

4. Thementagung der
Ethologischen Gesellschaft
Behavior and Evolution



February 12-14, 2009
Deutsches Primatenzentrum
Georg August Universität
Göttingen, Germany



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Abt. Verhaltensökologie und Soziobiologie
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and

Abt. Soziobiologie und Anthropologie
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Göttingen, Germany

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Welcome!

On behalf of all colleagues at the German Primate Center and the Department of Zoology and Anthropology at the University of Göttingen, I welcome our guests to this conference on behavior and evolution!

This meeting is the fourth annual thematic meeting of the "Ethologische Gesellschaft", organized by members of the Department of Behavioral Ecology and Sociobiology at the German Primate Center and the Department of Sociobiology and Anthropology of Göttingen University.

It is not by accident that this meeting coincides with the 200 birthday of Charles Darwin and that this year's topic focuses on evolutionary aspects of animal behaviour. Darwin has provided the both the foundation and inspiration for many current research projects in animal behaviour. This impact is reflected by the contributions to this meeting and we will acknowledge Darwin's role for our discipline with a plenary talk and a reception in honour of his birthday.

A common interest of local primatologists and psychologists in an evolutionary approach the study of social behaviour in primates and humans has resulted in the creation of a new research centre at Göttingen University within the framework of the Initiative of Excellence activities. As four other such centers (in geology, physics, economics and mathematics), this new interdisciplinary centre is named after Richard Courant – a famous Göttinger mathematician. Because there is hardly a more appropriate date, we will also celebrate the official inauguration of the Courant Research Centre for the Evolution of Social Behaviour also on Darwin's birthday, and we invite all delegates to the Thementagung of the Ethologische Gesellschaft to celebrate both events with us.

I wish all of us an interesting and stimulating conference.

Peter M. Kappeler
Conference organiser

Acknowledgements

It is a great pleasure to thank the following agencies, institutions and people for making this conference possible:

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Kerstin Mauth
Christina Oberdieck
Ulrike Walbaum
Guni Wilz

Scientific Program

Thursday, 12.02.2009

13:00 Welcome
Fritz Trillmich

Chair: Fritz Trillmich

13:05 The missed island
Peter M Kappeler

13:35 The evolution of monogamy in the round-eared sengi
Melanie Schubert, Neville Pillay, David O Ribble &
Carsten Schradin

13:55 O, brother where art thou? – Sex-biased dispersal in gray mouse lemurs
(*Microcebus murinus*)
Susanne Schliehe-Diecks, Manfred Eberle & Peter M Kappeler

14:15 Safe sleeping and risky roaming? Survival consequences of sex-specific
behavioral strategies in a small, sexually monomorphic primate
Cornelia Kraus, Manfred Eberle & Peter M Kappeler

14:35 MHC and mate choice in tree shrews
Claus Oppelt & Dietrich von Holst

14:55 *Afternoon coffee break*

Chair: Barbara König

15:25 Evolved endocrine mechanisms of social flexibility: how individuals
adapt to a changing environment
Carsten Schradin

15:45 Why do some primates not live in groups?
Melanie Dammhahn & Peter M Kappeler

16:05 Differences in the sexual cycle of two closely related dwarf hamster species
(*Phodopus campbelli* and *Phodopus sungorus*)
Martina Maaß, Peter Fritzsche & Dietmar Weinert

16:25 Preliminary notes on the mating behavior of the fossa (*Cryptoprocta
ferox*)
Mia-Lana Lühns & Peter M Kappeler

4. Thementagung der Ethologischen Gesellschaft: Scientific Program

16:45 Magnetic alignment in grazing and resting cattle and deer
Sabine Begall, Jaroslav Červen, Julia Neef, Pavel Nemeč,
Oldřich Vojtěch & Hynek Burda

17:05 *Transfer Aula, Wilhelmsplatz 1, Göttingen*

18:00 Birthday reception & Courant Research Center for the Evolution
of Social Behavior inauguration
Peter M Kappeler, Margarete Boos

Remembering Charles Darwin
Robert Trivers

Kurt von Figura (President of the University of Göttingen)
Stefan Treue (Director, Deutsches Primatenzentrum, Göttingen)
Elisabeth Brauner (Brooklyn College, New York, USA)

Friday, 13.02.2009

Chair: Peter M Kappeler

9:00 Social behavior and conflict in human groups
Dirk Semmann

9:45 Poster talks (2 min)

10:30 *Morning coffee break* with Poster Demonstration

Chair: Claudia Fichtel

11:30 Acoustic categorization of communication calls in tree shrews
Wiebke S Köhler, Simone Schehka & Elke Zimmermann

11:50 Song divergence in potentially sympatric North Atlantic blue whales
Lucia Di Iorio, Irene Voellmy, Seraina Tgetgel &
Christopher W Clark

12:10 Predation increases structural complexity in primate alarm calls
Claudia Stephan & Klaus Zuberbühler

12:30 *Lunch*

Chair: Cornelia Kraus

14:00 Male competition and primate social relationships
Julia Ostner

4. Thementagung der Ethologischen Gesellschaft: Scientific Program

- 14:45 Intestinal parasite infection and individual disease risk in red-fronted lemurs (*Eulemur fulvus rufus*)
Dagmar Clough, Michael Heistermann & Peter M Kappeler
- 15:05 The impact of weather conditions and social environment on endoparasite load in juvenile European rabbits
Anett Starkloff & Heiko G Rödel
- 15:25 *Afternoon coffee break*
- Chair: Flavio Roces*
- 15:55 Effects of body mass, but no effects of huddling on resting metabolic rates of post-weaned European rabbits under different simulated weather conditions
Martin W Seltmann, Thomas Ruf & Heiko G Rödel
- 16:15 New insights into bushcricket spermatophores
Gerlind UC Lehmann
- 16:35 Male competition in the ant genus *Cardiocondyla*
Sabine Frohschammer
- 16:55 The geographical distribution of sexual reproduction in the parthenogenic ant, *Platythyrea punctata*
Jon Seal, Katrin Kellner & Juergen Heinze
- 17:15 Sexual selection modifies the flight of the Banded Demoiselle *Calopteryx splendens* (Odonata: Calopterygidae)
Georg Rueppell & Dagmar Hilfert-Rueppell
- 19:30 *Conference Dinner at Eden Hotel, Reinhäuser Landstraße 22a, Göttingen*

Saturday, 14.02.2009

Chair: Carsten Schradin

- 9:00 Cooperation, coordination, and cognition in complex animal societies
Gerald Kerth
- 9:45 Out of sight, but not out of mind: behavioral coordination in pair-living sportive lemurs (*Lepilemur ruficaudatus*)
Claudia Fichtel, Walter Zucchini & Roland Hilgartner
- 10:05 Coordination of group movements in redfronted lemurs (*Eulemur fulvus rufus*)
Lennart Pyritz, Claudia Fichtel & Peter M Kappeler

4. Thementagung der Ethologischen Gesellschaft: Scientific Program

10:25 Circadian rhythms of locomotor activity in Djungarian hamsters (*Phodopus sungorus*) with an attenuated ability to synchronize
Konrad Schöttner & Dietmar Weinert

10:45 *Morning coffee break*

Chair: Gerald Kerth

11:05 Patterned string choice tasks in common marmosets (*Callithrix jacchus*)
Tina Gunhold, Katrin Hann, Anna Schnöll & Thomas Bugnyar

11:25 Transitive inference in greylag geese
Brigitte M Weiß, Sophia Kehmeier, Sandra Mikolasch & Christian Schlögl

11:45 Inference by exclusion in ravens, jackdaws and keas
Christian Schlögl, Anneke Dierks, Gyula K Gajdon, Ludwig Huber, Kurt Kotrschal & Thomas Bugnyar

12:05 Social and individual olfaction in horse faeces (*Equus caballus*)
Konstanze Krueger & Birgit Flauger

12:25 Upbringing in the animal kingdom: do animals educate?
Susanne Böx

12:45 Farewell
Fritz Trillmich

12:50 *End of conference*

13:30 *Business meeting, Institute of Zoology, Berliner Str. 28, Göttingen Council*

Poster Presentations

Posters will be displayed Thursday – Saturday outside the lecture hall

Bartsch C, Weiß M, Scharff C & Kipper S

Does intruder distance affect the response behaviour in the nightingale?

Begall S, Červen J, Neef J, Nemeč P, Vojtěch O & Burda H

Magnetic alignment in grazing and resting cattle and deer

Caspers BA & Voigt CC

Scent marking in the greater sac-winged bat: evidence for the assessment hypothesis?!

