



## FULL PROGRAMME

EUROPEAN HUMAN BEHAVIOUR AND EVOLUTION ASSOCIATION  
Annual Conference, 29<sup>th</sup> March to 1<sup>st</sup> April 2015  
University of Helsinki

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# Welcome to the EHBEA 2015 conference in Finland!

We wish you a warm welcome to Helsinki, and are delighted to host the first EHBEA conference in a Nordic country.

At EHBEA conferences researchers applying evolutionary theory to human behaviour can meet and exchange ideas. We have contributions from behavioural ecology, evolutionary psychology, cultural evolution, sociology, anthropology, primatology and biology. The conference lasts for 3,5 days and will include six plenary talks, 48 regular and speed session talks, and 90 posters. We have done our best to provide a multidisciplinary, international forum within a sufficiently small-scale and cosy setting.

We thank the University of Helsinki for hosting a wine reception on Monday, and the Mayor of Helsinki for inviting all participants to the Tuesday wine reception. The conference ends with the traditional conference dinner on Wednesday (tickets still available through the organisers).

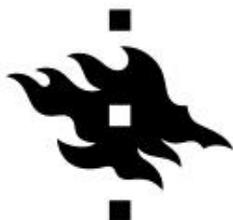
We wish to thank our generous sponsors: Wenner-Gren Foundation, Otto A. Malm foundation, The Galton Institute, Kone foundation, and the Federation of Finnish Learned Societies.

We are very grateful to Rafael Wlodarski and Slidemanship.com for the conference logo and poster. Circus Helsinki will be responsible for most of the surprises.

We hope you enjoy the conference and your stay in Helsinki!

## *The local organisers*

Venla Berg	Mirkka Danielsbacka	Markus Jokela	Ilmari Määttänen	
	Kristiina Janhunen	Essi Kaartinen	Liisa Keltikangas-Järvinen	
Sonja Koski	Michael Laakasuo	Minna Lyons	Anna Rotkirch	Antti Tanskanen



UNIVERSITY OF HELSINKI



Väestöliitto

## Practical information

### **VENUE**

Events are at the University of Helsinki Main building, Fabianinkatu 33, unless otherwise indicated, with Plenaries, individual Sessions and Parallel Sessions A in the Small Hall in the 4th floor, and Parallel Sessions B in Lecture room 13 on the 3rd floor.

Posters are situated in the 2nd floor lobby.

Lunch, coffees and teas are served in the lobby outside the Small Hall, 4th floor.

### **TWITTER**

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### **FULL PROGRAMME & ABSTRACTS APP**

[www.guidebook.com/getit](http://www.guidebook.com/getit)

event: EHBEA 2015, Helsinki

redeem code: vdmw7ohi

### **WEBSITES**

[www.ehbea2015.org](http://www.ehbea2015.org)

[www.ehbea.com](http://www.ehbea.com)

### **NEED A BREAK?**

For your convenience, small lecture rooms have been booked for taking a break, having small meetings, etc.:

Monday, March 30th

Lecture room 11 (3rd floor)

8 am – 7 pm

Tuesday, March 31st

Lecture room 9 (3rd floor)

8 am – 12

Lecture room 17 (4th floor)

12 – 7 pm

Wednesday, April 1st

Lecture room 11 (3rd floor)

8 am – 7 pm

## **UPLOADING THE PRESENTATIONS**

If you are giving a talk, please go to your assigned lecture room in the *morning of your talk*, before the programme starts, 8.30–9.00 am, to upload your presentation to the lecture room computer. There will be someone to assist you.

## **LOST?**

Information desk outside the Small Hall (4th floor) from Monday morning till Wednesday evening.

## **VOTING**

You can vote for the Best Student Presentation and for the Best Poster. Fill in your ballot and put it in the respective box by the Information desk.

## **CONTACT INFORMATION**

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*Antti Tanskanen*, Department of Social Sciences, University of Helsinki

The conference is organised by the Psychology unit at the University of Helsinki and the Population Research Institute at Väestöliitto.

# EHBEA 2015, Programme at a Glance

## Saturday, March 28<sup>th</sup>

- 9:00- **Pre-conference Satellite meeting: *Evolutionary Developmental Biology***  
16:00 Fabianinkatu 33, 2<sup>nd</sup> floor, Runeberg  
18:30 *Student get-together* with films, Gustavus Rex, 18:30, Leppäsuonkatu 11

## Sunday, March 29<sup>th</sup>

- 15:00 Registration opens (Main building, Entrance, 1<sup>st</sup> floor)  
Posters put up (Main building, 2<sup>nd</sup> floor)  
16:30 **Opening ceremony** (Great Hall, Unioninkatu 34, 2<sup>nd</sup> floor))  
17:00 **Plenary I**, Melissa Hines: *How does testosterone influence development of the human brain and human behaviour*. Chair: Anna Rotkirch  
18:00 *Wine reception* (outside Great Hall)

## Monday, March 30<sup>th</sup>

- 09:00 **Plenary II**, Oliver Schülke: *Monkey bromance – how and why males form close social bonds*
- 10:00 **Session 1: Primate intelligence**  
Forss *Testing the cultural intelligence hypothesis in orangutans*  
Sanchez *Strategic decision-making by chimpanzees in a Snowdrift-Game*  
Chair for Plenary II and Session 1: Carel van Schaik
- 10:50 *Coffee & tea*
- 11:20 **Speed session 2: The human family and maturation**. Chair: Rebecca Sear  
Moore *The reproductive strategies and partner choice of female breadwinners: an analysis of historical records*  
DeBruine *Testing competing hypotheses for the link between parents and partner's eye colour*  
Harju *Conditional Love: adult investment in children as a function of the number of children and the degree of relatedness to these children.*  
Saxton *Familial influences on individual differences in partner preferences*  
Lobmaier *Increased affiliation motivation during the luteal menstrual cycle phase: evidence from a fEMG study*  
Hõrak *Pathogen control accelerates pubertal but not early growth: evidence from the anthropometric study of Estonian schoolgirls born 1938-1953*
- 12:20 *Lunch*

- 13:10 **Plenary III** Beverly Strassmann: *Religious control of sexuality increases paternity certainty*
- 14:10 **Session 3: Religiosity and moral ideas**  
 Baumard *Increased affluence explains the emergence of ascetic wisdoms and moralizing religions*  
 Shultz *Costly religious behaviours are predicted by communal benefits*  
 Chair for Plenary III and Session 3: Louise Barrett
- 15:00 *Coffee & tea*  
*Parallel sessions 4A (Small Hall) and 4B (Lecture room 13, 3<sup>rd</sup> floor)*
- 15:30 **Session 4A: Fairytales and myths** Chair: Max van Duijn  
 King *Regiments of monstrous women: myth and horror characters as a window into life history theory*  
 Tehrani *Long stories: comparative phylogenetic analyses uncover the ancient origins of Indo-European folktales*
- 15:30 **Session 4B: Conformity and homogamy**  
 Chair: Tamsin Saxton  
 Fieder *The evolutionary potential of human homogamy*  
 Miu *Emergent conformity in cumulative culture*
- 16:20 *break*
- 17:15 **Poster session I** Unchaired by Ursula
- 18:30 *Wine reception hosted by the Rector of the University of Helsinki*

**Tuesday, March 31<sup>st</sup>**

- 09:00 **Plenary IV**, Chris Kuzawa: *Measuring the costs of human brain development: new insights into the evolution of a slow and prolonged childhood*
- 10:00 **Session 5: Biosocial development**  
 Orquin *A meta-analysis of blood glucose effects on human decision making*  
 Barthes *Does kin selection promote male homosexual preference in non-Western societies? Insights from Indonesia*  
 Chair for Plenary IV and Session 5: Daniel Nettle
- 10:50 *Coffee & tea*
- 11:10 **Poster session II**
- 12:10 *Lunch*
- 13:00 **Plenary V**, Wil Roebroeks: *The peopling of Pleistocene Europe – with or without fire?*  
 Chair: Gillian Brown

*Parallel speed sessions 6A (Small Hall) and 6B (Lecture room 13, 3<sup>rd</sup> floor)*

14:00 **Speed session 6A: Life history theory and strategies** Chair: Oskar Burger

Berg *Birth intervals between siblings and the risk of parental divorce*

Proske *Incidence, not duration, is the essential evolved feature of the human post-reproductive lifespan*

Thomas *Saami reindeer herders prefer cooperation with social group members over genetic kin*

Uggla *Life history decisions predict preventable mortality in Northern Ireland*

Willführ *Reproductive behavior of landless agricultural workers, small farmers, and the economic elite in the historical Krummhörn region*

14:00 **Speed session 6B: Prosociality and cognition** Chair: Masanori Takezawa

Dessart *Loud signals of prosociality and wealth: a case of dishonest superstimuli*

Ferdinand *A cognitive basis for cultural drift*

Magid *Cultural transmission and evolution of psychological traits in Bengali migrants to the UK*

Firat *The moral crisis of racial cognition in the human brain*

Launay *The icebreaker effect: Singing together creates faster social bonds*

15:00 *Coffee and tea*

*Parallel sessions 7A (Small Hall) and 7B (Lecture room 13, 3<sup>rd</sup> floor)*

15:30 **Session 7A: The evolution of art and language** Chair: Minna Lyons

15:30 Honkola *Isolation mechanisms and linguistic divergence: microevolutionary perspective*

Nelson *A method for predicting the sex of hand stencilers, with incidental insights into creative behavior*

Sarti *Discriminations and stereotypes in Italy (1922-2013). A cultural evolutionary approach*

**Session 7B: Family dynamics** Chair: Caroline Uggla

15:30 Larmuseau *Insights in the range of historical extra-pair paternity rate in Western Europe.*

Lawson *Is polygyny a harmful cultural practice? Marriage, ethnicity and child health in Northern Tanzania*

Sear *Parental absence and age at first birth in Sweden: does the timing of absence matter?*

16:50 *Student evening out (gather at the entrance, 1<sup>st</sup> floor)*

18:30 *Wine reception hosted by the Mayor of Helsinki, City Hall*

**Wednesday, April 1<sup>st</sup>**

09:00 **Plenary VI**, Gert Stulp (New Investigator Award): *Evolutionary Adaptations and Unexplored Assumptions: questioning the mismatched stone-age mind*

10:00 **Session 8: Evolution and cognition**

Barrett *Extending evolutionary psychology: why 4E cognition is more than just the icing on a paleo cupcake*

Järvelä *Detecting signatures of positive selection associated with musical aptitude in the human genome*

Chair for Plenary VI and Session 8: Susanne Shultz

10:50 *Coffee & tea*

11:20 **Speed session 9: Cooperation and risk-taking** Chair: Nicolas Baumard

Foa *Human nature and the state*

Jarecki *Process tracing across evolutionary domains: A novel view on risky choice*

Rauwolf *The evolution of the impact bias: optimizing affective forecasts for choice in noisy environments*

Rusch *What makes people go to war? Defensive intentions motivate retaliatory and preemptive intergroup aggression*

Szabó *Mindreading and Machiavellianism: manipulative tactics in focus*

12:20 *Lunch*

*Parallel sessions 10 A (Small Hall) and 10B (Lecture room 13, 3<sup>rd</sup> floor)*

13:10 **Session 10A: Mate attraction** Chair: Lisa De Bruine

Wlodarski *The possible functions of romantic kissing*

Havlicek *The spandrels of Santa Barbara and the peri-ovulation paradigm*

Das *The attraction of the city: Female rural-urban migration in the Netherlands*

13:10 **Session 10B: The origin and development of social structure** Chair: Michael Stirrat

Burkart *Tracing the evolutionary origin of human hyper-cooperation*

David- *"Here and Now" - social cognition*

Barrett

Debove *"Just deserts": partner choice explains the evolution of meritocratic preferences in humans.*

14:25 *Coffee and tea*

15:00 **Session 11: Let's dance!** Chair: Sonja Koski

Clark        *Body moving: assessing body attractiveness using static and dynamic stimuli*

Tarr         *Let's dance! The role of synchrony and exertion in social bonding during group movement'*

16:00 **EHBEA Annual General meeting (Small Hall)**

19:00 *Conference dinner* (with separately sold tickets only, 40 / 70 €, Ravintola Pörssitalo, Fabianinkatu 14)

*Dancing* (Navy Jerry's, Hietaniemenkatu 2)

## Plenary speakers and abstracts

**PLENARY I, Sunday March 29<sup>th</sup> at 17:00, Great Hall**

**Melissa Hines**

University of Cambridge

### *How does testosterone influence development of the human brain and human behaviour?*

#### *Abstract*

Thousands of experimental studies in non-human species have documented the important role of testosterone in sexual differentiation of the mammalian brain and subsequent behavior. Early exposure to testosterone also influences the development of gender-related human behaviors, contributing to behavioral differences between the sexes, as well as individual differences within each sex. Other factors, such as postnatal socialization and processes related to cognitive understanding of gender also are important for human gender development, however, and the different types of factors combine in different ways to influence specific gender-related characteristics. Conclusions include: 1. Testosterone contributes to the development of gender-related differences in the human brain and human behavior. 2. Neurobehavioral sexual differentiation is multi-dimensional, and different gender-related characteristics are subject to different combinations of influences; 3. The brain has multiple gendered elements, some of which might be more or less male-typical while others are more or less female-typical, and these can change over time.

#### *About*

Professor Hines has conducted groundbreaking research on gender development, with a particular interest in the factors that lead to sex-typical behavior in childhood. She is interested in how prenatal influences, such as exposure to gonadal hormones, interact with postnatal influences, including external socialization and self-socialization, to shape brain development and behaviour. Current research includes studies of individuals exposed to atypical hormone environments during prenatal or neonatal development, because they have disorders of sex development (formerly called intersex conditions), as well as studies measuring normal variability in the early hormone environment and relating this to later gender-related behavior. She also is interested in animal models of human sexual differentiation, and has discovered that non-human primates show sex differences in toy preferences similar to those seen in children.

**PLENARY II. Monday March 30<sup>th</sup> at 9:00, Small Hall**

**Oliver Schülke**

Göttingen University, Germany

### *Monkey bromance - how and why males form close social bonds*

#### *Abstract*

A bromance is a relationship between two men who spend a great deal of time together. Male mammals usually compete directly over access to mating partners and are thought to overcome competition and to form affiliate relationships only, if they are philopatric as in humans or chimpanzees. Dispersing male macaques have now been shown to form affiliative relationships that are strong, enduring, and equitable like those of male chimpanzees and human friends. Observational studies and time series analyses suggest that male macaques maintain a form of mental representation of these bonds, likely mediated by the oxytocinergic system, that the strength of social bonds predicts the formation of political coalitions among males, and that these coalitions affect male dominance status, which finally translates into enhanced paternity success. Broad-scale phylogenetically controlled comparative analyses suggest that male within-group coalitions are used more frequently and to a greater effect in species with reduced male competition like humans. Apart from their role in status acquisition and maintenance strong social bonds among males may also affect fitness via health. The stronger a macaque male's social bonds are the weaker his glucocorticoid response to increasing stressor levels. Thus, close social bonds buffer males against the adverse effects of chronically increased physiological stress. A monkey bromance seems to entail more than spending a lot of time together, it may be an emotionally mediated bond that conveys trust and support, buffers against social stress, and has consequences for reproductive success.

#### *About*

Primatologist Oliver Schülke studies the evolution of social relationships, or patterns of cooperation and conflict between individuals living in the same and in different groups. He currently investigates the costs and benefits associated with supporting another individual in terms of survival and differential reproduction, and particularly in the effects of accumulative, long-term effects of repeated interactions among the same individuals. Schülke is involved in a field study of wild macaques that has been conducted since 2005.

**PLENARY III, Monday March 30<sup>th</sup> at 13:10, Small hall**

**Beverly Strassmann**

University of Michigan, USA

### *Religious control of sexuality increases paternity certainty*

#### *Abstract*

The world religions (e.g., Buddhism, Christianity, Hinduism, Islam, and Judaism) attempt to regulate sexuality through shared belief systems that have important commonalities. My talk will explore these commonalities and argue that they serve the function of preventing male uncertainty over the paternity of offspring. Further, I will use data from the Dogon of Mali to test the hypothesis that religions that more strongly regulate female sexuality are more successful at achieving this biological goal. The Dogon have four religions: the indigenous one, Protestantism, Catholicism, and Islam. Using data on 1,706 father-son pairs, my collaborators and I compared paternity certainty by religion while controlling for confounding variables such as year of birth. We found that males in the indigenous religion had a significantly lower probability of cuckoldry (1.3% versus 2.9%) by enforcing women's attendance at menstrual huts. When a woman shows up at the menstrual hut, it is clear that she has come out of lactational amenorrhea (lasting about 20 months, on average) and will soon conceive. Dogon males reciprocate in mate guarding each other's wives and the menstrual huts are located in full view of public places, especially the men's shade shelters. The results of this study demonstrate that paternity certainty is high in the Dogon despite the absence of contraception and abortion. They also help to understand the ubiquity of religious patriarchy. This research was supported by National Science Foundation Grant BCS 0509019.

#### *About*

Professor Strassmann is well-known for her critique of the cooperative breeding hypothesis and her anthropological studies of the effects on of family structure on child development. She conducts a longitudinal study in the Dogon of Mali, West Africa. Strassmann's work also focuses on kinship to explore the interaction between biology and culture. In particular she is interested in the genetic effects of cultural practices that constrain female sexuality, such as patrilineality and polygyny

**PLENARY IV, Tuesday March 31<sup>st</sup> at 9:00, Small Hall**

**Chris Kuzawa**

Northwestern University, USA

*Measuring the costs of human brain development: new insights into the evolution of a slow and prolonged childhood*

*Abstract.* Humans are unusual in having a childhood stage characterized by a prolonged period of exceptionally slow growth. Many hypotheses have been proposed to explain why humans have evolved this life history stage. In this talk, Kuzawa will discuss his and his collaborators' recent work that quantifies the costs of the human brain and uses this information to shed light on the evolution of human life history. Compiling data from brain imaging studies, they find that the costs of the brain do not peak at birth, when relative brain size is largest, but at 4-5 years of age, when the brain consumes the equivalent of 66% of the body's energy use at rest. This childhood peak in brain costs reflects the proliferation of energy-intensive synapses prior to experience-driven synaptic pruning. Consistent with the hypothesis of a brain-body growth trade-off, body weight growth velocity is strongly inversely related to brain glucose demands from infancy until puberty, and maximal brain glucose demands co-occur with slowest body weight gain. These findings provide rare empirical evidence that humans have evolved very slow body growth to free up energy for our unusually costly pattern of brain development. Because peak brain energy needs occurs after complete weaning from breastmilk, but at an age when the child remains heavily dependent upon parental or allomaternal provisioning, these findings also underscore the importance of flexible, socially-based buffering strategies as key to the evolution of the modern human pattern of brain development.

*About*

Professor Kuzawa is interested in developmental plasticity, the evolution of the human life history, and the application of evolutionary biology to issues of health. He is also well-known for his studies on the psychobiology of fatherhood, and has worked on several projects related to human brain evolution.

## PLENARY V

Wil Roebroeks, Tuesday March 31<sup>st</sup> at 13:00, Small Hall

Leiden University, the Netherlands

### *The peopling of Pleistocene Europe – with or without fire?*

#### *Abstract*

In the last decades our views on the Pleistocene occupation history of Eurasia have changed significantly, with an unambiguous presence of hominins now attested at around 1.8 million years ago in Dmanisi (Georgia) and at minimally 1.6 million years in northern China, i.e. much earlier than previously envisaged. In Europe, the earliest traces of a hominin presence come from the Mediterranean area and are more than one million years old, but these earliest sites are very rare. From about half a million years ago, hominin occupation of Europe seems to have been more continuous, with stone artefacts present in sediments deposited under warm-temperate as well as under colder environmental settings.

Most archaeologists would agree that the colonization of Eurasia, where temperatures at time dropped below freezing point, was tied to the use of fire - as already proposed by Charles Darwin. Yet the archaeological record suggests that early hominins moved into Eurasia without the habitual use of fire. It is only from 300,000 years ago onward, that the European archaeological record regularly contains traces of fire use, suggestive of hominins' ability to conserve and transport and to use fire during successive occupations. But what does that mean, how strong is that archaeological record? Would it have been possible to survive without fire in Pleistocene Europe? Are we looking at the right sites, at the right data to study early fire use? I will use this specific "fire"-debate to illustrate the character of the archaeological record - notoriously incomplete - and the problems archaeologists face when interpreting their data in terms of "grand narratives" about humanity's deep history.

#### *About*

Professor Wil Roebroeks is a leading expert in the field of the archaeology of early hominins, with a focus on Neanderthal studies. He has published widely on various aspects of the behaviour of extinct hominins, including their subsistence strategies, lithic technology and the environmental settings of their presence and absence in Eurasia. Roebroeks has conducted fieldwork in the Netherlands, in England, France, northeastern Russia and Germany. He is the Vice-President of the European Society for the Study of Human Evolution (ESHE).

**PLENARY VI, Wednesday April 1<sup>st</sup> at 9:00, Small Hall**  
**Gert Stulp (The New Investigator Award 2015)**  
London School of Hygiene and Tropical Medicine, UK

*Evolutionary adaptations and unexplored assumptions: questioning the mismatched stone-age mind*

*Abstract*

What sets Evolutionary Psychology apart from other (evolutionary) approaches to human behaviour is the idea that our brain consists of a large number of domain-specific adaptations or ‘functional specializations’. These adaptations are identified using a method of reverse engineering, which characterises recurring adaptive problems in our evolutionary past and then specifies the design features needed to solve such problems. One implication of this approach is that the adaptations so identified need not serve an adaptive function in the present day, and hence there is often a mismatch between our evolved psychology and modern human lifestyles. Here, I question these premises, suggesting that a mismatch must be established empirically, rather than assumed, and that the process of reverse engineering is anything but straightforward. In addition, I suggest that a strongly adaptationist perspective has some undesirable consequences, including devaluing studies of present-day behaviour and those demonstrating current adaptiveness, and not appreciating fully the influence of (social) learning and how culture fundamentally shapes the brain. I conclude that the functional perspective used by Evolutionary Psychology is preferable over psychological theories that lack such a perspective, but that ideas of domain-specific adaptations and mismatches should be given much less weight. In so doing, EP would complement, rather than oppose, other (evolutionary) theories of human behaviour.

*About*

Gert Stulp is a behavioural biologist by training and has worked extensively on natural and sexual selection in relation to height in contemporary human populations. More recently, he has been investigating fertility decisions by humans in contemporary western populations, and investigating the extent to which behaviour can be considered maladaptive or mismatched relative to ancestral human environments.

## Talk abstracts

Talks are listed in Session order.

Remember to vote for Best Student Presentation! Student talks are indicated after the title.

Monday, March 30<sup>th</sup>

### **10:00 Session 1: Primate intelligence**

Chair: Carel van Schaik

#### **10:00 Testing the cultural intelligence hypothesis in orangutans (Student talk)**

**Sofia Forss**, Anthropological Institute & Museum, University of Zurich, sforss@yahoo.com  
Laura Damerius, Anthropological Institute & Museum, University of Zurich; Caroline Schuppli, Anthropological Institute & Museum, University of Zurich; Carel van Schaik, Anthropological Institute & Museum, University of Zurich

In order to explain human intelligence we need to understand its presence and causal mechanisms in animals. Here we present a study investigating the cultural intelligence hypothesis by using orangutans as a model taxon. Because intelligence is largely constructed developmentally, the cultural intelligence hypothesis focuses on the social inputs and opportunities for interacting with the physical environment during ontogeny. It predicts that the more of such inputs an individual experiences, the more learned skills it acquires, but also the better it gets at solving problems. This prediction can be tested at developmental and evolutionary time scales. First, the developmental perspective predicts differences between individuals depending on exposure to social learning experienced during a lifetime. Data from wild orangutans strongly support this idea in that more gregarious populations possess more enhanced skill sets and innovations. Moreover, is it supported by the difference we are observing between wild and captive orangutans, the latter exposed to artificially high social density as well as human social inputs. Second, from a evolutionary perspective species with systematically richer social environment may over time evolve to become more intelligent, reflected by larger brain size. We performed an across zoo study on two closely related species; Sumatran, *Pongo abelii* (N=19) and Bornean, *Pongo pygmaeus* (N=16). The homogenous and similar environmental conditions provided by zoos should allow us to detect any intrinsic differences between these two species. At eight European zoos mother-reared orangutans were examined on their novelty response as well as their cognitive performance, in the form of a set of tasks assessing problem solving ability. Results suggest an intrinsic difference in how the two pongo species apply their learning ability, with Sumatrans being more likely to show necessary problem solving skills. Thus *Pongo abelii* may have experienced higher selection on learning mechanisms.

#### **10:25 Strategic decision-making by chimpanzees in a Snowdrift-Game. (Student talk)**

**Alejandro Sanchez Amaro**, Comparative and Developmental Psychology, Max Planck Institute for Evolutionary Anthropology, alex\_sanchez@eva.mpg.de

Shona Duguid, Comparative and Developmental Psychology, Max Planck Institute for Evolutionary Anthropology;  
Josep Call, School of Psychology and Neuroscience, St Andrews University;  
Michael Tomasello, Comparative and Developmental Psychology, Max Planck Institute for Evolutionary Anthropology

Social primates must be able to coordinate with others, even when there are conflicts of interest. The “Snowdrift-Game” provides a model to study decision-making in such situations. By investigating whether and how chimpanzees solve these dilemmas we can gain insight into the evolutionary history of human cooperation in the context of a conflict of interest. Methods: We presented pairs of chimpanzees with two different Snowdrift games. In Experiment 1 subjects could provide equal food rewards to themselves and a partner by pulling a weighted tray in high and low weight trials either by cooperating (pulling together) or free-riding (letting a partner pull), with the risk that if both tried to free-ride the food was lost. In Experiment 2 subjects were faced with an unequal reward distribution. Similarly to Experiment 1, in the critical condition the higher reward was acquired by letting a partner act with the risk that if neither acted the rewards would be lost. Results: In both experiments chimpanzees were highly successful at solving the dilemma. They almost never lost the rewards because at least one partner was willing to pay the cost (increased effort or decreased rewards) to avoid coordination failure (no reward). In Experiment 1 chimpanzees solved the game by cooperating in 70% of trials. They were more likely to cooperate in high cost (high weight) condition, but cooperation in this situation was also likely to be more unequal (one partner invested more effort). In Experiment 2, subjects waited longer for their partner to act when this would lead to a higher reward. Conclusion: These results suggest that chimpanzees strategically maximize their gains while maintaining successful coordination.

