



Contributed Talks

Pre- and postcopulatory sexual selection in Threespine Stickleback

Theo C. M. Bakker, University of Bonn

Questions: Is there functional variation in sperm traits in Threespine Sticklebacks as expected from sperm competition theory? How do pre- and post-copulatory sexual selection interact? Highlights: Sperm with a longer tail and a smaller head-to-tail-length ratio swam faster but did not live as long. In sperm competition experiments with equal sperm numbers of rival males, head-to-tail-length ratio of a male's sperm determined paternity. When one of the two rivals ejaculated more sperm or ejaculated before the other male, his paternity share increased. Relatedness only influenced pre-copulatory sexual selection. Sperm traits correlated with breeding coloration. There are some intriguing links between pre- and post-copulatory sexual selection. Attractive males produced relatively more sons than duller males. Under food restriction, sperm swimming speed and coloration were traded off.

Early-birds take it easy in fish: the link between chronotype and personality in zebrafish larvae

Bawan Amin, Hans Slabbekoorn & Christian Tudorache

Diurnal rhythms are stereotypic oscillations in behaviour and physiology in the presence of zeitgebers. Chronotypes refer to inter-individual differences in these diurnal rhythms that are consistent over time. Inter-individual differences are well-known and widely studied as variation in personality. Here, we investigated whether there are consistencies in rhythmicity and whether they are related to personality in zebrafish larvae. We investigated the degree of stereotypy in diurnal activity patterns and whether these are related to chronotype and personality. We found individual consistency in the time that larvae have their maximum activity and their average activity level throughout the day. Furthermore, we found that larvae with an early peak were less active overall than the individuals that had a peak later in the day. Our study suggests a link between chronotype and personality and provides new insights into the early development of rhythmicity and personality in zebra fish.

Are personality traits consistent in fish? - The influence of social context

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Individual differences in behavioural and physiological responses to challenges are progressively accepted as adaptive variation and reveal a strong degree of evolutionary conservation throughout the vertebrate taxa. Previous studies in Seabream suggested that individual differences in behaviour reflect distinct coping styles or personality. One of the traits that have been shown to be consistent over time and across context is the escape response under a restraining test. Using this trait the influence of social context was investigated. Fish were subjected to a restraining test that consisted of keeping each fish in an emerged net for one minute. Behaviours measured in the net were collapsed into principal component scores using PCA and fish were distributed into homogeneous groups of proactive, reactive and intermediate. After one month the same fish were exposed to the same test. Results indicate that homogenous groups of proactive and reactive fish did not exhibit con....

Differential effects of maternal androgens under various contexts

Bin-Yan Hsu and Ton G.G. Groothuis

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In the past two decades, maternal hormones have been widely recognized as an important avenue of maternal effects, widely seen in all kinds of vertebrates and even in invertebrates. Among all maternal hormones, androgens in avian egg yolks are most extensively studied. However, because of large discrepancies in their effects on the offspring and the theoretical framework, the real fitness consequences of maternal androgens still remain unclear. Because the exposure to maternal testosterone has been demonstrated to have both benefits and costs, the final outcome of elevated yolk testosterone in bird eggs on offspring traits would depend on the cost-benefit balance that is in turn depending on relevant

environmental contexts such as, for instance, food availability, other egg components, and age. With a series of experiments in the rock pigeons (*Columba livia*), I will present the data examining the effects of elevated yolk testosterone under different contexts.

Social Network Analysis suggests that group-housed calves lack preferential relationships

Paul Koene and Bert Ipema

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Social networks in animal species may indicate social stress and social support that are important for welfare. A recent finding shows that “Calves seem to form preferential relationships before 3.5 months of age. Keeping cattle together from an early age seems beneficial for them”. This pilot study was performed with 1 group of 10 Holstein-Friesian calves (6 males/4 females) aged 3 to 4 months. Individual automated location registration (X-Y position) was used to calculate the nearest neighbour of each calf in the pen (4 x 11 meters). The standardized residuals are used as input for social network analysis (SNA) of the positive and negative associations of the calves (using Ucinet). The correlations between daily association matrices are not significant in the calves ($P > 0.05$), indicating instability of the social network and suggesting that group-housed calves lack preferential relationships. Social network analysis might be important for the welfare management of calves.