Franzke A

Acoustic communication in the field grasshopper *Chorthippus biguttulus* under extreme environmental perturbations

Haupt M, Eccard J & Winter Y

Place learning skills and foraging behaviour in the two vole species, *Microtus arvalis* and *Myodes glareolus*

Herlyn A, Schehka S & Zimmermann E

Sweet-talking male tree shrews: how female attractiveness influences male courtship vocalisations

Jeglinski JWE & Trillmich F

Diving under pressure: glimpses on the ontogeny of the diving behaviour of the Galapagos sea lion

Kehmeier S, Scheiber IBR, Schloegl C & Weiß BM

Gaze following in hand-raised greylag goslings

Kiefer S, Scharff S & Kipper S

Age-dependent changes in song type repertoires in common nightingales: the big step between year one and two

Kipper S

A vocal peacock tail? Constraints and use of large repertoires in nightingales (*Luscinia megarhynchos*)

Liesenjohann T & Eccard JA

Sex-specific variation in foraging strategies

Mortega KG, Kipper S & Scharff C

How pairing changes singing behaviour: a field study on nightingales, *Luscinia megarhynchos*

Mueller B & Trillmich F

Early development of Galapagos sea lions juveniles

Petri I, Scherbarth F & Steinlechner S

Voluntary exercise impairs reproductive success in Djungarian hamsters (*Phodopus sungorus*)

Pflüger F & Fichtel C

Usage and function of grunt vocalizations in redfronted lemurs (*Eulemur fulvus rufus*)

Rödel HG, Starkloff A, Schnödt C, von Holst D

Display of European rabbit pup calls induces behavioural responses of mothers: a study under field conditions

Schneider N & Fritzsche P

Isolation calls and retrieving behavior in wild-derived and laboratory golden hamsters (*Mesocricetus auratus*)

Troelenberg N, Weinert D & Fritzsche P

Inter- und intraspecific olfactory discrimination in dwarf hamsters of the genus *Phodopus*

Weydringer A & Kappeler PM

Organisation of vigilance behaviour at the individual and group level in redfronted lemurs (*Eulemur fulvus rufus*)

Witt C

Cinderella in Germany - parental investment in genetic and stepfamilies

Abstracts
of
Talks and Posters

Does intruder distance affect the response behavior in the nightingale?

Bartsch C, Weiß M, Scharff C & Kipper S

Research Group Animal Behavior, Institute for Biology, Free University of Berlin, D

Male songbirds often establish and maintain territories throughout the breeding season and one of the main functions of song is thought to serve this function. Therefore, the distance of a singing intruder should play a crucial role within dyadic singing interactions of territorial males, expected to be perceived as more threatening the closer the rival is. To test this hypothesis we conducted playback experiments on a population of nightingales in the Treptower Park, Berlin. We simulated intruders singing in different distances to the resident by using interactive playbacks during nocturnal song. Vocal responses of birds to playbacks were analysed concerning structural song parameters as well as features in the time domain. Follow-up playbacks performed the next morning allowed us to also investigate long-term effects of nocturnal playbacks such as approaches to the loudspeaker and revealed whether differences in intruder distance at night lead to changes in response patterns the following morning.

Magnetic alignment in grazing and resting cattle and deer

Begall S¹, Červen J^{2,3}, Neef J¹, Nemeč P⁴, Vojtěch O^{2,5} & Burda H¹

¹Department of General Zoology, Institute for Biology, University of Duisburg-Essen, D, ²Department of Forest Protection and Wildlife Management, Czech University of Life Sciences, Praha, CZ, ³Institute of Vertebrate Biology, Academy of Sciences of the CZ, Brno, CZ, ⁴Department of Zoology, Charles University in Prague, CZ, ⁵Sumava National Park Administration, Kasperske Hory, CZ

Since the exact experimental study of magnetic orientation in large mammals, based on statistically sufficient sample sizes, is challenging, mammalian magnetoreception has been studied and proven only in a few species of rodents and one bat species. Innate expressions of magnetoreception, however, have been examined only in mole-rats thus far. Here we demonstrate by means of simple methods (analysis of satellite images available at Google EarthTM, field observations and measuring deer beds in the snow) that cattle, as well as red deer and roe deer display significant magnetic alignment directing their body axis in North-South direction. Direct observations of roe deer revealed that animals orient their heads northwards when grazing or resting. Wind and light conditions can be excluded as factors determining the body axis orientation in unstressful climatic conditions. Thus, magnetic alignment is the most parsimonious explanation. To test the hypothesis that cattle orient their body axes along the field lines of the Earth's magnetic field, we analyzed the body orientation of cattle from localities with high magnetic declination. Here, magnetic North was a better predictor than geographic North. Further evidence for the magnetic nature of this phenomenon comes from our study of cattle and roe deer under power lines: the animals, body orientation was random on pastures under or near

power lines. This is the first study revealing magnetic alignment in large mammals based on statistically sufficient sample sizes and the first evidence of an overt behavioral reaction to weak extremely low-frequency magnetic fields generated by power lines.

Upbringing in the animal kingdom: do animals educate?

Böx S

Institute for Biosciences, University of Rostock, D

The question of whether animals are able to educate depends on the definition of education. One problem is that every society has its own concept of education which is deeply rooted in the intellectual history of that society. German-speaking countries are influenced by a long tradition of philosophical anthropology according to which humans cannot exist without culture, and vice versa. In this perspective humans are embedded in a social system, however, animals are believed to be instinct-driven. Against this background it is understandable that even today prevailing opinion, especially in the social sciences, holds education to be uniquely human. I have decided to use the German word 'Erziehung' to reflect this specific interpretation. However, the term 'Erziehung' is not clearly defined and varies according to context and focus. I will provide an overview of these definitions and find criteria which can be used to describe education (in the sense of 'Erziehung') in animals. I also look for the precursor of what we call 'Erziehung', as it is impossible, from an evolutionary point of view, that such a complex behavior evolved spontaneously. Working towards a clear understanding and definition of 'Erziehung' will help us to understand animal behavior in the same way as it will help us to understand how human society works.

Scent marking in the greater sac-winged bat: evidence for the assessment hypothesis?!

Caspers BA^{1,2} & Voigt CC¹

¹Reserch Group Evolutionary Ecology, Leibniz Institute for Zoo and Wildlife Research, Berlin, D, ²Department of Animal Behavior, University of Bielefeld, D

Scent-marks are relatively long-lived signals that can be perceived by conspecifics after the producer left the scenery. Therefore, it is often not obvious to whom the signal is directed at. In daytime roosts of the polygynous greater sac-winged bat, *Saccopteryx bilineata*, males scent mark territories with facial gland secretions. Territories are a valuable resource for males, since they offer exclusive courtship opportunities, which results in increased male reproductive success and, consequently, increased male-male competition over territories. The information encoded in male scent marks could, therefore, be either directed at females as part of an olfactory courtship display or at male competitors as part of territorial behavior. We expected territorial males to scent-mark in the morning, shortly before females return to the

territory and close at female roosting sites, if scent marks are directed at females as part of the courtship display. And we expected harem males to scent mark at the territory boundaries, where male-male encounters are most likely to occur, if scent-marks are directed at male competitors. Here we describe the spatial and temporal pattern of scent marking in the greater sac-winged bat and discuss the potential function of scent marking in this species.

Intestinal parasite infection and individual disease risk in red-fronted lemurs (*Eulemur fulvus rufus*)

Clough D^{1,2}, Heistermann M³ & Kappeler PM^{1,2}

¹Department of Behavioral Ecology and Sociobiology, German Primate Center, Göttingen, D, ²Department of Anthropology and Sociobiology, Institute of Zoology and Anthropology, University of Göttingen, D, ³Department of Reproductive Biology, German Primate Center, Göttingen, D

Parasites and infectious diseases represent an ecological force shaping animal social evolution. Although empirical studies supporting this link abound in various vertebrate orders, relatively little is still known about both the dynamics and the impact of parasite infections and infectious diseases in primates. We conducted a longitudinal parasitological study on four groups of wild red-fronted lemurs (*Eulemur fulvus rufus*) at Kirindy forest, Madagascar, during two 4-5 months field seasons over consecutive years in order to investigate parasite infection on the population and individual level. Using a comprehensive dataset with individual assignable parasite samples as well as information on age, sex, group membership, social rank, hormone constitution, behavior and reproductive success of all hosts, we examined parasite infection patterns and host traits that may affect individual infection risk. Lemurs of both sexes were parasitized by at least one taxon and we could identify eight helminth taxa and two protozoan taxa in total. On the population level, parasite infections seemed to vary seasonally with a close temporal correlation to the highly seasonal mating season of red-fronted lemurs, where increased testosterone and cortisol excretions as well as higher autogrooming frequencies were documented. Although these changes in hormone levels and behavior suggest increased infection susceptibility, preliminary results reveal that these factors are insufficient to explain variation in parasite infections and other factors need to be incorporated into the model. On the individual level, we will discuss whether parasite infections affect the reproductive success of males and thus play a decisive role in the distribution of paternity in male red-fronted lemurs.

Why do some primates not live in groups?

Dammhahn M¹ & Kappeler PM²

¹Department of Behavioral Ecology and Sociobiology, German Primate Center, Göttingen, D, ²Department of Sociobiology and Anthropology, Institute of Zoology and Anthropology, University of Göttingen, D

The various ecological and social determinants of group formation have been studied in detail, resulting in a large body of comprehensive theoretical models explaining the evolution and maintenance of group-living in primates and other mammals. However, the fundamental question why some species do not live in groups, has only been touched upon and remains to be answered satisfactorily. By summarizing newly available information on solitary primates, the aim of this study was to explore the determinants of this type of social organisation. Hitherto, factors linked to a solitary life style in primates include small body size, nocturnal activity, dietary specialization on small resources that can not be shared and reduced or increased predation pressure, but none of these factors was found to have a universal explanatory power even within primates. More generally, the disadvantages of group-living might prevent animals from communal foraging. First, aggregated individuals are more conspicuous to predators but many solitary primates show conspicuous anti-predator behavior. Second, individual feeding rates are decreased as a result of direct or indirect feeding competition. Although resource competition might explain a solitary life style in some species, a rigorous test of this explanation requires further detailed data on resource use patterns, spatial and temporal resource distribution and patch size relative to the body size and ranging behavior of solitary species. Thus, for the time being the adaptive basis of why some primates do not live in groups remains in the dark.