...Monday, March 30th

**11:20 Speed session 2: The human family and maturation**

Chair: Rebecca Sear

**11:25 The reproductive strategies and partner choice of female breadwinners: an analysis of historical records**

**Fhionna Moore**, Psychology, University of Dundee, f.moore@dundee.ac.uk  
Ethan Lumb; Charlotte Elliot; James McIntosh

While it is becoming increasingly clear that both biological sex differences and the allocation of men and women to gendered social roles contribute to sex differences in reproductive decision making, it is difficult to disentangle the relative contribution of each. We explored reproductive decision making (e.g. age difference between self and spouse, number of children, age at first child) from historical census records for a sample of women living in Dundee, Scotland, during the 19th and early 20th Centuries. This was an interesting time for our purposes, as rapid industrialisation of the jute mills meant that working class women became the primary breadwinners within families who were living under extremely harsh conditions. Our preliminary results suggest that, amongst working class women, (a) those who were primary breadwinners had a smaller age difference between themselves and their spouse than those who were not breadwinners, (b) there was a trade-off between number of children and a proxy measure of child survival, and (c) there were trade-offs between employment status with number of children and age at first child. These patterns were not evident in a comparison group of middle class women. We interpret our results in light of reproductive trade-offs under varying degrees of environmental harshness, and argue that women's social roles (including employment status) contribute to their reproductive strategies and to sex differences in partner choice.

**11:34 Testing competing hypotheses for the link between parents and partner's eye colour**

**Lisa DeBruine**, Institute of Neuroscience and Psychology, University of Glasgow,  
lisa.debruine@glasgow.ac.uk  
Benedict Jones, Institute of Neuroscience and Psychology, University of Glasgow;  
Anthony Little, Psychology, University of Stirling

Testing competing hypotheses for the link between parent's and partner's eye colour. Studies showing a positive relationship between the phenotypes of an individual's partner and their other-sex parent have been interpreted as supporting positive sexual imprinting-like effects, where individuals are more likely to choose mates with the physical characteristics of their other-sex parent as the result of experience. This interpretation has been strongly criticised because the same mating pattern could also be caused by sex-linked heritable preferences, where similarity in appearance between an individual's partner and their other-

sex parent is caused by similarity in preferences between the individual and their same-sex parent. This latter hypothesis has never been directly tested, but would be supported if partner-parent similarity was stronger for maternal traits among male individuals and for paternal traits among female individuals, regardless of the sex of the individual's partner. By contrast, the imprinting hypothesis would be supported if partner-parent similarity was stronger for maternal traits among individuals with female partners and for paternal traits among individuals with male partners, regardless of the sex of the individual.

Methods: Three hundred individuals (75 women with female partners, 75 women with male partners, 75 men with female partners and 75 men with male partners) reported their mother's, father's and partner's eye colour. All participants had grown up with both of their genetically related parents. Following previous studies, data were analysed using logistic regression models with both binomial and ordinal coding of eye colour. Results: Analyses supported the positive sexual imprinting hypothesis. Partner eye colour was predicted by maternal, but not paternal, eye colour among participants with female partners and by paternal, but not maternal, eye colour among participants with male partners, regardless of the sex of the participant.

Conclusions: Our results provide clear evidence against the sex-linked heritable preference hypothesis, and are compatible with the positive sexual imprinting hypothesis of the relationship between parental and partner's eye colour.

### **11:43 Conditional Love: adult investment in children as a function of the number of children and the degree of relatedness to these children (Student talk)**

**Christopher Harju**, Psychology, Åbo Akademi University, charju@abo.fi  
Jan Antfolk, Psychology, Åbo Akademi

Adults commonly invest emotional and actual resources in the rearing of children and children benefit largely from this investment. Not all such investment is directed from a parent to a biological child. Adults also invest in other young relatives (e.g. nieces and nephews) and non-relatives (e.g., non-biological children and friend's children). However, evolutionary theory suggests that certain constraints limit and shape the amount of investment an adult directs to a child.

Method: In a study of 1,056 Finnish adults we investigated whether the degree of relatedness to a child and the certainty of this relatedness was associated with the willingness to invest in a child. We also investigated whether the number of children a parent has is associated with the willingness the parent has to invest (emotionally and financially) in one given child.

Results: We found that relatedness was positively associated with a willingness to invest in a child. For biological relatives the certainty in relatedness also was positively associated with investment. For non-biological children we found that the willingness to invest was low for step- and foster children, but high for adopted children. Finally, we also that the number of children a parent had was negatively associated with the willingness to invest in a child.

Conclusions: We conclude that both the number of biological children and the degree and the certainty of relatedness to these children have strong effects on the willingness to invest in children. We discuss the implications of these findings.

## 11:52 **Familial influences on individual differences in partner preferences**

**Tamsin Saxton**, Psychology Department, Northumbria University,  
tamsin.saxton@northumbria.ac.uk  
Catherine Steel, Psychology Department, Northumbria University;  
Katie Rowley, Psychology Department, Northumbria University

Much research has documented that people's face preferences vary, but the emergence of these differences is less well understood. This pair of studies aimed to investigate how specific developmental phases and experiences may be instrumental in the formation of individual differences in face preferences in adulthood.

**Methods:** Study 1 made use of the established finding that people select partners who resemble their opposite-sex parent, especially if they are close to that parent. It tested whether this preference for parent-similar features arises during a specific developmental phase, by contrasting women's reported closeness at different developmental phases against those women's preferences for partners who resembled their parents. Study 2 tested whether women select partners who resemble their brothers. It also investigated whether any perceived similarity depends on whether the brother is younger or older than the woman, because younger siblings are thought to be more reliably detected as close kin and thus as inappropriate sexual partners through maternal perinatal association.

**Results:** Study 1 found that women's closeness to their parents after menarche predicted preferences for partners who looked more like their parents, whereas closeness prior to menarche predicted preferences for partners who looked less like their parents. Study 2 found that women select partners who resemble their brothers; there was no evidence that this effect was weaker in relation to younger than older brothers.

**Conclusion:** Experiences during specific childhood and adolescent developmental periods may have longstanding effects on individual differences in human facial preferences. These results indicate a possible interplay of positive and negative sexual imprinting that may arise from adaptations to promote optimal outbreeding.

## 12:01 **Increased affiliation motivation during the luteal menstrual cycle phase: evidence from a fEMG study**

**Janek Lobmaier**, Institute of Psychology, University of Bern, janek.lobmaier@psy.unibe.ch  
Vanda Lory, Institute of Psychology, University of Bern;  
Fabian Probst, Institute of Psychology, University of Bern

Facial mimicry describes the unintentional imitation of another person's facial displays and allegedly assists in understanding how others feel. At the same time it can signal empathy and compassion towards a counterpart. We tested whether facial mimicry is modulated by the female menstrual cycle phase. Given that increased progesterone levels during the luteal phase underlie increased social monitoring, we expect that women show more facial mimicry during the non-fertile luteal phase than during the late follicular phase.

**Methods:** We measured zygomaticus major and corrugator supercillii activation in 50 naturally cycling women while they viewed short video clips of 8 male and 8 female actors each showing happy, angry, and neutral expressions. Each woman was tested twice, once near ovulation and once during the luteal cycle phase. The order of testing sessions was

counterbalanced across participants and ovulation was determined using ovulation test strips. We additionally measured salivary estradiol, progesterone and testosterone levels to ascertain whether hormone levels could predict facial mimicry.

Results: We found that during the luteal phase (when progesterone levels are high) women mimicked more than near ovulation. This was especially true for zygomaticus activation in response to happy expressions.

Discussion: Women show increased facial mimicry of positive emotions during the luteal phase. Because during the luteal phase women's bodies prepare themselves for possible pregnancy, increased mimicry of positive emotions may be a part of an adaptive biological mechanism to protect foetal development.

Conclusions: These findings suggest that increases in progesterone during the luteal phase may be linked functionally with unintentional social mirroring which in turn may signal increased affiliation motivation. This behaviour may have evolved to maximize benevolent demeanours towards women during the vulnerable luteal phase and during pregnancy.

### **12:10 Pathogen control accelerates pubertal but not early growth: evidence from the anthropometric study of Estonian schoolgirls born 1938-1953**

**Peeter Hõrak**, Department of Zoology, University of Tartu, horak@ut.ee  
Markus Valge, Institute of Psychology, University of Tartu

Anthropometric traits are informative about resource-allocation trade-offs that are mediated by nutritional, hormonal and health state during growth. We asked how various anthropometric measures were affected by different kind of socioeconomic and biological stressors such as number of siblings, parental socioeconomic position (SEP), urban vs rural origin and postneonatal mortality (PNM), a proxy of disease burden in childhood.

Methods: We examined the dataset collected in an extensive anthropometric study of Estonian schoolgirls born between 1938 and 1953 and measured around the age of 16 (n = 1470). This period involved two opposite trends in economic and epidemiologic situation: increasing birth-time economic hardships during the war and particularly in the post-war period, and decreasing PNM since 1947.

Results: All measures of height (most strongly sitting height) were negatively affected by the number of siblings and positively by parental SEP, but these effects were weaker than the secular trend. Leg length (an indicator of pre-pubertal growth conditions) was independent of age and birth year while most of other traits, particularly measures of performance (skull volume, lung capacity and handgrip strength) showed acceleration. In all models, PNM at age 11 was better predictor of size parameters than birth year.

Conclusions: Our findings are of epidemiological relevance, showing that post-war reduction of disease burden affected pubertal growth more strongly than pre-pubertal growth. Our findings also imply that in the studied period, pathogens had stronger effect on growth and performance of schoolgirls than stress imposed by high number of siblings, low parental SEP and rural vs urban origin.

...Monday, March 30th

**14:10 Session 3: Religiosity and moral ideas**

Chair: Louise Barrett

**14:10 Increased affluence explains the emergence of ascetic wisdoms and moralizing religions**

**Nicolas Baumard**, Nicolas Baumard, Department of Cognitive Sciences, Ecole Normale Supérieure, nbaumard@gmail.com

Alexandre Hyafil, Department of Cognitive Sciences, Ecole Normale Supérieure;

Ian Morris, Classics, Stanford University;

Pascal Boyer, Psychology, Washington University

Increased affluence explains the emergence of ascetic wisdoms and moralizing religions. Between roughly 500 BCE and 300 BCE, three distinct regions, the Yangtze and Yellow River Valleys, the Eastern Mediterranean, and the Ganges Valley, saw the emergence of highly similar religious traditions with an unprecedented emphasis on self-discipline and asceticism and with otherworldly, often moralizing, doctrines, including Buddhism, Jainism, Brahmanism, Daoism, Second Temple Judaism, and Stoicism, with later offshoots, such as Christianity, Manichaeism, and Islam. This cultural convergence, often called the Axial Age, presents a puzzle: why did this emerge at the same time as distinct moralizing religions, with highly similar features in different civilizations? Methods: The puzzle may be solved by quantitative historical evidence that demonstrates an exceptional uptake in energy capture (a proxy for general prosperity) just before the Axial Age in these three regions. Results: Statistical modeling confirms that economic development, not political complexity or population size, accounts for the timing of the Axial Age. Conclusions: We discussed several possible causal pathways, including the development of literacy and urban life, and put forward the idea, inspired by life history theory, that absolute affluence would have impacted human motivation and reward systems, nudging people away from short-term strategies (resource acquisition and coercive interactions) and promoting long-term strategies (self-control techniques and cooperative interactions).

**14:35 Costly religious behaviours are predicted by communal benefits**

**Susanne Shultz**, Faculty of Life Sciences, University of Manchester,

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Tara Curry, Biological Sciences, University of Liverpool

Religious group membership confers numerous advantages to individuals through support and cooperation. These benefits are magnified where groups hold communal wealth and rely on communal labour. However, such groups are susceptible to invasion by free-riders. One way to minimise this risk is to demand members demonstrate honest, and costly, signals of membership and cooperative intent. Religious behaviours, including prayer, fasting, clothing, can be interpreted as costly signals as they are often time consuming and potentially

harmful. Previous work has demonstrated links between costly signals and longevity in 19th century collectivist communes (Sosis and Bressler 2003). Their inference was that groups with high signalling costs are better able to deter cheaters and are therefore more stable. In addition, we here predict that the pressure of free-riding, and hence costly signals, should increase both with group size and with conferred benefits. To test this, we used Sosis and Bressler's 19th century commune database to show that the number of costs imposed on members is correlated with communal, and particularly economic, benefits. Moreover, we demonstrate the same relationship between costly behaviours and communal benefits (e.g. accommodation, education, health care, servants, wealth) in English pre-Reformation abbeys. Using a path analysis we show the size of the abbey predicts the communal benefits, which in turn predict the degree of costly signals imposed on brothers. Moreover, larger and faster growing abbeys imposed higher costs but also conferred more benefits on members. These two datasets demonstrate that religious behaviours can be interpreted in an evolutionary cost-benefit framework, such that increasing group size both allows more communal wealth, but also creates greater temptation for parasitism of communal labour and wealth and potentially more difficulty in identifying free-riding individuals.

...Monday, March 30th

**Parallel sessions 4A and 4B**

**15:30 Session 4A: Fairytales and myths**

Chair: Max van Duijn

**15:30 Regiments of monstrous women: myth and horror characters as a window into life history theory**

**Robert King**, Applied Psychology, UCC, r.king@ucc.ie

This study (in press for *Evolutionary Behavioral Science*, 2015) aims to show universally recognized patterns of human socio-sexual interaction using a biological understanding. Stories allow humans to process virtual interactions of both past and possible futures in meaningful ways. A key debate is whether story telling per se has an adaptive function or whether it exists as a by-product of other human traits. Method Thematic analysis is used to analyze specifically female characters in folk tales, myths and horror stories. Result Archetypal female myth characters--their goals, concerns, threats they pose and opportunities they find--track the four major reproductive life history stages: puberty, mate selection, motherhood and menopause. Story telling is unisex and therefore unlikely to have adaptive function else it would give away potential reproductive strategic advantage. Conclusion A biological lens offers a non-reductive window into understanding human story telling. Although the acquisition of information by stories is a species-typical human trait, pleasure itself is not evidence of adaptation. Stories integrate experience into the biographies of eusocial humans.

**15:55 Long stories: comparative phylogenetic analyses uncover the ancient origins of Indo-European folktales**

**Jamie Tehrani**, Anthropology, Durham University, jamie.tehrani@dur.ac.uk

Sara Silva, Institute for Studies of Traditional Literature, New University of Lisbon

Ancient population expansions and dispersals often leave enduring signatures in the cultural traditions of their descendants, as well as in their genes and languages. Oral literatures have long been regarded as a potentially fascinating context in which to explore these legacies, going back to the Brothers Grimm. However, efforts to investigate the ancestral origins of traditional tales have been complicated by the lack of historical data and the impacts of more recent waves of diffusion. This study addressed these problems by using phylogenetic techniques of "virtual archaeology" to reconstruct patterns of inheritance in Indo-European folktale traditions and establish how far back they can be traced. Methods: Data for our study comprised 275 tales recorded in 48 Indo-European cultures. We used phylogenetic analysis and autologistic modelling to parse the contributions of inheritance from ancestral populations and diffusion between neighbouring societies. We then used likelihood-based methods of ancestral state reconstruction to estimate the contents of ancestral tale corpora

using a sample of language trees to incorporate phylogenetic uncertainty. Results: We discover strong evidence for the inheritance of a number of tales in each of the major clades in the Indo-European family, including two that can be traced back to a common Proto-Indo-European ancestor. Conclusions: Our findings suggest that, despite the magnitude of more recent influences on oral traditions, it is nevertheless possible to detect deep and coherent lineages of cultural descent and partially reconstruct the contents of ancient folktale corpora for which there is almost no literary evidence. On a broader level, the kinds of stories told in past societies can open a new window into their culture, complementing the perspectives offered by linguistic and archaeological reconstructions of Indo-European prehistory.

### **15:30 Session 4B: Conformity and homogamy**

Chair: Tamsin Saxton

#### **15:30 The evolutionary potential of human homogamy**

Martin Fieder, anthropology, University of Vienna, martin.fieder@univie.ac.at

Susanne Huber, anthropology, University of Vienna

Homogamy along traits such as body height, personality, education, or religion is very common in humans. The potential effects of homogamy on human evolution, however, have been considered to a lesser extent by evolutionary psychology. We therefore intend to show on basis of international census data (IPUMS) as well as data from the Wisconsin Longitudinal study and the Health and Retirement study that humans choose a homogamous mate because homogamy along some traits (for instance education and religion) has a strong influence on human reproduction (childlessness as well as number of children). We discuss the potential mechanisms underlying the effects of homogamy on reproduction such as a harmony among spouses, stability of relationships, as well as the onset of reproduction. Furthermore we highlight the evolutionary consequences of human homogamy from a population genetics perspective, as increased reproduction owing to homogamy of any trait with a genetic basis is expected to spread the frequency of this allele. Therefore homogamy may help to explain the rapid evolution of some human traits.

#### **15:55 Emergent conformity in cumulative culture (Student talk)**

**Elena Miu**, School of Biology, University of St Andrews, em95@st-andrews.ac.uk

Ned Gulley MathWorks, Natick, MA, USA;

Luke Rendell, School of Biology, University of St Andrews

Cumulative culture, the ability to progressively build on the achievements of others, is an important aspect of human uniqueness, but its dynamics are still poorly understood in anything beyond simple laboratory experiments. We aimed to study its dynamics in a realistic setting with a large-scale dataset collected over a 15 year period.

Methods: We analyzed the evolution of content and performance in a sample of 48000 entries submitted to 20 computer coding competitions. Entries were completely public, so

participants could submit a novel solution, modify an existing one, or submit any combination thereof. Contests were microcosms of cumulative cultural evolution encapsulated, with all activity recorded, but complex enough to produce genuine cumulative cultural evolution. We measured the flow of new and copied information over time, and similarities between submitted entries.

Results: Solutions improved over time in all contests, with collections of entries exhibiting collective improvement in performance. As solutions improved, the diversity of lines of code decreased, because contestants increasingly focused their efforts on tweaking the current leader. This was rational from the perspective of a contestant wishing to achieve the best score, as they took advantage of the efforts of the larger group of competitors who had worked on very similar solutions.

Conclusions: When complex solutions are built over time by cumulative culture, conformity can emerge simply as a consequence of direct bias, where individuals choose what to copy conditional only on the content of the cultural trait, without any regards to their model or any other socially predisposed biases. The question of whether this emergent conformity is adaptive remains open.

Tuesday, March 31st

**10:00 Session 5: Biosocial development**

Chair: Daniel Nettle

**10:00 A meta-analysis of blood glucose effects on human decision making**

**Jacob Lund Orquin**, Department of Business Administration, Aarhus University, jalo@badm.au.dk

Robert Kurzban, Department of Psychology, University of Pennsylvania

The academic and public interest in blood glucose has been increasing over the last decade and a prominent view suggests that higher levels of glucose function as brain fuel, enhancing self-control and cognition. To test this claim, we conducted a psychometric meta-analysis on the effect of blood glucose on decision making. We identified 42 studies relating to four dimensions of decision making: willingness to pay, willingness to work, time discounting, and decision style. Against the current understanding we do not find a uniform influence of blood glucose on decision making. Instead, we find that low levels of blood glucose increase the willingness to pay and willingness to work when a situation is food related, but decrease willingness to pay and work in all other situations. Low levels of blood glucose increase the future discount rate for food, i.e. decision makers become more impatient, and to a lesser extent increase the future discount rate for money. Low levels of blood glucose also increase the tendency to make more intuitive rather than deliberate decisions. However, this effect was only observed in situations unrelated to food. We conclude that blood glucose has domain-specific effects, influencing decision making differently depending on the relevance of the situation to acquiring food.

**10:25 Does kin selection promote male homosexual preference in non-Western societies? Insights from Indonesia (Student talk)**

**Julien Barthes**, Human evolutionary biology, Institute of Evolutionary Sciences of Montpellier, julien.barthes@univ-montp2.fr

Sara Nila, Department of Biology, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University, Indonesia;

Pierre-André Crochet, Evolutionary ecology, Center of Evolutionary and Functional Ecology, CNRS - Université de Montpellier - Université Paul-Valéry Montpellier - EPHE, France;

Bambang Suryobroto, Department of Biology, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University, Indonesia;

Michel Raymond, Human evolutionary biology, Institute of Evolutionary Sciences of Montpellier

Male homosexual preference (MHP), a classical evolutionary puzzle, is partially heritable, induces a reproductive cost and its prevalence is relatively important. It has been proposed that individuals with a MHP counterbalance reproductive costs through the transfer of

resources to kin, thereby improving reproductive success. However, this kin selection hypothesis is not supported in Western countries and Japan, although consistent evidence has been obtained in Samoa. New data from non-western societies are needed to further understand the role of kin selection in the evolution of MHP.

Methods: Here, data from Java (Indonesia) was obtained (52 heterosexuals and 50 MHP individuals) to examine and, for the first time, quantify the kin selection hypothesis.

Results: Consistent with the kin selection hypothesis, individuals reporting MHP displayed increased willingness to transfer resources towards nephews and nieces, and this willingness translated into actual behaviours, as individuals reporting MHP transferred more money to nephews and nieces. However, estimates of the inclusive fitness remained lower for MHP men compared with heterosexuals.

Conclusion: These results suggest that kin selection alone is insufficient to explain the maintenance of MHP, but could be considered as a cost modifier mechanism to reduce reproductive costs.

...Tuesday, March 31st

## Parallel speed sessions 6A and 6B

### **14:00 Speed session 6A: Life history theory and strategies**

Chair: Oskar Burger

#### **14:05 Birth intervals between siblings and the risk of parental divorce** (Student talk)

**Venla Berg**, Population Research Institute, Väestöliitto, venla.berg@vaestoliitto.fi

Markus Jokela, Psychology, University of Helsinki

Anna Rotkirch, Population Research Institute, Väestöliitto

Shorter time elapsed between the births of siblings is associated with perinatal complications, development of the children and reduced longevity of the parents, even in contemporary Western societies. Decreased parental longevity implies increased stress levels in parents with tightly spaced children, and this stress may affect marital relationship quality. We hypothesize that short birth intervals increase the risk of parental divorce. Data and methods The FINNFAMILY data is a compilation of national register data with a representative sample of Finns from birth cohorts of 1955, 1960, 1965, 1970, and 1975 (10,000 persons/cohort). For this study, we used parents with exactly two children who were both born in marriage (N=9,952, 53% women). Cox regressions were applied to study whether the interbirth interval of the two children was associated with parental risk of divorce in the next ten years after the birth of the second child (or up to the end of follow-up in 31st December 2012). The average follow-up time was 3242 (SD 866) days. Sex and age of parent, length of marriage at second birth, and birth cohort were controlled for. Results: As expected, short birth intervals increased the risk of divorce. Compared to parents with very short interbirth intervals (<18 months), parents with a birth interval between 24.01 to 30 months (hazard ratio = .78, p=.035), 30.01 to 36 months (HR = .68, p=.003), and 36.01 to 42 months (HR = .70, p=.010) had significantly lower risks of divorce. Conclusions: Studies of hunter-gatherers suggest that the species-typical birth interval of humans is circa three to four years, although there is much variation. In a modern Western society, for parents of two children, a birth interval around three or four years seems to be ideal with regards to duration of marriage.

#### **14:16 Incidence, not duration, is the essential evolved feature of the human post-reproductive lifespan** (Student talk)

**Beate Proske**, European Doctoral School of Demography, beate.proske@gmail.com

Oskar Burger, Anthropology, University of Kent;

Daniel Levitis, Biology, University of Southern Denmark

Evolutionary hypotheses regarding women's post-reproductive lifespan, (e.g., the Grandmother Hypothesis), have focused on explaining its putatively extraordinary duration. To investigate whether women's post-reproductive lifespan is actually driven by unusual

duration (as compared to the length of the overall lifecycle) we decomposed Post-reproductive Representation (PrR), a measure of the prevalence of post-reproduction, into Incidence (the proportion of adult women surviving to become post-reproductive) and Scaled Duration (the proportion of adult life-expectancy that is post-reproductive). Comparing various human populations to other primates, women are truly extraordinary in Incidence, but comparable to other primates (in safe environments) in Scaled Duration. Furthermore, Incidence is an excellent predictor of PrR across species, while Scaled Duration is not. Women's remarkable habit of surviving to become post-reproductive in large numbers, combined with the roughly exponential aging pattern seen across mammals, is sufficient to explain the remarkable prevalence of post-reproductive women. Attempts to explain that prevalence should increasingly focus on asking why evolution has shaped the human life-history such that so few women die during their reproductive years. Selective benefits of fertility, mothering and grand-mothering may all tend to decrease mortality of reproductive women and therefore increase the prevalence of post-reproductive females in human populations.

**14:27 Saami reindeer herders prefer cooperation with social group members over genetic kin** (Student talk)

**Matthew Gwynfryn Thomas**, Anthropology, University College London,  
m.thomas.10@ucl.ac.uk

Marius Warg Næss, Norwegian Institute for Cultural Heritage Research (NIKU), Fram Centre, Tromsø;

Bård-Jørgen Bårdsen, Norwegian Institute for Nature Research (NINA), Fram Centre, Tromsø;

Ruth Mace, Anthropology, University College London

An evolutionary interpretation of cooperative behaviours must ultimately include an increase the inclusive fitness of actors as well as recipients. At the proximate level, mechanisms for encouraging and maintaining cooperation include factors such as kin discrimination, limited dispersal as well as direct and indirect reciprocity. However humans are also known for co-operating with individuals who are not necessarily close relatives, and often in co-operative groups. Here, we aim to quantify the relative importance of kinship and social group membership as mediators of cooperative behaviour.

**Methods:** Using a modified, externally valid Dictator Game, we test whether indigenous Saami reindeer herders in Norway preferentially give gifts to genetic relatives or to members of their cooperative herding group (the "siida").