Emotion Processing in Homo and Pan

Mariska Kret

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Evolution prepared group-living species to quickly recognize and adequately respond to conspecifics' emotional expressions. When species unconsciously mimic their companions' expressions, they come to feel reflections of their affective states, fostering swift, adaptive reactions and empathic behavior. The majority of emotion research has focused on facial expressions of emotion in humans. However, facial muscles can to some extent be controlled; humans know when to smile, and when not to. In this talk, I argue for a broader exploration of emotion signals from sources beyond the face muscles that are more difficult to control. More specifically, I will argue that implicit sources including the whole body and subtle autonomic reactions including pupil dilation are picked up by observers and influence social behavior. I take a comparative approach and investigate similarities and differences in the perception of emotions between humans, chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*) with the aim to better comprehend emotional expressions and how we come to understand each other's emotions.

A general auditory bias for disregarding between-speaker variability in speech? Evidence in humans and songbirds

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Human speech perception requires deciphering a highly variable signal. Studies in humans and non-human animals show that experience with very few speakers is sufficient for vowel categorization. We tested the hypothesis that accounting for speaker and gender differences in isolated vowels does not require prior experience with speaker-related variability because there is an inherent tendency for the auditory system to transform vowel formants into formant ratios. Using a behavioural Go/No-go task and identical stimuli, we tested zebra finches' and Australian adults' ability to categorize vowels of a novel Dutch speaker after learning to discriminate those vowels from only one other speaker. Results show that categorization of vowels is possible without prior exposure to speaker-related variability in speech or non-native vowels, providing the first evidence for what might be a species-shared auditory bias that may supersede speaker-related information during vowel categorization.

The molecular biology of tidal rhythms

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Tidal rhythms are found in animals and plants that inhabit the intertidal zone and are characterised by 12.4 h, ~15 day and 29 day cycles that are generated by the gravitational pull of the sun and moon on the earth. Unlike terrestrial circadian ~24 h cycles of behaviour and physiology we know almost nothing about the molecular basis of tidal cycles. We have studied the circadian and tidal rhythms of the marine crustacean, *Eurydice pulchra* (the speckled sea louse), which is found off the coast of Britain. By developing dsRNAi and using environmental and pharmacological manipulations we have tested whether canonical arthropod circadian genes are involved in the tidal oscillator. Our results reveal an unexpected and novel regulation of tidal behavioural cycles.

Favored parent-offspring trait combinations? Within-family parent-offspring co-adaptation in a wild bird species

Carsten Lucass, Marcel Eens and **Wendt Müller**

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Social interactions between parents and offspring are a central component of family life. Due to their reciprocal nature it has been hypothesized that the respective parent and offspring traits could co-adapt within families. The latter is supported by empirical studies, but most of these were performed under controlled conditions, where costs stabilizing co-adaptation are lacking. We studied co-adaptation of offspring begging and parental provisioning in wild blue tits in a series of cross-fostering experiments. Different parent-offspring trait combinations were analyzed, taking also behavioural plasticity into account. We explored the costs that contribute to evolutionary stable co-adaptation and which party is in control of provisioning. We found evidence for covariation, but only if parental responsiveness in provisioning to offspring begging was considered. Costs of cross-fostering depended on parent and offspring phenotypes, yet overall parents largely controlled provisioning.

Effects of repeated sound exposures on seabass behaviour throughout the diurnal cycle

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Humans have been exploiting the sea for both fossil and sustainable energy resources. Related human activities, such as seismic shootings and pile driving during wind farm and oil rig constructions, are performed in multiple bouts, literally day and night. Such operations generate a substantial amount of noise in the underwater environment that may negatively affect fish behaviour. Fish have been shown to change their behaviour in response to single sound exposure events, but it is unknown if their response decreases for each subsequent exposure due to habituation. Furthermore, their response may also be modulated by other environmental factors, such as the time of the day, which still needs to be demonstrated. Here, we present our findings from an experiment conducted on European seabass in an outdoor pen.