Song divergence in potentially sympatric North Atlantic blue whales

Di Iorio L¹, Voellmy P¹, Tgetgel S¹ & Clark CW²

¹Department of Animal Behavior, Institute of Zoology, University of Zürich, CH,

²Bioacoustics Research Program, Cornell Laboratory of Ornithology, Ithaca, USA

Geographical variation in communication systems allows to determining the structure and demographics of animal groups and populations and identifying possible selective forces that have shaped the variation. Knowledge about such divergence helps understanding population dynamics and may reflect differences due to isolation between groups. This can be useful in defining and monitoring management units of endangered species, such as the North Atlantic blue whale (*Balaenoptera musculus*), whose population structure and movements remain poorly described. Blue whales are wide-ranging, and males emit long, patterned infrasonic sequences of sounds almost year-round with a peak around the breeding season. These sequences, referred to as songs, are supposed to represent reproductive displays. We examined variation in the songs of eastern and western North Atlantic blue whales, who are potentially sympatric during migration and breeding season, physically or/and acoustically. We found that the two groups differed in song composition (frequency of unit use), unit rate, and the phonic structure of the predominant song unit type. Furthermore, a multivariate analysis of the unit parameters revealed a different development of frequency parameters in the two North Atlantic areas over the course of the years (2000-2006). The study provides evidence for song divergence between neighboring North Atlantic blue whales. We suggest that the different song traits (unit use, unit rate, and phonic structure) might have been sub-

ject to different selective forces such as ecological factors or sexual selection and discuss implications of our results for population monitoring and management programs.

Out of sight, but not out of mind: behavioral coordination in pair-living sportive lemurs (*Lepilemur ruficaudatus*)

Fichtel C¹, Zucchini W² & Hilgartner R¹

¹Department of Behavioral Ecology and Sociobiology, German Primate Center, Göttingen, D, ²Institute for Statistic and Econometrics, University of Göttingen, D

Many animals are organized into social groups that differ in size from few individuals to several millions, but also composition, permanence and cohesion. In order to maintain group cohesion, individuals need to synchronize their activities, such as foraging, resting and locomotion. A recent model predicted that in a pair of animals, each of which chooses between resting and foraging to maximize its own survival, individuals should synchronize their activities when there is an advantage of foraging together. As a result of this synchronization, difference in the energetic reserves of the two players spontaneously develop and the individual with lower reserves emerges as a pace-maker, of synchrony. Here, we explore whether nocturnal red-tailed sportive lemurs, which live in dispersed pairs, synchronize their activities. We observed eight pairs continuously for at least one annual reproductive cycle in Kirindy Forest, western Madagascar. During focal observations one observer followed the female and another observer followed the male of a pair simultaneously. By using instantaneous sampling we recorded the exact location and behavioral state, such as resting, foraging and locomotion of the focal animal every 5 minutes. Although red-tailed sportive lemurs moved mostly solitary throughout their territory with an average distance of about 43 m between pair partners, synchrony of activities was above chance level. We will discuss the influence of distance between pair-partners, nightly activity pattern and season on the fine-tuning of intra-pair behavioral synchronization.

Acoustic communication in the field grasshopper *Chorthippus biguttulus* under extreme environmental perturbations

Franzke A

Department of Evolutionary Biology, University of Bielefeld, D

Acoustic communication in different species signals the mate attraction. These signals are constrained considerably by environmental factors, such as weather extremes. Host plant quality will be affected by those events and in turn affects herbivore performance and signaling. The question is how grasshoppers perform under stressed environments and how these regimes affect signaling in males. I simulated extreme weather events by manipulating host plant species of *Chorthippus biguttulus* by water- and moisture stress in a greenhouse. Grasshoppers fed on stressed

plants over their developmental time. Attractive courtship song structures like amplitude, duration of chirps, syllables and pauses, number of syllables and pauses and the pause/syllable ratio was analyzed in the maturity stage of grasshoppers. I found that host plant quality may have a strong effect on courtship song structure and can reduce the attractiveness of males.

Male competition in the ant genus *Cardiocondyla*

Frohschammer S

Institute for Zoology, University of Regensburg, D

In most ant species, mating takes place during a short and highly localized nuptial flight, in which males do not compete aggressively for access to females. In contrast, sexuals of the genus *Cardiocondyla* usually mate inside the nest. The resulting 'seraglio situation' allows individual males to monopolize mating with all female sexuals in their nests and has resulted in the evolution of unique, wingless fighter males. In some species of *Cardiocondyla*, such 'ergatoid males' have fully replaced the ancestral winged males, while in other species both male types co-occur. Ergatoid males of most species use their strong mandibles to kill all freshly eclosing ergatoid rivals and, in a few species, also their adult competitors. In contrast, several ergatoid males may peacefully coexist in the nests of species from xeric environments. We investigate the behavior of *Cardiocondyla* males and the evolution of their reproductive tactics. I performed experiments on *Cardiocondyla venustula*. Wingless males of *C. venustula* use their strong mandibles to kill freshly enclosed rivals and also engage in short fights with other adult males, but in addition show a novel behavior hitherto not reported from social insect males: they spread out in the natal nest and defend 'territories' against other males.

Patterned string choice tasks in common marmosets (*Callithrix jacchus*)

Gunhold T, Hann K, Schnöll A & Bugnyar T

Department of Neurobiology and Cognition Research, University of Vienna, A

One of the possible methodological paradigms investigating physical cognition, in particular, the understanding of means-end connections, is the string pulling task. Although there is a plenty of patterned string task studies that has been applied to different species, only a few investigated this type of problem solving in Callithrichids.

In our experiment we confronted common marmosets (*Callithrix jacchus*) first with the standard paradigm (food attached on string, dangling from perch) and then with three different conditions of string choices, in which we varied either the length of one of two strings (and therefore also the 'effort' to reach the goal) and/or the type of reward attached (preferred versus non-preferred food). We hypothesized that the individuals would choose (1) the preferred food either if both strings have the same

or different lengths, regardless of the costs to gain the reward, and (2) the shorter string if the type of reward on both strings is the same. Our results show that the individuals were able to use different pulling techniques to solve the tasks successfully, suggesting that they can use a string as a means to reach a specific goal, in this case, the retrieval of a preferred food. The subjects chose significantly more often (1) the preferred food, either when the strings had the same or different lengths and (2) the shorter string when both strings were baited with the same food. Hence, the data supports our three hypotheses concerning the ability of discrimination between the strings and types of rewards.

Place learning skills and foraging behavior in the two vole species, *Microtus arvalis* and *Myodes glareolus*

Haupt M¹, Eccard J¹ & Winter Y²

¹Department of Biology, Chair of Cognitive Neuroscience, University of Bielefeld, D,

²Animal Ecology, Institute for Biology and Biochemistry, University of Potsdam, D

The two genetically distant vole species, *Microtus arvalis* and *Myodes glareolus*, occur sympatrically but employ distinct foraging strategies: whereas *M. arvalis* inhabits underground tunnel systems and feeds on spatially predictable, slowly depletable food resources, *M. glareolus* lives on ground and arboreally and also feeds on spatially and temporally unpredictable and depletable food resources. Here we ask, if the distinct cognitive demands of these foraging tasks have led to convergent or divergent place learning skills. We used an automated RFID-based conditioning system in which voles could learn at self-determined activity rhythms. In a first task, a reference memory task, we asked if voles were able to learn that water reward was available at only 3 out of 8 potential places, if they were later able to recall this information and switch to new spatial reward contingencies. In a second task, a working memory task, we asked if voles could remember previously visited water places and avoid them subsequently. Both species learned the tasks to stable performance within 200 (reference memory) and 500 (working memory) decisions on average. However, whereas both species performed similarly in the reference memory task (median 100 % correct), *M. glareolus* significantly outperformed *M. arvalis* in the working memory task (medians: 79 % correct vs. 73 % correct). Our results indicate convergent place learning skills in a reference memory task but divergent place learning skills in a working memory task hence meeting our hypothesis that differential life histories would be reflected in terms of differing cognitive traits.

Sweet-talking male tree shrews: how female attractiveness influences male courtship vocalisations

Herlyn A, Schehka S & Zimmermann E

Institute of Zoology, University of Veterinary Medicine Hannover, D

Comparative research on mammal vocalisations showed, that there may be universal coding rules for communicating the signaller's state of arousal. In order to

explore this hypothesis we studied vocalisations of male tree shrews (*Tupaia belangeri*) in a courtship paradigm. We expected predictable changes in vocal cues of vocal expression of males according to female's attractiveness. Female's attractiveness was assessed by female response towards male courtship approaches. Females refusing male contact were defined as unattractive, females accepting male contact as attractive. The arousal of males was determined by tail-position. Attractive females were postulated to induce high arousal in males, in comparison to unattractive females. We paired seven males and seven females in a courtship paradigm for 20 minutes and video- and audiotaped their behavior and vocalisations. A multi-parametric sound analysis combined by a frame-by-frame video analysis showed that the vocal expression of the male varied predictably with the attractiveness of the female and the induced arousal state. A higher arousal is attended by softer calls with a higher peak frequency (Wilcoxon Signed Rank Test). Findings will be compared with comparable experiments in rodents to examine universality in acoustic coding rules of mammals.