**Results:** Membership of the same siida strongly increased the odds of receiving a gift. Kinship had a small (and not statistically significant) effect, even for close relatives. Gifts were not preferentially given to younger family members.

**Conclusions:** These patterns suggest that social grouping can trump genetic factors in mediating cooperative behaviour in this population. This is likely due to the importance of herding groups in day-to-day subsistence.

#### 14:38 **Life history decisions predict preventable mortality in Northern Ireland**

**Caroline Uggl**a, Anthropology, University College London, caroline.uggla.09@ucl.ac.uk  
Ruth Mace, anthropology, University College London

The level of effort individuals put into their health varies greatly and results in large differences in risk of preventable mortality. Life history theory predicts that individuals should respond to ecological cues that shift the perceived fitness payoffs to health investment (somatic maintenance). Previous research on health-related behaviours has failed to isolate effects of various ecological factors, often relying on data aggregated at a high level without individual-level controls. Here we examine the role of multiple ecological cues (extrinsic mortality rate, morbidity, crime and adult sex ratio (ASR)) on preventable mortality over and above a number of important individual factors. Methods: We use census based data from Northern Ireland on nearly one million people to test the predictions that higher ward-level extrinsic mortality rate, morbidity, and crime rate should be associated with a higher risk of preventable death (accidents/suicides, alcohol-related death and death from other preventable diseases, analysed separately). We also examine whether a skewed sex ratio increases or decreases preventable mortality risk. Results: Ward-level extrinsic mortality rate and crime rate were positively associated with preventable mortality for younger men, particularly those with low socioeconomic position (SEP). We found no association between ASR and male preventable mortality, but some tentative evidence that a male-biased sex ratio was associated with higher risk of accidental death among younger females. Conclusions: Evidence of ecological effects on preventable mortality was found even with important confounders at the individual level (e.g. SEP), especially for young men. Our results indicate that it is crucial to consider effect heterogeneity, i.e. that effects of ecological cues might vary between individuals with different sex, age and access to resources. Implications for public health are discussed.

#### 14:49 **Reproductive behavior of landless agricultural workers, small farmers, and the economic elite in the historical Krummhörn region [East Frisia, Germany, 1720-1870].**

**Kai Willführ**. Max-Planck-Institute for Demographic Research, Germany, willfuehr@demogr.mpg.de  
Charlotte Störmer, University of Utrecht, The Netherlands

It is often observed among historical as well as among contemporary populations that reproductive success is associated with social rank. We investigate among the Krummhörn region [Northwest Germany, 1720-1850] how reproductive behavior of different social strata was affected by their social status and by short-term fluctuations in socioeconomic conditions.

Data & Methods: The historical population of the Krummhörn can be characterized as a non-industrialized, early capitalist agricultural society. Around 70 percent of the families had either no land or owned farms too small to ensure subsistence, and therefore worked on the big farms owned by the families of the economic upper class. Poisson and Cox regression models are used to analyze the age at first reproduction, fertility, the sex ratio of the offspring, sex-specific infant survival rates, and the number of children. In addition, we investigate how fluctuations in crop prices affect seasonal-specific infant mortality and

fertility. We also include information about the seasonal climate that may have an effect on crop prices as well as on infant mortality via other pathways.

Results: We find that reproductive success was correlated with social rank. Individuals from high-ranking families had a higher number of surviving children due to higher birth numbers, not lower child mortality. We also find that social strata-specific constraints were important factors: birth rank and sex-specific reproductive values affected both infant mortality and the female age at first marriage differently in the different social strata. High crop prices were associated with a rise in infant mortality in the autumn and the winter. Warm or hot weather was associated with an increase in child mortality in the summer.

Conclusions: Our results support the hypothesis that social success can be converted into reproductive success. However, socio-economic and environmental constraints appear to be significant factors.

...Tuesday, March 31st

**14:00 Speed session 6B: Prosociality and cognition**

Chair: Masanori Takezawa

**14:05 Loud signals of prosociality and wealth: a case of dishonest superstimuli**

(Student talk)

**Francois J. Dessart.** Business Administration, University of Namur,  
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Costly signalling theory suggests that loud, exaggerated signals are seen as honest because they are particularly costly in terms of resources, time, and risks of detection by predators. Applied to human communication, loud signals should thus be preferred over quiet signals. However in some cases, this sort of superstimuli is cheaper, hence less honest than the quieter version. In this paper, we investigate signals perception and strategy for two traits (wealth and prosociality) in a consumption context (luxury vs. charity) as a function of their conspicuousness. Our objectives are (1) to assess the extent to which loud signals are seen as more or less honest than quiet signals, and (2) to address how this perceived signal honesty impacts signalling strategies.

Methods. Experiment 1 used a 2 (conspicuousness: loud vs. quiet) x2 (type of signal: wealth vs. prosociality) between-subjects design, where participants indicated how wealthy/prosocial they perceived a consumer of luxury/charity brands. In Experiment 2, we evaluated participant's willingness to use a given signal depending on its conspicuousness, in a similar 2 (conspicuousness: loud vs. quiet) x2 (type of signal: wealth vs. prosociality) between-subject design.

Results. A significant two-way interaction was found in Experiment 1 ( $p = .02$ ), whereby loud signallers of wealth were seen as less wealthy than quiet signallers. In contrast, participants saw loud signallers of prosociality as more prosocial than quiet signallers. In Experiment 2, we found a significant two-way interaction ( $p = .03$ ), mirroring signal perceptions on signalling strategies: participants signalling wealth preferred quiet signals whereas those signalling prosociality favoured loud signals.

Conclusions. Consistent with the importance of cost for signal honesty, loud, exaggerated signals of wealth are seen as dishonest superstimuli, whereas the opposite occurs for signals of prosociality. Signallers adapt their signalling strategies based on this perceived signalling honesty.

**14:16 A cognitive basis for cultural drift**

**Vanessa Ferdinand.** Santa Fe Institute, vanessa@santafe.edu

Drift is an important null hypothesis to rule out when affirming processes of biased transmission (i.e. cultural selection) in cultural evolution research. Drift has been well-specified for genetic evolution, first formalized by Wright (1931) and Fisher (1930), and social learning researchers have imported the Wright-Fisher model to describe cultural drift

(e.g. Bentley 2004). This model specifies the sampling error associated with a given population size of variants between generations and in doing so, identifies trajectories of cultural change that are likely to occur under neutral evolution. Social learning researchers often approach cultural transmission as a process in which variants are directly copied and Mesoudi (2006) describes this as a macro-level approach to understanding cultural evolution. At the micro-level, the cognitive science approach to cultural evolution zooms in on the copying process itself and describes cultural copying as a necessarily indirect process of reverse engineering by inductive inference (e.g. Kirby et al, 2014). This means that the sampling error associated with neutral cultural evolution may not follow the mathematics of directly sampling concrete, discrete variants from populations: instead, this is an open empirical question. I present an experiment in frequency learning and explain how probability matching behavior satisfies the conditions for neutral evolution, though with different sampling errors than Wright-Fisher drift, and demonstrate how this is a more appropriate baseline for ruling in selective pressures associated with biased linguistic frequency learning. Human learners have the capacity for reproducing frequency distributions of cultural variants with higher fidelity than Wright-Fisher drift does. In consequence, neutral cultural variation is lost at a slower rate than predicted by Wright-Fisher drift. The good news here is that the Wright-Fisher model is a conservative baseline, however using this baseline prevents the detection of weak selection pressures that may actually exist in a pool of evolving cultural variants.

#### **14:27 Cultural transmission and evolution of psychological traits in Bengali migrants to the UK**

**Kesson Magid**, Department of Anthropology, Durham University,  
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Alex Mesoudi, Department of Anthropology, Durham University

The fundamental ways in which humans conceptualise their social environments and relate with others have long been assumed human universals. However, many supposedly universal psychological traits have recently been shown to be specific to Western Educated Industrialised Rich Democratic (WEIRD) societies, and instead vary between cultural and geographic groups. Yet much of this work remains descriptive: the mechanisms and speed of transmission of psychological traits through cultures remain unclear, as does the importance of horizontal (peers) or vertical (parents) factors for the transmission of traits. Here we use migration from non-WEIRD to WEIRD societies as a natural experiment to tease these factors apart. Methods: We tested four measures of social orientation (individualism-collectivism, closeness of social relations, emotional engagement with others, self-enhancement) and four measures of cognitive style (object categorisation, causal attribution, attentional style, perception) across multiple generations of 187 Bengali migrants to the UK, plus 99 British-born individuals with British-born parents, all resident in London, UK. Results: Bangladesh-born individuals were more individualist and collectivist, and attributed the behaviour of others more to situations rather than dispositions, compared to children of British-born parents. British-born children of Bangladeshi migrants did not significantly differ from children of British-born parents in individualism, but were more collectivist, and did not differ from Bangladesh-born individuals in attributional style. Other measures did not differ between migrants and non-migrants. Increased collectivism related

to time spent with kin and identification with traditional Bangladeshi cultural values.  
Conclusions: Different traits appear subject to different transmission dynamics: individualism appears to be horizontally transmitted, while collectivism appears to be vertically transmitted. Overall, these findings illuminate the individual-level cultural transmission dynamics that generate and maintain population-level variation in psychological characteristics, and serve to integrate cultural evolution theory with cross-cultural psychology.

#### 14:38 **The moral basis of racial cognition in the human brain**

**Rengin Firat.** Evolution, Cognition and Culture Laboratory, University of Lyon,  
rfirat@gmail.com

Recent evolutionary anthropological research suggests that racial categorization is the byproduct of an essentially moral capacity: coalition building. However, little research explores the moral basis of racial cognition in the human brain. The purpose of this study is to address this gap by investigating whether or not brain regions involved in moral processing are also associated with racial evaluations.

Methods: This study used a functional Magnetic Resonance Imaging (fMRI) experiment (N = 15), and a lesion experiment with patients who have damage to their Ventromedial Prefrontal Cortex (VMPFC) as well as brain damaged and healthy comparison groups (N = 31). In all experiments, Caucasian American, adult participants were presented pictures of White and African American people in three different socio-economic positions (low, middle, upper). In the lesion experiment, participants reported their feelings of eight emotions (happiness, pride, sadness, pity, anger, disgust, envy and fear) on a computer. In the fMRI experiment, subjects underwent scanning while viewing the same pictures (the picture ratings were collected after the scanning, outside the scanner).

Results: Results indicate that the VMPFC, the key brain region for processing/regulating moral emotions, is involved in racial encoding, of especially those in the middle class groups. There was increased VMPFC activation in response to Whites vs. Blacks. Additionally, patients who had damage to their VMPFC were more likely to favour Whites over Blacks than the comparison groups.

Conclusions: Observing that the VMPFC, the key brain region for the appraisals of socially and morally salient information, is involved in racial evaluations supports the assumption that racial categorization is the consequence of a cognitive system evolved to track coalition memberships and negotiate complicated social landscapes.

#### 14:49 **The icebreaker effect: Singing together creates faster social bonds**

**Jacques Launay.** Experimental Psychology, University of Oxford,  
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Eiluned Pearce, Experimental Psychology, University of Oxford  
Robin Dunbar, Experimental Psychology, University of Oxford

Throughout human evolution membership of a cohesive social unit was vital for survival and various universal human behaviours may have evolved to facilitate social bonding. In this

longitudinal study we test whether weekly singing classes create stronger social bonds between class-mates than other activities.

Methods: We set up four new singing classes and three new comparison classes (creative writing and crafts) comprising 84 singers and 51 non-singers. Over 7 months, questionnaires were administered before and after three sessions: one in Month 1, one in Month 3 and one in Month 7. Questionnaires included measures of mood (PANAS) and their closeness to their class (adapted Inclusion of Other in Self scale, IOS). Change in IOS and PANAS scores were calculated for each time-point (after-session minus before-session). At each time-point participants were asked to list all the people in their class whose names they knew.

Results: Both singers and non-singers felt closer to their class-mates in Month 7 compared to Month 1. Only in Month 1 did singers show a significantly greater increase in how close they felt to their class-mates compared to non-singers. A similar pattern was found for positive affect. In Months 3 and 7 singers were able to name a significantly higher proportion of their class-mates compared to non-singers.

Conclusion: Although both singing and non-singing activities increase group connectedness to a similar level over time, singing seems to have a greater immediate effect on both feelings of social closeness and positive mood. In addition to potential differences in the speed of bonding, singers in this sample knew the names of a greater proportion of their class-mates, suggesting the formation of deeper relationships than was the case in the comparison groups.

Overall, singing may provide a quicker boost to well-being than other activities through elevating positive mood and may be particularly useful in bonding unfamiliar individuals without the need for sustained prior interaction.

...Tuesday, March 31st

**15:30 Session 7A: The evolution of art and language**

Chair: Minna Lyons

**15:30 Isolation mechanisms and linguistic divergence: microevolutionary perspective (Student talk)**

**Terhi Honkola**, Department of Biology, University of Turku, [terhi.honkola@utu.fi](mailto:terhi.honkola@utu.fi)  
Outi Vesakoski, Department of Biology, University of Turku;  
Kalle Ruokolainen, Department of Biology, University of Turku;  
Kaj Syrjänen, School of Language, Translation and Literary Studies, University of Tampere

Our objective was to study the drivers of linguistic divergence within a language, that is, in the microevolutionary level as that is where the primary processes possibly leading to language divergences occur. In biology, drivers of population divergence have commonly been quantitatively studied. In linguistics, however, issues relating to linguistic divergence have been discussed but quantitative studies have remained scarce. Hereby, we combined hypotheses from linguistics and biological evolution to study the drivers of linguistic divergence as humans, the language speakers, are ecologically dependent on their surroundings like any other species. More specifically we tested how geographical isolation, environment, culture and administrative history contributed to early stages of linguistic diversification. As our material we used ca. 100 years old dialect data of Finnish language, statistics records of 40 environmental and cultural variables, geographical distances and data on historical administrative border changes. The data was originally collected for each municipality but the data was also clustered to dialects. We used multiple regression on distance matrices (MRM) analyses with variation partitioning as our methods. MRM is a multiple regression method computed on data that is turned to distance matrix instead of raw data. Our results indicate that moderate and large environmental and cultural differences contribute to the isolation of Finnish dialects more than geographical distance does. Instead, fine-grained linguistic differences between municipalities were mostly structured by geographical distance together with differences in administrative history. Our results demonstrate that physical isolation is not necessarily needed to induce linguistic differentiation but that differences in the surrounding living conditions may initiate the process. As humans adjust to their local environment with cultural adaptations we suggest that cultural adaptations play a role in the process of how different environmental conditions may induce the divergence of linguistic groups.

**15:55 A method for predicting the sex of hand stencilers, with incidental insights into creative behavior**

**Emma Nelson**, School of Medicine, University of Liverpool, [emma.nelson@liv.ac.uk](mailto:emma.nelson@liv.ac.uk)  
Jason Hall, Department of Archaeology, Classics and Egyptology, University of Liverpool;  
Patrick Randolph-Quinney, School of Anatomical Sciences, University of the Witwatersrand;  
Anthony Sinclair, Department of Archaeology, Classics and Egyptology, University of Liverpool

Paleolithic cave art is one of the most enigmatic behaviors to be found in the archaeological record and its prominence in the media is testimony to this. Understanding more about cave artists would provide a significant step forward for interpretations of cave art. Over the past decade several methodologies for assessing the sex of Paleolithic hand stencilers have been proposed, but these approaches have provided conflicting results. To produce a statistically robust means of accurately predicting the sex of the makers of hand stencils. Method: Experimental replications of hand stencils comparable with Paleolithic methods led to 264 hand images (106 males; 158 females). Digital images were captured, with 19 landmarks applied to each stencil. Geometric morphometrics was used to quantify sexually dimorphic shape variation reflected in the stencils. Results: The technique allows sex-assessment based on stencils of the whole hand, the digits, palm, or isolated parts of each. When both shape and size are factored into the analysis, successful classification of sex ranges between 85% and 91%. Conclusions: This approach offers significant discriminating power in predicting the sex of individuals from hand stencils. We also report on some of the incidental behaviors we observed during data collection and during our work in a simulated cave environment. We discuss the potential advantages of this technique for detecting creative behavioral signatures in Paleolithic cave art.

#### **16:15 Discriminations and stereotypes in Italy (1922-2013). A cultural evolutionary approach**

**Simone Sarti**, Dipartimento di scienze sociali e politiche, Università degli Studi di Milano, [simone.sarti@unimi.it](mailto:simone.sarti@unimi.it)

Tommaso Vitale, Department of Sociology, Sciences Po, CEE

Discriminations require an active work of categorization. The ways in which this process has been studied have not contributed to understand the patterns of discrimination in the long run. Our paper focuses on stereotyped cultural markers, rooted in the individual identities through education and scholarly socialization. Methods: We analyze the evolution of the meaning of 66 entries in the most popular Italian Vocabulary (Zingaretti), 11 editions. We consider that a systematic study of their semantic shift could offer a robust proxy of the evolution of cultural markers. We apply a delphi technique to assess the discriminatory semantic of the definitions, measuring patterns for each entry, and for each class of entry (social marginality, ethnic/racial categorization, sexual and gendered entries, stratification issues). Every entry has been analyzed by 10 commissioners, involving 89 commissioners. The definitions have been chronologically randomized. We collected over 10000 evaluations. We used self-anchored scales collecting “discrimination score's and “acceptance score's based on online questionnaires and mediated deliberative techniques finalized to push toward the convergence on specific scores (yet measuring the variance). Results: We have tested three main sets of hypothesis, concerning: I) the decline of the semantic of discrimination, II) the shape of the cultural change, III) the presence of different shapes of change per class of entries. The empirical results show periods of asynchronous evolution of different areas of discrimination. We discuss how much cultural reproduction proceed at different rates and in very different ways, and the implication for an evolutionary understanding of discriminatory patterns. Conclusions: The paper shows how generative is an evolutionary approach to study cultural change in the long run, and shows how stereotypes are units of replicating information, characterised by longevity, causality, fidelity, and fertility.

...Tuesday, March 31st

**15:30 Session 7B: Family dynamics**

Chair: Caroline Ugglá

**15:30 Insights in the range of historical extra-pair paternity rate in Western Europe**

**Maarten Larmuseau**, Laboratory of Socioecology and Social Evolution, Department of Biology, KU Leuven (University of Leuven), maarten.larmuseau@bio.kuleuven.be  
**Koenraad (Koen) Matthijs**, Centre of Sociological Research (CESO), Faculty of Social Sciences, KU Leuven (University of Leuven)  
**Ronny Decorte**, Forensic Biomedical Sciences, Department of Imaging & Pathology, KU Leuven (University of Leuven)

When the caring and official father is not the biological one, a so-called extra-pair paternity (EPP) event occurs. After decades of speculation and many false or highly biased claims, data on EPP frequencies within contemporary human populations became available in the last decade. Although highly relevant for human behavioural studies, EPP frequencies of past West-European populations still remain controversial as current measurements may not reflect past frequencies due to changes in social interactions especially since the demographic transition. Here we provide a large-scale study using several genetic genealogical approaches to get insights in the historical EPP rate in a Western European human population. Methods: We were able to calculate past EPP frequencies in the Flemish population (Belgium) since the surname establishment in the late Middle Ages (13th-14th century). This was realised using four independent genetic genealogical methods based on comparing state-of-the-art Y-chromosomal data to infer genetic patrilineages with in-depth genealogical and surname data, which reflect known historical presumed paternity. Results: Based on all four independent genetic genealogical methods we estimated that since the late Middle Ages, the range of EPP rate in Flanders was around 1-2% per generation. Conclusions: Our results showed a much lower historical EPP rate than the 8-30% per generation reported in some behavioural studies, but comparable with the rates reported by studies of contemporary Western European populations (1-2%). Therefore, the results of the pilot study suggest that human EPP rates did not change substantially in Western populations since the late Middle Ages, although many evolutionary, cultural and socio-demographic factors changed in the last centuries due to the demographic transition.

**15:55 Is polygyny a harmful cultural practice? Marriage, ethnicity and child health in Northern Tanzania**

**David Lawson**, Dept of Population Health, London School of Hygiene and Tropical Medicine, David.Lawson@lshtm.ac.uk  
**Monique Borgerhoff Mulder**, Department of Anthropology, UC Davis, USA  
**Susan James**, Savannas Forever, Tanzania

Polygynous marriage has been described as a "harmful cultural practice" serving the interests of men contrary to those of women and dependents, and is often considered a

barrier to socioeconomic development. Here, we review the evidence behind this proposition, focusing on the relationship between polygyny and child health. Large-scale studies of national demographic surveys consistently demonstrate that poor child health outcomes are concentrated in polygynous households. Population-level studies have also revealed negative group-level associations between polygyny and wellbeing, consistent with the idea that monogamy evolved via cultural group-selection. However, aggregated population samples are vulnerable to statistical confounding between ecological and individual determinants. Small-scale anthropological studies report more mixed findings emphasizing both female choice and male coercion, but are limited by low statistical power and generalizability. Methods: Overcoming several limitations of existing research, we explore relationships between polygyny, food insecurity and child health in an ethnically and ecologically diverse sample of 56 villages (3500 households) in northern Tanzania. Relationships are estimated across and within villages, and stratified by ethnic group, using a multilevel statistical framework. Results: At the village-level, polygyny is associated with higher household food insecurity and relatively poor child health. However, within villages male-headed polygynous households are wealthier compared to monogamous households and food insecurity, and child health is either not significantly different or relatively improved. Village-level associations between polygyny and child health appear primarily accounted for by underlying socioecological variation, such as rainfall and market integration. Conclusions: We question the interpretation of prior studies and provide counter evidence that children in polygynous households are often advantaged relative to children in neighbouring monogamous households. We highlight the need for improved measurement tools and appropriate scales of analysis in the study of polygyny, and discuss the relevance of our findings to anthropological accounts of marriage and contemporary population policy.

### 16:15 **Parental absence and age at first birth in Sweden: does the timing of absence matter?**

**Rebecca Sear**, Population Health, London School of Hygiene and Tropical Medicine, rebecca.sear@lshtm.ac.uk

Cristina Moya, Population Health, London School of Hygiene and Tropical Medicine  
Anna Goodman, London School of Hygiene and Tropical Medicine

Research suggests that children who grow up with an absent parent in high income contexts experience faster progression to reproductive events such as puberty and first birth. Various evolutionary models have been proposed to explain this phenomenon, which is somewhat counter to the simple prediction from parental investment theory that higher parental investment should lead to earlier, not later, reproductive onset. Some models assume that there is a critical period in early development (under ~7 years), during which the loss of a parent will set in motion a faster reproductive trajectory. Other models suggest that parental influence in later childhood, such as encouraging investment in embodied capital, plays a role in this relationship. Here we test whether the timing of parental absence is important in determining the association between parental absence and age at first birth, using data from Sweden. Methods: We use the Uppsala Birth Cohort Multigeneration Study (UBCoS), a longitudinal study on ~14,000 individuals born 1915-29, and their descendents. We test: (1) whether there a critical period in early childhood, during which parental absence is most strongly associated with children's later reproductive events; and (2) whether education

mediates the association between parental absence and earlier first births. Results: We find that parental absence in childhood is correlated with earlier first births, but do not find clear evidence for a critical period in early childhood which drives this association. We also find that education partially mediates this association, but this pathway of influence changes across historical cohorts. Conclusions: Our results suggest that parental influence on age at first birth is not confined to a critical period in early childhood, and that education partially, but not entirely, mediates this relationship. This suggests there may be multiple explanations for the association between parental absence and reproductive trajectory.

Wednesday, April 1st

**10:00 Session 8: Evolution and cognition**

Chair: Susanne Shultz

**10:00 Extending evolutionary psychology: why 4E cognition is more than just the icing on a paleo cupcake**

**Louise Barrett**, Psychology, University of Lethbridge, [louise.barrett@uleth.ca](mailto:louise.barrett@uleth.ca)  
Gert Stulp, Population Health, London School of Hygiene and Tropical Medicine  
Thomas Pollet, Social Psychology, VU Amsterdam;

We address criticisms of our recent attempt to reconceptualize aspects of evolutionary psychology (EP) theorizing by incorporating ideas from "4E cognition" (embodied, embedded, enactive and extended). In essence, these criticisms have suggested that the addition of 4E thinking into evolutionary psychology represents the icing on the cake of our evolved psychological propensities, as opposed to requiring any substantive reconsideration of the nature of "human nature".

**Methods:** We present a conceptual analysis of the arguments countering our position which suggest (i) that we have misrepresented EP by conflating hardware and software arguments with respect to computational theories of mind; (ii) that current EP theories can and do incorporate cultural influences in the manner suggested by 4E cognition such that the latter offers no true alternative to EP; and (iii) that 4E approaches are focused at a proximate level of explanation, rather than at the ultimate level studied by EP.

**Results:** Our analysis suggests that, on the whole, these criticisms miss their mark because they either (i) fail to tackle the issues at stake (e.g., whether psychological adaptations can be identified via the same means as morphological adaptations); (ii) introduce contradictory positions regarding the plasticity of human psychological traits; and (iii) do not recognize that 4E cognition offers a functional evolutionary perspective and cannot be treated simply as the proximate manifestation of the psychological adaptations argued for by EP.

**Conclusions:** We maintain that adopting a 4E approach to the study of the human mind offers a true alternative to current evolutionary computational approaches. This is due to its consideration of the interpenetration of cultural and biological traits, and not because it rejects computationalism per se.

## 10:25 **Detecting signatures of positive selection associated with musical aptitude in the human genome**

**Irma Järvelä**, Department of Medical Genetics, University of Helsinki,

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Xuanyao Liu, NUS Graduate School for Integrative Science and Engineering, National University of Singapore;

Jaana Oikkonen, Department of Medical Genetics, University of Helsinki;

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Kai Karma, DocMus School, University of Arts, Sibelius Academy

Music practice is an important and well preserved culture in the human history.

What is the evolutionary advantage of music in human history? Music cultures can develop in diverse directions but they are linked to the genetic composition of sound perception and handling in the human brain. From the evolutionary point of view, hearing and communication via sounds is important for the survival of humans as well as other species. The structure and function of the auditory center is highly similar in modern humans and the first primates. Comparative studies between human and animal song have shown that both contain a message, an intention that reflects an innate emotional state (a desire for communication, fear or appealing), that is interpreted correctly even between different species. This is supported by the adaptive convergent evolution of echolocation found in bats and dolphins implicating that numerous evolutionary preserved genes are linked to hearing.