Impulsiveness predicts social behaviour in monkeys

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Both in human and animal personality research, high impulsivity is often linked with aggression. However, aggression exists in several gradations, which may differ in their relation with impulsivity. Additionally, impulsivity may be related with sociopositive behaviour. In humans, impulsiveness facilitates the acquisition of a good position in the dominance hierarchy. It is suggested that dominance acquisition is a measure of social competence, however, more research is necessary to reveal the link between impulsiveness and social competence. We investigated whether there is a link between on the one hand impulsiveness and on the other hand mild and severe aggression and sociopositive behaviour in a non-human primate. We observed naturally occurring social behaviours and experimentally tested individual performance on an impulsiveness task.

Ferrets' behavioural priorities and preferences as determined in a three- and seven-chamber consumer demand study

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Two consumer demand studies were used to determine preferred enrichments for ferrets. Seven female ferrets were housed in a set-up with a home chamber (HC) connected to one or multiple enrichment chambers (EC) and an empty chamber (CC) by weighted doors. In EC, items from the category tunnels, balls, water, foraging, sleeping or social were placed. The ferrets' motivation to reach EC was measured by daily increasing the door's weight until the maximum price paid (MPP) was reached. Preferences within a category were determined by comparing the interaction time with the items. Motivation was highest for access to sleeping and water enrichments in both studies and for foraging enrichment only in the seven-chamber

study. Within these categories, the ferrets preferred the hammock and water bath, while there was no preference within the foraging category. The results of these studies suggest that a hammock, water bath and foraging opportunity are preferred enrichment items for ferrets.

How do social associations over winter influence breeding behavior in the great tit (*Parus major*)?

James L. Savage

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In some species, individuals that will breed together may associate extensively in the months prior to the breeding season. These interactions are crucial to understanding both how pair bonds form, and whether individuals benefit from strong partner associations through earlier breeding, more efficient parental care, or greater reproductive success. We explore these questions using a long-term population of great tits (*Parus major*) near Oxford, UK. Using passive integrated transponder (PIT) tags on birds and detectors at feeding stations, we investigate the strength and exclusivity of associations between future partners, in addition to how individuals embed into the wider network. The PIT tags also allow us to monitor breeding behaviour in detail, considering visit rates and parental coordination as well as breeding timing and success. We find that pre-breeding social activity indeed influences behaviour during the following season, and that these effects differ between the sexes.

Communicative significance of diversity and alternation of syllables in the chiffchaff: an experimental study

Javier Sierro, Jaime Sierro, Hans Slabbekoorn (Leiden University)

Birdsong complexity has probably evolved under strong sexual selection and it has been linked to male quality in several species. Song complexity is a broad concept that includes different hierarchical scales; from repertoire size down to complexity within a single song. Previous studies have found song complexity to play a role during intra and inter sexual interactions, although its communicative significance is unclear. Songs of the Common Chiffchaff (*Phylloscopus collybita*) are short sequences of small and discrete units called syllables. In this species, a large proportion of complexity within song is defined by two parameters; the diversity of syllable types used per song and the pattern in which all syllables are structured in it. We have carried out two separate field experiments following a playback design to investigate the importance and influence of these parameters during male-male territorial interactions. In the first experiment, we compared male responses to high and l....

Rule learning in birds: zebra finches generalize by positional similarities, budgerigars by the structural rules

Michelle Spierings & Carel ten Cate

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The ability to abstract a rule that defines the structure of strings of sounds is a core mechanism underlying the language faculty. Up until now, it is unclear whether non-human animals possess this rule abstraction ability. In this study we trained zebra finches and budgerigars to discriminate between two sets of sound strings that followed either an XYX or an XXY structure. Afterwards, each subject received a number of test strings that followed the same structural rules, but consisted either of new combinations of known elements or of novel elements. Zebra finches categorized test stimuli with known elements by the positions that these elements occupied in the training strings. In contrast, the budgerigars categorized both novel combinations of familiar elements as well as strings consisting of novel elements by their underlying structure. Our study is the first clear indication that abstract rule learning in auditory strings is not specific to language or to humans.

