expression over the course of their menstrual cycles, with a focus on social behaviour. Continuous focal sampling was used to collect data from four adult females during three pill cycles (each of 28 days). The subjects were housed in multisex groups (n = 2) at Fundació Mona. Scan sampling was used to obtain behavioural data on all group members (n = 8). The females did not exhibit any significant behavioural changes over the course of their menstrual cycles with the exception of positive human interaction (behaviours directed towards keepers/visitors). The rate of positive human interaction was significantly higher in the second week of their cycle, compared to weeks 1, 3 and 4. The lack of changes in their behaviour may be due to the influence of artificial hormones in the contraceptive pill and their inhibitory effect on endogenous hormone release and subsequent behavioural expression. The results of this study may directly influence future contraceptive decisions for managers of captive primates.

Intertemporal Preferences in Great Apes

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Key Words: Pongo pygmaeus · *Pan paniscus* · *Gorilla gorilla* · Temporal discounting · Intertemporal preferences

Economists found that humans are more impatient when making short-run tradeoffs than when making long-run tradeoffs. In order to find such an effect in great apes, we tested 6 orangutans, 5 bonobos and 3 gorillas at Leipzig Zoo. In one condition, they were offered either an immediate grape or 3 grapes delayed 3 min. In another condition, we offered either 1 grape delayed for 6 min or 3 grapes delayed for 9 min. Results show that in the long-run subjects were more prone to wait longer for a larger reward. This phenomenon, often referred to as preference reversal, implies that a subject's preferences change over time. When a subject makes a long-run decision, he might choose the larger-later reward but, as the time of the reward comes, he might

switch his decision to the smaller-sooner reward. Therefore, a self-aware individual could resolve to eliminate an option that seems inferior now, but might tempt him later. We studied this ability, called sophistication, in 6 orangutans and 4 bonobos at the same institution. Subjects chose between a game in which, 6 min afterwards, they would be offered a decision involving a tempting (immediate) but smaller reward, or a game in which, at the same point in time, they would be offered some non-tempting (delayed) but larger rewards. Results were inconclusive. Overall, our study constitutes the first evidence of preference reversal in great apes. Also, we failed to demonstrate sophisticated-like behavior. We conclude that there is a need for a different paradigm to study the latter ability.

Natural Choices of Food in Chimpanzees and Orangutans

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Key Words: Natural choice · Decision-making · Apes · Rational election · Food preference

When primates are faced with different foods they have to decide which they prefer. In the following study, we investigated how apes allocated their choices between two food options that varied in terms of their quantity and quality. Experiment 1 tested whether subjects followed a 'rational election' strategy by preferring the AB option over the A option, where the A item is preferred to the B item. Additionally, we tested whether the length of the inter-trial interval affected subjects' choices. Five orangutans and 6 chimpanzees received three types of trials: preference (A vs. B), quantity (AA vs. A) and rational-election (AB vs. A where A is the preferred food). We used three food items that substantially differed in terms of preference (carrots, apples and pellets). Subjects showed no overall preference for the rational option compared to the non-rational option, although they showed clear preferences during both the preference and quantity trials. Only orangutans showed some significant preferences in test trials, but only in two out of six food combinations. The inter-trial length had no effect on choice behaviour. Experiment 2 further explored apes' 'rational election' by using three types of highly preferred food items (bananas, grapes and pellets) presented to 6 orangutans, 4 gorillas, 8 bonobos and 18 chimpanzees. Unlike the results of Experiment 1, here apes generally chose rationally in testing trials. Taken together, these results indicate that apes can choose rationally, but this depends on the value of the food items. Experiments were carried out at the Leipzig Zoo in Germany.

Assessment of Chimpanzee *(Pan troglodytes troglodytes)* Personality through the Process of Release into the Wild, Conkouati-Douli National Park (Republic of Congo)

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Key Words: Personality · Chimpanzee · Wild · Release · Questionnaire

Recent research on personality of great apes [King and Landau, 2003; Pederson, 2004; Uher, 2007; Weiss, 2009] has focused mainly on captive animals. Following the same approach in the wild, we studied a sample of 40 released wild-born chimpanzees *(Pan troglodytes troglodytes)* of the Congolese NGO HELP Congo, which is a model for chimpanzee release. The study was performed in the NGO sites, 'Triangle' and 'Bivouac' for release and the Sanctuary for rehabilitation, in the National Park of Conkouati-Dolui (Republic of Congo). The aim of the study was to optimize a method of personality assessment for the released great apes. Twenty-two workers of different types assessed the chimpanzees' personality on the basis of an Eysenck's questionnaire adapted for non-human primates. On the whole, they perceived a certain stabilization of the behaviour pattern through the process of liberation. Data analysis showed small differences between the questionnaire evaluations depending on the human evaluators' gender, training and time of contact with the chimpanzees. We also found personality differences between chimpanzees regarding sex and time of release. We took additional observational data of the chimpanzees' behaviour over this period. The questionnaire and behavioral results were compared, searching for a correspondence. We conclude that the questionnaire, despite its subjective nature, was a good tool to classify the profiles of personality of the released chimpanzees and that these profiles did not contradict the differences in behaviour patterns during the process of liberation.