In this study, with phenotype data on musical aptitude and whole genome genotyping data, we performed genome-wide scan of positive selection signals in 74 Finnish unrelated cases with high musical aptitude and 74 Finnish unrelated controls with low musical aptitude belonging to the MUSGEN project. Three metrics (HaploPS, Fst and XP-EHH) were used to identify positive selection regions underlying music aptitude in the human genome. The phenotype was assessed using three music tests: the auditory structuring ability test (Karma Music Test, KMT) (Karma 1994) and Carl Seashore's subtests of pitch (SP) and time discrimination (ST). The differential signals detected between cases and controls are the candidate regions underlying the positive selection of music in human. We identified genes in the selection regions associated with inner ear development, cognitive performance, memory and neurodegeneration. Interestingly, four of the identified regions were detected with both haploPS and Fst.

Our study provides primary evidence of positive selection underlying the music culture in human. Interestingly, the selected regions contain genes affecting auditory perception, cognitive functions and specifically, genes that affect the singing of songbirds.

...Wednesday, April 1st

**11:20 Speed session 9: Cooperation and risk-taking**

Chair: Nicolas Baumard

**11:25 Human nature and the state** (Student talk)

**Roberto Foa**, Government, Harvard University, foa@fas.harvard.edu

We live in a "world of states". Yet as Hobbes once considered, living in a state is fundamentally at odds with the natural condition of man. Most of our evolutionary history has been spent in small bands of 150-500 individuals, engaged in frequent warfare, with up to sixty per cent of born males losing their lives in violence (Keeley 1996, Pinker 2011). For the sociobiological explanation of human behaviour, this gives rise to two ongoing puzzles: first, why and how did the state form 'emerge' in the first place? And second, why have states proven durable features of human social organization, rather than periodically regressing to pre-state social forms? While a substantial literature has explored the origins of early states (e.g. Carneiro 1974, Mann 1986, Oppenheimer 1927), the subsequent persistence of large-scale, non-familial social organisation remains a puzzle for evolutionary psychology.

"Atavism", or the return to pre-state society, is rare. In this paper, I attempt to solve the puzzle of persistence by arguing that states survive by repurposing loyalty from the personal to the public sphere, generating collective identities, and establishing a social compliance equilibrium (Weber 1982, Elias 1972, Foucault 1976, Pinker 2011). I test this hypothesis by looking for evidence of the persistence of such norms under conditions of a historical natural experiment in India. In the centuries preceding colonial rule India was host a remarkable diversity of polities, from pre-state hunter-gatherer societies in the interior uplands and the mountainous northeast, to the centralised, proto-bureaucratic states of the southern Deccan. Yet most of India's precolonial states ceased to exist following East India Company's consolidation from 1757 to 1856, and definitively abolished after independence. By testing for regression discontinuities along the borders of precolonial regimes, I find that where historically centralised regimes had ruled prior to the colonial experience, citizens two centuries later exhibit greater willingness to comply with laws, cede revenue in taxes, and fulfill public service duties. Persistent memetic 'political capital' generated by historical regimes can explain why state society persists, rather than revert to pre-state forms.

**11:36 Process tracing across evolutionary domains: A novel view on risky choice**  
(Student talk)

**Jana B. Jarecki**, Center for Adaptive Behavior and Cognition, Max Planck Institute for Human Development, Berlin, jarecki@mpib-berlin.mpg.de  
Andreas Wilke, Psychology Department, Clarkson University,

This research aims to unify the study of cognitive information-processing during risky choice with the study of evolutionary domain-dependencies of risk attitudes. We investigate the stability of domain-specific risk attitudes across ten evolutionary domains, the retrieval of

informational cues for risk within these domains, and cognitive processing across these domains. To this end we combined a cognitive process-tracing technique to elicit information retrieval (Johnson, Häubl, & Keinan, 2007) with a novel evolutionary risk questionnaire to elicit risk attitudes across ten domains of evolutionary relevance (Wilke et al., 2014). Using a sample obtained via Amazon MTurk we undertook a replication study of past quantitative findings showing domain-differences in risk attitudes; and furthermore assessed both qualitative and quantitative process data, such as open responses about situational aspects of decision-relevance, as well as numerical data on the directionality, number, and order of cues influencing human risk taking. Results suggest (a) stable risk-attitudes and sex-differences across the ten evolutionary domains as previously shown; (b) retrieval of an overall greater amount of cues in favor of risk taking, except for the kinship domain; (c) similar numbers of cues utilized across domains; (d) retrieval of similar but not independent cue-patterns within domains; and (e) domain-specific order effects in terms of retrieving risk-favoring prior to risk-avoidance cues. Understanding risk information processing from an evolutionary perspective contributes to basic research in terms of theory integration, enables decision science to shed novel light on the strategy selection problem, and further, process-level understanding of risky choice is a prerequisite to derive intervention measures in applied research.

#### **11:47 The evolution of the impact bias: optimizing affective forecasts for choice in noisy environments** (Student talk)

**Paul Rauwolf**, Computer Science, University of Bath, p.rauwolf@bath.ac.uk  
Joanna J. Bryson, Computer Science, University of Bath,

There is robust evidence that prior to an anticipated event, people systematically fail to accurately predict their feeling after the event. They predict more intense emotions compared to their actual affective experiences, a phenomena known as impact bias. Furthermore, individuals do not improve their predictions by learning, despite previous experience. Many explanations for impact bias have been hypothesized, including biased memories, over-emphasis of one's current focus (focalism bias), and limitations in imagining future events. These account for the bias's mechanism (proximate explanation), but not how the bias survives natural selection (ultimate explanation). We hypothesize an ultimate explanation: impact bias helps humans navigate decision making in noisy environments. Method: Extending Error Management Theory through stochastic evolutionary game theory, we evaluate whether agents with the impact bias can outperform unbiased agents. In Experiment 1, agents choose between actions by predicting the utility of the actions. This is tested in environments with differing quantities of noise. In Experiment 2, we evaluate when it is advantageous not to update predictions from past experience. Results: In noisy environments there is selective pressure for the impact bias. Furthermore, under noise it can be sub-optimal to learn from previous experiences. Additionally, we show that the consequences of the model match previously unexplained experimental data. The model predicts that impact bias will increase as 1) the affective intensity of an event rises, and 2) the amount of noise increases. Both correlations are found in the experimental literature. Conclusion: Our evolutionary simulations support the hypothesis that the impact bias has evolved to navigate decision-making under noise. Our model demonstrates the hypothesis is

theoretically coherent and logically plausible. Further, it accounts for previously unexplained findings of empirical experiments. This supports the model's likelihood as an account of this affective bias.

### **11:58 What makes people go to war? Defensive intentions motivate retaliatory and preemptive intergroup aggression**

**Hannes Rusch**, Behavioral Economics, JLU Giessen, hannes.rusch@tum.de  
Robert Böhm, Decision Analysis, RWTH Aachen University  
Özgür Gürerk, Economics, RWTH Aachen University;

Although humans qualify as the most cooperative and altruistic animal species, the scale of violent intergroup conflict among them is tremendous. Explaining the underlying motivation of participation in intergroup conflict, however, remains puzzling. While previous research shows that intergroup conflict increase's in-group love', it fails to identify robust triggers of 'out-group hate'. For a recent overview of this field of research see Rusch 2014 (Proc R Soc B: 281).

Methods: Here, we present a controlled economic laboratory experiment with N=215 students, which demonstrates that 'out-group hate' can be provoked systematically. Participants faced modified versions of an established experimental game modeling intergroup conflict – the Intergroup Prisoner's Dilemma-Maximizing Difference, IPD-MD. Building on own previous theoretical work (Rusch 2013, *Evol Psychol* 11(5); Rusch 2014, *Hum Nat* 25(3)), we manipulated the extent to which participants perceived themselves as being in a defensive position while leaving the incentive structure of the IPD-MD unchanged. In one manipulation, group defense was ex-post, i.e. participants reacted to previous actions of the members of the out-group. In the other treatment, group defense was ex-ante, i.e. participants could preemptively harm an out-group in order to reduce the threat it posed. Results: We find direct and causal evidence that the intention to protect the in-group is not only a crucial motivator of 'out-group hate' in defensive reactions, but also promotes preemptive offensive actions against out-group threat.

Conclusions: We find that group defense is a strong motivator of 'out-group hate'. This finding improves our understanding of the escalation of intergroup conflicts and may have important implications for their prevention, as we find in our experiment that removing out-group threat substantially reduced intergroup aggression, leading to virtually full peace.

### **12:09 Mindreading and Machiavellianism: manipulative tactics in focus (Student talk)**

**Edit Szabó**, Institute of Psychology, University of Pécs, szabo.edit@pte.hu  
Tamás Bereczkei, Institute of Psychology, University of Pécs,

Successful manipulation should be associated with a high level of mindreading capacity, since an excellent ability for understanding the mental states of others is supposed to mislead others. However, the former research on Machiavellianism and theory of mind could not prove this assumption. Therefore, Machiavellians are considered as having a lower level of cognitive performance in interpersonal relationships. Objective. We assumed that Machiavellian individuals could have a specific mindreading ability that enables them

successful manipulation in certain circumstances. In order to study this kind of theory of mind, we developed a new approach to the understanding of mindreading in general.

**Methods.** In this study we introduced a new method of measuring mindreading that includes story tasks based on different kinds of narratives and dialogues. The tasks including dialogues present a type of stimulus similar to real-life social contexts, and a group of them directly focuses on manipulative tactics.

**Results.** We found that high Machs solved the mentalization tasks of dialogue-based stories better than those of narrative-based stories. Besides, Machiavellians outperformed others in the mindreading tasks of manipulative-style stories and showed a specific sensibility on recognizing the intentionality of the cheaters.

**Conclusions.** Our results show a positive correlation between Machiavellianism and a specific dimension of mindreading that represents a possible cognitive basis of their successful manipulation. Accordingly, this finding can throw new light upon the Machiavellian's theory of mind.

**Parallel sessions 10 A and 10B**

**13:10 Session 10A: Mate attraction**

Chair: Lisa De Bruine

**13:10 The possible functions of romantic kissing**

**Rafael Wlodarski**, Experimental Psychology, University of Oxford,

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Robin Dunbar, Experimental Psychology, University of Oxford

It has been previously observed that humans use some courtship behaviours to communicate the presence of desirable traits, assess potential mates, and gain preferential access to mating partners. "Romantic kissing" is a cross-culturally prevalent courtship custom which has been hypothesised to be useful in such contexts. The objective of the studies presented here was to examine the possible functions of romantic kissing in the mating context. Methods: International online surveys were carried out examining variations in attitudes towards kissing across multiple mating interaction contexts, with analyses conducted to examine how such attitudes vary by sex, mate-value, sociosexuality, relationship status, and menstrual cycle phase.

Results: Results supported the notion that romantic kissing behaviours may be strategically used during the assessment of potential mating partners, and within established relationships to mediate pair-bond attachments. Conclusions: Romantic kissing appears to serve several useful functions in context of mate choice and retention. Here we also suggest some likely candidate mechanisms by which kissing may operate within mating relationships.

**13:35 The spandrels of Santa Barbara and the peri-ovulation paradigm**

**Jan Havlicek**, Faculty of Science, Charles University, jhavlicek@natur.cuni.cz

Kelly D. Cobey, School of Natural Sciences, University of Stirling;

Lousie Barrett, Department of Psychology, University of Lethbridge;

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Numerous recent studies document peri-ovulatory increases in women's physical attractiveness and in their preferences for certain male traits, which appear to be linked to cyclical fluctuation in levels of ovarian hormones. Changes in physical traits are subtle, leading to the idea that cues of ovulation are suppressed, thus enabling women to pursue a mixed-mating strategy characterized by pair-bonding with opportunistic extra-pair copulation when conception is possible. Men's preferences for peri-ovulatory cues, and women's cyclical preference shifts are thus argued to reflect distinct psychological adaptations. Here, we re-interpret the evidence for each of these putative adaptations and argue that cyclical changes may not result from incomplete concealment of ovulatory status. We also

emphasize that ovarian hormone levels underpin between-individual differences in both women's attractiveness and their mate preferences, which influence the sex's mate choice decisions. We contrast the salience and efficiency of these within- and between-individual effects, and suggest that, while both effects have the potential to influence mating behavior, the between-individual effects are stronger and more robust. This introduces the possibility that both men's increased attraction towards peri-ovulatory women and women's cyclical shifts in preference for certain male traits may not constitute adaptations per se, but are, instead, inevitable byproducts, or "perceptual spandrels", of putative adaptations related to between-individual differences in reproductive potential. Our framework parsimoniously explains several observable phenomena, and potentially could transform the way evolutionary researchers interpret changes in behavior associated with the menstrual cycle.

#### **14:00 The attraction of the city: Female rural-urban migration in the Netherland**

**Marjolijn Das**, Social Economic Statistics, Statistics Netherlands, [mdas@cbs.nl](mailto:mdas@cbs.nl)  
Jan Latten, Human Geography, Planning and International Development, University of Amsterdam

Nowadays, in the largest Dutch cities young women outnumber young men. Migration to cities is often triggered by opportunities for education and work. In this study we investigate whether female rural-urban migration also serves to increase the probability of finding a 'high quality' partner. Women derive fitness benefits from choosing partners with a high social status and a high level of resources (Geary, 2004).

**Methods:** The study is based on five integral birth cohorts of Dutch women, born between 1966-1971 in rural areas (N=287621). Outcomes were measured at age 40-45. Data were derived from administrative registers available at Statistics Netherlands.

**Results:** Irrespective of their own educational level, women who were partnered with a highly educated man more often had children within this partnership than women who were partnered with a lower educated man. Compared to women who lived in rural areas, women aged 40-45 who had migrated to cities had higher educated partners with higher incomes, also after correcting for the woman's own educational level. However, women who migrated to cities were also more often single. **Conclusions:** In line with literature on female mate preferences, women appear to commit more to relationships with high status partners: they more often have children with highly educated men. Female migration could be a investment in their own resources (education, career) as well as an investment in the search for such a high status partner. In this last respect however, migration to cities is probably a risky strategy, since city women have a higher probability of being single as well.

...Wednesday, April 1st

**13:10 Session 10B: The origin and development of social structure**

Chair: Michael Stirrat

**13:10 Tracing the evolutionary origin of human hyper-cooperation**

**Judith Burkart**, Anthropological Institute and Museum, University of Zurich,  
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Human cooperation is highly unusual, and a key mechanism underlying it is proactive prosociality, which is strikingly rare in our closest relatives, the great apes. A number of evolutionary explanations have been proposed, with particular emphasis on uniquely human evolutionary processes such as cultural group selection. Our aim was to use comparative data from nonhuman primates to help pinning down when uniquely human evolutionary processes are necessary, and when more general evolutionary mechanisms suffice.

Methods: We experimentally assessed proactive prosociality and social tolerance in 24 groups of 15 primate species, including humans, and tested which factor best explains interspecific variation: cooperative hunting, cognitive ability or brain size, social tolerance, the presence of strong social bonds, or allomaternal care, i.e. help that mothers receive from other group members to raise their offspring.

Results: Our results show that proactive prosociality is neither unique to humans nor most pronounced in our closest relatives, the great apes. Rather, it shows a patchy distribution across primates, which is by far best explained by allomaternal care rather than one of the other factors. Crucially, the human data exactly fits this general pattern.

Conclusions: Our findings suggest that the evolution of human proactive prosociality was not based on uniquely human evolutionary processes but simply arose when we started to engage in allomaternal care, as it did too in some other primates (but not in nonhuman great apes). We propose that engagement in high levels of allomaternal care is likely to explain how cooperation could evolve in small-scale societies in prehistoric times, whereas uniquely human evolutionary processes more likely became important when these small-scale societies started to evolve into much larger and more complex societies during the Holocene.

**13:35 "Here and Now" - social cognition**

**Tamas David-Barrett**, Experimental Psychology, University of Oxford, [tamas.david-barrett@psy.ox.ac.uk](mailto:tamas.david-barrett@psy.ox.ac.uk)

This presentation tackles the problem of how to achieve the collective action among large groups necessary to exploit multi-dimensional environments. Inclusive fitness theory of collective action have highlighted the role of kin-based relationships in achieving cooperation, but empirical evidence suggests that primates can manage this only in small groups. I hypothesize that human social cognition has developed a coping strategy whereby

individuals assume that those with whom there is a meaningful cooperative exchange in the recent past or present, "the here and now", are also those with whom exchange will take place in the future, ie., those with whom there will be a repeated game. This social cognition shortcut facilitates cooperation. Using a large database of drama and musical performances I present evidence that suggests that (a) this shortcut exists and limits social cognition to a certain number of characters and (b) drama and music provide emotional cues which facilitate and expand social cognition to allow a greater number of characters to be perceived.

**14:00 "Just deserts": partner choice explains the evolution of meritocratic preferences in humans** (Student talk)

**Stéphane Debove** , Ecole normale supérieure, Paris, [sd@stephanedebove.net](mailto:sd@stephanedebove.net)  
Nicolas Baumard, Institut Jean Nicod, Ecole normale supérieure;  
Jean-Baptiste André, Human evolutionary biology group, Institute of evolutionary sciences

Meritocratic preferences (preferences for "reward according to contribution") constitute a central aspect of human fairness, but the evolutionary rationale behind them remains unknown.

Methods: We present agent-based simulations in which individuals cooperate to produce and divide a resource, and choose their cooperative partners based on how they are willing to divide the resource. We observe how the resource is divided at the evolutionary equilibrium depending on the contribution of each partner.

Results: Meritocratic distributions emerge as the best evolutionary strategy: giving more to better contributors is the best strategy in an environment where partner choice is possible.

Conclusions: Our results extend our understanding of the origins of human fairness beyond the traditional preferences for equal divisions observed in the Ultimatum Game.

15:00

## Session 11: Let's dance!

Chair: Sonja Koski

### 15:00 **Body moving: assessing body attractiveness using static and dynamic stimuli**

**Andrew P. Clark**, Department of Life Sciences, Brunel University,

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Ian S. Penton-Voak, School of Experimental Psychology, University of Bristol

This study aimed to use ecologically valid stimuli and rating measures to definitively assess the strength of anthropometric, psychometric, and behavioural predictors of body attractiveness.

**Methods:** Volunteers (80 male, 80 female, aged 18-30) were filmed from multiple angles in 4 movement conditions (static, normal walk, proceptive walk, competitive walk) to create 640 stimulus videos. Extensive anthropometric and psychometric measurements were taken at the time of filming. We used two methods of assessing attractiveness of opposite-sex stimuli to online participants. In the first, 687 participants (after exclusions) viewed 80 videos presented individually and assigned attractiveness scores based on a 7-point Likert scale (54960 ratings in total). Mean Likert scale scores were calculated for each stimulus video. In the second method, 579 participants (after exclusions) viewed 40 pairs of videos and simply chose which member of each pair was most attractive (23160 ratings in total). Elo scores (a scoring system originally devised for chess rankings) were calculated for each stimulus video.

**Results:** Elo scores correlated strongly with mean Likert scores and produced qualitatively similar results, but were cheaper to collect and, anecdotally, imposed less cognitive load on participants. Repeated measures ANOVAs using Elo scores showed a significant effect of movement condition for female walkers but not for male walkers. Female walkers were more attractive when walking than standing still, and most attractive when walking proceptively. Many significant predictors of attractiveness were identified, but some previously identified predictors (e.g. BMI, waist-to-hip ratio, height) were much less effective than expected. We present multivariate solutions for each sex.

**Conclusions:** Results from this ecologically valid and information rich stimulus set offer a comprehensive depiction of body attractiveness in both sexes, but also highlight how little about the topic is well understood.

## 15:25 Let's dance! The role of synchrony and exertion in social bonding during group movement

**Bronwyn Tarr**, Experimental Psychology, University of Oxford, bronwyn.tarr@psy.ox.ac.uk  
Jacques Launay, Experimental Psychology, University of Oxford;  
Emma Cohen, Cognitive and Evolutionary Anthropology, University of Oxford;  
Robin Dunbar, Experimental Psychology, University of Oxford

It is suggested that dance and other music-based activities involve bonding simultaneously with multiple people, enabling large-scale social bonding. Social dancing involves synchronised, often exertive movement to music, and to fellow dancers. Previous studies suggest that (non-exertive) synchrony involves blurring of self and other via neural pathways that code for both action and perception. These studies have demonstrated that synchronised movement leads to social bonding, although this has mostly been investigated in dyads and with low-exertive movements (e.g. finger tapping, walking, rocking). Synchronised exertive movements are also known to activate the Endogenous Opioid System (EOS), which is associated with social bonding in other primates. However, the relative role of exertion and synchrony in the social bonding that arises during dance, and the role of the EOS, is unknown.

The present study measures these effects on pain threshold (a proxy measure for endorphin release) and bonding amongst acquaintances in Northern Brazil. Groups of 3 (high school students) were randomly allocated to one of four conditions: high exertion synchrony, high exertion partial synchrony, low exertion synchrony or low exertion partial synchrony. Pain threshold and various in- and out-group social bonding measures were obtained before and after the movement activity.

The results demonstrate that both synchrony and exertion have significant ( $p < 0.01$ ) but independent effects on pain threshold, and on in-group (but not out-group) social bonding. This study provides incipient evidence to suggest that synchrony itself (in the absence of exertion) is associated with endorphin release. Although EOS activation and self-other mechanisms of social bonding have previously been independently investigated, both (possibly related) mechanisms are likely to be operating in cases of low and high exertive synchrony. The results contribute towards our understanding of the possible mechanisms underpinning the social bonding which arises during group dance and music-making, culturally ubiquitous group activities.

## Poster abstracts

Posters are listed in alphabetical order. Remember to vote for Best EHBEA 2015 Poster!

### **1. The evolution of cultural systems**

Culture, as we encounter it every day, is more than just individual traits being transmitted independently of one another. We learn a language, including its vocabulary, grammar, and syntax, as an integrated system. Religions constitute whole sets of ideas about metaphysics, history, and morality. In other words, culture presents itself in systems. While this viewpoint has existed for some time in cultural anthropology, it has largely been ignored in evolutionary approaches to culture. If culture evolves, and systems of cultural traits are the norm, then how does the evolutionary process produce and maintain these systems?

In this paper we develop an agent-based simulation model to explore this question. Our hypothesis is that cultural systems are the result of basic relationships between cultural elements and filtering mechanisms (e.g. transmission or copying biases) that determine how and which cultural information gets copied. We constructed a trait universe, akin to a cultural design space, in which we could vary the proportion of binary relationships of compatibility or incompatibility. Results from the model show that highly compatible cultural systems can result from even highly incompatible design spaces due to the action of individual filtering. We also find that filtering based on trait compatibility produces more compatible systems- and more compatible individuals - than does filtering based on cultural models. Finally, we find that filtering is strongest when the variance in the number of compatible relationships in the trait universe is highest, a result analogous to Fisher's fundamental theorem of natural selection.

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### **2. Evolutionary explanation of homophobia in heterosexual males**

At first sight homophobia and particularly that of heterosexual males directed towards gay men, seems to make no evolutionary sense. Surely, anything which removes competition for mates can only be a good thing in terms of fitness opportunities. Moreover, if just the fact of two people of the same biological sex having a relationship provokes negative attitudes in males, why is it that pornographic literature directed towards straight males often features two females together? The idea that homophobia towards gay men exists more strongly in males than females has been noted as far back as William James (1890) and is supported by more recent research (e.g. Poteat & Anderson, 2012). While many socio-cultural explanations have been suggested to account for homophobia (Fone, 2001), there has been little speculation in the evolutionary literature, and what there is could be considered outdated, dating as it does from the early 1980s and 90s (Gallup & Suarez, 1983; Gallup, 1995). Essentially, Gallup's argument for the evolutionary origins of homophobia stem from the belief that homosexuality is environmentally determined, and that therefore parents would not want their children to interact with

homosexuals in case they too became homosexual, thus reducing their parents direct fitness. In this study a slightly amended homophobia questionnaire was used to select males scoring particularly high and low on homophobia for further semi-structured interview. It was found that males scoring higher on homophobia distrusted the sexual motives of gay men in relation to their female partners more than those having lower levels of homophobia. Thus, it could be argued that the belief that stated homosexuality is merely a sexual tactic relating to potential cuckoldry, underpins some aspects of homophobia.

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### **3. The impact of artificial fragrance use on the detection of mate quality cues present in body odour**

In the present study, we investigated the impact of artificial fragrances on the accurate detection of biologically relevant information communicated by human body odour. To do this, we examined whether the perception of masculinity and femininity, which have been highlighted as potential indices of mate quality, are present and detectable across two sensory modalities in humans (faces and odours), and how cross-sensory consistency in perception is influenced when artificial fragrance is used.

Methods: Participants (N= 239) rated odour samples (with and without a fragrance), and photographs (N= 130) for masculinity (20 male donors) and femininity (20 female donors). Results: Findings indicated that, for female but not male raters, cues of masculinity/femininity were correlated across modalities. However, fragrance use abolished the correlation between ratings of male facial and odour masculinity; further analysis indicated that pre-existing differences in odour masculinity, between men with very masculine or less masculine faces, were removed by the addition of fragrances. This effect was absent in ratings of female odours by both female and male raters, suggesting sex-specificity in effects of fragrance on odour perception.

Conclusions: As fragrance use is extremely wide spread it is important to investigate the effect that this cultural practice may have on our ability to detect and utilise mate-choice relevant cues. Our findings suggest that females may be more sensitive to these cues, and therefore also to disruption of this information through fragrance use. These findings are discussed in relation to existing literature concerning sexual selection in humans, and are interpreted using a culture-gene coevolution framework.

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### **4. The emergence of wise and fair leaders**

**Objective:** To present the findings of a model in which we compare a shared decision making procedure with an unshared, centralized decision-making process with leadership.