The bold and the shy: the response of different species to experimental light in their natural habitat

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Species have evolved on a rotating planet, with a strong modulation of light intensity: high light levels during daytime, and little to no light during the night. Over the last decades, the use of artificial light has dramatically increased, and consequently the intensity of light at night have gone up in vast areas in the civilized world. However, relatively little is known on the impact of light at night on our ecosystem. In a large, long term study, we measure the response of birds, mice, bats, large mammals and moths to experimental illumination of three different spectra in their natural habitat. We aim to assess direct and indirect responses

in behaviour and physiology, and ultimately know how these affect species at the population level. Here, we present current results on birds and mammals. The response observed is highly variable and is strongly species dependent.

Pan personality: genes and behaviour in chimpanzees and bonobos

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The purpose of this study was to investigate personality differences in bonobos and chimpanzees and proximate mechanisms shaping these both within and between species. First, we measured personality in bonobos using two approaches: a personality psychology approach (ratings) and a behavioral ecology approach (codings). Dimension reduction analysis of ratings (N=154 bonobos) revealed a 6 factor structure, while for codings (N=46 bonobos) a 4 factor solution was found. Second, the association of variation in two candidate genes was investigated as a potential mechanism for shaping personality differences: the vasopressin 1a (Avpr1a) and oxytocin (OXTR) receptor genes. Unfortunately no further evidence was found for OXTR SNP variations with Pan personality. Our study did provide support for an association between Avpr1a and personality differences both within and between bonobos and chimpanzees. These results highlight the importance of candidate genes with large effects on personality.

Co-variation between behaviour and physiology in zebrafish stress coping styles

Christian Tudorache (Leiden University, Netherlands), **Hans Slabbekoorn** (Leiden University, Netherlands), **Marcel Schaaf** (Leiden University, Netherlands)

Vertebrates exhibit individual variation in physiological and behavioural stress response. In adult and larval zebrafish, stress leads to distinct reactions in different coping styles: in adults, reactive individuals display a) increased basal cortisol concentrations after repeated stress, b) higher cortisol secretion over time and c) a slower recovery of cortisol concentration towards basal levels after acute stress. The physiological stress response is similar in larvae. Additionally, swimming kinematics before and after stress differs with coping styles, with higher swimming activity but lower recovery rates in reactive individuals. Here we show that coping styles a) are associated with different physiological and behavioural responses over time, especially during recovery, and b) can explain otherwise unaccounted variation in the response to stress. A better understanding of coping styles is of great value for medical applications, animal welfare issues and conservation physiology.

Bats as a genetic model for vocal communication.

Sonja Vernes (Max Planck Institute for Psycholinguistics)

Bats possess a wealth of vocalisations that they use for social interactions including courtship, territorial defense and coordinated foraging. A number of species also learn vocalisations, a rare trait shared by few other animals, but required for human speech. Together, this suggests bats as an ideal model to investigate the genetic basis of complex vocal communication. We have performed transcriptome profiling of the bat brain to gain insight into genetic networks that may be related to vocalisation. Furthermore, expression analysis of key genes causing speech/language disorders in humans demonstrated highly concordant patterns in the bat and human brain, proposing bats as a new model to investigate the neurogenetic bases of speech/language disorders. This work represents first steps towards establishing bats as a genetic model to study complex vocal traits such as vocal learning, which could ultimately inform our understanding of the encoding and evolution of human speech.

The valence of experience: learning and the directionality of preferences.

Machteld Verzijden (Aarhus University)

Mate preferences are a driver of sexual selection. They are shaped by a combination of genetic and non-genetic influences. Individuals of many species learn some aspect of their mate preference through social interactions with other individuals. Social environments can thus affect the strength and direction of sexual selection. However, variation in the extent to which learning affects mate preferences also causes variation in sexual selection. I will discuss two examples of how local ecological circumstances may change how and what individuals learn to form their preferences and how this translates in variation in the strength and direction of mate preferences.