Ethograms or Questionnaires? A Comparative View on Personality Assessment in Chimpanzees *(Pan troglodytes)* at the Fundació Mona (Girona, Spain)

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Key Words: Chimpanzee · Personality · Eysenck · Five Factor Model · Ethogram

The study of animal personality has followed two methodological approaches: (1) evaluation from questionnaires, formed by lists of adjectives that are evaluated by people who know the animals well (rating), and (2) the quantification of behaviour through observation (coding). Both methods have been used to detect personality traits in animals. Although ethograms have been mainly used, some authors have preferred the mixed method, which increases validity and reliability. Our aim was to evaluate the personality and behavioural phenotype of a group of chimpanzees (n = 11) using the dual approach. First we used two of the most widely used questionnaires applied in humans: Five Factor Model (FFM) and Eysenck (EYS). The evaluators were 28 people who knew the animals well. Secondly, we recorded behaviours (n = 117) using focal sam-

pling. Results showed that (a) both questionnaires presented a clear factorial structure with the same number of factors that were established in humans (5 for FFM and 3 for EYS) and (b) although correlations were detected between the factors of the questionnaires and some behaviours, the number of correlations was not very high. However, the pattern of significant and non-significant correlations between behaviour and personality was acceptable for the construction of valid personality factors. In conclusion, although the questionnaires detected a personality structure in chimpanzees, the low correlation with the factors of the questionnaires showed that behavioural assessments were not sensitive enough.

Chimpanzees to the Public: The 'Visitor Effect' and Its Impact on Animal Welfare at the Fundació Mona Rehabilitation Centre (Girona, Spain)

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Key Words: Visitor effect · Welfare · Rehabilitation · Chimpanzees

The public is one of the most important welfare factors for captive animals and particularly for great apes. Many rehabilitation centres do not allow visits because of their potential negative impact on welfare. In contrast, some zoos and sanctuaries argue that 'controlled visits' can be used as environmental enrichment. The aim of this study was to determine the impact of controlled visits on the chimpanzees at the Fundació Mona. The sample was composed of 14 chimpanzees *(Pan troglodytes)*. Data were recorded over 4 months using scan sampling mixed with all occurrences sampling for the two experimental conditions: control (no visits) and treatment (days with visits). Behaviours (n = 53) were recorded at three distinct time periods: before, during and after visits. Visits were categorised depending on the number of people and the age of the visitors. Overall results have shown that visits do not have a negative impact on animal welfare, although behaviours differed depending on the recorded time period (before, during and after the visit) and the type of visit. If the visitors behaved 'well' we did not detect a negative impact (increasing inactivity, abnormal, self-directed behaviours or aggressiveness). The variable which had the highest influence on behaviour was the type of visit. The number of visitors was a key factor in predicting the response of the chimpanzees. We conclude that controlled visits could be positive for primate centres because of their null effect on animal welfare and positive effect in increasing public awareness and education through primate conservation.

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Poster Presentations

Is Nipple Preference Related to Growth in Common Marmosets *(Callithrix jacchus)*? A Preliminary Approach

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Key Words: Callithrix jacchus · Nipple preference · Weight · Time suckling · Offspring

Some studies have described the existence of nipple preference and its symmetrical distribution in marmoset twins. However, in a previous study, our results showed a significant preference for the left nipple in a group of 11 offspring ($t = -2.45$; $p = 0.03$). The aim of this study was to explore the difference in weight of these marmosets in relation to nipple preference and time suckling at each nipple. We choose 10 offspring, (5 sets of twins) and analyzed teat preference based on the number of times they suckled at each one, the percentage of time suckling at the left nipple, and the weight of the offspring at 2 months of age. Four of the infants showed a preference for the left nipple, one for the right and the rest showed no significant preference. Grouping the infants with their twin revealed that in two sets of twins, neither of the offspring showed significant preference for either nipple; in another set, both individuals showed a preference for one of the nipples, one for the left and one for the right nipple; and in the other two pairs, both offspring displayed a preference for the left nipple. The relation between percentage of time suckling at the left nipple and weight at 2 months of age showed a value near significance ($r = 0.54$; $p = 0.06$) – offspring nursing for a greater length of time at the left nipple weighed more than their siblings. These preliminary results show the existence of a relationship between nipple preference in marmoset infants and the amount and/or the quality of the milk. MEC-PSI2012-30744.

Grooming Relationships between Adult Males and Other Group Members in Co-Operatively Breeding Moustached Tamarins *(Saguinus mystax)*

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Key Words: Polyandry · Male-bonding · Kin selection · Co-operation · Reciprocity

Grooming is considered a tradable commodity for several species, to be exchanged for other benefits. Moreover, grooming has been used in many primates to assess the quality of a relationship between two or more individuals. Our aim was to examine grooming relations between

adult males with other group members in moustached tamarins *(Saguinus mystax)*, considering inclusive fitness and direct reciprocity. We studied four wild groups with known genetic relationships located in a primary rainforest in northeastern Peru, two from January to December 2001 by P. Löttker and M. Huck and two from September 2009 to May 2010 by the first author. The results obtained showed intense grooming activity by both breeding and potentially breeding males and suggest a preference to groom each other more than other partner classes. Since genetic analyses revealed that potentially breeding males in the different study groups were mainly siblings, we concluded that they maximize their benefits through inclusive fitness, promoting the survival and reproduction of their siblings with breeding status. Comparison of the amount of grooming each male category directed or received to/from other partner classes revealed that breeding males tended to groom breeding females longer than potentially breeding males. As observed values showed that breeding males also received more grooming from breeding females than potentially breeding males, this could be interpreted as an effort on the part of the breeding pair to secure their breeding position. Finally, in relation to non-breeding offspring, we did not find evidence of 'pay-to-stay' and 'pay-for-help' mechanisms to regulate group size. PSI2009-08581-PSI 2012-30744-HE 1870/10-1.