**Methods:** We developed a mathematical model where individuals within a group differ with respect to their preferences for a course of action, vary in personality types, are motivated to reach a consensus and use simple heuristics to update their preferences through interactions with others in the group. **Results:** The model shows the benefits of leadership particularly when groups face time pressures and there is significant conflict of interest as a result of individual differences in agreeableness. Less agreeable and more persuasive individuals are most likely to emerge as leaders as a result of the model. Finally, the model shows the benefits of having a leader through reputation building, so that group members can pick the fairest (for distribution problems) or the most knowledgeable (for information problems) one to follow.

**Conclusion:** The model offers an explanation for why leadership and decision making hierarchies are widespread, especially in human societies.

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## **5. The evolved cultural mechanisms and informational cultural selection**

Human populations carry a pool of acquired information (Richerson and Boyd, 2005). In this context, culture is a set of information deposited in cultural features present in every population with distinct characteristics. These features have an adaptive nature, thus, they solve adaptive problems, hence, survival and reproductive problems that humans face during their lifetime. In analogy with evolved psychological mechanisms (EPM) proposed by the evolutionary psychologist David Buss, in this paper we propose a new conceptual paradigm in studying culture, the evolved cultural mechanisms (ECM). The main characteristics of evolved cultural mechanism are: first, they evolve during time and are constantly changing in a given population, secondly, they are shaped by informational cultural pool present in a human population and lastly, the mechanism responsible in creating them is cultural selection. Culture evolves gradually and the features best adapted to solve an adaptive problem, tend to propagate in other social groups or human population. Informational cultural pool is responsible in creating cultural material and nonmaterial features which we name evolved cultural mechanisms (ECM), are subject to a selection process. In this context, cultural selection acts upon informational units (the basic units of informational cultural pool) presented in ECM and thus cultural evolution happens because of another type of selection, informational cultural selection. Therefore, culture must be viewed as units of information deposited in evolved cultural mechanisms, which are responsible for cultural evolution in human population and are subject to informational cultural selection.

**Keywords:** culture, informational cultural pool, informational units, evolved cultural mechanisms, informational cultural selection

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## **6. Early menarche is associated with a preference for masculine partners and a younger ideal age to have a first child**

One developmental factor that is influential in life history trajectory is pubertal timing. For instance, girls who experience early menarche have romantic relationships at an earlier age, engage in sexual intercourse at an earlier age, and have their first pregnancy earlier. It has been argued that age of menarche also influences women's mate preferences because partner selection is instrumental to the implementation of reproductive strategies. More specifically, it has been suggested that early pubertal timing should lead to preferences for masculine faces, but there has been no study explicitly showing such a link. We therefore aimed to investigate the relationship between pubertal timing, reproductive plans, and masculinity preferences in a large sample of women from the United Kingdom.

Methods: 10,212 Caucasian nulliparous heterosexual women aged 18-30 (Mean years  $\pm$  SD =  $23.74 \pm 3.51$ ) from the United Kingdom were recruited online. Participants were first presented with a questionnaire and then instructed to select which face they considered to be the most attractive from several pairs, where each pair was made up of a feminized and a masculinized face shape.

Results: We found that women who experienced earlier menarche reported a younger ideal age to have a first child and showed stronger masculinity preferences. Conclusions: Our results provide evidence that women who experience early pubertal timing not only have children earlier but notably, plan to have children earlier. Additionally, our masculinity findings suggest that developmental factors, such as age of menarche, influence not only reproductive strategies but also partner selection, which is instrumental to the implementation of such strategies.

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## **7. From environmental connectedness to sustainable futures: topophilia and human affiliation with nature**

The objective of this study is to explore the co-evolutionary foundation for place-based human affiliation with nonhuman nature, and its potential to support sustainable development at the local level. In particular, we analyse the Topophilia Hypothesis, an expansion of the Biophilia Hypothesis which includes also non-living elements in the environment.

Methods: The study represents a multidisciplinary conceptual analysis of how biological selection and cultural learning may have interacted during human evolution to promote adaptive mechanisms for human affiliation with nonhuman nature via specific place attachment.

Results and Conclusions: The Biophilia Hypothesis has been one of the most important theories of human connectedness with nature, suggesting a genetically based inclination for human affiliation with the biological world. The Topophilia Hypothesis has extended the ideas of Biophilia to incorporate a broader conception of nonhuman nature and a co-evolutionary theory of genetic response and cultural learning. It also puts more emphasis on affiliation processes

with the local environment. We propose that nurturing potential topophilic tendencies may be a useful method to promote sustainable development at the local level, and ultimately at the global level. Tendencies of local affiliation may also have implications for multifunctional landscape management, an important area within sustainability research, and we provide some examples of successful landscape management with a strong component of local engagement. Since human affiliation with nonhuman nature is considered an important dimension of environmental concern and support for pro-environmental attitudes, the Topophilia Hypothesis may provide a fruitful ground for a discourse within which scholars from many scientific fields, including human evolution and humanistic geography, can participate.

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## **8. Cultural predictors of preferences for female body weight**

Cross-cultural studies have found a preference for heavier bodies in populations with reduced access to visual media compared to Western populations. Very few studies have addressed this while controlling for the potential confounding effects of nutritional stress, however. Here we examined preferences for female body shape in 150 men and women from Nicaragua, including an urban sample, a sample from a village with established television access, and a sample from a nearby village with very limited television access. As predicted, the highest BMI preferences were found in the village with greatest levels of hunger and least media access, while the lowest BMI preferences were found in the urban sample. Analysing individual data using backwards regression models showed that amongst rural women, greater media access (indexed by television consumption) predicted a preference for figures with lower body weight even controlling for acculturation, nutritional status and education. Amongst men, only demographic factors predicted preferences. These results are discussed in the context of bio-cultural impacts on attraction and beauty ideals.

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## **9. Manipulating sex differences in confidence on a mental rotation task**

Evolutionary psychologists have suggested that sex differences in spatial tasks, such as mental rotation, are due to selection pressures on men's hunting skills during human's history as hunter-gatherers. However, the sex difference in mental rotation appears to be mediated at least in part by the participant's confidence. We therefore aim to manipulate the sex difference in confidence to measure the effect of this on the sex difference in mental rotation performance.

Methods: We used a stereotype threat/lift paradigm, i.e. informing participants that women (or

men) are expected to perform poorly on a task, in order to induce lower or higher confidence. We used a mental rotation task with images of human bodies as stimuli; half the participants (N=30) were told that the task relies on spatial skills and that men outperform women, while the other half (N=30) were told that the task relies on perspective taking skills and that women outperform men.

Results: Women's confidence was higher when they were told that women perform better in the task, compared to women that were told that men perform better. Men's confidence was also higher when told that women perform better, compared to men that were told that men perform better. The sex difference in performance previously found on this task was also present in our control condition with no priming; however, this sex difference disappeared in both stereotype threat and lift conditions.

Conclusions: These findings add to previous studies that demonstrate the sex difference in mental rotation is malleable and may be underpinned by differences in confidence. Socially transmitted norms and expectations therefore appear to impact upon a cognitive task that is thought to reflect an evolved psychological sex difference. The results also add to findings that suggest men react differently to stereotype threat than women, as stereotype threat increased men's confidence on this task.

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## **10. The Dark Triad and female infidelity**

Objective: To identify the influence of primary and secondary psychopathy, Machiavellianism, and narcissism on previous incidence of infidelity, intentions to engage in infidelity and perceived likelihood that a partner will be unfaithful.

Method: Heterosexual women, each in a romantic relationship at the time of the study, were recruited online and from the campus of a British University. Participants completed the Mach IV (Christie & Geis, 1970), NPI-16 (Ames, Rose & Anderson, 2006), Levenson Self-Report Psychopathy Scale (Levenson, Kiehl, & Fitzpatrick, 1995), Attitudes Towards Infidelity Scale (Jones, Olderbak & Figueredo, 2011), bespoke Infidelity Experience Scale and Susceptibility to Infidelity Instrument (Buss, & Shackelford, 1997).

Results: Linear multiple regression analyses were conducted with primary and secondary psychopathy, Machiavellianism, and narcissism as predictors. The model predicted previous incidence of infidelity. Narcissism was the only significant individual predictor such that women with higher levels of Narcissism were most likely to report previous incidence of infidelity. The model also predicted intentions to engage in infidelity; narcissism and secondary psychopathy were the only significant individual predictors. Women with higher levels of narcissism and secondary psychopathy were most likely to report the intention to engage in infidelity. Finally, the model predicted perceived susceptibility to a partner's infidelity. Secondary psychopathy was the only significant individual predictor, such that women with higher levels of secondary

psychopathy reported being most susceptible to a partner's infidelity.

Conclusions: Dark Triad traits predict women's previous incidence of infidelity, intentions to engage in infidelity and perceived likelihood that a partner will be unfaithful. Narcissism and secondary psychopathy are most influential.

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## **11. Area-level deprivation and aggregate level breastfeeding outcomes in England**

This study aimed to test a prediction based on life history theory - that deprivation affects lactational investment - using aggregated area-level data.

Methods: Index of Multiple Deprivation and Department of Health breastfeeding statistics at Primary Care Trust (PCT) level were used to explore the association between area-level deprivation and breastfeeding initiation and prevalence of any and exclusive breastfeeding at 6-8 weeks in England for 2011/12. Generalised linear model analyses were conducted on non-London and London PCTs separately due to their different sociodemographic profiles. Multivariate analyses controlled for the potential confounders of ethnicity, education, age, smoking, and hospital factors.

Results: Area-level deprivation remained significantly associated with breastfeeding initiation in both PCT groupings in adjusted analyses. Non-London PCTs had higher initiation rates in less deprived areas but the opposite trend was observed in London PCTs. The prevalence of any breastfeeding at 6-8 weeks was only significantly negatively associated with area-level deprivation in non-London PCTs and exclusive breastfeeding rates showed no relationship in either group.

Conclusions: Area-level deprivation was used as a proxy for extrinsic mortality risk and as such lower breastfeeding rates in more deprived areas can be seen to reflect the adoption of faster life trajectories. Where perceived extrinsic mortality risk is greater, both the desire and ability to provide high levels of parental investment through lactation may be reduced. The present area-level analyses suggest that socioeconomically disadvantaged women need extra support to improve breastfeeding rates and this needs to be provided at all levels. The difference between London and non-London PCTs warrants further investigation. Future research should adopt a multi-level approach and use longitudinal data to provide a more holistic view of lactational investment.

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## **12. Behavioural innovation: State or trait?**

Innovation is integral to cultural evolution and yet, compared with social learning, little is known

of its emergence and development in humans. Previously, we ran a study in which 4- to 9-year-old children (N = 209) observed a demonstrator interacting with a novel puzzle-box task. Only 26 children innovated following demonstrations. Building on the work of animal behaviourists, who suggest stable learning and personality traits predispose some individuals to innovate more than others, we set out to discover more about these 26 children and whether innovation in childhood appears more of a trait than state.

Methods: The 26 innovators were matched with 26 children who demonstrated high levels of imitation fidelity in their puzzle-box interactions, creating an 'innovator' and 'imitator' group suitable for comparison on a battery of tasks - each with a theoretical and/or empirical rationale as to why they might relate to innovation.

Results: Significant group differences were found on two measures: number of methods discovered with the Pan-pipes (asocial problem solving) and flexibility in alternate uses for a common object (divergent thinking). However, more cumulative tests, wherein overall composite scores were created for each task by noting which individual (within each matched pair) scored higher than the other, revealed that 'innovator's achieved significantly higher scores across measures on the glass-ceiling box ( $F(1, 2) = 13.33, p = .001$ ), Pan-pipes ( $F(1, 2) = 6.66, p = .016$ ), and cumulative culture puzzle-box ( $F(1, 2) = 9.74, p = .003$ ). These findings suggest consistency in the extent to which these individuals are exploring in artificial fruit tasks.

Conclusions: From these and further findings, we propose that innovation is a complex interplay of state and trait: there appear to be individual propensities for innovation, but contextual factors likely play a role in eliciting these.

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### **13. Formation of a new group of chimpanzees (*Pan troglodytes*) at Leipzig Zoo and attendant changes in social behaviour**

This study investigates the upkeep of social relationships among chimpanzees (*Pan troglodytes*) when the value of these relationships changes due the formation of a new group. In socially living animals, other individuals are both potential rivals and social resources (e.g. sources of information, mating partners, grooming partners). Relationships can thus have different values depending on characteristics of the partner and the relationship. Based on theories by Cords & Aureli (2000), Kummer (1978) and Lewis (2002) regarding the values of relationships to primates, I (have) developed hypotheses regarding the behaviours that maintain these relationships. I expect the changes in group composition to lead to changes in the social relationships for each individual as well as the dominance structure of the group. This will change the value of each individual for its partners. I hypothesised that these changes in the individual's relationship values would lead to changes in their partner's relationship behaviours. To test these hypotheses, I observed the introduction of three adolescent females into a group of three human-reared juveniles and an adolescent male at the Wolfgang Köhler Primate Centre at Leipzig Zoo. Confirming my hypothesis, I found that chimpanzees can adjust their behaviour

flexibly to changing social circumstances and the relative values of different relationships.

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#### **14. Gamification implementation model - An approach of linking psychology and game thinking**

Gamification is a powerfully uprising new trend in the field of motivation, usability and learning. It can be a strengthening tool in human-robot interactions, simulations or mobile applications. However, the methodology has been used in a great variety of situations, problems with definitions and differences in views do occur. This paper presents a model (Gamification implementation Model - GiM) with the scope of creating a unified approach in which one can describe the role of game elements, psychological factors and output related variables (motivational affordances), not only in the context of gamification, but also from the field of game research and game design.

**Method.** This study focused on the third level of the GiM, examining the effect of motivational affordances on the problem-solving process. During specified workshops, groups of 3 to 5 people were asked to create User Generated Gamified Systems (UGGS) using Marczewski's gamification cards as a toolbox to provide solutions for different challenges. The most acknowledged motivational affordances (eg. Story/Theme, Clear Goals, Rewards, Achievements/ Badges) were represented in the study.

**Results.** According to the data gathered during the study, one can describe the preferences related to the usage of motivational affordances. Also, feasibility of the method can be defined in different situations of problem-solving and solution-providing in the context of UGGS. **Conclusion.** Gamification is a widely used method to foster motivation and engagement. By the results of this study, we defined the usability of the Gamification implementation Model, focusing on the User Generated Gamified Systems. Differences between the usage and effect of motivational affordances do occur, which can be used as an instrument in the process of creating gamified systems.

**Keywords.** Gamification, Motivational Affordances, Game Elements, Game Mechanics, Gamification implementation Model

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#### **15. The correlation between grandparental investment and happiness in Finland**

Grandchildren are often called the "dessert of life". Evolutionary theory argues that emotions are proximate mechanisms that encourage behaviour that has produced fitness benefits in our

evolutionary past. The feeling of happiness may be one proximate mechanism (i.e. an emotional reward) that directs behaviour towards evolutionary beneficial action, such as investing in grandchildren. However, studies examining the associations between grandparental investment and happiness are scarce.

**Methods:** We use nationally representative data from the Generational Transmissions in Finland project (n = 1,412 grandparents). First, using linear regression analysis we study whether there is an association between grandparental investment (measured by contact frequencies with grandchildren) and a grandparent's self-evaluated happiness. Second, we study whether differences in the associations between grandparental investment and happiness vary according to the sex and lineage of a grandparent.

**Results:** We found a positive association between grandparental investment and grandparent's self-evaluated happiness in the case of maternal grandmothers. **Conclusions:** The results indicate that maternal grandmothers may increase their happiness by investing in grandchildren. This could be one explanation for the common finding that maternal grandmothers invest the most in their grandchildren.

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## **16. Bonds, sweat and peers: the effects of group exercise on cooperation and performance**

In two experiments, we investigated the interrelated nature of two long-standing claims: that group exercise leads to social bonding in humans and that cues to social bonding lead to a psychosocial environment where exercise ability and motivation is enhanced.

**Methods:** In Study 1 we used a two-by-two between-subjects design to test the effects of synchronous movement - – a pervasive element of coordinated group exercise - and exercise intensity in groups of rowers. Social bonding measures were taken before and after 30-minute rowing trials in four conditions that varied intensity (low/high) and synchrony (synchronous/non-synchronous). In Study 2 an elite, highly bonded team of rugby players took part in a repeated measures design that tested the effect of cues of social bonds (via a synchrony prime) on anaerobic performance. Prior to a solo performance test, participants warmed up alone, synchronously with another teammate, and asynchronously with another teammate (order counterbalanced across conditions).

**Results:** Study 1 found a main effect of intensity - high-intensity exercise led to significantly higher levels of social bonding among participants. Study 2 found that participants' anaerobic performance was significantly improved after synchronous warm-up as compared to the non-synchronous warm-up. **Conclusions:** These findings support claims concerning the bidirectional relationship between group exercise and social bonding. Study 1 substantiates long-standing claims that group exercise involving moderate-to-high intensity physical activity can increase group cohesion. Study 2's findings support a "social placebo" account for the cohesion-performance link: cues to securely bonded relationships can enhance physiological performance. Our findings potentially contribute to explaining the ubiquity of group exercise

across cultural domains as varied as play, ritual, sport, and dance.

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## **17. Cultural transmission of collaboration between young children**

Young children successfully imitate and collaborate with adults; however, when interacting with peers, they should assume more active roles and make agreements with more equal partners. Objectives. In this study, we aimed at establishing how different types of collaborative tasks affect the fidelity of imitation along pairs of children.

Method. 3- and 4-year-old children were tested across four tasks: two cooperative games and two cooperative problem-solving tasks. One of each of these task types could be played by partners in similar roles, and the other two required complementary roles. Children were organised in chains of three pairs; the initial pair in the chain was trained to successfully execute the actions needed within each task and acted as models to the next pair. After two attempts at each task, the second pair demonstrated the coordinated actions to a third pair, who had two attempts to reproduce them. Pairs in a control condition performed the tasks without models.

Results. Children copied actions with similar fidelity regardless of the type of task or role, although the fidelity decreased along the chain. Children within chains were also able to coordinate better than children in control condition. Communication between partners within chains consisted mainly of instructions or comments about the task.

Conclusions. Young children were able to transmit coordinated actions between them in different types of collaborative tasks. The increased level of coordination within chains indicates that the demonstrations helped children: a) to understand the roles and goals of the tasks; and b) to perform with a partner with similar level of skill, without any direct instructions to them or adult scaffolding. Future studies may explore further the relationship between cultural transmission and cooperation in children.

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## **18. Face recognition and hand-washing behaviour in a hazardous health scenario**

Hand-washing is of essential importance in the battle against cross-transmission of infectious microorganisms in high-risk environments. We compared the response sensitivity, biases, and reaction time (RT) to faces linked to different hand-washing behaviours in a hypothetical hospital emergency ward: clean hands, dirty hands, or unknown hand-washing (control). The results of two experiments showed no significant differences in sensitivity, biases, or RT to clean or dirty hands, even though the sensitivity to them tended to be higher than in the control condition. The third experiment examined if the occupation of hospital staff (nurses vs porters) modulated face recognition linked to the previous hand-washing behaviours. Again, no reliable differences in

sensitivity and response bias were observed. On the other hand, the RT to nurses was faster than to porters in all conditions. The absence of a clear memory advantage towards relevant hand-washing behaviours in hazardous environments points to the need to devise better strategies to remind people of the importance to observe (and remember) the hand-washing behaviour of others when exposed to hazardous health environments. Authors: Fatima Felisberti, Department of Psychology, Kingston University London, f.felisberti@kingston.ac.uk; Tor-Arne Haugland, Psychology, Kingston University London.

## **19. Effect of biological relatedness on perfume selection**

Previous studies suggest that people tend to select their fragrance to complement their body odour. As relatives share some qualities of their body odour one might expect that their ability to select complementary fragrance for their relatives would be higher compared to non-relatives. We tested this hypothesis in two studies by comparing selection of a perfume for a target man performed by i) him, ii) relative (sister) or non-relative individual (girlfriend).

Methods: Twelve pairs of men and their sisters took part in Study I and another 13 pairs of men and their girlfriends took part in Study II. They were asked to select the most suitable fragrance from a list (N=24) which covered main perfume types. Target men subsequently applied the two perfumes to their armpits and for 12h worn cotton pads which served as stimuli. The fragrance and body odour blends were subsequently rated for attractiveness by panels of female raters. We further asked an independent panel of raters to assess the fragrances alone.

Results: In Study I, the body odour-fragrance blends selected by sisters were unexpectedly rated as more attractive compared to samples selected by the target men. This also applied to the ratings of the fragrances alone. In Study II, we found that body odour and fragrance blends selected by girlfriends were rated as non-significantly more attractive compared to the selection made by the target men. However, there was no significant difference when fragrances were rated alone. Conclusions The results indicate that, irrespective of biological relatedness, women may be better at selecting perfumes than men, perhaps because they have more complex olfaction-related cognitive abilities.

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## **20. Women's preference for attractive makeup tracks changes in their salivary testosterone**

Attractive makeup increases women's attractiveness to potential mates and their competitiveness among potential rivals for resources. The factors underpinning changes in motivation to wear attractive makeup are unclear, however. Cross-sectional studies reporting that women's makeup use differs between high- and low-fertility phases of the menstrual cycle

present preliminary evidence that women's preference for attractive makeup may change as a function of their hormonal profile. Consequently, we used a longitudinal design to test whether women's preference for attractive makeup tracks changes in their measured hormone levels.

**Methods:** In five weekly test sessions, we measured 85 women's preferences for wearing 50 different combinations of makeup varying in attractiveness. In each test session, we also collected saliva samples, which were used to measure testosterone, estradiol, and progesterone levels.

**Results:** Multilevel analyses of these data showed that women reported preferring to wear makeup that others perceived to be attractive. However, this tendency was more pronounced in test sessions where testosterone level was high. This effect of testosterone level was independent of the possible effects of estradiol, progesterone, or estradiol-to-progesterone ratio.

**Conclusions:** These results suggest that testosterone may play an important role in changes in women's motivation to wear attractive makeup and, perhaps, their motivation to appear attractive in general. Moreover, they are consistent with recent models of the role of testosterone in behavior, which propose that testosterone increases the probability of behaviors that support the acquisition of mates and other resources.

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## **21. Domain of judgment affects majority-bias in young children**

Like adults, children change their judgments after observing a majority census, sometimes selecting obviously incorrect responses in order to conform. Importantly, this majority-bias is not uniform across contexts, but varies according to culture and age. As majority bias has important implications for cultural acquisition, there needs to be a better understanding of the factors that influence it. Here, we address how the domain (perceptual versus preferential) affects children's conformity.

Children's propensity to conform was manipulated across two domains: a perceptual judgment, and a group's preference (counter-balanced within-subjects). Fifty-six children (3- and 5-year-old) participated. Children were exposed to a novel apparatus, the "Duo-box", a transparent puzzle box that contained two different items that could be retrieved (one in either identical side). In the perceptual judgment condition children witnessed four adults, each being asked to retrieve the biggest item from inside the box; however, all retrieved the obviously smaller item. In a reward preference condition models were asked which reward they wanted, all chose the less desirable single-sticker over a more desirable 10-sticker reward (the preference was established in a control condition). Children were then asked to retrieve the biggest item, or the reward they preferred, respectively.

Three-year-olds conformed significantly more than five-year-olds in the preferential condition ( $Z = 3.22$ ,  $p < .001$ ), but there was no difference in the perceptual judgment condition ( $Z = 1.34$ ,  $p = .182$ ). Conforming, even when expressing incorrect judgments, may be useful. But by 5-years, children learn to override a majority-bias to obtain a more desirable reward. This research highlights the variable nature of majority influence across different domains, and potentially establishes how different aspects of culture (values versus knowledge) develop.

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## **22. Effect of sibling alloparenting on female fertility in Samoa, a natural fertility population**

The aim of this research is to investigate the impact of alloparenting on Samoan women's fertility. Samoa, formerly known as Western Samoa, is a small island nation located between Hawaii and New Zealand in the Polynesian region of the South Pacific. In contrast to the industrialized West, Samoa's fertility rate has slightly increased over the last ten years despite the ongoing transition to developed nation status.

The current study employed a mixed methods approach, collecting both interview data and observational data in Samoan households. Interviews were conducted with 150 Samoan mothers from various sampling locations on the most populous island of Upolu. From these interviews a subset of Samoan households were selected for observation. Observations of helping activities by all members of the household were noted. Few Samoan mothers reported receiving help from their offspring. However, observations of helping activities made it apparent that, although Samoan mothers do not report receiving help from their children, the children are, in fact, performing multiple behaviours that reduce the amount of time Samoan mothers spend engaged in household duties and childrearing.

Results indicated that neither reported helping by children (survey responses) or observed helping by children had an effect on female reproductive success. No effect was found at the village level (reported help:  $p = .31$ ; observed help:  $p = .73$ ) or at the population level (reported help:  $p = .36$ ; observed help:  $p = .46$ ). These results suggest that although children in Samoa are responsible for a large number of tasks that reduce the workloads of their mothers, this helpfulness does not impact female fertility.

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## **23. Evolution of sensitive periods**

Sensitive windows, developmental periods or stages in which experience shapes phenotypic development to a larger extent than other periods or stages, are widespread in nature. Despite a recent focus on neural-physiological explanation, few formal models have examined the

evolutionary selection pressures that result in developmental mechanisms that produce sensitive windows. Here, we present such a model. We model development as a specialization process during which individuals incrementally adapt to local environmental conditions, while collecting a constant stream of cost-free, imperfect cues to the environmental state. We compute optimal developmental programs across a range of ecological conditions and use these programs to simulate developmental trajectories and obtain distributions of mature phenotypes.

We highlight four main results. First, matching the empirical record, sensitive windows often result from experience or from a combination of age and experience, but rarely from age alone. Second, individual differences in sensitive windows emerge as a result of stochastic sampling: individuals who sample more consistent cue sets lose their plasticity at faster rates. Third, in some cases, experience during a sensitive window shapes phenotypes only at a later life stage (sleeper effects). Fourth, individuals might perseverate along developmental trajectories despite accumulating evidence suggesting the alternate trajectory is more likely to match the ecology.

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#### **24. Estradiol levels do not predict women's preferences towards facial masculinity**

Sex steroid hormones were suggested to be associated with cognitive functions. However, there have been few studies actually measuring hormone levels and simultaneously analysing women's preferences. Here, we studied the relationship between women's estradiol levels and their preferences for facial masculinity.