Disturbance-specific social responses in long-finned pilot whales, *Globicephala melas*

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Social interactions among animals can influence their response to disturbance. We investigated responses of long-finned pilot whales to killer whale sound playbacks and two anthropogenic stimuli, tagging effort and naval sonar exposure. All three disturbance stimuli resulted in increased social cohesion during disturbance. However, the nature and magnitude of other responses differed between disturbance types. Tagging effort resulted in a clear increase in synchrony and a tendency to reduce surface logging and to become silent, whereas whales increased logging during sonar exposure. Killer whale sounds elicited increased calling rates and the aggregation of multiple groups, which approached the sound source together. This behaviour appears to be part of a mobbing response, a likely adaptive strategy for interactions with predators or heterospecific competitors. All observed response-tactics would reduce risk of loss of group coordination, suggesting that, in social pilot whales, this...

Sensory-drive speciation: visual development affects color-based mate preference

Shane Wright, Ole Seehausen, Ton G.G. Groothuis and Martine E. Maan (University of Groningen)

Sensory drive predicts a co-evolutionary relationship between sensory systems and signals. Aquatic environments provide a natural spectral gradient that is useful for exploring such coevolution. *Pundamilia pundamilia* and *Pundamilia nyererei* are sympatric species inhabiting different depths at rocky islands across southern Lake Victoria. They differ in male coloration (blue vs. red), colour discrimination, and have divergent female preferences for conspecific male colour. We test behavioural effects of visual adaptation by manipulating colour vision - raising both species and hybrids under light conditions mimicking shallow and deep habitats. Using two-way mate choice, we test female preference under both light conditions. We find that rearing light significantly affects female preference and that natural rearing light increases species-assortative preference. These results support sensory drive, suggesting that differences in visual perception underlie variation in mate preference.

Posters

Do parents coordinate their efforts while caring for offspring?

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The amount of care parents devote to joint offspring is affected by a conflict of interests between the sexes (sexual conflict). In turn, on a behavioural time scale empirical evidence also shows that parents negotiate over parental care, modifying their efforts in response to the effort provided by their mates. Although theoretical explorations suggest that sexual conflict and negotiation should reduce parental care, and as a consequence parental and offspring fitness, a recent model (Johnstone et al. 2014; *Behav.Ecol.* 25:216-222) proposes that alternation of the provisioning visits as a negotiation rule can help to overcome this and lead to a cooperative and more efficient level of parental care. This turn-taking mechanism implies that each parent monitors its partner's behaviour. We investigate the temporal coordination of the foraging activity as a behavioural mechanism mediating negotiation. We studied great tits (*Parus major*) and analysed the sequence of provisi...

Vocal sequence predictability modulates activity in songbird auditory forebrain

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Birdsongs arguably have the most complex structure among all non-human vocalizations, consisting of long sequences of different yet stereotyped vocal elements. How such sequences are perceived remains poorly understood. Of particular interest is whether their recognition depends mainly on a memory representation of recurring sounds, or, additionally involves analysis of sequence regularities ('rule learning'). We recorded action and local field potentials at 64 sites in parallel in the auditory forebrain of anesthetized zebra finches, and played sequences of song elements in random order, interspersed with episodes where elements followed a simple sequence rule. We find that elements that immediately follow a regular sequence elicit stronger non-sensory activity in auditory nidopallium than the same elements embedded in a random

sequence. This suggests that songbird auditory forebrain monitors short-term predictability in element sequences, a capacity needed for syntactic analysis.