Patterns of Aggression and Social Hierarchy in Wild Spider Monkeys *(Ateles belzebuth)*

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Key Words: Aggressions · Hierarchy · Dominance · Spider monkey · Social control

Although several features of spider monkey (*Ateles* spp.) and chimpanzee *(Pan troglodytes)* societies have converged (e.g., high degree of fission-fusion dynamics, male philopatry, territorial boundary-patrols), it is still unclear whether the social relationships of spider monkeys are also organized hierarchically, similar to those of chimpanzee societies. Based on previous studies of patterns of aggression in *Ateles*, we evaluate the presence of hierarchical versus egalitarian relations in a group of wild spider monkeys. From 2006 to 2012 we conducted behavioural follows on all adult males (n = 6) and females (n = 11) in one group of white-bellied spider monkeys at Tiputini Biodiversity Station in Ecuador, completing 7817 h of focal animal sampling. We recorded all aggressive events in which the focal animal was the recipient or the initiator of aggression and complemented these systematic observations with ad libitum data. In total, we recorded 231 aggressions between adult spider monkeys. Males were the initiators of most of the aggressions (~87%), while females were the principal recipients (~96%); male-male aggression was low (~4%). Contrary to previous studies, female-directed aggression was not predominantly against cycling females. Approximately 40% of male-to-female aggressions took place in the context of subgroups coming together, suggesting a potential role in 'social-control'. However, the number and directionality of aggressive encounters was not enough to reveal hierarchic relations between group members, especially among same sex adults. This study suggests that some aspects of within-group competition may be strikingly different between spider monkeys and chimpanzees.

Plasticity and Resilience in Grouping and Grooming Patterns of Chimpanzees: Effects of Rearing Condition and Stability of Group Membership

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Key Words: Behavioural plasticity · Behavioural resilience · Rearing conditions · Demography · Captivity · Chimpanzee

The grouping and grooming patterns (GPs) represent key parameters of a group's social system. Although GPs have traditionally been taken to be species-specific, the truth is that species typically exhibit large variation in GPs. Determining the extent of such plasticity and the causal factors that account for it continues to be a hot issue in the field. We compared the GPs of two groups of captive chimpanzees (Rainfer, n = 8 and Zoo-Aquarium Madrid, n = 9), that were demographically similar (multimale-multifemale), over periods of 1 and 2 months, respectively. However, the two groups differed in the rearing conditions their members had experienced; one containing individuals who had been severely socially deprived for a long period of time (SSD), whereas the members of the other group had been socially reared in a peer-group (PG). The two groups also differed in the stability of group membership; the SSD was recently established, whereas the PG members had lived together for several years. Our main goal was to explore the effect of rearing conditions and stability of group membership on GPs. GPs were analysed in terms of gregariousness, sociality, closeness and grooming. SSD individuals scored higher than PG individuals on the four measures, suggesting that although chimpanzee's GPs can be plastic, they can also deploy resilience, with individuals exhibiting responses that could counteract the harmful effects of a rearing history of severe deprivation. Supported by studentship SFRH/BD/69069/2010 from FCT (Portugal) to N.A.-V. and by project grant PSI2011-29016 from MINECO (Spain) to F.C.

A Coding System for Analysing Conflict Management Strategies in Primates

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Key Words: Methodology · Conflict resolution strategies · Coding system · Great apes · Social dynamics

Social conflicts over a variety of resources that enhance welfare and fitness are a prominent consequence of living in groups. Two critical aspects of such conflicts are that they typically involve multiple participants and that their dynamics can be context-dependent. The method of

comparing observations recorded after conflicts (post-conflict or PC periods) and during control periods not preceded by conflicts (matched-control or MC periods) has become the standard approach in conflict management research involving primate and non-primate species. The method we propose in this study has been designed to incorporate two additional sources of information that are not fully considered in the standard PC versus MC comparison method. We focus on the recording and coding of the behaviours (1) that take place during the conflict itself (C period) and (2) that are displayed by two (dyadic) or more (polyadic) individuals at the same time (i.e., parallel occurring conflicts are taken into account). The coding system we describe in this study is an attempt to address these two issues. To explore and illustrate the possibilities offered by this coding system we apply it to a sample of aggressive conflicts recorded during feeding contexts in three species of great apes: chimpanzees, bonobos and gorillas. Our analysis not only incorporates traditional PC behaviours such as affiliative, aggressive, socio-sexual and self-directed actions, but it also examines the use of play during conflicts. Supported by studentship SFRH/BD/69069/2010 from Fundação para a Ciência e a Tecnologia (Portugal) to N.A.-V. and by project grant PSI2011–29016 from MINECO (Spain) to F.C.

Altruistic Punishment in Young Children: A Developmental Study

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Key Words: Cooperation · Altruistic punishment · Public Goods Game · Developmental origins · Young children

Altruistic (costly) punishment, that is the punishment of uncooperative partners, is thought to be a unique signature of human cooperation. Although altruistic punishment in adults has been addressed in a number of studies, the developmental origins of this sophisticated prosocial responding remain largely unchartered. The aim of the present study was to investigate early signs of strong reciprocity in human ontogeny and track its developmental schedule, by testing 250 4.3- to 7-year-old children in a Public Goods Game (PGG) without and with costly punishment (treatments 1 and 2, respectively), in which participants were given the opportunity to make discrete contributions to the group's welfare or to free-ride on the contributions of others. In both treatments (T1 and T2), children were paired with two partners (puppets) in three possible conditions: the two partners were stingy (SS), one partner was stingy and the other was nice (SN), and the two partners were nice (NN). In absence of punishment (T1), most children tended to be cooperative and remained so unless they were paired with stingy partners, in which case cooperation decayed. When punishment was possible (T2), stingy children shifted to a cooperative mode probably in order to avoid punishment. This pattern was already in place in 5-year-olds. These findings suggest that some of the prosocial strategies observed in adult humans develop early in ontogeny. Supported by studentship AP2010-2864 from ME to I.B.d.P. and project grant PSI2011-29016 from MINECO to F.C.