Methods: Participants were 115 women, between 24 and 36 years of age, who did not use hormonal contraception. Estradiol was measured in saliva samples taken every day for the entire menstrual cycle. Each woman evaluated attractiveness of 9 pairs of male faces that varied in masculinity, in a long-term and short term mating context.

Results: There was no statistically significant relationship between the morning level of estradiol measured on the day of taking the masculinity preference test, nor mean estradiol level of menstrual cycle and computed preference for masculinity in either of the mating contexts (P values ranging from 0.34 to 0.98).

Conclusions: Our results do not support the idea that estradiol levels influence preference for facial masculinity in women, regardless of the assumed length of relationship (i.e. within subjects short- or long-term mating context trials).

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## **25. The reward value of infant facial cuteness tracks within-subject changes in women's salivary testosterone**

Cute physical characteristics in infants trigger adult caregiving and protective behavior. Although testosterone is known to modulate behaviors that function to nurture and protect infants, how hormones modulate responses to infant cuteness is not known. Here we used a longitudinal design to explore the possible relationships between changes in women's hormone levels and a behavioral measure of the reward value of infant facial cuteness.

**Methods:** In five weekly test sessions, we used a standard key-press task to measure the effect of experimentally manipulated cuteness on the reward value of infant faces in a sample of 60 women. In each test session, we also collected saliva samples, which were used to measure testosterone, estradiol, and progesterone levels.

**Results:** Multilevel modeling of these data showed that infant cuteness was more rewarding in test sessions where testosterone levels were high. Moreover, this effect of testosterone was independent of the possible effects of estradiol, progesterone, estradiol-to-progesterone. Further analyses showed that this putative effect of testosterone on the reward value of infant cuteness was also independent of possible changes in women's perceptual sensitivity to infant cuteness.

**Conclusions:** Our results suggest that women's behavioral responses to infant cuteness track changes in their testosterone levels. Recent models of the role that hormones may play in parental behavior have emphasized the role of testosterone in generalized motivational dispositions relating to the protection and nurturance of infants. Our data suggesting that testosterone also enhances motivational responses to infant facial cuteness potentially then reveal an additional role that testosterone may play in regulating behavior to infants.

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## **26. Mating success is positively related to immunity, body attractiveness and testosterone in young men**

Testosterone dependent traits such as muscularity and masculinity have been associated with better immune function which might be mediated through stress response. In addition, these secondary sexual characteristics seem to play a part in male attractiveness and thus sexual success, although the results are not consistent. In this study, we examined the association of secondary sexual characteristics with sexual success and the connection of the sexual success to testosterone and cortisol level and immune function.

**Methods:** Sexual success of the 74 men that took part to this study was measured by the number of sexual encounters, amount of used prostitution and number of extra pair copulations. Each male's percentage body muscularity, testosterone and cortisol level, and the amount of antibodies produced to hepatitis B vaccination was also measured. The photographs of the

males were rated according to attractiveness and masculinity by females.

**Results and Conclusions:** Our results show that especially facial masculinity correlates positively with the number of sexual encounters and the use of prostitution negatively with male body muscularity, which has not been shown before. Furthermore, this study indicates that the strength of the immune response and testosterone production are positively associated with the number of female partners of men, providing support to the link between testosterone and immune function. However, the level of stress hormone cortisol did not seem to have a significant association with the mating success of males.

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## **27. The role of language and emotions in the triggering of perceived charisma**

Throughout evolutionary history, group coordination challenges have driven the evolution of leadership. Among a range of different traits that define "strong leadership quality", charisma appears to be of great importance. Yet, it is still unclear which traits define an individual's charisma. Recently a list of verbal and nonverbal tactics that contribute to charismatic leadership have been proposed in the domain of management. This study aims at investigating the predictive power of these tactics in the context of political leadership, using the 2012 US presidential debates as a case study.

To examine perceived charisma of both presidential candidates, a survey using the Verçiç & Verçiç charisma scale was conducted amongst a sample of Belgians ( $N=124$ ;  $M=36.54$ ;  $SD=15.62$ ). Next, two content analyses investigated the use of verbal and nonverbal (facial expressions) tactics of both candidates in the first and last debate. For the positive emotion "happiness" a distinction was made between the use of Duchenne and non-Duchenne smiles. Survey results show that Obama scores significantly ( $M=133.29$ ,  $SD=14.84$ ) higher on the Verçiç & Verçiç scale compared to Romney ( $M=98.77$ ,  $SD=17.40$ ).

Results of the content analyses reveal subtle differences in the use of verbal charismatic leadership tactics that seem to differ from the predictions based on the charismatic leadership tactics list. With regard to nonverbal tactics, Obama significantly expressed more negative facial expressions. Yet with regards to happiness, Obama significantly signaled more Duchenne smiles compared to Romney, who displayed non-Duchenne smiles more often. In sum, this study analyzed the employment of the different verbal and nonverbal tactics, and also shows that the use of negative emotions may not necessarily imply a loss of perceived charisma. The expression of Duchenne vs. non-Duchenne smiles appeared to be an important predictor of perceived charisma, and is definitely worthy of further research.

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## **28. Women's facial attractiveness, body mass index and salivary cortisol**

Many studies have demonstrated that women with relatively low levels of adiposity tend to have attractive faces. More recently, one study suggested that women with relatively low cortisol levels also have attractive faces, even when controlling for the effect of adiposity. Here we sought to replicate this finding.

Methods: Young adult white women (N=93) attended the lab once a week for five weeks. In each test session, a saliva sample was collected from each woman and subsequently analysed for cortisol level. Each woman's height and weight were also measured and used to calculate their body mass index (BMI). In the first test session, a digital face photograph was taken of each woman under standardised conditions. We then obtained third-party attractiveness ratings of colour-calibrated versions of these face images. Face images were masked so that hairstyle and clothing were not visible when the images were rated.

Results: Data were analysed using an ANCOVA, in which rated facial attractiveness was the dependent variable, rater sex was a within-item factor, and BMI and mean cortisol level were covariates. To control for diurnal variation in cortisol, all variables were standardised for time of day. This analysis showed independent negative effects of BMI and cortisol. No other effects were significant.

Conclusions: Replicating previous work, our results suggest that women's facial attractiveness is independently related to their BMI and cortisol level. These findings present further evidence for a link between women's facial attractiveness and aspects of their health.

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## **29. Innovation and flexibility in chimpanzees**

Objective: To investigate whether chimpanzees are capable of flexibly switching between and innovating novel solutions in response to a changing extractive foraging task. Previous studies indicate chimpanzees are conservative in their approach to foraging tasks (Hrubesch, Preuschoft & van Schaik, 2009; Marshall-Pescini & Whiten, 2008). More recent work, however, suggests that great apes may be capable of responding to changing tasks with cumulative, progressive solutions (Lehner et al. 2011).

Method: Captive adult chimpanzees were provided with an extractive foraging task, consisting of a tube partially filled with diluted juice, and a variety of tool materials, such as sticks and cloth. The task was presented in an area chimpanzees could access, as a group, for up to two hours daily. After 10 hours of testing, the tube was made narrower to restrict available solutions. After a further 10 hours of this restricted condition, scaffolding was provided by priming the tube with a potential solution.

Results: 3,202 attempts were made, including 11 instances of potential innovation, but only one of these was successful. No innovation was repeated by other individuals. Chimpanzees did not alter their choice of tool material in response to the task changes, despite two of the three most frequently used tool materials becoming significantly less successful in the latter stages. Scaffolding provided by priming the apparatus with a potentially more efficient solution had no effect upon tool choice.

Conclusions: Adult chimpanzees failed to flexibly alter their behaviour in response to a changing task. Future work will further examine this issue by repeating the experiment with groups including young chimpanzees at Chimfunshi Wildlife Orphanage in Zambia to examine potential demographic factors and the impact of previous tool use experience. A complementary study will involve a similar task to be given to both children and chimpanzees.

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### **30. Rural livelihoods and biased parental investment in child education in Northern Tanzania**

Evolutionary and economic models of the family argue that child education increases with socioeconomic development in response to increased returns to low-fertility, high-investment parental strategies. The effects of increased educational investment on patterns of biased parental investment are less clear. Recent studies have demonstrated that greater wealth within developing rural communities is associated with larger biases in the allocation of education in terms of birth order and child gender. On the other hand, modern post-demographic transition populations are generally characterised by stronger norms of equal treatment of children by gender and birth order. Here, we explore how livelihood and wealth influence child education in a region of Northern Tanzania characterised by mixed livelihoods, and recent, rapid uptake of education.

Methods: This study used data collected by the non-governmental organisation Savannas Forever Tanzania, spanning an ethnically diverse sample of 56 villages. We conducted descriptive and multivariate logistic regression analyses to investigate the effect of livelihood (comparing pastoralists, farmers and business-owners), household wealth, gender, and birth order on education level of children aged 7 to 19.

Results: Preliminary results indicate children in pastoralist households are disadvantaged in terms of access to education, whereas the children of farmers or business-owners received higher levels of education. As expected, children in wealthier households are more likely to be educated. Adult education levels show a history of favouring male education; however we find little evidence of investment bias by gender or birth order in contemporary children.

Conclusions: Livelihood was found to be an important determinant of education, with children in pastoralist households being less likely to be educated, and less likely to progress to secondary school. The lack of evidence for parental investment bias by gender or birth order is consistent with a strategy of 'bet-hedging' within families, as returns to education are unpredictable.

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### **31. Making sense of early false-belief understanding**

Based on my recent publication in *Trends in Cognitive Sciences* a theoretical framework will be presented in order to address the puzzle about early belief ascription: young children fail elicited-response false-belief tasks, but they demonstrate spontaneous false-belief understanding. Building on recent converging evidence, a pragmatic account will be articulated in order to solve this puzzle. Young children do understand the contents of other's false belief, but they are overwhelmed when they must simultaneously make sense of two distinct actions: the instrumental action of a mistaken agent and the experimenter's communicative action.

More specifically, it will be argued that what makes the standard where-prediction question so taxing for children before the age of four is that it simultaneously requires them to take a detached (or observational) third-person perspective on the mistaken agent's instrumental action while taking an involved second-person perspective on the experimenter's communicative action. In support of this view new empirical data will be provided showing that 3-year-olds succeed in social versions of the false-belief task in which they are asked to take an involved second-person perspective onto the instrumental action of a mistaken agent by being prompted to either please or trick her. The core insight underlying this pragmatic framework is that a main evolved function of the human ability to track the contents of other's false beliefs is to enable humans to deal with false beliefs in the context of communicative agency.

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### **32. Skin colour reflects recent ill-health**

Carotenoids are group of red-yellow pigments present in fruit and vegetables and known to impart a healthy and attractive looking colour to human skin. In many bird and fish species, carotenoids colour sexually selected ornaments; the intensity of colour in these ornaments relates to condition or health beyond carotenoid intake. The present study investigates whether carotenoid colouration of human skin is related to retrospective signs and symptoms of ill health.

Methods: Skin colour was measured in 84 Caucasian participants aged 17-24, using a spectrophotometer. Participants also completed an abbreviated version of the Symptoms of Illness Checklist, reporting the duration and severity of 13 cold and flu like symptoms during the previous 60 days. Fruit and vegetable intake during the previous week was assessed using a 7 item food frequency questionnaire.

Results: A bootstrapped linear regression confirmed that past symptoms of ill-health were a

significant predictor of skin yellowness ( $\beta = -.156$ ,  $p = .043$ ) at participant's inner forearm when controlling for skin lightness and fruit and vegetable intake. Past symptoms of ill-health did not predict skin yellowness at participant's palm.

Discussion: Carotenoid colouration of human skin may reflect recent health of individuals; suggesting that the perceived preference for this colouration is rooted in an honest signal of mate quality. Location specificity of effects begs further investigation. Differences in skin thickness may reflect different timescales of past health.

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### **33. Competing measures of competitive ability: assessing strength using Likert scales and Elo rankings**

This study aimed to investigate Elo rating as a tool to analyse judgements of human strength.

Methods: Twenty eight male and 28 female raters viewed 82 photos of men, for whom extensive anthropometric measures had been taken, and judged their physical strength using two different methods in a counterbalanced design. Men ("targets") were rated on a Likert scale, from 1 (very weak) to 7 (very strong), and presented in pairs with the rater indicating which man they thought to be stronger (each image was presented twice, paired at random, for an equivalent number of trials in Likert and pairwise conditions). We used Elo rankings to analyse paired presentations, a technique that awards points to targets based on the comparative rank of their opponents (i.e. beating a high-ranked target leads to a large increase in Elo score, compared to victory over a low-ranked target).

Results: Judgements using the Elo method correlated strongly with Likert ratings ( $r^2 = 0.90$ ,  $P < .001$ ). Both rating measures accurately predicted grip strength (Elo:  $r^2 = 0.42$ ,  $P < .001$ ; Likert:  $r^2 = 0.40$ ,  $P < .001$ ) and other measures of strength (e.g. estimated muscle mass from impedance analysis). Additionally, Elo strength rankings were associated with competition-relevant traits that were not associated with Likert ratings (e.g. neck circumference, height), and were more strongly associated with anthropometric measures than Likert ratings across measured traits.

Conclusions: We suggest that Elo ranking is a useful alternative to traditional Likert scales when asking for social judgements of stimuli, efficiently gaining the advantages of forced choice presentation, without requiring exhaustive pairing of all stimuli. Anecdotally, participants also found the pairwise comparisons easier to make than Likert ratings.

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### **34. Why do males from good families cooperate less?**

Human behavior is remarkably plastic, yet evidence suggests that much of an individual's behavioral tendencies are established via parental influence during childhood. Also current conditions, like feelings of being socially connected, can affect people's social and moral decisions. We tested associations between an individual's parenting styles experienced at childhood, their current relationship quality with their parents and their cooperative behavior in a Public Goods social dilemma game (PGG).

Methods: We ran a PGG experiment with 240 subjects, and assessed their backgrounds with a questionnaire that contained questions about childhood experience and their relationship with their parents.

Results: We found that an individual's tendency to cooperate in PGG was correlated with the quality of the relationship that they had with their parents. Specifically, those who felt they had a distant relationship with their parents cooperated more and those with a close relationship cooperated less. However, this correlation only existed for males. Furthermore, the quality of relationships with parents was strongly associated with harsh treatment in childhood.

Conclusions: One possible explanation for lower cooperative tendencies in males that had a good relationship with their parents is that they have stronger feelings of being socially connected to others, which has been shown to increase utilitarian choices in social dilemmas and decrease motivation for generating new affiliations. Likewise, people who feel socially disconnected may seek to connect with others, which may explain the higher cooperativeness for those males that had poor parental relationships. The reasons why this effect could be limited to males is currently unknown, but may be linked to higher competitiveness of males in general, and to males' tendency to cooperate in larger groups.

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### **35. Sex, pathogens, and rock'n'roll: does disgust sensitivity dictate our mating behavior?**

Recent research has revealed that the propensity to react to various (disgust sensitivity) might be associated with mating strategy. To further explore this possibility and to combat some of the methodological limitations (e.g., small, unrepresentative samples) in earlier studies we measured disgust sensitivity and several measures of mating strategy and mating success in a large sample.

Methods: In a survey of a representative sample consisting of 3,000 individuals living in Finland we explored the relationship between disgust sensitivity and several measures of mating strategies, such as socio-sexuality, number of sexual partners, hetero (vs. non-hetero) sexuality, and of actual mating success (i.e., number of biological children).

Results: We found disgust sensitivity to be linked to all outcome measures with effect sizes

ranging from small to moderate. As expected sexual disgust showed stronger relationships than did pathogen and moral disgust sensitivity.

Conclusions: We suggest that these relationships can be meaningfully interpreted from an evolutionary perspective. Importantly, however, the correlative nature of the present study does not allow for interpretations of causality.

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### **36. Emotional expression modulates the effect of stimulus sex on the reward value of faces**

Studies have shown that physical attractiveness has a greater positive effect on the reward value of smiling faces compared to faces with relatively negative expressions. These results suggest cues of positive social interest can modulate the reward value of other facial cues, potentially supporting efficient allocation of social effort. Since previous neurobiological and behavioural studies have shown that heterosexual men find women's faces more rewarding than men's faces, here we tested whether this effect of sex of face on reward is also modulated by emotional expression.

Methods: Young adult heterosexual men (N=61) completed a standard key-press task to assess the reward value of men's and women's faces displaying happy, sad, angry and fearful expressions. In this task, participants can control the length of time they view a face by pressing buttons to either increase or decrease viewing time. Longer viewing times indicate greater reward value.

Results: Analyses revealed a main effect of sex of face, whereby women's faces were more rewarding than men's faces. As we had predicted, however, there was an interaction between sex of face and emotion. The effect of sex of face was greatest for smiling faces.

Conclusions: Our results present further evidence that cues of social interest can modulate the effect of other cues on the reward value of faces.

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### **37. Car design and road crossing behaviour**

Humans possess a highly developed sensitivity for facial features. This sensitivity is also deployed to non-human beings and inanimate objects such as cars. In the present study we aimed to investigate whether car design has a bearing on the behaviour of pedestrians.

Methods: An immersive virtual reality environment with a zebra crossing was used to determine a) whether the minimum accepted distance for crossing the street is bigger for cars with dominant appearance than for cars with friendly appearance (Block 1) and b) whether the speed of dominant cars are overestimated compared to friendly cars (Block 2). In Block 1, the participant's task was to cross the road in front of an approaching car at the latest moment. The point of time when entering and leaving the street was measured. In Block 2 they were asked to estimate the speed of each passing car. An independent sample rated dominant cars as being more dominant, angry and hostile than friendly cars.

Results: None of the predictions regarding the car design was confirmed. Instead, there was an effect of starting position: From the centre island, participants entered the road significantly later (smaller accepted distance) and left the road later than when starting from the pavement. Consistently, the speed of the cars was estimated significantly lower when standing on the centre island compared to the pavement. When entering the visual size of the cars as factor (instead of dominance), we found that participants started to cross the road significantly later in front of small cars compared to big cars and that the speed of smaller cars was overestimated compared to big cars (size-speed bias).

Conclusions: Car size and starting position, not car design seem to have an influence on road crossing behaviour.

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### **38. Women with more feminine digit ratio have larger number of children and give birth to the last child at later age**

Digit ratio (2D:4D) has been suggested to be an indicator of sex hormone exposure during prenatal development. It is hypothesized that women with more feminine digit ratio were exposed to higher prenatal estrogen levels. Therefore, it might be expected that 2D:4D will be related to women's reproductive characteristics.

Methods: The study participants were 319 women, who went through a natural menopause between 45-60 years of age and whose husbands were alive at least until their menopause. Women were recruited at The Mogielica Human Ecology Study Site located in Polish rural area with a high birth rate.

Results: Women with more feminine 2D:4D had more children ( $P=0.004$ ), higher number of daughters, when controlled for the number of sons ( $P=0.03$ ), and gave birth to the last child at later age ( $P=0.02$ ), than women with more masculine 2D:4D. Individual's age was included as a potential confounder in all analyses.

Conclusion: Our results indicate that early developmental hormonal environment may influence women's future reproductive success. Higher prenatal exposition to estrogen may be responsible for more efficient functioning of women's reproductive system and may influence behaviour

which increases chances of higher reproductive success (e.g. sex drive, level of sexual excitement, preferred age at first reproduction). While the relationships between 2D:4D, adult sex hormone levels and reproductive characteristic are still inconclusive, maternal factors like WHR, which correlates with hormone levels in adulthood, provide an honest signal of women's reproductive potential and may predict offspring's sex and their number.

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### **39. Social perceptions of physical formidability**

We hypothesized that humans might apply a "better is bigger" bias when perceiving objects and people: a heuristic based on an evolved predisposition to associate physical formidability with status and status with physical formidability. Three studies (two longitudinal) tested whether perceptions of performance are positively associated with perceptions of physical formidability in sports and politics. We also tested whether winning or losing a contest affects these perceptions.

Methods: Study 1 was conducted on campus during the European Football Championship 2012. Experimenters asked 299 participants to rate 4 prominent players in the Dutch national team on performance, height, and weight. Study 2 was conducted online before and after a football match between Ajax and PSV in September 2013. Before the game 227 participants rated performance, height and weight for 4 players of their favorite team. After the game, 67 participants made the same estimates again. Study 3 was conducted online during the Dutch general elections 2012. Before the elections, 2,015 participants randomly rated political leaders on political skills, height, weight, and strength. After the elections, 632 participants estimated the same leaders again.

Results and Conclusions: All three studies supported the better is bigger bias, suggesting that the link between physical formidability and positive evaluations is even more generic than previously thought, and that it also applies to size estimates of individuals based on their performance. Furthermore, study 3 showed that a politician who won the elections was perceived as being taller after winning the elections, while the loser of the race for the largest share of the votes was perceived as being shorter after the elections, as compared to their perceived height before the elections (replicating Higham and Carment, 1992).

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#### **40. Social content is not a primary factor in stereotypical judgments related to facial appearance**

In social animals, the ability to detect acts of conspecifics which makes their future behaviour predictable is crucial in optimizing prosocial behaviour. Natural selection might have favoured sensitivity to behavioral cues related to trustworthiness in humans as well. We tested the assumption whether domain-specific algorithms are responsible for these stereotypical social judgments, or are based on general, low-level cognitive processes.

**Methods.** Ten facial photographs were shown to two groups. For the first group, the facial stimuli were preceded by images with different valence for a perithreshold duration. Five of the images were primed with images with negative, five with positive valence. Members of the second group were asked to learn behavioural descriptions of the same set of faces. The task was the same for both groups: participants were asked to choose from two composite faces the more likeable one. These were made of the five individual faces associated with the negative and the positive images or behaviors, respectively.

**Results.** The participants preferred the positive composite to the negative one above chance. The type of the task (i. e., priming or learning) did not influence the subjects' choice significantly.

**Conclusions.** Following a short, but emotionally intense, exposure, faces resembling previously seen ones evoke similar reactions. This effect is mediated only by the valence of the stimuli associated with the original faces. The social information encoded in these stimuli does not have any enhancing effect on the performance. Therefore, it seems possible that stereotype formation and social decision-making based on facial appearance - especially when the amount of available information is limited - builds on low-level cognitive processes, such as associative learning, categorization, and generalization.

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#### **41. Who were the medieval English people? Dental affinities between Poulton and Gloucester populations**

Nonmetric dental traits have been proven successful in estimating phenetic and by proxy genetic distances among different human populations. A large proportion of the current research in dental anthropology has focused on continental and regional scale study, including African, Asian, or Native American populations. However, there is a lack of studies carried out on English populations. Therefore, the present study focuses on determining the biological distance between two medieval samples from England. One of the samples is from Poulton and the other from Gloucester, both of which are located in western England approximately 150 km apart. The phenetic affinity between these two samples was studied based on dental morphological traits.

**Methods:** Ten nonmetric dental traits were recorded in a total English sample of 100 individuals.

In addition, data on dental morphologies in four archaeological samples from southern Europe were used when comparing the samples. Trait frequencies were calculated for the English samples and phenetic affinities were calculated for all of the six samples using the mean measure of divergence. The affinities were also represented visually in the form of two-dimensional scaling and Ward's hierarchical clustering method.

Results: The phenetic affinities showed that the English samples significantly differ from each other and they also significantly differ from the four southern European samples. The trait frequencies also revealed that there is a surprisingly high occurrence of upper central incisor shovelling and upper canine distal accessory ridge in the Gloucester population.

Conclusions: The evidence from this study suggests that the Poulton and Gloucester populations diverged at a point in time and continued evolving separately. However, further studies should be conducted in order to establish if the findings were real. In addition, a study on a larger scale in Britain would be beneficial in establishing phenetic affinities between other parts of the country.

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#### **42. The life history of child sexual abuse victims: A meta-analysis on abuse characteristics and outcomes**

Life history theory suggests that childhood experiences, such as child sexual abuse (CSA), modulate psychological dispositions and actual behavior later in life. Although research shows that the effects of CSA extend into adulthood, the variation is considerable with some individuals being affected to a greater, while others to a lesser, extent. Because CSA is a heterogeneous phenomenon, we postulated that this variation may partly be due to the characteristics of the abuse, and that the differing outcomes can be understood from an evolutionary perspective.

Methods: The present study addressed the effects of age at CSA onset, abuse quantity, penetration, relationship with the perpetrator, and physical force on psychosexual distress (e.g., risky sexual behavior); health risk behavior (e.g., disordered eating); social dysfunction (e.g., interpersonal functioning), and depression.

Results: We identified more than 200 studies on more than 50,000 participants who had experienced CSA. We found that penetration, abuse quantity, relationship with the perpetrator, and physical force resulted in increased risk across several outcome variables. No significant effects were found for age at CSA onset.

Conclusions: Our results highlight the importance of research regarding the effects of abuse characteristics in research on CSA. Moreover, we suggest an evolutionary perspective might be useful for understanding the variability in the consequences of CSA.

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#### **43. Fairness motivation and SES in young children from two countries**

Moral motivation develops dramatically from 5- to 6- years old (for an explanation, Sheskin et al., 2014), and studies with adults suggest that cultural differences may account for some intergroup differences in moral motivation (Henrich et al., 2005). However, other studies comparing people from harsh vs. less harsh environments in adults (Nettle et al., 2011) and children (Benenson et al., 2007) have shown that intragroup variability in moral behavior can be as great - if not greater - than intercultural ones, suggesting that life history strategies may modulate one's motivation to invest in moral motivation: the harsher a child's environment, the less she will be willing to invest in her moral reputation.

We studied children from a very deprived and a middle-class area in the same city, both in France (Calais) and Romania (Slatina), to compare how children shared 4 toys with an unknown child (adapted from Sheskin et al., 2014). After the sharing task, children rank-ordered 12 toys (including replicas of the 4 toys they had previously shared). Value scores were assigned according to rank: first toy's value is 12, second toy's is 11, etc. A generosity score was then calculated for each child (added value of the given toys minus added value of toys kept). There was no significant difference between Romanian (-12.98) and French (-10.97) children's mean generosity scores:  $t(112) = 0.7494$ ,  $p < 0.46$ . However, the difference between the mean generosity score of children from very deprived areas (-14.56) and middle class areas (-8.75) was significant:  $t(112) = 2.3432$ ,  $p < .02$ .