Diving under pressure: glimpses on the ontogeny of the diving behavior of the Galapagos sea lion

Jeglinski JWE & Trillmich F

Department of Behavioral Biology, University of Bielefeld, D

Recent research has shown genetic and morphological differences between the western and central population of the Galapagos sea lion (*Zalophus wollebaeki*). Based on the theory of natal habitat preference, these indications of some degree of reproductive isolation might develop due to early learning of site specific foraging behavior possibly in conjunction with competition between Galapagos fur seals (*Arctocephalus galapagoensis*) and sea lions of the western population. As part of an ongoing study on ecological adaptation and foraging ecology of Galapagos sea lions, we plan to compare the ontogeny of diving behavior between the western and the central population by placing time-depths-recorders (TDRs) on juvenile sea lions between the age of three months and two years. First results show that pups younger than two months spent most of their time on land. Pups between two and three months are increasingly aquatic, but do not show any diving behavior. One year old sea lions dived regularly with maximum diving depths ranging from 8 to 350 metres. Dive depth was highly variable among individuals and correlated with body mass. Galapagos sea lion immatures of both populations develop diving abilities earlier and faster than Galapagos fur seal immatures and exceeded in some cases even the diving depths of adult Galapagos fur seal females.

It remains surprising and difficult to explain why the size of the western Galapagos sea lion population is much smaller than that of the Galapagos fur seal even though the former is a better and faster developing diver than the latter.

Gaze following in hand-raised greylag goslings

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To visually co-orient on another's gaze (gaze following) may provide important information about the location of food, social interactions or predators for socially organized animals. Gaze following has been shown for a variety of mammals, but only in few bird species and has not been tested in precocial birds at all. In altricial ravens and rooks gaze following emerges shortly after fledging. However, if gaze following is adaptive, we would propose that the developmental pattern should be different in altricial and precocial birds. Greylag geese are highly social birds with a precocial development. Goslings move and feed independently within 24 hours post-fledging, but are highly vulnerable to aerial predators and dependent on protection by their parents. Therefore we predict that greylag geese should be capable of gaze following and that they should develop this skill already pre-fledging. We experimentally tested 19 hand-raised greylag goslings for their ability to follow a conspecific's gaze between ten days and six weeks of age. Model look-ups were elicited by projecting a laser-point dot on a location invisible to the observer and we scored if the observer (a sibling) responded to the model's look-up with looking up itself. Additionally, we performed two control conditions to rule out that the observer could either see the dot or would look-up without any stimulus. Our results not only demonstrate that greylag goslings follow other's gaze, but that they also develop this skill much earlier than altricial birds, as a response was already detectable in ten day old goslings.

Cooperation, coordination, and cognition in complex animal societies

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As individuals need to coordinate their activities to benefit from group living, group decisions are essential for societies, especially if group members cooperate with each other. How animals make group decisions has important implications for our understanding of animal societies. Models show that shared ('democratic') decisions outperform unshared ('despotic') decisions, even if individuals disagree about actions. This is surprising as in most other contexts, differences in individual preferences lead to sex-, age-, or kin-specific behavior. However, empirical studies testing the predictions of the theoretical models are only beginning to emerge. Because bats live in complex fission-fusion societies that depend on group decisions but where individuals can avoid decisions that are not in their interest, bats provide novel opportunities for this kind of research. I present results from a long-term study on information transfer and group decision-making in wild Bechstein's bat colonies, for which I have data on social and genetic colony structures. Combining field experiments with behavioural, genetic, demographic, physiological, and morphological

data, including *in vivo* magnetic resonance imaging of brain structures, I aim to assess how bats that differ in their abilities, interests, personal experience and personalities make group decisions.

Age-dependent changes in song type repertoires in common nightingales: the big step between year one and two

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Bird song is among the best investigated models to study mechanisms and functions of communication systems. In accordance with the honest signaling theory, song characteristics are often related to male quality such as foraging efficiency, motivation to contribute to parental care, or good genes. Age is supposed to reflect male quality, too. For example, older males might provide better territories or just proof their longevity. Here, we investigate how information about age might be encoded in the song of common nightingales (*Luscinia megarhynchos*). Males of the species possess large song type repertoires and repertoire size is variable between individuals. Furthermore, males are able to acquire new song types after their first breeding season. In this longitudinal study we analysed nocturnal song of individual subjects in their first and second breeding season and compared the findings to those of a longitudinal study conducted on birds which were in their second breeding season or older. Between first and second year, repertoire sizes increased on average by 24 %. In the following years, repertoire sizes remained stable with large inter-individual differences. Comparing the number of song types present both in the first and second season (permanent song types) of an individual revealed a lower overlap than that reported for subsequent seasons. These findings invite to discuss the pronounced changes especially between first and second breeding season as a case of delayed maturation. Alternatively, it might be that these changes lead to an adjustment to the song types in the population.

A vocal peacock tail? Constraints and use of large repertoires in nightingales (*Luscinia megarhynchos*)

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In some animal species, exaggerated ornaments are used to display individual quality. Such ornaments have evolved through sexual selection and have been mostly studied in terms of morphological displays. Among singing birds, one can observe a similar phenomenon: some species have extraordinarily large signal repertoires of numerous songs or elements, whereas most others have a very limited number of songs in their repertoire. Our study species, the common nightingale, is a territorial songbird known for its apparently endless variety in song. This variety is achieved by acquisition of song templates mostly in early ontogeny. Song templates

are copied precisely and imitations may persist as stereotypic song types over several years. This stereotypic performance of song types makes the species very well suited for intra- and inter-individual comparison of repertoire size and repertoire composition. I analysed and compared long, undisturbed nocturnal song bouts of free ranging territorial nightingales. The analyses revealed large individual variation in repertoire size. Comparison of these individual repertoire sizes within a season and between successive seasons indicate that this measure is a rather stable individual trait and thus might be used as an indicator of male quality. In addition, I present data addressing whether repertoire size is limited by the species repertoire, and how long one actually needs to listen to a song sequence in order to estimate repertoire size. I will discuss potential functions of large repertoires and also the 'usefulness' of repertoire size for potential listeners such as conspecific males or females.

Acoustic categorization of communication calls in tree shrews

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Empirical research on human and nonhuman primates suggest that listeners assess distinct categories of their social world acoustically, e.g. identity of the sender and referential information. Acoustical categorization in nonhuman primates is commonly assessed by the habituation-dishabituation paradigm. We applied a reciprocally designed habituation-dishabituation paradigm to evaluate the ability of tree shrews to spontaneously categorize communication calls from different contexts. Tree shrews are small diurnal mammals, closely related to primates. They live in pair-bonded social systems in the forests of Southeast Asia and use context-specific calls during social interactions. We tested pairs of three different call types that differed both in physical structure and social context. These were a disturbance call, produced during disturbance or alarm, a call of defensive threat, vocalized during agonistic conflicts and a male advertisement call, produced during courtship interactions. An asymmetric dishabituation-response indicated that tree shrews categorized call types not only according to their physical structure, but additionally according to their social significance. Calls associated with courtship evoked a stronger response than those indicating general disturbance. Additionally, responses to disturbance calls were stronger than those to calls associated with aggression. Findings imply that basal, primate-related mammals, such as tree shrews, categorize their social world acoustically according to social contexts and the associated affective state.

Safe sleeping and risky roaming? Survival consequences of sex-specific behavioral strategies in a small, sexually monomorphic primate

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Dispersal, fighting and roaming can be dangerous. In mammals, males are usually much more prone to engage in such risky behaviors than females - likely to enhance their reproductive success. Often, other sexually selected traits such as sexual size dimorphism render it difficult to directly assess survival costs of sex differences in behavior. Here we isolate and quantify the survival consequences of two potentially risky male behavioral strategies in a small sexually monomorphic primate, the grey mouse lemur *Microcebus murinus*. (1) In the Kirindy Forest population females hibernate, whereas males remain active which has been suggested to lead to increased predation on males during the austral winter. (2) During the short annual mating period, males roam widely in search of receptive females. We statistically modelled capture-mark-recapture data from a long-term study of *M. murinus* in Kirindy Forest, western Madagascar to estimate sex-specific seasonal survival probabilities. Surprisingly, males survived as well as females during the austral winter, suggesting that these sex-specific strategies are equal in terms of survival. During the breeding season however, male survival was substantially lower compared to females (16 %). We could trace this sex gap in survival back to the short annual mating period, providing strong circumstantial evidence that roaming behavior is indeed risky for male mouse lemurs. Our findings show that sex differences in survival in a promiscuous mammal can be substantial even in the absence of sexual dimorphism.

Social and individual olfaction in horse faeces (*Equus caballus*)

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Living in complex social systems requires perceptual and cognitive capacities for social and individual recognition. Olfactory recognition is one means by which this can be achieved. Thus, many animals identify individual proteins in urine, skin secretions, or saliva. Additionally, marking behavior with faeces in several mammals and especially in horses indicate the importance of faeces for olfactory recognition. To test this hypothesis, we conducted two separate tests: test one addressed the question of whether horses recognise the social affiliation of other horses by sniffing their faeces. The horses were presented four faecal samples: 1) their own, 2) those of other members of their own group, 3) those of unfamiliar mares, and 4) those of unfamiliar geldings. Test two was designed to assess whether horses can identify other individuals by sniffing their faeces. Here, we presented the horses faecal samples

from their group mates in random distribution. As controls for both tests, soil heaps and sheep faecal samples were used. In test one horses preferred to sniff their conspecifics faeces in comparison to their own, paid significantly more attention to faeces from unfamiliar horses and even more to unfamiliar faeces from the same sex. Furthermore, in test two, the horses paid most attention to the faeces of horses from which they received the highest amount of aggressive behaviors. We therefore suggest that horses of both sexes are capable of determining the social affiliation, the sex and, for their own group members, the identity of individuals, by sniffing their faeces.