Human Inequity Aversion in the Investment Game

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Key Words: Cooperation · Investment Game · Inequity aversion · Human evolution · Trust

Trust emerges as a key factor for human cooperation in economics games. To explain cooperative behaviour in humans and other primates it is necessary to take a multi-dimensional approach. Recently, it was found that cooperative primates, such as chimpanzees or capuchins, display disagreement when the distribution of a reward is unequal (inequity aversion); therefore, we would expect trust to bloom when an equal distribution of benefits exists. Two hundred and sixteen undergraduate students completed the Investment Game across three conditions: baseline, cooperative-equity and cooperative-inequity. While under all conditions the best strategy for participants is to give the maximum number of tokens to the other player, we found that participants increased their trust behaviour during only the cooperative-equity condition. Under the cooperative-inequity condition, participants showed reduced trust compared to under the equity condition, those levels were similar to the baseline levels. Additionally, trust levels in both conditions were independent from partner cooperation levels. Participants that showed a higher level of trust behaviour under baseline condition showed less trust under the inequity condition. Our results indicate that inequity distribution contexts reduce cooperative trust between players; furthermore, we found that more trusting subjects are also more sensitive to inequity. These results are consistent with previous studies, showing the role of inequity aversion in human cooperation.

Environmental Enrichment in Captive Chimpanzees and Its Role in the Re-Socialization Process in a Social Group: A Case Study

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Key Words: Environmental enrichment · *Pan troglodytes* · Re-socialization · Abnormal behaviours

As highly social and intelligent beings, primates require a great level of social and environmental stimuli. By improving the complexity of the environment, their behavioural repertoire and activity budget should became as close as possible to what is observed in their wild conspecifics. The present study consisted of the introduction of two different types of foraging devices into a social group of captive chimpanzees (n = 8) in Fundació Mona, Spain: an artificial termite mound and a hosepipe, after a base-line period. The termite mound could be used by more than one individual at the same time (social context), while the hosepipe could only be used individually. Changes, activity budget and level of association were assessed in the group (scan sampling), but especially on the newest member (focal), who had shown some significant behavioural variation as well as abnormal behaviours (hair pulling). Our main objective was to decrease such abnormal behaviours and increase social behaviours in the activity budget. Our hypotheses were

confirmed, as the enrichment with a social component did enhance social interactions (affiliative interactions and grooming in the entire group) during both types of enrichment, and it decreased inactivity and abnormal behaviours, especially during the termite mound period (self-inflicted behaviours in Africa; stereotypic and non-stereotypic behaviours in the group). In summary, both enrichment devices had a positive influence on chimpanzees' behaviours. Creating a wider variety and opportunity of use is important, considering that enrichment strategies should depend on the group and the individual personalities, giving them freedom of choice. Improving social interactions is important to reduce abnormal behaviours.

Manual Preference across a Variety of Tasks in Common Marmosets *(Callithrix jacchus)*

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Key Words: Callithrix jacchus · Hand preference · Visuospatial requirements · Experimental task · Simple task

The aim of this study was to analyze the hand preference of a group of common marmosets across a variety of tasks with different visuospatial requirements in the same individuals. As some studies have suggested, the expression of manual preference in adults can be changed with the visuospatial requirements of the tasks. We registered the hand use of 6 adult (3 males and 3 females) marmosets in a simple task (reaching and taking food), in a task with postural demands and in a task with an increase of visuospatial demands. In the simple task, all marmosets showed significant preference, 5 for the left hand and 1 for the right hand. In the second task 5 showed significant preference, 4 for the left hand and 1 for the right hand. In the last task, all the subject showed significant preference, 5 for the left hand and 1 for the right hand. However, 2 of them showed different significant hand preference between the simple task and the other ones. Correlations between different tasks were not significant, but all of them were positive and the relationship between the simple task and the task with postural demands showed values near significance ($p = 0.07$). Although it is necessary to extend the study sample, our results seem to support the hypothesis of the importance of the nature of the task for the expression of hand preference.

Proximate Causes of Allomothering Behaviour in Twin Births of Uniparous Primates

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Key Words: Allomothering · Twins · Uniparous species · Primates

In primates, generalized allomothering occurs only in species with twin births, large infant/mother weight ratio and elevated kinship among group members (subfamily Callithrichidae). However, occasional infant care by individuals other than the mother may occur in different taxonomic groups. At a proximate level, maternal infant rejection and maternal tolerance allow

group members to interact with infants. These behaviours can be promoted by maternal costs and depleted by infant risks, such as predation or infanticide. We have explored anecdotal occurrences of twining in uniparous primate species to evaluate the occurrence of infant allocare. We found 15 behavioural reports of twining (13 different species): 12 reporting the occurrence of allomothering, 1 reporting there was no occurrence and 2 not including this information. Allomothering was described during twining in 11 species of New (5) and Old World monkeys (6), and in 7 of them allomothering was not a feature of singleton births. Authors described infant care by related (42%) and not related (58%) group members. We found no relationship between frequency of allomothering and infant/mother weight ratio. Neither variable associated with predation (the species' size and the arboreal/terrestrial ecology) showed any relationship with those behaviours. Allomothering also appears in species in which infanticide is considered a frequent behaviour. Twining doubles maternal costs, which seems to promote allomothering behaviours even when phylogenetic and socio-ecological factors do not predispose for it. PSI2009-08581 and PSI 2012-30744.