When moral motivation first develops, children from harsher environments are less generous than children from less harsh environments. This conclusion is in line with the hypothesis that there is a life history calibration of the motivation to invest in one's moral reputation.

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#### **44. Preferences for subtle facial cues to health are present in early childhood**

Detecting the health status of conspecifics is critical to reduce exposure to pathogens in social interactions. Perhaps unsurprisingly, then, adults are highly attuned to subtle cues of health in conspecifics including cues from skin color. Carotenoid-linked skin color provides a cue to current health and is found attractive and healthy-looking by adult observers across genders and ethnicities. Melanin ('sun-tan') coloration is also found attractive and healthy-looking, at least in Western cultures, but does not provide a direct cue to health. As such, different mechanisms may underpin preferences for carotenoid and melanin coloration: an evolved sensitivity for health cues may underlie carotenoid preferences, while melanin preferences may be based on learning systems sensitive to cultural norms. Understanding whether carotenoid but not melanin cues are preferred early in life, would provide evidence for these differential learning trajectories.

Here, in two studies, using forced choice paradigms between controlled stimuli manipulated only along i) carotenoid-linked skin coloration or ii) melanin-linked skin coloration, we demonstrate that young children (age 4-6 years), like adults, show strong preferences for health-linked carotenoid coloration. However, unlike adults, children do not show a preference for melanin skin coloration. These results are consistent with the existence of a specialized learning system for detecting health-relevant cues in conspecifics and indicate that preferences for melanin coloration are culturally learned later in life.

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#### **45. Evolutionary Demography, please meet Evolutionary Development**

In all human populations, and across species and environments, mortality is high early in ontogenesis (fetal and infant mortality) and declines with development, a pattern called ontogenescence. For humans, this has been proposed to arise from the fact that early deaths of inviable offspring free up resources for their parents to reproduce again. However, this 'Sibling Replacement Hypothesis' cannot explain ontogenescence beyond the cessation of parental investment, which is observed in most species of animals and plants.

Ontogenescence can be explained more broadly by risks associated with the events of ontogenesis. The Transitional Timing Hypothesis, states that ontogenescence arises because biological transitions are dangerous, and are concentrated early in life. Early tests of this hypothesis lend it strong support, and suggest that more complex developmental pathways may lead to more mortality during development. Experiments with developing barnacle larvae reveal excess mortality in the stages before and after their two metamorphoses, and suggest important losses due to failed timing of transitions. Experiments with hydra show excess mortality around the transitions sexually produced offspring must go through, but no ontogenescence for the far simpler development of asexual offspring. Comparative analysis reveals that across plants and animals, sexual or asexual meiosis leads to higher offspring inviability than does less complex mitotic reproduction. The Transitional Timing hypothesis successfully explains a major phenomenon of evolutionary demography (ontogenescence) in terms of one of the central facts of evolutionary development (the complexity of ontogenesis). Understanding how this shapes developmental pathways and life-histories will require collaboration between these two often mutually isolated fields. its putatively extraordinary duration.

To investigate whether women's post-reproductive lifespan is actually driven by unusual duration (as compared to the length of the overall lifecycle) we decomposed Post-reproductive Representation (PrR), a measure of the prevalence of post-reproduction, into Incidence (the proportion of adult women surviving to become post-reproductive) and Scaled Duration (the proportion of adult life-expectancy that is post-reproductive). Comparing various human populations to other primates, women are truly extraordinary in Incidence, but comparable to other primates (in safe environments) in Scaled Duration. Furthermore, Incidence is an excellent predictor of PrR across species, while Scaled Duration is not.

Women's remarkable habit of surviving to become post-reproductive in large numbers, combined

with the roughly exponential aging pattern seen across mammals, is sufficient to explain the remarkable prevalence of post-reproductive women. Attempts to explain that prevalence should increasingly focus on asking why evolution has shaped the human life-history such that so few women die during their reproductive years. Selective benefits of fertility, mothering and grand-mothering may all tend to decrease mortality of reproductive women and therefore increase the prevalence of post-reproductive females in human populations.

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#### **46. Mood changes following social exclusion across the menstrual cycle**

The menstrual cycle can modulate a woman's social behavior such as mating, competing with others or experiencing jealousy and social anxiety. In this within-design study we estimated the association between menstrual cycle phase and mood changes following social exclusion. Because women show a higher affiliation motivation in the infertile luteal phase than in the fertile follicular phase, we expected social exclusion to lead to more negative mood ratings in the luteal phase than in the late follicular phase.

Methods: Fifty naturally cycling women participated in a computerized ball tossing game ("Cyberball"). In the first round of the game (inclusion-condition) participants received the same number of balls as two other, virtual, players. In the following exclusion-condition participants only received the ball in 4 out of 30 tosses. Mood ratings (MDBF) were taken after inclusion and after exclusion conditions. All women took part in the game twice: Once during the late follicular phase and once during the luteal phase. Cycle monitoring was done with OvaCUE®. Ovulation was determined with urine tests measuring the luteinizing hormone and was verified based on salivary hormone concentrations. Order of testing was counterbalanced across women.

Results: Compared to social inclusion the experience of social exclusion was associated with decreased MBDF-mood ratings ( $F(1,48) = 10.86$ ;  $p = 0.002$ ). This decrease in mood was more pronounced during the luteal phase than during the late follicular phase ( $F(1,48) = 5.486$ ;  $p = 0.023$ ).

Conclusion: Our results suggest that women react more sensitively to social exclusion during the luteal phase than during the late follicular phase. These findings could be explained by different needs of a woman across the menstrual cycle: While in the fertile phase women are more interested in reproduction, they show a higher affiliation motivation in the infertile luteal phase when they are potentially pregnant.

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#### **47. The many face of leadership**

Leadership involves coordination strategies evolved within human society to accomplish collective goals. The ancestral environment may have shaped human's implicit preference of leadership. Ancestral human society was not always hierarchical. Archaeology and anthropology provides evidence suggesting early human leader's influence was limited to their domain of expertise. Previous studies find dominance is not always preferred in leaders, particularly in peace and intragroup conflict situations. We explore leadership preference from faces. We hypothesise (a) leadership preference is context contingent: different characteristics are desired in different leadership roles and (b) preferences are similar across cultures.

Methods: Caucasian and East Asian participants were asked to sort male Caucasian faces into Business Leader, Sports Leader, Moral Leader, Not a Leader categories using an online card-sorting interface. A Not Sure category was also included to allow uncertain and alternative leader categorisation. Face choices were compared with apparent personality ratings (e.g. masculinity, dominance, intelligence, attractiveness, health).

Results: (1) An individual's facial appearance predicted whether or not he/she will be considered as a leader. (2) different sets of faces were chosen according to leadership contexts. (3) Contextual choice was driven by facial cues to different personality traits (perceived intelligence was important for business and moral leadership but not a sports leader). (4) Cross-cultural agreement was found with subtle differences in the visual representations of leadership prototypes.

Conclusions: Facial appearance can be used to explore implicit leadership theory. Leadership preference patterns are context contingent and largely consistent across cultures.

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#### **48. Eyes Wide Open: when "Eyes" do and do not promote norm compliance**

Recent research in evolutionary psychology suggests that the mere presence of eye images can promote norm compliance, with the original study investigating payments for milk via an honesty box. Since then, the "eye-images effect" is the source of considerable debate because it remains unclear if what matters is an eye gaze, a face, or anything to do with humans. We suggest that one critical factor may be whether the eyes really need to be watching to effectively promote norm compliance.

Method: In two experiments, involving 439 participants (M<sub>age</sub> = 21.26 years), we tested the "eye-images effect" on compliance with local prosocial norms in a laboratory setting. Participants were randomly assigned to view an image of "watching eye's" (eyes with direct gaze), an image of "non-watching eye's" (i.e. eyes closed or eyes with averted gaze for Studies 1 and 2, respectively) or an image of flowers (control condition). Upon exposure to the stimuli, participants decided whether or not to comply with the local norms in a laboratory setting.

Results: Data showed that norm compliance was significantly greater when exposed to a direct

gaze as compared to flowers; and when exposed to a direct gaze as compared to eyes closed or eyes with averted gaze.

Conclusions. Our data suggest that eyes gazing at an individual, rather than any proxy to social presence (e.g. "just eyes"), serves as a reminder of reputation. It is the "feeling of being watched" that can lift the veil of anonymity and serves as a powerful facilitator of norm compliance.

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#### **49. Men's preferences for female facial femininity decline with age**

Facial femininity is associated with youth and fertility in women and is typically judged as most attractive by men. While the strength of male preferences varies cross-culturally, the mechanisms that contribute to the maintenance of this variation remain to be fully investigated. Preferences for feminine faces are higher among young men reporting stronger sexual desire and with higher salivary testosterone. Although androgenic sexual desire decreases with age, to our knowledge no study has tested whether facial femininity preferences decrease with age.

Methods: There were 2125 heterosexual participants from multiple countries. All men answered a survey online where they judged attractiveness of women's faces with modified facial femininity. They also completed Sociosexual Inventory Survey.

Results and Conclusions: Facial femininity preferences decreased with age, being highest among men in their 30's and lowest among men in their 70's. This pattern was independent of age-related sociosexuality and cross-national variation in health or income. At the proximate level, differences in preferences could reflect the decline in testosterone with advancing age. At the ultimate level, it could benefit older men, who are less able to invest in mating effort, to opt out of competition with younger males for higher quality mates. For the present our study is the first to suggest that men's preferences for facial femininity are age dependent.

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#### **50. Psychological correlates of fertility variations within the menstrual cycle in a large population-based sample**

Fertility variations within the menstrual cycle modulate psychological mechanisms related to female sexual behavior. Although several studies have explored these effects, many of these studies have methodological limitations such as small sample sizes and lacking generalizability due to convenience sampling.

Methods: To combat these shortcomings and aiming at reliable estimates of effect sizes, we conducted a population-based survey study of more than 2,000 Finnish women. For the purpose of this study women were categorized as either fertile or non-fertile based on self-report data concerning their last menses. We also gathered information regarding their disgust sensitivity, sociosexuality, sexual preferences, incest aversion, altruism, and perceptions regarding mate value.

Results: Our results largely corroborate the findings of earlier studies, suggesting that evolution crafted female sexual psychology to take advantage of sexual opportunities when fertile.

Conclusions: While our results substantiate earlier findings, we want to underline that the within-individual variability is moderate and that although these effects are evolutionarily significant, it remains unclear whether they play a significant role in the lives of women.

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### **51. Should have known better: the impact of mating experience and the desire for marriage upon attraction to the narcissistic personality**

Narcissistic males frequently lack commitment and do not make good long-term mating partners. Despite this, narcissistic males are still desired by females. Females value different traits in short-term and long-term mating partners. Previous mate sampling experience is also important to facilitate mate assessment. The objective of this study was to determine whether amongst young adult heterosexual females; their mate sampling experience and desire for marriage influenced their attraction to narcissistic personality traits in a potential mate.

Methods: Young adult British females aged 18-28 (N=146) participated via online questionnaire promoted on the websites Facebook™ and Twitter. Participants provided information on past mating experience, future desire for marriage and rated their agreement with 20 statements relating to the extent that they found narcissistic personality traits attractive in a potential mate. These statements were based on the Narcissistic Personality Inventory.

Results: Individuals wishing to get married were more attracted to the narcissistic male personality ( $U=1463.5$ ,  $z=-2.197$ ,  $p=0.028$ ,  $r=-0.182$ ). Females with greater mating experience were more attracted to the narcissistic male personality than those individuals with lesser mating experience ( $U=112$ ,  $z=-3.911$ ,  $p<0.0005$ ,  $r=-0.419$ ).

Conclusions: The narcissistic personality, whilst having many negative qualities, also possesses qualities associated with resource acquisition, status, attractiveness and confidence. These traits are desirable to females in short and long-term mating contexts. Despite future long-term mating desires which are unlikely to be achieved with a narcissistic male and possession of substantial mate sampling experience, females view the narcissistic male as a suitable partner: a testament to the success of the narcissistic personality in facilitating short-term mating.

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## **52. Postnatal depression and reproductive success in modern, low-fertility contexts**

Evolutionary explanations of postnatal depression (PND) have proposed that it is a signal to warn mothers that continued investment in a particular offspring poses a threat to her fitness, and is indicative that she should divert investment away from this infant. Such hypotheses suggest that it is adaptive, and should serve to enhance the reproductive success of women experiencing PND. However, depression is costly to mother's health and to infant development, and thus seems more likely to be detrimental to fitness and unlikely to help optimize the life history trade-off between quality and quantity of offspring. Until now data on the impact of PND on fertility has been lacking.

**Methods:** An online survey of postmenopausal women (N = 306) collected complete reproductive histories, including retrospective measures of PND assessing incidence rate, severity, longevity, and actual diagnosis.

**Results:** PND associated with the first birth led to a reduction in completed fertility, which dropped below replacement levels. PND also negatively affected parity progression. Controlling for factors known to influence childbearing, for example kin and paternal support and infant health, results show that experiencing two bouts of PND, increasing PND severity, and PND lasting over six months all reduce the likelihood of a woman progressing to a third birth.

**Conclusions:** PND presents costs to reproductive success in modern low fertility contexts. While these results represent only the first attempt to bring empirical data to adaptive debates surrounding PND and depression more generally, they nonetheless suggest pathways by which PND is detrimental to fitness by lowering fertility. The below replacement fertility of women experiencing PND strongly suggests preventative measures should be a target for those concerned with population ageing and its economic repercussions.

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## **53. Gender and race gaps in academic engagement: A risk management approach**

In the developed world, female students earn higher grades than males in all subjects for as long as there has been reliable data. The gender gap in academic achievement is even greater among Latino and African American students in the U.S., suggesting that both gaps may share causal links. Analyses of data on grade point average from participants across broad demographic samples (N = 1,430) reveal the gender gap in achievement may have its roots in fundamental differences in risk sensitivity and "male honor" that differ between males and females. These differences are then exacerbated by environmental inputs, including neighborhood income inequality (Gini). Little evidence for an "oppositional culture" hindering academic effort among Blacks and Latinos is found, but rather, "macho" qualities that

facultatively emerge from unequal environments and are incongruent with academic environments stymie minority students and males of any ethnicity. Disparities in friendship networks may also contribute to minority underachievement.

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#### **54. Research of Machiavellianism by using a card game**

In our research we examined Machiavellian people's manipulative abilities by using a card game by which we created a lifelike situation. We worked with the Hungarian adapted version of Mach-IV test (Christie and Geis, 1970). By using this test we classified 141 college students (men and women) into groups of low, medium or high level of Machiavellianism.

We used a version of the Hungarian bluffing card game "Svindli" in which players have to be called several times during the game in order to win. In each round of the game three players participated with different Mach values. After the card game subjects filled a questionnaire related to the game by which their strategy, impressions, and feelings were examined. We predicted that high Machs are more successful than the average population, because of their superior manipulative skills.

The results of the card game indicate that high Machs detected other player's bluffs more often than low Machs, probably because they appropriately detect false signals on the others' face, gesture, or in their voices in a lifelike situation. Furthermore, they could hide their own emotions better, than low Machs. In summary, high Mach players were more risk-taking and impulsive and low Machs were more careful and reserved during the card game.

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#### **55. Whom should I copy? Directed social learning in a complex and variable environment.**

We investigate how the use of observable cues about other individuals can direct social learning in a complex and changing environment, comparing the competitive ability of different formulations of 'model-based bias' in an evolutionary context.

Methods: We organised a computer tournament in which entrants had to specify a strategy to decide when and how simulated agents learn in a 'restless multi-armed bandit' learning problem. Learning was either through random exploration or the observation of the exploited actions of others. When observing, cues about another's age, total returns from lifetime exploits, number of times copied and number of offspring could be used to direct learning toward specific individuals. Pairwise simulations isolating the model-based bias components of each strategy reveal how model choice impacts competitive ability due to evolutionary dynamics.

Results: We find that copying those who are relatively successful for their age is effective and

remarkably robust to large amounts of error, expanding the range of conditions under which a reliance on social learning is profitable. More surprisingly, a bias towards younger models additionally increases the competitive ability of a model-based bias. We show that this result is driven by uncertainty in the cues of older models due to environmental fluctuations.

Conclusions: These results give further insight into when and how copying others can be a particularly adaptive way of acquiring information about the environment. Whilst contrary to much existing work, the value of young individuals in a fluctuating environment is clear, prompting potential aims for future empirical research. Given the efficacy of learning biases and their propensity to constrain the diffusion of behaviour within populations, such processes are likely to impact behavioural diversity and cultural evolution.

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## **56. Sexual equality in parental investment among rural Zulu women**

Parental investment in humans is often sex-biased, reflecting the differential costs of male and female offspring. Liddell et al. (2003), investigating parental investment in schooling, found that, among a rural Zulu population in South Africa, there was no difference in the level of schooling between male and female children, nor was level of schooling related to birth order. This suggests that female children are not kept out of school in order to make use of their labour within the household. We used different data from the same area to investigate this further. We hypothesized that, given the patterns seen in schooling, there should be no difference in the fertility of women based on the birth order and sex composition of their children.

Methods: Interviews were conducted in Uhlamba, KwaZulu-Natal. Data were collected on female reproductive histories, including mother's age, education, birth and death dates of all offspring, along with their sex. Poisson regression was used to investigate the effect of sex of first-born offspring on female reproductive output. We used a multi-level mixed model to investigate the influence of birth order and sex on inter-birth interval (IBI), nesting IBI within mothers, and controlling for birth cohort.

Results: There was no significant effect of sex of the previous offspring or previous infant's survival on the duration of the subsequent IBI, with no interaction. Birth order and sex of the first-born offspring on total number of surviving offspring both had no effect. Education did not influence reproductive output. Age at first and last birth had a significant influence on the total number of offspring produced.

Conclusions: We found no significant sex-biased investment. Birth spacing is generally wide in this population (3.4 years), which may enable more equitable investment in offspring.

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### **57. The Dark Triad in World of Warcraft players**

In Massively Multiplayer Online Role-Playing Games, such as World of Warcraft, the primary goal is to reach higher levels with the created character that serves as one's alterego by completing quests, trading, fighting monsters or each other either alone or in groups. Yet previous researches examining players describe them to be lonely and introvert. We suggest in such virtual environments people form relationships. This research was designed to investigate whether players behave differently or have different characteristics in the game than in their real lives and to help gain a better understanding of factors influencing success in MMORPGs.

**Methods.** World of Warcraft players of all over the world were asked to take a survey online, that, amid gaming data, consisted of basic demographic informations, their presumed reputation, popularity and number of friends in the game and in their real lives, and questions concerning their motivations to play. Participants also filled out a short Dark Triad and a short Big Five questionnaire, once as themselves and once as if they were their main character in the gameplay. All questionnaires were self-report.

**Results.** Significant differences were found between scores reached as themselves and their characters. According to these, gamers would describe their characters to be more conscientious and extrovert but less agreeable, neurotic and open to experiences than themselves. The characters also reached higher scores in narcissism and psychopathy, but not machiavellianism or overall in dark triad. Gamers also surmise having more friends, higher reputation and popularity in their real lives than their characters do in the gameplay.

**Conclusion.** World of Warcraft players do distance themselves from their characters, have different personalities and values, but being a gamer does not mean having fewer friends or lower reputation.

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### **58. The lady in red might leave us blue: no robust evidence that red enhances women's attractiveness from three experimental studies and a meta-analysis.**

Researchers have argued that color cues influence judgments of opposite-sex conspecifics (e.g., Elliot & Niesta, 2008). Based on Color-in-Context theory (Elliot & Maier, 2012), red should enhance attractiveness ratings. Three studies failed to support this prediction and a meta-analysis indicated that the current evidence for a red effect is weak.

**Methods/Results:** In Experiment 1, 206 men rated attractiveness of a woman in a photograph in a 2 (short vs. long term scenario) x 3 (white vs. red vs. black t-shirt) between-subject design.

There was no interaction effect and only evidence for a weak main effect, but with the woman in a white shirt being rated as slightly more attractive than in either a black or red shirt. Experiment 2 was an online replication of Experiment 1 (n=191 men), showing no interaction or main effects (all  $p > .6$ ). This prompted us to directly replicate an earlier study examining the effect of red on female attractiveness (Experiment 3), we failed to replicate the original effect (Cohen's  $d = -0.12$ , 95%CI:  $-0.31, 0.07$ , original study: Cohen's  $d = 0.86$ , 95% CI:  $0.03, 1.68$ ; replication  $n=433$  vs. original  $n=25$ ). Finally, a meta-analysis covering all studies on red and attractiveness ratings, 27 papers with 83 effect sizes, suggested a weak red effect ( $r=0.23$ , 95%CI:  $0.16, 0.3$ ) but after accounting for publication bias, the effect size estimate was strongly reduced ( $r=.11$ ; 95%CI:  $0.04, 0.19$ ). Further analyses using moderators in meta-regression, suggested that the red effect is absent when contrasted to black ( $r=0.03$ , 95%CI:  $-0.02, 0.08$ ). The red effect is also significantly stronger when the background is manipulated ( $r=0.33$ , 95%CI:  $0.22, 0.43$ ) rather than the clothing ( $r=0.17$ , 95%CI:  $0.09, 0.25$ ). Finally, it seems that studies from outside the original lab. find weaker evidence ( $r=0.11$ , 95%CI:  $0.01, 0.20$ ), than those from the original lab. ( $r=0.34$ , 95%CI:  $0.25, 0.43$ ).

Conclusions: We discuss the limitations and avenues for future research on red and attractiveness.

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### **59. Do men flee while women tend? Differential emotive reactions of stressed men and women while viewing newborn infants**

Infant care often is carried out under stressful circumstances. For breeding animals it is crucial to maintain an adequate level of parental care and to protect offspring even in threatening situations. This may be especially true for women, because in most societies women are more involved in caretaking responsibilities.

Methods: Stress was induced in 40 participants by means of the cold pressor stress test, 40 serving as controls. Participants then rated their urge to care for newborn infants shown on short video clips. Skin conductance was obtained while participants viewed the videos and salivary cortisol was measured to capture stress responses.

Results: We found sex differences in caretaking motivation and skin conductance only in stressed participants, such that stress led to decreased caretaking motivation and stronger sympathetic responses in men but not in women.

Discussion: These findings are supportive of the idea that women respond to stress with a "tend-and-befriend" reaction while men respond with a "flight (or fight)" reaction. Given that caring for a newborn infant often is stressful in itself, these sex specific reactions to stress may help to explain why men are more prone to act with aggression towards a newborn infant than women.

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### **60. Beauty stereotypes, social norm enforcement and Machiavellianism: The Third-party Punishment and Reward Game (TPRG)**

It is well documented that in experimental games involving trust and reciprocity attractive trustees are viewed as more trustworthy; should they fail to reciprocate however, participants inflict larger punishments on them than on less attractive cheaters ("beauty penalty"). Recent studies have revealed that Machiavellians adjust their behaviour to social circumstances and use "rational" thinking in order to maximize their own good. The aim of this study was to investigate the effect of beauty stereotypes on Machiavellians in a third-party context.

Methods: In the Third-party Punishment and Reward Game (TPRG) participants had to observe a short Public Goods Game between two fictitious individuals then they had the opportunity to punish and/or to reward either just one or both players. Interfering in the game was costly for the participants. Among the eight rounds of the game there were stereotype consistent (attractive co-operators with unattractive free-riders) and stereotype inconsistent (attractive free-riders with unattractive co-operators) scenarios. The participant's level of Machiavellianism was assessed by the Mach IV questionnaire (Cronbach's Alpha .83).

Result: Both low and high Mach individuals punished attractive free-riders more severely than unattractive ones. Additionally participants rewarded unattractive co-operators more than those of higher attractiveness. There were no significant differences between the two groups (LM vs. HM) in the amount of money they spent on punishment and reward.

Conclusions. Stereotype inconsistent scenarios evoked more extreme emotions and interventions than stereotype consistent scenarios did. Although intervening in the TPRG was irrational, even high Machs got emotionally involved and did not restrain their spending.

Keywords: Strong reciprocity, Beauty stereotypes, Machiavellianism, TPRG

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### **61. Does women preference for cues of strong immune defence change with menstrual cycle?**

A number of studies have found that women in the fertile phase of their menstrual cycle have stronger preference for masculinity in men than they do when in non-fertile phases of the cycle. It has been commonly thought this may increase the women's chances of gaining indirect genetic benefits (genes for good immunity) for their offspring from high quality males, but direct evidence has been lacking so far. Further, a recent study suggests that masculinity is weaker indicators of immunocompetence than adiposity.

In this study we tested for the very first time whether women preference for cues of immunocompetence or sex hormone levels change with the menstrual cycle. We measured the ability of men to produce antibodies against hepatitis-b vaccine, and their testosterone and cortisol levels, masculinity and adiposity. We also presented photographs of their face and body to women raters. We found that facial attractiveness correlates with the immune function in a way that depends on the phase of menstrual cycle of the rater. However, the relation no longer holds when partialling out the effects of obesity and/or masculinity. This suggests that there are cues to immunity embedded in the structure of men's face (fatness, and masculinity). Masculinity affects attractiveness rating in a way that it depends on the menstrual cycle of the rater, but this relationship is not dependent on facial obesity. Oddly the masculinity allure during ovulation (high fertility) does not depend on men's current testosterone levels, while current testosterone not necessarily reflects the levels of testosterone during puberty when face shape is defined. Similarly, current testosterone levels affects attractiveness in a way that depends on the menstrual cycle phase of the rater, and this does not depend on face obesity, and the relationship also is largely independent of face masculinity.

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## **62. Partner choice is key to cooperation through indirect reciprocity**

Indirect reciprocity provides an appealing way in which cooperative systems might work. However, its evolution is problematic because those who withhold help from recipients who have failed to help others may harm their own reputations. In previous treatments, individuals have been assigned potential recipients and then decided whether to cooperate or defect. A second way of achieving discrimination that has not so far been considered is through partner (i.e. recipient) choice. Here, I present both a model and an experiment in which individuals can choose to donate to anyone within their group, or to no-one. I found that partner choice facilitates much higher and more stable levels of cooperation through image scoring than previously reported. This works because individuals can simply avoid defectors, so discrimination is no longer in conflict with an individual's strategic interests. Partner choice thus provides a simple mechanism that allows indirect reciprocity to work.