The influence of sex hormones on brain lateralisation and cognitive performance

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Brain lateralization is the phenomenon that both hemispheres of the brain are specialised in different functions. Lateralization differs in strength and direction between individuals and among tasks within individuals, potentially affecting cognitive performance. There is debate to what extent individual differences in lateralization are due to early or later exposure to sex hormones. We use unique data sets to test this: (1) Existing data on prenatal hormone exposure, obtained from amniotic fluid during pregnancy of the mothers, will be correlated with brain lateralization and cognitive performance in a group of healthy adolescents of 13-15 years old (30 boys, 30 girls). (2) Current testosterone and progesterone levels are measured in saliva and will be correlated with brain lateralization and cognitive performance of the same individuals. Brain lateralization of verbal fluency, mental rotation and facial emotion processing is measured with functional transcranial Doppler sonography.

Experimental demonstration of real time bird call adjustment in response to anthropogenic noise

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Birds facing high levels of urban noise have developed behavioural strategies to avoid noise masking of their songs, such as increasing their minimum frequency in noisy conditions. We have documented this strategy in descriptive and experimental studies in the house finch. Here we investigated whether male house finches also adjust in real time the acoustic properties of their calls. We captured 21 males in noisy and quiet areas of Mexico City and exposed them to Low and High levels of urban noise; their calls were recorded. Males did not increase the minimum frequency of their calls when exposed to high levels of noise. However, individuals from noisy areas made an upward shift in peak and maximum call frequencies, while males from quiet zones did not. Our results are in line with the idea that behavioural vocal plasticity has been fixed by Natural or Sexual Selection in noisy areas, but not in quiet places. Vocal plasticity may promote the maintenance of house finch urban population.

Source level and estimated communication range of male harbour seal (*Phoca vitulina*) roars

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Male harbour seals produce low-frequency broadband vocalizations („roars“) throughout the mating season. Earlier studies have described the temporal and spectral properties of the signals but not the source level. Measuring the source intensity is important for understanding the range at which other seals can hear these sounds, and also to evaluate how sensitive the detection of these vocalizations is to masking by human-induced sound sources. In this study, harbour seal roars were recorded using an array of four hydrophones synchronized with GPS. The position of roaring seals was determined using acoustic localization and roar source levels were estimated from empirically derived transmission loss patterns. Source levels ranged from 138 to 154 dB (RMS) re 1 μ Pa. It was estimated that the communication range was a couple of hundred meters up to several kilometers, depending on the level of ambient noise and the assumed detection threshold of signals in noise by harbour seals.

The effect of mating on female reproduction: An Ovipostatin-like effect across hermaphroditic freshwater snails

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Sexual conflicts arise between mating partners because each sex tries to maximize its own reproductive success. One major strategy to influence a partner's resource allocation is by transferring seminal fluid

proteins (Sfps) via an ejaculate. In simultaneous hermaphrodites, the effect of Sfps is complicated by their ability to flexibly allocated resources between both sex functions. In the great pond snail, *Lymnaea stagnalis*, the Sfp Ovipostatin was found to reduce female fecundity by suppressing egg laying in the partner. To investigate this effect in a comparative framework, we tested whether repeated mating reduced egg laying across eight pulmonate freshwater snail species. We found that five of the eight species suppressed egg laying, with fewer and lighter egg masses being laid, after repeated mating. These changes, which are not restricted to hermaphrodites, result from combined effects of Sfps, mating costs and maternal environment.

Auditory discrimination learning in zebra finches: a meta-analysis on the effects of sex, early life conditions, and stimulus characteristics

Kriengwatana, B., Spierings, M.J., ten Cate, C.

A meta-analysis was conducted to investigate whether sex differences, developmental history, and stimulus number and/or characteristics affect auditory discrimination learning abilities of zebra finches, as tested in a Go/No-go task. Results indicate that early life conditions, the number of stimuli, type of stimuli (made from zebra finch song elements or human speech), and type of discrimination (based on phonetic characteristics or sequential structure of sounds), but not sex, significantly influenced learning. Learning ability was enhanced if birds were reared in larger broods or were larger as juveniles. Greater numbers of stimuli and human speech-based stimuli were harder to learn than fewer stimuli and zebra finch-based stimuli. Stimuli differing in phonetic characteristics were learned faster than those varying in structure. Our findings show that discrimination learning can be affected by factors that have been suspected to, but not yet definitively shown to, impact learning.