New insights into bushcricket spermatophores

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Bushcricket spermatophores transferred during mating are costly for males to produce but females receive several benefits from these nuptial gifts. Isotope studies revealed that females incorporate nitrogen originated from nuptial gifts and fuel their metabolism with spermatophore nutrients within hours. Therefore, spermatophore size should be subject to sexual selection through female choice and should depend on a range of factors. These include male condition which can be influenced by parasitism and mating history - the longer the intervals between matings the larger the spermatophore. I have shown, that females choose heavier males in binary choice tests and also those, who have not mated recently. Males in turn spend several days to build this large spermatophores and should trade their donations between current and future reproduction. In the light of recent findings in other animals, my data suggest, that male fitness is based in part on male metabolism efficiency to convert food intake into new spermatophores.

Sex-specific variation in foraging strategies

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Animals invest time and energy searching and handling food and are rewarded in terms of energy. Some must actively search for food that is patchily distributed. With searching activities, additional tasks like mating and/or territory defence can be fulfilled. The value of a spotted food resource thus is not only defined by the risk and travelling distance but as well by its opportunities. These additional values depend on the social system, territoriality of the investigated species and of the sex of the respective individual. Evolution should have shaped foraging strategies of males and females of any species different, according to their additional duties while active. To provide experimental support for this prediction, we analysed 12 field voles (*Mircotus arvalis*) of each sex in artificial resource landscapes. In adjoining

arenas with four different levels of risk, animals could feed from artificial food patches. In these arenas, either travelling to patches or feeding in patches was safe, or the whole environment was safe or risky, depending on the provided cover and thus assigning different costs to the realisation of additional tasks. Results show that foraging and activity patterns were different between males and females and adjusted to the provided type of risk. Differences were found in the number of used feeding stations, time and investment in the feeding stations, whereabouts, traveling distance and length of activity phases. We could thus show that behavioral variation in an investigated species can be caused by differences in assessment of alternative opportunities in males and females.

Preliminary notes on the mating behavior of the fossa (*Cryptoprocta ferox*)

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The fossa (*Cryptoprocta ferox*, Eupleridae) is Madagascar's largest extant carnivore. Previous studies with small sample sizes have indicated the existence of a unique mammalian mating system, combining elements of scramble competition polygyny and a lek system. Females visit traditional mating trees and appear to actively solicit multiple matings. In 2007 and 2008, we observed mating activities of four females in Kirindy Forest, central western Madagascar. Continuous observations revealed that mating activities of all females were concentrated at night. Both males and females mated multiply, and copulations were often prolonged, with the longest lasting > 6 hours. Copulation duration decreased with an increase of the number of rival males present, and there was a skew in male mating success. Interestingly, male-male interactions were not merely aggressive, but often indifferent or even affiliative. Our observations confirm that the mating system of the fossa is a unique mixture of lek system and scramble competition polygyny.

Differences in the sexual cycle of two closely related dwarf hamster species (*Phodopus campbelli* and *Phodopus sungorus*)

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The genus *Phodopus* consists of three species. Two of them (*P. campbelli* and *P. sungorus*) did separate only about one million years ago and they are considered as distinct species only since the eighties of the last century. At the same time, the environmental conditions in their natural habitats are rather different and this should have behavioral and physiological consequences, manifested genetically. For this reason we performed comparative studies on both species and particularly of their

sexual cycle. Investigations were carried out on adult though sexually naive female hamsters of our own breeding colony. To characterize the sexual cycle, vaginal smears were taken. During the first two hours of the dark time, a male conspecific was introduced for 15 minutes and the behavior was observed. Also circadian rhythms of motor activity were investigated by means of passive infrared motion detector and running wheels. Body temperature was recorded using implanted Thermochrone iButtons. The analysis of the vaginal smears revealed a clear sexual cycle of four days, occasionally 5 days, in *P. campbelli*. Sexual behavior, motor activity and body temperature did change simultaneously. Permanent olfactory contact with an adult male conspecific over three weeks had no visible effect on the sexual cycle. On contrary, in *P. sungorus* no sexual cycles could be detected. None of the investigated parameters showed any regular changes. Only when the females had permanent olfactory contact with a male, regular sexual cycles of four days occurred. This may reflect differences in the social behavior between the two species.

How pairing changes singing behavior: a field study on nightingales, *Luscinia megarhynchos*

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In many bird species of temperate zones, singing of males is restricted to the breeding season. It has been shown that singing plays a crucial role in male-male interactions during the establishment and maintenance of territories and in mate attraction. Seasonal patterns of song characteristics and singing activity of male birds have been thoroughly studied, but little is known about how these patterns vary with mating status and phases of the breeding season. In this study, we investigated seasonal patterns of nocturnal and diurnal song in paired and unpaired male nightingales, *Luscinia megarhynchos*. As part of a long-term study, in 2008 we collected data on arrival, singing activity, and pairing/breeding status of 28 males of a Berlin population. We correlated arrival dates, singing activity, and breeding phases. Assuming that early returning males might be able to obtain the best territories and keep these during territory disputes, we expect these males also to be early breeders. In addition, we predicted that singing activity will in general decrease after pair formation. Our results suggest that not only singing activity, but also specific song characteristics do indeed change during the breeding season. Differences between paired and unpaired males shed further light on the dual function of song and might help to identify song characteristics that might be crucial in territory defense from those that mainly serve to attract females.

Early development of Galapagos sea lions juveniles

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Early development is a key factor in life history determining the progress from juvenile to adult status. It implies a change in allocation of resources from somatic

growth to development of reproductive potential. Individuals that invest more resources into early growth may mature later, but may also face survival costs when food becomes limiting. The Galapagos sea lion (*Zalophus wollebaeki*) lives in a highly unpredictable environment in which food abundance varies not only seasonally but also annually due to El Niño. Sea lions are vulnerable to ocean warming causing reduced food abundance because - due to their alternating strategy - nursing females are tied closely to the coastal colonies. When food shortage arises lactating females spend more time at sea before returning to pups. To compensate declines in food abundance maternal care can be extended up to three years. Juvenile Galapagos sea lions seem to start foraging while still dependent on milk which enables accelerated growth at an earlier age. Thus sea lions of Galapagos represent a suitable subject to study factors influencing early development and its life time consequences. Here we present data on growth from birth until three years of age for the Galapagos sea lion to (1) characterize early growth of pups, (2) analyze the effects of changes in sea surface temperatures (and correlated food abundance) on mass gain of juveniles, and (3) determine juvenile development up to three years of age. Even small changes in sea surface temperature proved to be crucial regarding growth and survival.

MHC and mate choice in tree shrews

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The MHC (Major Histocompatibility Complex) and its gene products play an important role in the adaptive immune system of vertebrates. The combination of MHC-alleles strongly affects an individual's specific immune response against pathogens and parasites. The MHC also shapes the individual body odour, which therefore can be used as a cue for mate choice decisions: females should prefer partners with compatible (i.e. dissimilar) MHC to avoid inbreeding or to optimize MHC-heterozygosity of their offspring. On the other hand mate choice in mammals is often influenced by imprinting effects during early life, particularly related to the mother. In addition, it has been shown in studies on laboratory mice that also the MHC-dependent mate choice is influenced by imprinting; however, this fact has been largely ignored in studies on other mammals. In the present study MHC-DRB-genes (exon 2) of tree shrews (*Tupaia belangeri*, order Scandentia) were characterized for the first time and their influence on mate choice decisions was investigated. Particularly, we examined whether self-referent MHC-matching or imprinting on the mother's MHC serves as a reference for mate choice. Given the choice among several males, females preferred maternal-MHC-dissimilar males, i.e. males which were MHC-dissimilar to the females, mothers. It might be suggested that the female behavior was due to imprinting mechanisms during early pre-weaning life.

Male competition and primate social relationships

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Most primates are relatively long-lived and group-living and partner choice for social interactions is constrained. Since dispersal from groups is costly and often restricted to one sex group members may form long-lasting social relationships. Patterns of social relationships within and between the sexes show considerable variation between species and populations. Evolutionary explanations for this variation have focused on competition for limited resources as a major determinant of social relationships (especially in females). While agonistic relationships and cooperation among relatives are readily explained by variation in competitive regimens, cooperation and tolerance among unrelated individuals is not yet well understood. Our recent results from comparative analyses, computer simulations and field work suggest a major role of male reproductive competition in shaping primate social relationships - not only among males but also among females. However, in contrast to some other evolutionary explanations for variation in social relationships we suggest a sex difference for the effect of increasing male competition on social tolerance within a sex.

Voluntary exercise impairs reproductive success in Djungarian hamsters (*Phodopus sungorus*)

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Small rodents are known for their voluntary and extensive use of running wheels (RWs) which may cause striking effects on the animals' physiology. In Djungarian hamsters (*Phodopus sungorus*), wheel running decelerates testis regression after transition from long days (LD) to short days (SD), and advances testis recrudescence after the change from SD to LD. Given that the female gonads are affected in a similar way, a continuous high activity level might extend the natural breeding season, which is restricted by temporary regressed gonads during autumn and winter. In this study, we investigated at first whether an elevated activity level per se influences reproduction. In the first experiment under a natural photoperiod, breeding pairs with access to a RW produced significantly less litters compared to sedentary control pairs. In a following experiment under artificial LD conditions, one group of five breeding pairs obtained a locked RW for twelve weeks followed by an additional twelve weeks with a released wheel. In a second group, the two experimental phases were reversed. Litters were born regularly in the first group until the hamsters got access to the RW. Afterwards, all newborn litters were cannibalised. In the second group, only one litter was born during the period with access to the RW, but litters were born regularly again when RWs were locked. In conclusion, the results demon-

strate a negative effect of wheel-running activity on the reproductive outcome in *P. sungorus*. More studies are necessary, however, to analyse the reasons for this phenomenon.