Naturalistic Enclosures Provide Suitable Enriched Environments for Primates in Zoos

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Key Words: Animal welfare · Enclosure design · Environmental enrichment · Naturalistic enclosures · Zoological parks

Several studies have shown that zoo visitors perceive naturalistic enclosures as those that best satisfy the biological needs of the animals housed within them and, therefore, best ensure their welfare. In this study, we investigated whether naturalized enclosures for primates actually provide a better environment than non-naturalized ones. For this purpose, we evaluated 284 enclosures in 47 zoos (100% of the primate enclosures in Spanish zoos). Each enclosure was classified into two categories: 'naturalistic' (when identifiable parts of the species' habitat was simulated) and 'non-naturalistic' (all the rest). Additionally, we assessed the enclosures' suitability by evaluating: (1) space available, (2) resting places, (3) absence of risks and disturbing stimuli, (4) provision of refuge and runaway routes, (5) social environment, (6) temperature and (7) supply of water and humidity. An enclosure was considered to provide a suitable environment for its animals when all seven aspects were met. Our results revealed that over half of the enclosures (53.2%) provided a suitable environment for their inhabitants (in those cases were they did not, it was mainly due to failure in meeting one aspect). Most naturalistic enclosures (80%) met the seven aspects evaluated. Non-naturalistic ones also had suitable environments, but in a lower percentage (50.6%). In summary, we found a positive relationship between naturalistic designs of primate zoo enclosures and the suitability of the environment provided. These results should be taken into account during zoo inspection and accreditation, when enclosure suitability must be assessed in an accurate and fast manner.

Exploring Social Relationships of a Captive Group of Chimpanzees *(Pan troglodytes)*

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Key Words: Social structure · Demography · Zoological park · *Pan troglodytes*

Understanding the 'deep structure' of social systems (i.e. the theoretical principles that account for the regularities observed across groups both within and between species) requires the observation of a large number of groups varying in as many demographic and ecological contexts as possible. We studied a captive group of chimpanzees *(Pan troglodytes)* that consisted of 1 adult male, 3 adult females, 1 sub-adult female and 1 juvenile male, housed at the Zoo Bioparc (Valencia, Spain) in July 2012. Our goal was to determine the group's social structure (which was assessed in terms of the type and number of inter-individual interactions) in order to throw further light on the role that demography plays in the structuring of chimpanzee social groups. The group was intensively observed during a two-week period, totalling 20 h of observation per animal. A single observer, using focal sampling, performed the observations. Our results show a relatively low overall rate of social interactions, with affiliative exchanges (mainly grooming) more frequent than agonistic interactions. Contact aggression was observed at low rates during the whole study. The adult male offered more grooming to females than he received from them, suggesting that affiliative behaviours were clearly biased in favour of females. Taken together, our analysis reveals a social structure characterized by the existence of a well-integrated subgroup of adult females who maintain limited affiliative interactions with the adult male. We evaluate factors that may have contributed to the observed behaviour patterns (e.g. the presence of a strong female coalition).

New Postgraduate Programme in Primatology: Enhancing Learning through Research and Practice

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Key Words: Primatology · Training · University · Research

Studying the behaviour of primates is critical for understanding the evolution and the genesis of human behaviour and for protecting and conserving these species both in the wild and in captivity. Therefore, it is essential to have educational programmes which train and prepare future primatologists not only in theoretical aspects, but also in more practical aspects. The Fundació Mona, in collaboration with the Fundació Universitat de Girona: Innovació i Formació, have joined forces to set up a new postgraduate degree in Primatology: Research and Practice, including training in various subjects such as cognition, animal welfare, statistics and conservation. The programme will be practically based, allowing students to acquire and improve their educational skills related to the world of primatology. The programme will also impart professional skills which will enable students to find later employment as primatologists in recovery/rehabilitation centres, conservation projects, research units, teaching, etc. Our new training programme recognizes the importance of simulating situations that primatologists will commonly

encounter throughout their careers. Both the graduate programme and training course require starting out with more practical aspects while encouraging participation, design, implementation and management of actual research projects both in captivity and in the wild. For a teaching/learning process to be successful, the student must truly feel that he/she is a protagonist and active agent in the entire process. This new academic programme is committed to creating a primatological hub which will train future primatologists.

Is 'Tool Use' a Welfare Tool? Using an Artificial Ant-Fishing Task as Environmental Enrichment in Naturalistically Housed Chimpanzees from the Fundació Mona

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Key Words: Environmental enrichment · Sensorial enrichment · Welfare · Chimpanzees

Environmental enrichment activities are a tool to improve welfare and to elicit species-typical behaviours in captive animals. Wild, non-human primates spend most of their time foraging. Furthermore, chimpanzees can make and use tools during some of their feeding activities. The main goal of this study was to improve the overall welfare of a sample of captive chimpanzees using an artificial ant-fishing task called 'tube juice'. The study animals consisted of two groups of 13 chimpanzees housed at the Fundació Mona. The study was structured in two phases with different dosage treatments (low and high). Each phase had two conditions: baseline and test. Data analysis was structured in two parts: (1) welfare indexes and (2) behavioural analysis. Data were recorded over 5 months using the scan sampling method. Overall results have shown that: (1) welfare indexes were not affected in the comparison between baseline and test, or phase 1 and 2; (2) the enrichment task had a positive effect during high doses, enhancing feeding, manipulation and grooming, among other behaviours; (3) high doses also had a positive impact, improving most of the welfare indexes. We conclude that, although this kind of environmental enrichment task could be a potential welfare tool, we have to take into account that its effectiveness is mainly determined by the quantity and length of the treatment (dose). Finally, we note the importance of emulating 'wild complex tasks' in order to elicit species-typical behaviours and to cognitively enrich captive non-human primates.