Transgenerational effects of the social environment in Japanese quail

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Studying the effects of the social environment on hormones and development across generations in Japanese quail, we aim to understand if and how the social environment induces maternal effects on the offspring. We investigated whether pair vs. group living affects plasma hormone levels and the physiological response to challenges (corticosterone/CORT after restraint, GnRH stimulation of testosterone/T production) in breeding females. Additionally, we measured the effects on egg mass and yolk T concentrations as mediators of maternal effects and looked at chick development.

Social conditions affected females T and CORT levels, modified the relationship between egg mass and yolk T concentration, and chick growth in relation to egg mass. This demonstrates that the social environment is indeed able to induce maternal effects on offspring development, with yolk T as a potential mediator. Next, by studying F2 and F3 offspring we hope to see whether such effects persist across generations.

Separating paternal from maternal effects in red junglefowl (*Gallus gallus gallus*)

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Female animals invest more than males in reproduction and are therefore selective in mate choice as males can fertilize very many females but females can raise only few offspring. In a natural where females know with whom they mate it is impossible to tease apart the relative contribution in reproductive investment and the effects that has on the offspring, because the outcome of fertilization is always an interaction between the investment of the male and the investment of the female based on the experience with/knowledge of the partner. In order to tease apart and understand the relative contributions of male and female birds to their offspring we create a match-mismatch design based on the ejaculate quality the females receive, and study the effects on the offspring

Testosterone concentration in plasma and ejaculate came from 6 pairs of winner and loser. They housing in a single cages to allow the normal interaction.

Play behaviour in wild juvenile chimpanzee (*Pan troglodytes*)

Calogero Montedoro, University of Louvain (UCL)

Hans Van Dyck, University of Louvain (UCL)

Marie-Claude Huynen, University of Liège (ULg)

Zarin Machanda, Harvard University

Richard Wrangham, Harvard University

The emergence of sociality in the animal kingdom is considered a major evolutionary innovation. In order to integrate social life, play behaviours are considered as an effective and universal learning engine of social

rules and facilitate knowledge on other individuals. Play also contributes to social cohesion and development of cognitive skills for social life.

Chimpanzees coordinate their activities by a variety of social interactions which could be related to juvenile social play development in term of evolutionary adaptations. We observed that the intensity of play differed relative to gender and age of the player and of the playing partner. Male games were more intense. Play also increased in intensity with age, especially when directed to females. Moreover, because of the male philopatry, the social play benefits are lower for females than for males. Time allowed to social play was found to be longer in males than in females, who spent more time in solitary and mothering games.

Adult zebra finch song can change over time

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Zebra finches, *Taniopygia guttata*, like many other other songbirds, are so-called closed-ended learners: their song is not supposed to change after crystallisation.

We here investigated how stable both repertoire and performance related parameters were over time by comparing the songs of males recorded at two time points almost 2 years apart both for repertoire and performance related measures.

Is attractiveness inherited in the field cricket, *Gryllus bimaculatus*? A Quantitative Genetics approach

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Sexual Selection Theory assumes that an adaptive mating trait has to be preferred (chosen by the other sex) and heritable. Research has measured the heritabilities of male mating traits but not of attractiveness itself. Attractiveness, the ability of a male to elicit an accepting response on the female with the purpose of mating, is a complex multi-trait character susceptible to have its own heritability. In this study, we addressed if mating traits in *G. bimaculatus* are heritable. We used a half-sib/full-sib breeding design to examine the quantitative genetics of attractiveness, body mass, courtship song and guarding behaviour. We found attractiveness and body mass to be heritable ($h^2=0.13$ and 0.49 , respectively) and all traits to be repeatable (attractiveness: $R=0.17$, body mass: $R=0.86$, courtship song: $R=0.10$, guarding: $R=0.06$). Our results suggest that males differ from each other through time on how attractive they are and that attractiveness itself has evolutionary potential.