Usage and function of grunt vocalizations in redfronted lemurs (*Eulemur fulvus rufus*)

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Many primates produce contact calls to maintain group cohesion during group progression. The same calls are, however, often given during social interactions. The function of these calls remains largely unexplored. In a two-month field study, we investigated the usage and function of such vocalizations in redfronted lemurs (*Eulemur fulvus rufus*) in Kirindy forest, western Madagascar. We recorded vocalizations of eight adult females and eight adult males. Redfronted lemurs produce variants of grunts in both contexts mentioned above. In order to study whether variants of grunts differ in call structure, we conducted a multivariate acoustic analysis. Furthermore, we investigated whether grunts serve as signals of benign intent that facilitate social interactions. For this question, we observed all social interactions of focal subjects and examined whether the usage of grunts has social consequences for subsequent interactions when approaching conspecifics. Preliminary results on grunt frequencies and their impact on social interactions will be presented.

Coordination of group movements in redfronted lemurs (*Eulemur fulvus rufus*)

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Individuals benefit from group-living in a number of ways (i.e., dilution effect, increased vigilance, division of labor), but there are also conflicts of interest between individual group members, which jeopardize group cohesion. To maintain group cohesion, activities of group members therefore have to be coordinated. Particularly, spatial movements of a group represent an excellent model to study the fundamental social processes and mechanisms involved in group coordination. The objective of this ongoing study is to analyze the patterns, processes, mechanisms and decision types underlying group movements of cathemeral redfronted lemurs (*Eulemur fulvus rufus*, Lemuridae) in Kirindy Forest, western Madagascar. Using behavioral observations, custom-made GPS-tags and sound recordings, we quantify movements of four groups of redfronted lemurs day and night. Additionally, phenological and

physiological (ketone-tests) data are being collected to examine the possible influence of environmental, social and intrinsic factors on group movements. Preliminary results revealed that both adult females and males led group movements, but females did so more often. There was no sex difference in the number of followers and in the distances covered with group movements, however. GPS data allowed detailed analyses of home ranges and intergroup ranging behavior. In general, this study of a species without sex-specific dominance patterns that is active both day and night can contribute important comparative information to elucidate the control of group movements in primates and other non-anonymous groups.

Display of European rabbit pup calls induces behavioral responses of mothers: a study under field conditions

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The communication between the mother and her offspring, which might already start shortly after birth, is an important feature of mammalian reproductive behavior. The most prominent functions relate to the context of nursing, such as the stimulation of the mother's milk release or the guidance of the offspring to the teats. However, cues released by the offspring (mostly vocal) may also serve as signals to alarm the mother, for example when a young is hurt or at risk of being killed. We studied the function of pup calls in the European rabbit, which has not been explored under natural conditions so far. Usually, this species is considered to show a rather low amount of maternal care, which is restricted to a short daily nursing bout of only a few minutes. We conducted display experiments with calls of pre-weaned pups in a field enclosure of two hectares. The calls (previously recorded in the lab) were displayed by a remote-controlled recorder placed next to the subterranean breeding burrows (a) shortly (2-5 days) after the pups were born and (b) around one week before the pups left their breeding burrow. Our results revealed that European rabbit mothers respond rapidly to the display of pup calls by running to the breeding burrows and investigating the close environment. These responses did not differ between the two tested time windows. We suggest that this behavioral response of the mother might serve to repel infanticidal females as well as small predators from the breeding burrow.

Sexual selection modifies the flight of the Banded Demoiselle *Calopteryx splendens* (Odonata: Calopterygidae)

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Ancient and basal groups of odonates as Epioplebiidae, Coenagrionidae or Lestidae have got hyaline wings and show a very uniform flight behavior. They beat both pairs of wings counterstrokingly. This is economic because thrust and lift are pro-

duced continuously. In contrast Calopterygids show a variety of different flight types: females and males beat both wing pairs simultaneously fore- and backward in normal flight. The stroke angles then are wide while the wing beat frequencies are low. By this flight-type males use their blue wings to threaten other males. Through variations of the flight-paths, of the flight velocities, and the durations of wing standstills they can react on threatening flight patterns of other males. Additionally both sexes are able to beat their wings counterstrokingly. Here the stroke frequencies are very high and the stroke angles are small. Females show this flight to threat other females competing for the same perch during feeding flight. Males court for females by this flight type. The high wing beat frequency and the duration of this courtship flight could be essential for female choice. Different flights of both sexes of *Calopteryx splendens* have been filmed by a new slow motion technique and were analysed. The theoretical development of these flight types caused by sexual selection is discussed.

O, brother where art thou? – Sex-biased dispersal in gray mouse lemurs (*Microcebus murinus*)

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Dispersal can be defined as a one-way movement of an individual to a new area away from its natal site. Dispersal is an important process that has profound effects on the spatial, genetic and social structure of populations. The aim of this study was to investigate the proximate mechanisms and the distance of dispersal of gray mouse lemurs (*Microcebus murinus*), small, nocturnal, solitary primates endemic to Madagascar. Genetic studies indicated the existence of male-biased natal dispersal in gray mouse lemurs. To shed light on the proximate mechanisms and the process of dispersal in this species, I equipped 17 males and nine females with radio collars and observed them by means of sequential radio tracking between April and July 2007. Individuals qualified as dispersers if they shifted the center of their home range over a distance of one home range diameter. During the study, six out of 17 males relocated their home range between 180-960 m, but none of the females dispersed. Of eleven resident males five could be identified as immigrants through parentage analyses. Dispersers made rather straight movements. Explorative behavior occurred in the form of straight line excursions. The destination of these explorative movements was invariable for one individual but differed between dispersers. Morphometric data indicate that body condition might be a proximate mechanism that drives dispersal. Dispersers declined in body condition in relation to resident males or females. There was no indication that mortality is dispersal-related. Therefore, dispersal in male gray mouse lemurs seemed to be, at least partially, driven by intrinsic factors.

Inference by exclusion in ravens, jackdaws and keas

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In birds, corvids and parrots independently evolved advanced cognitive abilities, recognizable in their exceptionally large, cognitive, brains. Despite intense research on the cognitive abilities of several species of both groups, only little is known about the specificity of avian cognition. That is, species either may have evolved only a limited, species-specific set of cognitive tools or may possess a general cognitive toolbox. Here, we tried to approach this question by testing food-caching ravens, non-caching jackdaws as well as non-caching keas in a well-established 'inference by exclusion' task. As one form of causal reasoning, 'inference by exclusion' has been regarded as a hallmark of cognitive flexibility. Through inference by exclusion, available, but incomplete information may be used to deduct missing information; e.g., in two-choice situations, knowledge about the absence of food in one place may allow inferring the presence of the food in the other place. In our task food was hidden underneath one of two opaque bowls and we informed the birds about the content of the unbaited bowl before they made their choice. Whereas ravens were highly successful, only one jackdaw and none of the keas inferred the location of the hidden food in this task. This suggests that in the same context, these large-brained birds at least use their cognitive tools differently.

Isolation calls and retrieving behavior in wild-derived and laboratory golden hamsters (*Mesocricetus auratus*)

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Isolated juvenile golden hamsters produce ultrasonic and audible vocalizations as reaction to being separated from their mother and nest and therefore cooling down, the so-called isolation calls. Their aim is to stimulate mothers to search and retrieve the pups. In this work the vocalization of 62 juvenile laboratory (Zoh: GOHA; Institute of Zoology, University of Halle-Wittenberg) and 28 juvenile wild-derived golden hamsters after birth up to the age of 18 days were digitally recorded, analyzed and compared using an ultrasonic microphone and the Software Avisoft. Furthermore, the retrieving behavior of the mothers was observed and compared. The results showed that the number of the isolation calls was age-specific and the structure of the calls was influenced by body temperature, body mass and sex of the pups. Mean frequency and mean amplitude of the audible vocalizations (ADV) correlated negative with the body temperature. The heavier the pups, the less number of calls they emitted. Also, mean frequency and mean amplitude of ADV and of ultra-

sonic vocalizations (USV) sank with increasing body mass. Males on day 3 post partum had larger intervals between their calls and a smaller minimal frequency of the ADV than females. Maternal golden hamsters retrieved the pups in dependency on their age, but they did not discriminate between own or foreign pups. In spite of enormous genetic differences between wild-derived and laboratory golden hamsters there were found only less differences between the strains.

Circadian rhythms of locomotor activity in Djungarian hamsters (*Phodopus sungorus*) with an attenuated ability to synchronize

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The Djungarian hamster (*Phodopus sungorus*) is a nocturnal and highly seasonal species. Therefore, it should have a robust and properly functioning circadian system for a precise photoperiodic time measurement. However, in a comparative study with hamsters of the genus *Phodopus*, we found a noticeable instability in the circadian activity rhythm of *P. sungorus* as against *P. campbelli* and *P. roborovskii*. Moreover, the activity onset in some animals is delayed by several hours whereas the activity offset is still coupled to light on. In those, so called delayed activity onset (DAO-) animals, the activity onset can be shifted as far as the activity time reaches a critical value. Passing the critical value lead to a breakdown of the rhythm in almost all cases. The properties described above clearly indicate that DAO-hamsters are characterized by a strongly attenuated ability to synchronize under daily environmental changes. First results showed that DAO-animals have an elongated period length compared to wild-type animals in constant darkness. Furthermore, DAO and wild-type hamster display differences in the phase response following photic stimulation in the late subjective night (100 lux, 15, at CT22). The phase advance is significantly smaller in DAO-hamsters compared to wild-type animals. The above mentioned findings fit to theoretical predictions, but cannot explain the specific features of the overt activity rhythms in the DAO-hamsters completely. Therefore, further experiments are necessary to investigate the underlying causes for the diminished ability of DAO-animals to synchronize in the periodic environment.