Grouping Patterns and Activity Budgets in Mandrills *(Mandrillus sphinx)* and Geladas *(Theropithecus gelada)*: A Comparative Study

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Key Words: Grouping patterns · Activity budgets · Mandrills · Geladas · Captivity

Although mandrills and geladas are cercopithecine monkeys belonging to the same tribe, i.e., Papionini, they are remarkably different in many respects, such as habitat and substrate use, body anatomy and size, sexual dimorphism, social system and behaviour. One way to assess the

impact of current socio-ecological factors and phylogenetic history on the individuals' grouping patterns (GPs) and activity budgets is to compare groups of individuals of different species, but housed in a similar ecological setting. We studied a group of mandrills and a group of geladas housed at La Vallée des Singes (France) in similar captive settings. In each group, group scans and point sampling were used to record proximity and behavioural activity. We analysed three GPs (gregariousness, sociality and closeness) and time budgets for seven behavioural measures (foraging, moving, resting, self-directed behaviour, aggression, play and affiliation). Geladas were found to be more gregarious, sociable and socially close than mandrills. Interestingly, geladas were also more frequently engaged in other-oriented behaviour (i.e., social play and aggression) than mandrills, while the latter scored higher than geladas in moving and resting. These findings suggest that ecological factors have selected for different social traits and that these contrasting social styles are evolutionarily resilient so that they surface even under the restricted conditions of captivity. Findings from studies such as the present one are also useful to assess social stress and the success of a group's formation, which have important implications for the housing and general welfare of groups, whether in the wild or in captivity. Supported by project grant PSI2011-29016 to F. Colmenares.

Changes in Group Dynamics of an Already Established Social Group as a Result of the Integration of a New Chimpanzee

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Key Words: Social behaviour · Welfare · Group dynamics · Transfer · Chimpanzees

Social structure in animals has an impact on the social dynamics and relationships among group members. In the case of chimpanzees and other primate species, changes in social structure mean changes in the quality and quantity of social relationships. Although captive settings block natural changes in the social structures of animals, sometimes the management procedures lead to the transfer and moving of animals. Our objective was to assess whether the introduction of a new male chimpanzee into a previously established multimale group had an impact on its social dynamics, activity budget and welfare. The sample was made up of five male chimpanzees *(Pan troglodytes)* housed at the Fundació Mona: four of them belonging to the same social group and one transferred from another group. Data were collected over two and a half years (from early 2011 to mid-2013) using instantaneous scan sampling. Our study focused on the comparison between the pre- and post-transfer periods. Overall results have shown that: (1) association (twice-weight association index) among established members did not change between periods; (2) most of the established group members increased their affiliative behaviours; (3) we also found a significant increase of some non-desirable behaviours during the post-transfer period. We concluded that the introduction of a new subject into an established group does affect the behavioural repertoire of members, increasing some negative behaviours, but does not affect the strength of the relationships and the links between the previously established group members.

Transfer and Integration of a Male Chimpanzee into a New Social Group: A Case Study at the Fundació Mona (Spain)

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Key Words: Transfer · Integration · Chimpanzees · Welfare · Group dynamics

It is assumed that an individual moved from a specific social group to another one may experience changes in its behavioral repertoire and welfare related to the new group, environment and stimuli. The aim of this study was to assess the adaptation of one male adolescent chimpanzee (Juan) moved from his family group to a new multimale group (n = 4). Our study focuses on the comparison between the pre- and post-transfer over a 3-year period (from 2011 to 2013). Data were recorded using an instantaneous scan sampling technique (2-min intervals). The analysis was structured in three parts: activity budget (n = 19 behaviours), welfare indexes (resocialisation index and rehabilitation index) and space use (exploration field index). Overall results have shown that: (1) rehabilitation index, affiliative and agonistic did not change before and post-transfer; (2) socialization decreased in the post-transfer period; and (3) field exploration increased in the post-transfer period. We conclude that although group transfer has a negative impact on the sociability of the individual, at the same time the new physical and social environment elicit spacial exploration. It can be noted that although in the short-term this kind of subject transfer had an initial negative impact on the subject's well-being, thanks to proper management, integration into a new multimale adult group had an overall positive impact on chimpanzee welfare.

Working Together – Save the Drill

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Key Words: Drill · Species protection · Conservation

The drill *(Mandrillus leucophaeus)* is listed by the IUCN as endangered; only about 3,000 individuals are left in the wild and the numbers are decreasing. The main threats are deforestation and hunting, not only for bushmeat, infants have also become popular as pets. The species last refuges are Nigeria, southwest Cameroon and Bioko Island (Equatorial Guinea). Outside Africa, there are around 80 drills kept in 19 zoos. In 2004, the non-profit association 'Save the drill' (www.save-the-drill.org) was founded targeting the promotion and preservation of drills in their natural habitat. One of our projects is to support the Limbe Wildlife Centre (LWC) in Cameroon, where there is a group of almost 100 drills, all confiscated by the Cameroonian government. Since no wild drill groups have been fully habituated for behavioural studies, LWC provides the opportunity to gather information about their social organization and behaviour – information that can be shared – with our help – with keepers and zoos worldwide. Conservation and education of local communities play an important role in the Centre's activities. Keepers provide lessons on a regular basis in schools and make excursions with the children. The Centre is also a leading employer in the Limbe region, having 30 Cameroonian workers with permanent jobs. The food for the animals is bought at the local market, thereby boosting the local economy. The ultimate goal of our work at the LWC is to one day reintroduce the drills into the wild.