Spatial distribution and swimming behaviour of captive zebrafish affected by sound and light exposure

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Aquatic habitats are quite diverse and vary by natural in sound and light conditions. Man-made sound and artificial lighting have increased in, on and near aquatic habitats and cause physical, physiological and also behavioural responses in free-ranging fish species. Captive fishes are also exposed to variation of sound and light conditions. However, little is known about the effects of sound and light changes on fish spatial distribution and swimming behaviour in captivity. Here we investigated whether sound affects the spatial distribution of zebrafish that had a choice between two fish tanks: a treatment tank in which sound level could be quiet or noisy and light level could be bright or dark and a quiet and light escape tank. Our results showed that sound and light treatments caused various behavioural changes in zebrafish spatial distribution and swimming behaviour. This study highlights the potential relevance for studying multiple modalities when investigating fish behaviour.

Zebra finch song phonology and phonological syntax across populations and continents: a computational comparison

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Variation in birdsong exists between individuals and sometimes populations, while maintaining species specificity. The evolution of such songs will depend on the balance between plasticity and constraints. Here, we analyzed this balance in zebra finch (*Taniopygia guttata*) songs recorded from 13 populations including songs from wild-caught males. Cluster analyses on elements and syllables suggested zebra finch song units

broadly belonged to universal categories, probably linked to production and learning biases. Across populations, songs showed some syntactical structure; although any song unit combination occurred, some combinations are more likely to occur than others. Differentiation between populations was statistically significant, but the effect size was small. This weak cultural divergence might be explained by 1) short time of isolation of each population 2) relatively weak song imitation, creating strong within population variation.

Attention for emotions of familiar and unfamiliar conspecifics in bonobos (*Pan paniscus*)

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In social animals, the quick recognition of emotional expressions is crucial for the maintenance of social bonds and facilitates the fast judgment of intentions. The dot probe task is a well-established paradigm in psychology measuring emotional attention. In the task, an emotional and neutral picture are presented briefly on the left and right side of the screen. One image is then followed by a dot, which participants have to touch. Humans are faster when the dot replaces the emotional rather than the neutral picture. In a previous study, we have shown that bonobos, apes that are closely related to humans, share this attentional bias. In our current study, we investigate whether there is an attentional bias for emotional expressions of ingroup members (familiar) versus outgroups (unfamiliar) in bonobos. We predict that attention for affectionate and threatening emotions differs depending on ingroup/outgroup membership.

The role of nuptial gifts in the maintenance of a male dimorphism

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In many species males are either fighters, using physical weaponry to monopolize females, or sneakers, who dodge fighters or excel in sperm competitions. We propose a large nuptial gift to be another sneaker benefit. Male dimorphic bulb mite sneakers have none of the said benefits and are therefore a suitable species to test our hypothesis. We mated a female with a fighter or sneaker, either fed or starved on the preceding day, for 10 days and weighed the mites and counted their offspring regularly.

The results show that: 1) male morph has a contrasting, but net neutral effect on changes in female mass, 2) fed males lose more mass than starved males and 3) females mated with fed males produce more offspring. We conclude that a morph-specific difference in nuptial gift size seems unlikely for *R. robini* but male nutritional state may very well affect nuptial gift size. Whether nuptial gifts can contribute to the maintenance of male dimorphisms in populations remains unclear.

Referential Gestures in the Bankiva?

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Pika and Bugnyar (2011) described referential gestures in raven as showing and/or offering of non-edible items to recipients, leading to frequent orientation of receivers to the object and the signallers and subsequent affiliative interactions. The courtship behaviour “tidbitting” in the bankiva is mostly performed with edible items, however when these are absent non-edible items are used (Kruijt, 1964). This last behaviour fits within Pika and Bugnyar's description. Pika and Bugnyar (2011) compare the referential gestures of ravens with those of human infants. This comparison may suggest anthropomorphic assumptions. An explanation only based on phylogeny and natural selection seems more according to Morgan's Cannon. It is, therefore, concluded that tidbitting with non-edible items in bankiva's, and probably also in ravens, is ritualised food sharing.

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