Evolved endocrine mechanisms of social flexibility: how individuals adapt to a changing environment

Schradin C

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Behavior is a product of evolution, but the optimal behavior often differs from individual to individual, and behavioral flexibility has evolved in many species. To understand the evolution of behavior one must also understand its evolved physiological mechanisms. The relative plasticity hypothesis predicts that alternative tactics are associated with changes in hormone levels. In species with alternative male

reproductive tactics, the highest androgen levels have usually been reported in dominant males. However, in sociable species, dominant males show amicable behaviors to gain access to females, which might conflict with high testosterone levels. I compared testosterone, corticosterone and prolactin levels in male striped mice (*Rhabdomys pumilio*) following a conditional strategy with three different reproductive tactics: (i) philopatric group-living males, (ii) solitary living roamers, (iii) dominant but sociable group-living territorial breeders. Philopatrics had the lowest testosterone but highest corticosterone levels, suggesting that they make the best of a bad job. Dominant territorial breeders had lower testosterone levels than roamers. Roamers had the highest testosterone levels, which might promote risky behavior, such as invading territories defended by territorial males. This result suggests that dominant males' testosterone levels reflect a trade-off between low testosterone amicable behavior and high testosterone dominance behavior. Prolactin, a hormone correlated with parental care, was highest in paternal territorial breeders. These differences in hormones levels disappeared during the non-breeding season, indicating that they were correlated with differences in reproductive behavior during the breeding season. I concluded that evolved endocrine mechanisms are likely to underlie social flexibility in the striped mouse.

The evolution of monogamy in the round-eared sengi

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In species lacking bi-parental care, monogamy may occur when males are unable to achieve polygyny due to ecological and physical constraints. In the present study, the social and mating system of the round-eared sengi (*Macroscelides proboscideus*) was investigated using radio-tracking, trapping and behavioral observations in a semi-desert in South Africa. The population was characterized by a low density with a balanced adult sex ratio and asynchronous reproduction during an 8-9 months long breeding season. There was no indication of sexual dimorphism in body mass. Space use of males and females indicated that social monogamy was the predominant social system with stable pairs and year-round territoriality. However, females maintained smaller-sized and more stable territories, whereas males occupied significantly larger areas that were sensitive to population density and the presence of neighbouring males. Paired males annexed vacant space and single neighbouring females leading to polygyny. However, polygynous associations were short-termed and ended when a new, still unpaired male intruded into the vacant area. Furthermore, all males showed mate guarding behavior prior to and during female oestrus. Guarding males lost about 5 % of their body mass, and the onset of guarding as well as the intra-pair distance was influenced by population density, the number of neighbouring males and by male body mass. These results indicate that males are constrained into social monogamy by demographical factors, limiting the opportunity to encounter additional mates, and by physical aspects, associated with costly guarding and probably a low variance in male resource holding potential.

The geographical distribution of sexual reproduction in the parthenogenic ant, *Platythyrea punctata*

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Platythyrea punctata is one of the six ant species that are capable of producing diploid workers from unfertilized eggs by thelytokous parthenogenesis. *P. punctata* is found throughout the Caribbean (from south Florida to Barbados/Grenada) and central America (south Texas to Costa Rica). Whereas the Caribbean population appears to be predominantly clonal, the mainland population appears to have some mixed populations. This species thus provides a suitable model to investigate the benefits of unisexual vs. sexual reproduction in a social insect. Theory about the distribution of sex predicts that parthenogenesis should be most common in young, rapidly expanding populations or also in extreme or unpredictable environments (geographic parthenogenesis). We conducted a combination of microsatellite and phylogenetic analyses to test these predictions. Although the data seemingly support these models, the results are not clear-cut.

Effects of body mass, but no effects of huddling on resting metabolic rates of post-weaned European rabbits under different simulated weather conditions

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An animal's metabolic rate (often measured as oxygen consumption) can be used to determine the costs of living in a specific situation. After leaving the shelter of their breeding burrow, young European rabbits are exposed to high variations in ambient temperature and rain, which can negatively influence their costs for thermoregulation. However, such effects might be modified by different individual characteristics. European rabbits have a high variation in litter size, hence in weaning mass of the young. Due to their variable body masses and surface area/volume-ratios, there might be differences in the response of the juveniles towards adverse weather conditions. Furthermore, staying in body contact with siblings might buffer the negative influence of wetness and low ambient temperature. In our lab study, we compared the effects of body mass and huddling on oxygen consumption of rabbits under different weather conditions. In particular, we run experiments under different ambient temperatures and simulated rainfall. We found interacting effects of temperature and wetness, which strongly affected juvenile oxygen consumption. Although huddling showed no significant effects, the oxygen consumption was related to juvenile body mass. When the body mass was higher, young rabbits consumed less oxygen. However, such effects were only apparent under wet conditions and when temperature was low. In conclusion, our study highlights the importance of a high weaning mass in juvenile European rabbits, which reduces their maintenance costs under adverse environmental conditions.

Social behavior and conflict in human groups

Semmann D

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Evolutionary theory predicts human strategies that yield the highest payoffs to outcompete the less successful strategies within a population. On the basis of this assumption we observe many potential conflicts between individuals. For instance human subjects refrain from investing into a public good as long as defection yields a higher net payoff than cooperation. Nevertheless modern human societies are strongly dependent on cooperative behavior of their unrelated members. The evolutionary puzzle how cooperative behavior could have evolved and how it can be evolutionary stable has been a focus in theoretical and empirical studies in recent years. The talk will review some findings on how reputation, punishment and certain dynamics increase cooperation and thereby help sustain public resources. It will also provide some inside on reputation building, the use of reputation and how information about reputation can be gained through gossip.

The impact of weather conditions and social environment on endoparasite load in juvenile European rabbits

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It is well known that parasites have the potential to reduce an animals' reproductive success and survival (often through effects on body condition). In social mammals, the abiotic and social environment, particularly experienced during an individual's early life, can have long-term implications for its development. This includes effects on body condition and susceptibility to endoparasites. In the present study, we tested and compared the influence of weather conditions and social environment on infestation with endoparasites in juvenile European rabbits. Our study was conducted on animals from a field enclosure population of two hectares size. We focused on agonistic interactions and positive social behavior with conspecifics and measured the percentage of rainy days during the first months after emergence above ground. In autumn, the juveniles were killed and the gastro-intestinal infestation with endoparasites was analysed. We found effects of the social environment as well as of weather conditions on endoparasite load of the juveniles: endoparasite load was higher in juveniles, which were exposed to more rainy days in the first weeks after leaving the nest. Animals, which displayed more positive social behavior with conspecifics had a lower infestation with endoparasites, most probably due to effects of social support. Thereby, the presence of bonding partners might attenuate the immune suppressive effects of stress, leading to lower infestations with endoparasites.

Predation increases structural complexity in primate alarm calls

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According to most accounts, primate alarm call behavior is biologically hard-wired with signallers having little voluntary control over their acoustic products. However, more recent studies have suggested that this theory may only apply to acoustic features, not the structural organisation of calling patterns. Here, we show that two adjacent populations of Diana monkeys differ significantly in the structural organisation of alarm calling to crowned eagles and leopards. At Tai forest (Ivory Coast), the monkeys regularly interact with both predators; at Tiwai Island (Sierra Leone) they are only threatened by crowned eagles. We experimentally simulated the presence of both predators and monitored the alarm call responses of the adult males at both sites. Despite their differences in experience, all males produced predator-specific alarm calls to eagles or leopards that were acoustically identical. However, there were significant differences in the temporal organisation of call sequences to leopards, but not to eagles. We concluded that Diana monkeys are biologically predisposed to use their vocal repertoire in predator-specific ways, but that ontogenetic experience determines the syntactic organisation realised by a caller.

Inter- und intraspecific olfactory discrimination in dwarf hamsters of the genus *Phodopus*

Troelenberg N, Weinert D & Fritzsche P

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Chemocommunication is the major requirement in the formation of social networks, the finding of appropriate sexual partners as well as the identification and discrimination of familiar or kin conspecifics. The purpose of the present study was to compare the scent based inter- and intraspecific discrimination aptitude in the three species of the genus *Phodopus*. This was particularly interesting under the aspect that the speciation of *P. campbelli* and *P. sungorus* occurred only around one million years ago and they were considered as one species up to the eighties of the last century. Male *P. sungorus*, *P. campbelli* and *P. roborovskii* were tested for species preference using a hole-board apparatus and soiled shavings. To test inter- and intraspecific discrimination of individuals by ventral gland scents a habituation technique was used. Males of all three species were presented samples of a) unfamiliar non kin conspecifics, b) kin males of the same litter raised together and c) heterospecific males.

The hole-board experiment revealed the existence of an odour-based species recognition and preference in all three hamster species. In the habituation test males of all three species differentiated both between two unfamiliar non kin and two kin conspecifics. The discrimination of heterospecific males only appeared in *P. sungorus* and *P. campbelli*, but not in *P. roborovskii*. The reason therefore could be in the evolution of the genus with earlier separation and higher genetic distance of *P. roborovskii* compared to the two other *Phodopus* species.