Social Learning Mechanisms in Chimpanzees *(Pan troglodytes)*: An Experimental Study through Two Manipulative Tasks

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Key Words: Social learning · Imitation · Emulation · Chimpanzee · Two action task

Controversy currently exists over the nature of chimpanzees' social learning. The main focus lies in the ability of this species to learn socially through imitation (copy of actions), or other types of social learning such as emulation (copying of results). In this study, we evaluate social learning cognitive mechanisms in chimpanzees *(Pan troglodytes)* through two experimental manipulative tasks. The first one has a single component allowing two different actions. The second one has two different components and it is a two action task. Both tasks are presented to the individuals in three different experimental groups which involve different levels of access to social information: (1) no information (control group), (2) non-social information and (3) social information. In addition, we also controlled causal information, introducing the opaque vs. transparent factor. The two tasks were conducted with a sample of 11 and 14 Fundació Mona chimpanzees respectively. We evaluated the following measurements across conditions: (1) latency, (2) percentage of success, (3) exploratory actions, (4) the consistency of their actions with the original performance and (5) the method applied to the task resolution. Differences were detected between control and experimental groups in latency, exploratory actions and the consistency of their actions, but almost no difference was found between both non-social information and social information groups. In conclusion, individuals do not benefit from social information, but mainly learn from the results of the solved task.

Types of Locomotion and Infant Carrying in the Common Marmoset *(Callithrix jacchus)*

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Key Words: Carrying costs · Locomotion · Primate reproduction · Callithrichidae

In the cooperative breeding system of callitrichids all group members contribute to infant carrying. Infant twins represent between 20–25% of adult body weight at birth and are carried until the 8th week when they can weigh up to 120 g. The weight of the infants hampers locomotion, velocity and leaping ability. Parents and helpers suffer costs derived from carrying, such as reduced foraging and feeding and increased predation risk. Additionally, infant carrying is related to body mass losses in fathers and helpers. We studied 4 breeding couples of common marmosets (n = 8) *(Callithrix jacchus)* during the 8 weeks following the birth of infants. We observed them for 15 min per day, 4 days per week, using a 15 s group scan sample. We recorded 10 different stationary positions and locomotion, and also infant carrying. During carrying bouts, marmosets expended more time *resting* (d_{cohen} = 0.92) and *reposing* (d_{cohen} = 1.53) and reduced those

stationary behaviours with a more postural complexity: being *hanging on branches* (d_{cohen} = –4.02) or *on the cage mesh* (d_{cohen} = –1.41). When carrying, we found a reduction in all types of locomotion. The reduction was larger in those behaviours that seem to be more costly: *leaping* (d_{cohen} = –3.86), *climb on the cage mesh* (d_{cohen} = –1.97), *running* (d_{cohen} = –1.65), *walking faceup* (d_{cohen} = –1.20), than in *climbing on the branches* (d_{cohen} = –0.70) or *walking* (d_{cohen} = –0.74). Our study shows that when carrying, marmosets reduce locomotion and complex postural behaviour. This must entail a larger cost in the wild where these behaviors must be important in terms of food access (insects, flowers or exudates) and predator avoidance. PSI2009-08581 and PSI 2012-30744.

Structural and Feeding Enrichment Effects on a Group of Barbary Macaques *(Macaca sylvanus)*: A Case Study

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Key Words: Macaca sylvanus · Welfare · Enrichment · Rehabilitation · Resocialisation

For many years the Barbary macaque, *Macaca sylvanus*, has been a victim of illegal animal trade for the pet industry in Europe. Once the animals are fully grown, they quickly outgrow the capabilities of their owner and then owners are forced to bring these wild animals to zoos or rescue centres. Our study looks at the impact of structural and feeding enrichment on the welfare and rehabilitation process of 4 Barbary macaques at the Fundació Mona. We used a behavioural catalogue (n = 71) structured in five areas: social activities, individual activities, interspecific interactions, vocalisations and others. Data were recorded using an instantaneous scan sampling technique (30-second intervals). Our study focuses on the comparison between the pre- and post-enrichment observation phases over 2 years (2012 and 2013). The data analysis was structured in three parts: activity budget, welfare indexes and space use. Overall results have shown (1) a positive effect of the enrichment, with decreased inactivity and increased manipulation; (2) welfare indexes did not improve between phases and years in the way we had expected; and (3) space use did not change in a significant way. We conclude that although enrichment activities are important in the management and welfare of captive animals, we did not detect any overall and significant improvement in our study sample, even though some negative behaviours decreased (inactivity) and others increased (manipulation).

Long-Term Use of Sensorial Enrichment in Chimpanzees *(Pan troglodytes)*: Is It Really Powerful or Just Ineffective?

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Key Words: Environmental enrichment · Sensorial enrichment · Welfare · Chimpanzees

Evaluation and improvement of animal welfare are essential for the maintenance of species in captive settings. Primates subjected to unfavourable rearing conditions tend to manifest associated pathological behaviours. At that point, psychotherapy is needed as an intervention for behaviour problems or disorders. The most frequently used tool with non-human primates is environmental enrichment. In addition, the individual´s life history and its personality are both factors that establish differences in the way they receive the treatment and their effects. In this study, we measured individual differences after the same long-term sensory stimulation treatment (video and audio). We evaluated the impact on the welfare of a group of 3 chimpanzees *(Pan troglodytes)* at the Fundació Mona. We measured: (1) interest in the stimuli, (2) changes in the activity budget and (3) welfare indexes. Baseline data were collected 5 days before the treatment started and 5 days after it had finished. The treatment consisted of an 8 month programme where chimpanzees were exposed to different videos and music. Behaviours were recorded during each session using instantaneous scan sampling (30-second interval). Overall results have shown that: (1) chimpanzees showed differences in interest and effects, (2) inactivity and locomotion decreased during the treatment with residual effects in the final baseline, (3) the treatment elicited manipulation behaviour that increased during treatment and afterwards and (4) we did not detect significant differences in general welfare indexes. We conclude that is necessary to consider the individual when designing an enrichment programme.

Taxonomic Multiplication in the Order Primates: Causes, Examples and Perspectives

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Key Words: Primates · Taxonomy · Species concept · Platyrrhini · Lemuriformes

The most notable trait in recent revisions in primate taxonomy is, probably, the multiplication of the number of species listed in the latest classifications. Three factors are mainly responsible for this situation: First, the discovery of unknown primate populations, a not infrequent circumstance, but proportionally of marginal importance; second, the great improvement in taxonomic analysis techniques (morphological, ethological, molecular, etc.) in the lab as well in the field; third, and perhaps the most relevant of the three, the substitution of the traditional and paradigmatic Biological Concept of Species by the Phylogenetic Concept of Species. In this poster, after an introduction with a brief commentary about these factors, I show a summary comparing several taxonomic arrangements of our Order proposed over the last 40 years. Then, I briefly present and discuss two examples of taxonomic explosions, one from the American family of Pitheciidae and the other one in the Malagasy Cheirogaleidae. The two examples suggest that the same decimation caused by human activities may be used to distinguish different primate populations.

Trade and Selling of Callitrichids in Spain: The Need for an Adequate Law

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Key Words: Trade · Callitrichids · Spain · Law

In this work, we want to point out recent data on the monkey trade in Spain and the urgent need for more adequate legislation, especially for primates that are easy to rear such as callitrichids. Marmosets and tamarins have always been much appreciated pets and are an easy source of illegal money for those who, after obtaining a breeding pair, sell their offspring. This kind of trade has increased in recent years with the internet causing many administrative problems and problems to the facilities that receive the rescued animals. For many years the Darwin Foundation (Barcelona, Spain) has been rescuing callitrichids from the 'legal' pet trade in Spain. Currently 25 monkeys live at the Darwin Foundation but the demands for rescue are continuous. In 1994, a Spanish Ministry approved a Royal Decree on animal health by which primate transactions between institutions were the only ones authorized, but at the same time another Ministry, based on the CITES convention, legalized the trade in offspring of monkeys owned by private persons, traders and owners of zoo. Almost all authorities apply the rule based on CITES: that is: if the owner has all the documents and demonstrates the legal origin of the animals, he/she is allowed to keep the monkeys, rear them and sell them. Moreover, offspring of species in Appendix I of CITES are moved to Appendix II and thus their trade will be 'regulated' and not forbidden. In total contradiction, if the same case is subject to the Royal Decree of 1994, the primates are confiscated.

Personality in Chimpanzees *(Pan troglodytes)*: A Comparative Study between Psychobiological and Pentafactorial Models at the Fundació Mona (Girona, Spain)

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Key Words: Chimpanzee · Personality · Eysenck · Five Factor Model

The comparative study of animal personality has received much interest in recent years from both psychologists and primatologists. One of the goals is to detect whether non-human species have personality structures homologous to ours. Our objective was to evaluate a sample of chimpanzees (n = 11) adapting two of the most widely used questionnaires in humans: the Five Factor Model (FFM) and the psychobiological model of Eysenck (EYS). The FFM has been successfully applied in previous studies with chimpanzees. In contrast, EYS hasn't been used in this species. For both models, we designed two questionnaires, using lists of adjectives that were evaluated by 28 people who knew the animals well. To identify the factor structure of the questionnaire we used Principal Component Analysis (Varimax rotation) and to assess the reliability of the evaluators an Intraclass Correlation Coeficient (ICC) was calculated. Results indicated that both questionnaires showed a clear factor structure with the same number of factors that are es-

tablished in humans (5 for FFM and 3 for EYS). In the case of FFM, the results were related more to that established for humans, than to those obtained in other studies for chimpanzees. While for EYS, the factor psychoticism has evolved to an idiosyncratic factor for chimpanzees associated with dominance. Likewise, the reliability of raters was acceptably high. In conclusion, the main factors of personality were consistent with those expected for humans, so both models were able to detect personality structures in chimpanzees homologous to those in humans.

Early Trade of African Apes: New Evidence from the 15th Century in Central Asia

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Key Words: History of primatology · *Gorilla* sp. · Iconography · Trade · Asia

Historical and iconographic sources on the African primate trade are quite numerous from the Bronze Age. However, reports or other kinds of data about anthropomorphic primates are very scarce in the body of knowledge before the 16th century. The first supposed contact with great apes might have happened in the 6th century B.C. when Carthage sent Hanno the Navigator to find colonies along the west coast of Africa. Among Classical authors only Claudius Aelianus (ca. 170–235 AD) may have referred to an African ape (possible *Pan troglodytes*) when describing the Onocentaura people. The first known depiction of a chimpanzee was by the physician Nicolaas Tulp in 1641, whereas the first image of a gorilla is even more recent, dating to the 19th century. In this work, we present an earlier representation of a *Gorilla* sp. (15th century), which, according to art historians, may come from Persia or Central Asia. This is so far the first known image of an African ape. The image is still a mix of human and ape features: the animal has the face, shoulders, arms and posture of a gorilla, while its hands and feet are more human-like. Trade of big fauna and primates from Central Africa to Asia is demonstrated by historical evidence since Ancient times, but until now no great ape had been found. This image is intriguing and worthy of attention because it opens up new scenarios regarding the trade of great apes and knowledge of them in the Late Middle Ages.

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