Transitive inference in greylag geese

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The social complexity hypothesis posits that animals living in large, organized and complex groups have evolved enhanced cognitive abilities. Greylag geese possess complex social relationships, including social support in agonistic interactions, clan structures and an understanding of third party relationships. They form dominance hierarchies in which families typically dominate pairs and pairs dominate unpaired individuals. However, competition is costly and because it is unlikely that an individual will observe all possible agonistic interactions among flock members, the ability to infer relationships based on indirect and incomplete information may be highly advantageous. We tested five juvenile greylag geese for their ability to track multiple dyadic relationships and their transitive inference competence. Individuals were trained on a series of discriminations between successive pairs of five implicitly ordered colours (A - E). All individuals successfully learned to simultaneously track four dyadic relationships, i.e. to discriminate all colour pairs when presented in randomized order within a session. When presented with non-adjacent, transitive colours (B and D), birds chose the higher-ranking colour (B) above chance, thus showing that greylag geese are indeed capable of transitive inference. Our results add to the understanding of social complexity as an important selective pressure for the evolution of intelligence not only in primates, but in all social vertebrates.

Organisation of vigilance behavior at the individual and group level in redfronted lemurs (*Eulemur fulvus rufus*)

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Vigilance represents the most important anti-predator strategy for a variety of prey species. A gregarious lifestyle affords the benefit of collective detection through the many-eyes effect, leading to a decrease in an individual's investment in vigilance. Studies of vigilance are generally concerned with exploring this relationship between group size and vigilance rates. A mechanistic understanding of the rules individual animals use to achieve this group level behavior is lacking, however. In order to elucidate whether or not scanning is organised as a random process, we studied the organisation and structure of vigilance activity in redfronted lemurs (*Eulemur fulvus rufus*) analysing vigilance activity on the structural levels of individual and the group, respectively. Observations on four groups of redfronted lemurs were made between October and December 2008 in Kirindy Forest, western Madagascar. We used continuous focal animal sampling to record interscan intervals (ISI) within varying subgroup sizes. Spectral analyses of ISI-sequences were

used to test for sequential randomness across scans. Additionally, subgroups were video-recorded to identify bouts of collective vigilance and test for independent scanning between group members. We will present preliminary results on all these aspects.

Cinderella in Germany: parental investment in genetic and stepchildren

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In many cultures, fairytales and myths featuring evil stepmothers and lecherous stepfathers exist. Is there any truth to these tales? The corresponding Cinderella effect was first demonstrated in a Canadian population with respect parental abuse, neglect and infanticide. Subsequent studies revealed evidence for discrimination of stepchildren, compared to genetic children, in everyday kinds of parental investment in several other countries. The main aim of this study was to compare parental investment with respect to time and money between stepchildren and genetic ones in a German sample. Using the German Socio-Oeconomic Panel (GSOEP), which offers representative longitudinal micro data, we were also able to take additional, potentially confounding factors, such as a child's emotional status, maternal age and experience and the socio-economic situation of the family, into account. Our preliminary analyses confirm the central prediction of kin selection theory that parental investment into genetic offspring exceeds that for adopted ones.

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General Information

Coffee breaks

Coffee, tea and munchies are available free of charge to registered conference participants in the lobby during the official breaks.

Dinner

A joint dinner will be held for those who indicated their participation at registration on Friday evening. Details will be announced on Friday before the coffee break.

Lunch

Lunch is available in numerous restaurants, fast food joints and the University Mensa. Some suggestions can be found on the map at the end of this programme.

Posters

Poster authors can put their poster up beginning at 12:00h on Thursday. The necessary materials are available at the registration/information desk. Please remove your poster after the last session on Saturday at the latest.

Questions?

For further questions, contact the registration/information desk or any member of the organizing committee wearing a red nametag.

Registration

Registration will take place on Thursday, February 12 from 11.30h onwards in the lobby of the Albrecht-von-Haller Institute of Botany.

Sanitary facilities

Bathrooms are located next to the auditorium and can be accessed from the lobby.

Smoking policy

Smoking is prohibited in all public buildings. Ashtrays can be found outside the lobby.

Wardrobe

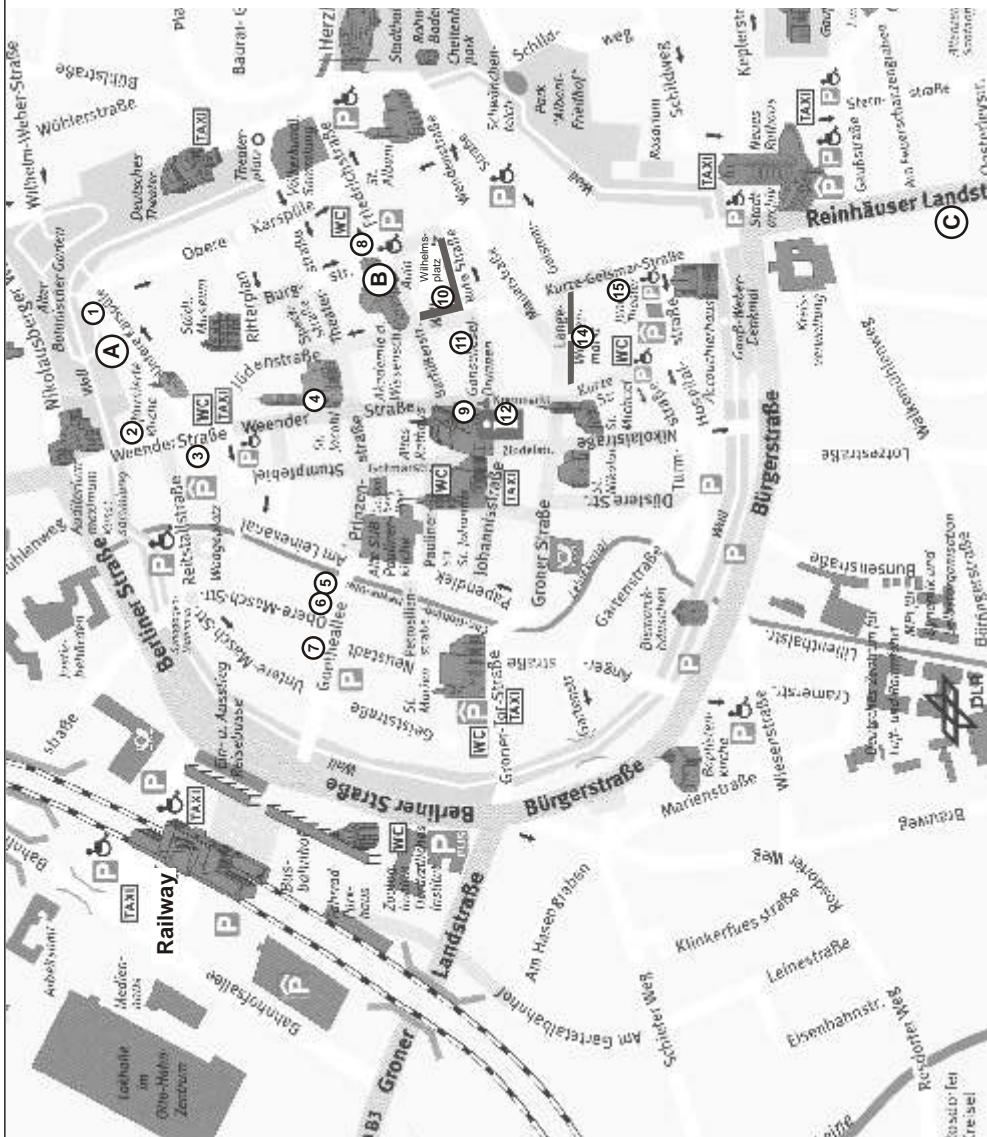
A large, unattended wardrobe is located outside the auditorium.

Social events

On Thursday evening (18:00h), conference participants are invited to the Charles Darwin birthday party and the inauguration of the CRC Evolution of Social Behavior at the Aula (Wilhelmsplatz), about 10 min by foot from the Botany institute. Bob Trivers, free beer and free food on one evening – can life offer anything better?

On Friday evening (19:30h), the official conference dinner will take place at the Eden Hotel. Your voucher entitles you to access to a buffet-style dinner; drinks are on you.

Taxis can be ordered by calling 69300.



Restaurants

- 1 Café Botanik (Untere Karspüle 1B)
- 2 Charly Max (Weender Str. 106)
- 3 Pinusa (Weender Str. 75)
- 4 Max L. (Weender Str. 58)
- 5 Mr. Jones (Goetheallee 8)
- 6 Kartoffelhaus (Goetheallee 8)
- 7 Anadolü (Goetheallee 11)
- 8 Inti (Burgstr. 17)
- 9 Ratskeller (Markt 9)
- 10 Mensa (Wilhelmsplatz 3)
- 11 Nudelhaus (Rote Str. 13)
- 12 Kreuzgang (Markt 7)
- 13 Z.A.K. (Am Wochenmarkt 22)
- 14 El Sol (Kurze Geismarstr. 9)

Conference Locations

- A Albrecht-von-Haller Institut für Pflanzenwissenschaften (Untere Karspüle 2)
- B Aula (Wilhelmsplatz 1)
- C Eden Hotel (Reinhäuser Landstr. 22a)

4. Thementagung der Ethnologischen Gesellschaft