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## **63. Changes in purchase rates of antidepressants due to divorce are predicted by a state-dependent optimal behaviour model**

Many indicators for depression, such as prevalence of purchases of antidepressants recorded in a national register of Finns (n = 304 112) between the years 1995 and 2007, show a peak around time of divorce that is difficult to explain by disorder processes. Several evolutionary

models view depressive reactions as adaptive responses that trade current fitness for future expected reproductive value (e.g., a beneficial resolution of marital conflict). We assessed how well such models explain the data.

Methods: A four-state model (1 = seeking partner, 2 = in reproductive relationship, 3 = relationship at risk, 4 = dead) was introduced. Time- and state-dependent optimal allocation of two behavioural modes ("usual" and "depressed") that trades survival probability to relationship-bargaining leverage) was solved by dynamic programming; that is, mode-transition behaviour that maximizes lifetime reproductive value (as in evolution) was determined. Prevalence of "depression" strategy around transitions from state 3 to 1 was convolved with antidepressant-purchases probability model (2 free parameters estimated) and the total model was compared to the observed changes in prevalence of purchases around divorce.

Results: The optimal-behaviour model explained ~93% of the prevalence changes in purchases of antidepressants from 60 months before to 60 months after divorce; much more than two-parameter linear model (0.22%), and still more than a six-parameter polynomial expansion (0.89%). Observed peak in the purchases prevalence got more pronounced for elderly.

Conclusions: Modelling depression as an adaptive trade-off predicts well observed divorce-related changes in purchases of antidepressants, suggesting that adaptive models could be on the right track; yet, it seems necessary to consider indirect reproductive value to explain the effects of old age.

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#### **64. The social strategy: How social motivation regulates social evaluations and social preferences**

Social motivation is a set of psychological dispositions and biological mechanisms biasing humans to preferentially orient to the social world, to seek social interactions, and to work to maintain social bonds. We test the idea that this mechanism is linked to the social strategy developed by the human species and that it evolved to specifically motivate people to invest in collaborative activities (rather than in solitary activities). Our hypothesis is that while the social strategy brings about a lot of benefits, it also entails a range of potential costs, in particular through the risk of being exploited by cooperative partners. This hypothesis predicts that highly socially motivated individuals, who have heavily invested in the social strategy, should give more weight than other individuals to personality traits associated with exploitation risks.

Methods : To investigate the impact of social motivation on social preferences we asked participants to choose between faces parametrically varying in trustworthiness and dominance (Studies 1-2, 260 participants). We then studied this process at the perceptual level by examining the formation of two highly relevant traits for partner choice: likeability and threat (Studies 3-5, 150 participants).

Results and Conclusions: in line with our hypotheses, we demonstrated that social motivation is associated with an increased saliency of trustworthiness and with a positive bias in favour of

trustworthy faces. This behaviour is not due to differences in the ability to detect dominance and trustworthiness but to differences in combining these cues. Our findings suggest that social motivation is associated with a tendency to preferentially draw on trustworthiness when choosing potential partners, confirming its link with an investment in cooperation.

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### **65. Engagement of attention by evolutionary-relevant visual stimuli across menstrual cycle. An eye-tracking study**

Variations in hormone levels across the menstrual cycle affect women's mood, cognition and behavior. Particularly, during the pre-ovulatory (follicular) phase women are more sensitive to reproductively-relevant stimuli, while in the post-ovulatory (luteal) phase they are sensitive to stimuli related to risk of pregnancy termination. The engagement of attention by evolutionary-relevant stimuli measured using eye-tracking should reflect changes in this sensitivity.

Methods: Female participants (N=20) were tested twice, first in the luteal and then in the follicular phase, or vice-versa. Progesterone level was measured from saliva sample. One hundred and twenty images from six evolutionary-relevant categories were presented: Children, High-calory food, Low-calory food, Threat, Disgusting objects, and Erotic scenes. Images were segmented to key region (e.g., figure of an aggressor in case of Threat) and background. Eye movements were recorded during 5-second presentation of each image. Number of fixations in the key region were compared in the two menstrual phases.

Results: In the luteal phase first fixation fell more often in the key regions of Children ( $t(19) = 2.4$ ,  $p = .026$ ) and Threat images ( $t(19) = 3.0$ ,  $p = .007$ ) than in the follicular phase. This tendency was sustained during following fixations in case of Threat;  $t(19) = 2.2$ ,  $p=.042$ .

Conclusions: Phase of the menstrual cycle influenced automatic and rapid capture of attention, as it modulated chance of the first fixation being drawn towards meaningful objects. In the luteal phase woman might be pregnant, which may cause enhanced attending to children and facilitation of detecting danger. The tendency to avoid risk is also reflected by sustained attention towards threatening objects.

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### **66. Are we really "Better off than we know"? Challenges for measuring perceptions of inequality**

Monitoring inequality in modern societies represents a novel problem for humans as it involves

advanced numeracy, and particularly comprehension of large numbers. Recent research has reported that Americans, and particularly self-identified liberals, overestimate current levels of inequality. However, interpreting this finding is difficult because, using the methods commonly used to estimate perceptions of inequality, errors introduced via innumeracy should increase estimates of large numbers (and lead to large departures from normality). We aimed to address these issues by gauging perceptions of inequality using measures of varying mathematical demand, incorporating tests of numeracy, and by analyzing data using non-parametric statistics.

**Methods:** We conducted an online survey of 809 U.S. citizens about perceptions of inequality. Perceptions of inequality were measured in three ways that differed in mathematical demand. Following this, we administered a numeracy test in which participants were asked to convert English numerals to numbers (e.g. 'twelve' to '12'), and asked questions regarding political affiliation (Liberal vs Conservative).

**Results:** The numeracy test confirmed that errors made in the absence of ignorance result in upwards revision of mean (but not median) estimates of large numbers, and in non-normal data. Using non-parametric tests, we found that responses to the low and medium demand questions produced evidence of significant underestimation of inequality. Only when responding to the high-demand question was there evidence of over-estimation. Using non-parametric tests, we found no differences between liberals and conservatives on any measure of perceptions of inequality.

**Conclusions:** Taking mathematical demand into account, and using appropriate tests, we found that 1) Americans most likely underestimate, rather than overestimate inequality, and 2) there is little difference between liberals and conservatives in this regard.

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## **67. (How) Paternal grandmothers and maternal grandfathers invest in children from rural Guatemala**

Grandparents are known to invest in grandchildren. Past research has reported differing levels of investment from different grandparents, although grandmothers, particularly maternal grandmothers, are most commonly associated with child survival. Nevertheless, we expect all grandparental investment to contribute to improved child health. Until now, it has been unclear just how grandparents help: what kind of grandparental support benefits children.

**Methods:** We use data from the Guatemalan Survey of Family Health (EGSF) comprising 2,892 mothers and 3,370 children to investigate which grandparents impact on child health (measured by height), and also differentiate between the types of support grandparents provide: pastoral and financial. We further identify under which conditions do grandparents help; infants (0-12 months) or older children (1-5 years). All models control for multiple socio-demographic factors.

**Results:** Regression analyses (with a random effect for mother, where appropriate) indicate that maternal contact with paternal grandmothers (mothers-in-law) is positively associated with height in infants, but not in older children. Financial support from paternal grandmothers is associated

with increased stature in older children. Receiving advice from maternal grandfathers is associated with increased stature in older children although receiving financial aid from them is associated with shorter stature.

Conclusions: These findings differ from previous literature that purports a stronger role for maternal grandmothers, and little influence of grandfathers, on child health.

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## **68. An evolutionary account of moral development**

To describe and provide an evolutionary account for the slow emergence of moral behavior over childhood development, given that complicated social evaluation (e.g., expectations of fairness in third-party contexts) emerges in infancy.

Method: This talk/poster begins with a review of several studies that jointly establish that moral knowledge typically precedes moral behavior by several years in childhood development. This review includes (but not be limited to) empirical work by the authors, including both published studies and newer data. As an example, one study (Sheskin et al., 2014) shows that 5-year-old children have strong social comparison motivations that are contrary to fairness, such that they will act spitefully and choose an advantageous distribution (e.g., "1 toy for self and 0 for other") over a fair distribution in which everyone gets more (e.g., "2 each"). Only 5 years later, around age 10, are children sufficiently motivated by fairness to take costs so that others receive fair outcomes. The second part of the talk/poster provides an evolutionary account of the slow emergence of moral behavior. This account is based on an analysis of when, during typical childhood development in the evolutionary environment of adaptedness, taking short-term costs to act prosocially towards others is likely to yield long-term rewards.

Results: Social evaluation can be advantageous in infancy because it requires observation but not costly behaviors, and allows an individual to determine who to trust and learn from. On the other hand, taking costs to behave prosocially towards others is only advantageous at older ages, when moral reputation is important for securing interaction partners in cooperative activities. The distinct timelines associated with the emergence of social evaluation and costly moral behavior mirror this cost/benefit analysis.

Conclusion: This analysis accounts for previous research and provides testable predictions for future research.

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### **69. Better the devil you know: evidence for an assortative mating effect for self-reported psychopathy**

Previous research suggests both men and women show assortative mating for anti-social personality traits, such as psychopathy. However, this has not yet been investigated with regards to secondary psychopathy (i.e., anti-social impulsivity) and primary psychopathy (i.e., callous predisposition). We expect for both sexes, there will be a homogamous mating preference for both psychopathy subtypes in short- and long-term relationships.

Method: In an on-line study, participants (N = 281; 241 women, 40 men) rated opposite-sex dating vignettes, differing for high- and low- primary and secondary psychopathy. These character statements read by participants and judged on suitability on an 11-point Likert scale (1 = Extremely Unlikely, 11 = Extremely Likely) for short-term relationships (affair/one-night stand and spontaneous dating); and for long-term relationships (marriage and parent of future children). Finally, participants completed the Levenson Self-Report Psychopathy Scale (Levenson, Kiehl, & Fitzpatrick, 1995).

Results: We found an assortative mating effect for male and female primary psychopathy in both short-term and long-term relationships. Interestingly, high secondary psychopathy men showed no preference for high psychopathy adverts. Women high in secondary psychopathy, in turn, had a robust assortative mating preference, rating both secondary and primary psychopathy men desirable in short- and long-term relationships.

Conclusion: We demonstrated that assortative mating extends to both psychopathy subtypes, with some interesting sex-specific effects. Unexpectedly, secondary psychopathy in men related to a more discriminative mating style, indicating that the likes-attract hypothesis does not extend to secondary psychopathy men. Findings are discussed in line with social and evolutionary perspectives on mate choice.

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### **70. Resource scarcity and female choice: do women like manipulative men in harsh environments?**

Previous research has demonstrated that women's mate choice is contingent on their socio-ecological environment as well as the type of relationship that a woman is seeking (Little et al., 2007). In this study, we investigated female choice for the Dark Triad (i.e., psychopathy, Machiavellianism, and narcissism) facial morphs in different environmental conditions.

Method: Altogether, 203 women participated in one of four on-line conditions: with variables of environmental context (high/low environmental harshness) and relationship context (long/short term). On entering the survey, participants read a vignette (Little et al., 2007) priming participants to a harsh or safe environment, followed by a description of either a short, or a long-term relationship. After that, they had to choose between male facial morphs in a two alternative forced-choice task, manipulated to be high or low in the Dark Triad characteristics.

Result: Overall a dislike was found for dark triad facial morphs (see Lyons et al., 2015, for similar results). Our results suggest that environmental priming has little effect on female preference for the Dark Triad morphs as no significant interactions were found between poor and rich environments and mating context. However women had a significantly higher preference for high Machiavellian male faces when evaluating them as long term partners in socio-ecologically poor, rather than in rich environment.

Conclusion: Our results suggest that the prime had an effect on preference for Machiavellian faces, which were chosen more as long term partners in insecure, rather than in secure environments. We discuss the results in relation to inter-sexual selection, and the plasticity of female choice.

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### **71. Assortative mating on personality characteristics as predictor of relationship satisfaction in heterosexual and homosexual men from Czech Republic and Brazil**

The study was aimed at the possible effect of similarity in personality traits on relationship satisfaction in heterosexual and homosexual men from two different populations, Czech Republic and Brazil. We hypothesized that higher degree of homogamy would increase the level of relationship satisfaction in heterosexual as well as homosexual male participants.

Methods: In total, 174 heterosexual men (68 from Czech Republic, 106 from Brazil) (mean age=28.83, respective 27.09) and 137 homosexual men (80 from Czech Republic, 57 from Brazil) (mean age=28.48 and 25.88, respectively) in long-term relationships completed an online set of anonymous questionnaires, including Revised Dyadic Adjustment Scale (RDAS), and Ten-Item Personality Inventory (TIPI), which the respondents filled in for themselves and also for their partners. The degree of dyadic similarity was calculated by absolute differences between participant self-reports and perceived personality of his partner.

Results: Linear stepwise regression showed that higher level of similarity among partners in Openness positively predicted Total RDAS score in Czech homosexual men ( $R^2=.066$ ,  $B=.257$ ,  $t=2.292$ ,  $p=.025$ ) and Brazilian heterosexual men ( $R^2=.125$ ,  $B=.357$ ,  $t=3.471$ ,  $p<.001$ ).

Conclusions: Results have shown that homogamy among romantic partners in Openness contributes to relationship satisfaction in men from both cultures, apart from sex of partner. From evolutionary perspective, higher level of spousal similarity might be adaptive, because it decreases conflicts and quarrels between partners. This project was supported by the GAUK 1164213.

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## **72. A clear conscience is the sure sign of a bad memory: Testing for a moral content bias in recall**

Moral stories form the basis of religious a range of texts, folklore and tabloid newspapers. Previous research has suggested that moral codes are built on evolved foundations. This study tests for a cognitive bias favouring the retention and recall of moral information.

Methods: "Moral" and "non-moral" versions of twenty vignettes were rated by 133 participants (online) for moral, social-related, survival-related, self-relevant, and gender-stereotypical content. They also specified which emotion (from a list of 14) was most salient. A further 41 participants (in-lab) were then tested on their free recall of these vignettes. They were also tested on recognition of sentences that were or were not present in the vignettes and asked to rate the likelihood of severe outcomes. Recalled vignettes were coded using propositional analysis.

Results: Moral vignettes were not better recalled than non-moral vignettes (GLMM;  $X_{21} = 1.92$ ,  $p > .05$ ) nor better recognised ( $X_{21} = .21$ ,  $p > .05$ ), but were rated as more likely to have serious consequences ( $X_{21} = 4.65$ ,  $p < .05$ ). Recall was significantly predicted by participant age, vignette emotion, word count, survival information and social information (AIC weight = .45,  $R^2_{GLMM(c)} = .54$ , comparison to null model:  $X_{212} = 108.48$ ,  $p < .0001$ ).

Conclusions: Moral content did not have a significant effect on recall itself. However, the results suggest that moral stories may prove to be culturally successful due to their exploitation of different biases in combination, primarily for emotional, social and survival-related content. A follow-up experiment (in progress) will examine the transmission of moral information through a transmission chain.

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## **73. Evolutionary psychology and contemporary behavioural frameworks for environmental policy**

The objective of the study was to investigate the extent to which evolutionary psychology is applied in common behavioural frameworks that are used to explain, analyse and promote pro-environmental behaviour and inform environmental policy in the EU context. Such behavioural frameworks have been developed and analysed by for example the UK Department for Environment, Food and Rural Affairs and the Sustainable Practices Research Group.

Methods: A review of documents was conducted that consisted of contemporary behavioural frameworks related to environmental behaviour as well as environmental policy documents within the EU. We also reviewed previous efforts to link the field of evolutionary psychology to pro-environmental behaviour.

**Results and Conclusions:** The results show that contemporary behavioural frameworks for environmental policy lack an evolutionary perspective. Evolutionary-related behavioural theory is mentioned once, as sexual signaling theory by the Ecologic Institute (2014). The behavioural theories informing contemporary frameworks and recommendations are predominantly drawing on the fields of social and cognitive psychology, behavioural economics and sociology. The current narrative on behaviour change is primarily focused on personal responsibility and choice, and how these are shaped by individual's attitudes and values. We argue that an evolutionary consideration of behaviour could be beneficial when designing environmental policies that aim to take into account individuals mechanisms for motivation and behaviour. A combination of instruments that target innate psychological mechanisms could be used to promote pro-environmental behaviour and such instruments could aid policy-makers and environmental campaigners in developing strategies. The evolutionary perspective is to be regarded as a complementary framework for analysis of behavioural change and is not intended to replace the contemporary frameworks.

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#### **74. Machiavellian strategy in social dilemma situations**

In the last decade Machiavellianism was intensively studied in evolutionary psychology. How do Machiavellian people behave in social dilemma situations? Do personality traits influence their strategy? Are they successful? In order to answer these questions, we used an experimental game and we measured personality features.

**Methods:** 116 university students (52 male, 64 female) took part in our study. To model social dilemma situations we used an experimental game, the so called Trust Game. The level of Machiavellianism was measured by the Mach IV-Questionnaire. Personality factors were measured by the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ).

**Results:** We found no significant relationship between the level of Machiavellianism and the deposits made by the first player. However, we found negative significant relationship the level of Machiavellianism and the deposits made by the second player. Our results also show that there is a significant positive correlation between the level of Machiavellianism and the profit gained at the end of the experimental game. We found no significant correlation between the level of Machiavellianism and the personality factors.

**Conclusions:** Our results show that Machiavellian people use an exploiting strategy in social dilemma situations. They try to convince their partners about their trustworthiness in order to make them engaging in cooperation, then they exploit them. According to our results their strategy is successful; the profit gained by high-Machs is higher than the amount which was gained by the low-Machs.

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### **75. Perceived intelligence: the overthrow of the attractiveness halo**

Perceptions of intelligence influence mate selection and shape student-teacher expectations. Impression formation is profoundly influenced by beauty, but the existence of facial cues which affect judgments beyond such an "attractiveness halo" may be underestimated. We therefore investigated malleable facial cues that may influence first impressions of intelligence.

Methods: Perceived intelligence and attractiveness ratings of 90 school aged children, 100 adult and 24 facial images of the same person before and after sleep restricted were gathered and compared to perceptual ratings and objective measurements of mouth curvature and eyelid-openness.

Results: In both the adult and children's facial images intelligence impression was partially mediated by attractiveness, but there were independent effects of eyelid-openness and subtle smiling that enhanced intelligence ratings independent of attractiveness. Since the facial cues implicated can change within an individual, in a third set of stimuli we explored changes in these cues within participants with and without sleep restriction and again the variation in eyelid-openness and mouth curvature influenced intelligence ratings beyond their impact on attractiveness. The subtlety of the cues was apparent from the failure of observers to differentiate the subtle differences in seemingly neutral facial images. Nonetheless, perceptual judgments concurred with objective measurements when evaluators were instructed to focus specifically on mouth curvature and eyelid-openness.

Conclusions: These findings suggest potential overgeneralizations based on subtle facial cues that indicate low mood and tiredness, which impair cognitive ability. This combination of findings has important implications for mate selection, students who are directly influenced by expectations of ability and teachers who may form expectations based on first perceptions of intelligence.

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### **76. Investigating decision models in the forgiveness system**

The forgiveness system enhances fitness by maintaining valuable relationships in spite of conflict. First, we elucidated how the decision whether to forgive resembles a signal detection task: Given imperfect information, one has to decide whether to forgive and bet that a relationship with the offender will bring more fitness benefits than costs. The two errors (miss and false alarm) are likely to have asymmetrical costs and will impact the decision process. Second, we investigated if individuals solve that task with fast and frugal trees (FFT) (a simple

heuristic that considers cues sequentially), or Franklin's rule (FR) (a linear model where cues are weighted and integrated). Both have decision criteria that shift to reduce the probability of either error.

**Method.** We asked participants to recall an incident with a relationship partner and elicited their hypothetical decision to forgive across several trials that varied three cues (offender's intent to harm, blame for harm, and presence of a sincere apology). The perceived relationship value and exploitation risk of that relationship partner were measured and used to inform the cost of errors (i.e., a relationship that is highly valuable and low in exploitation risk indicates the miss error being more costly than false alarm). Accuracy was given by the ability of FFTs and FR with several decision criteria to predict the participant's decisions.

**Results.** FFTs predicted decisions slightly better than FR despite using less cues on average. Crucially, we found that participants decide as in a signal detection task - adopting a liberal decision criterion when the miss error was perceived as more costly than false alarm, and vice versa.

**Conclusion.** Taken together, these results support the assertion that signal-detection concerns are involved in the decision and that FFTs are the decision strategy used in forgiveness.

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## **77. Conflicts between adult full and half siblings in Finland**

Human sibling competition is most severe in childhood but persists also in adulthood, when siblings may compete over e.g. parental financial transfers, help with child care, access to shared family resources or inheritance. Inclusive fitness theory and parent-offspring conflict theory create different predictions concerning sibling conflicts. Based on inclusive fitness theory, one may expect more conflicts and especially more severe conflicts between half than full siblings due to the closer genetic relatedness of the latter. Parent-offspring conflict theory, by contrast, predicts more competition over parental resources between full than half siblings, since full siblings compete over resources from the same parents while half siblings may additionally receive support from non-shared biological parents.

**Methods:** We study sibling conflicts with multilevel logistic regression analysis using data of two family generations gathered in the Generational Transmissions in Finland surveys. Respondents represent an older generation ( $n = 2,015$ ) and their adult children ( $n = 1,565$ ). Sibling conflicts are measured by self-reported disagreements.

**Results:** In both the parental generation and the generation of adult children, full siblings were more likely to report conflicts than half siblings. This was the case even after we controlled for several potential confounding factors including respondent's financial condition and number of siblings.

Conclusions: Our results are in line with the prediction based on parent-offspring conflict theory but not inclusive fitness theory. Unlike half siblings, full siblings compete over resources from the same two parents. This basic but hitherto overlooked fact may explain why adult full siblings have more conflicts than half siblings. This could be the case at least concerning milder conflicts and disagreements. Evolutionary family studies need to incorporate the dynamics of sibling conflicts in addition to sibling altruism.

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## **78. Sex differences in facial width-to-height ratio and no association with testosterone levels**

Previous studies have considered facial width-to-height ratio (fWHR) being sexually dimorphic trait as a result of testosterone's influence on growth trajectories of facial features. However, this notion was recently challenged as studies based on several populations have shown no sex differences in fWHR and its relation to basal testosterone levels being restricted to men. Nevertheless, the previous studies were predominantly based on fWHR measurements taken from photographs which might be systematically biased by head tilt. Here we conducted a study testing the association between testosterone, 2D:4D ratio and fWHR employing direct measurements.

Methods: Direct anthropological measurements of facial width (Zy-Zy), facial height (Na-Sto), and length of 2nd and 4th digits of both hands (which served as a marker of prenatal testosterone exposure), age, height, weight, and levels of basal testosterone (from saliva samples) were collected from 414 (138 males) participants from the Czech Republic.

Results: Independent sample t-test showed fWHR being significantly higher in women than in men. No correlation between levels of testosterone, 2D:4D ratios and fWHR was found in both women and men. Further, fWHR was negatively correlated with age in both sexes. Positive correlation was found between body weight and fWHR in both sexes, correlation with body height was found only in women, though. After entering body weight and age into subsequent GLM analyses as covariates, the difference between sexes in fWHR remained significant.

Conclusions: Although, some recent studies showed evidence for fWHR not being a sexually dimorphic trait, our results do not support this notion. Moreover, fWHR was neither associated with basal levels of testosterone, nor with markers of prenatal levels of testosterone. Further, we bring supportive evidence of fWHR being influenced by age and overall body size of individual.

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## **79. Investigation of teaching behaviour in golden lion tamarins**

There is currently considerable interest in animal teaching, including in primates. There are, at present, only three nonhuman species that fulfil Caro and Hauser's (1992) definition of teaching behaviour, a definition that allows the behaviour to be quantifiable. None of these three species are primates. The study conducted investigates evidence of teaching behaviour in the golden lion tamarin (*Leontopithecus rosalia*), a species in which there is highly suggestive evidence of this behaviour in two contexts: food-offering and food calling. In both cases, the first two criteria of Caro and Hauser's (1992) definition have been fulfilled, but evidence is still lacking for the third: whether pupils learn from the potential teaching behaviour, or not.

The project addresses this issue by combining experimental and observational work in wild populations of golden lion tamarins in Brazil, as well as the application of cutting-edge statistical modelling which will facilitate the detection of this behaviour. I will present results on an experiment conducted in the food-offering context, where different novel and familiar food have been presented to wild golden lion tamarins. The goal is to test the hypothesis that once young forage independently they are more likely to incorporate in their diet food that has been offered to them previously (social learning), compared to food that they have foraged on their own (individual learning). In doing so, we are also looking at whether both behaviours vary according to the juvenile's age. We found that different rates of food transfers (from adults to juveniles) had occurred for distinct types of food, and we used statistical modelling to explain the diverse mechanisms juveniles use to learn about their diet.

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## **80. Do masculine women produce more sons? A test of the Trivers-Willard Hypothesis on the basis of anthropometric data from Estonian schoolgirls**

The Trivers-Willard hypothesis poses that offspring sex ratio is adjusted in response to maternal condition. A modified version of this hypothesis (Grant 2007) predicts that females with high testosterone levels produce more sons. We tested whether anthropometric measures related to testosterone exposure predict offspring sex ratio in a homogenous sample of Estonian females born between 1949 and 1953.

Methods: The sample consisted of 225 schoolgirls from Tallinn, with average age of 16.04 years (SD=0.35) at measurement. Wide range of anthropometrical measurements was recorded for each person, of which we used handgrip strength, jaw width and relative facial width as potential indicators for levels of masculinity/testosterone exposure. Records for number of children and offspring's gender were obtained for 148 subjects via national census registry.

Results: Anthropometric indices of masculinity were positively intercorrelated. Handgrip strength positively predicted the number of sons born (standardized regression coefficient  $\beta = 0.23$ ,  $SE = 0.08$ ) in a model adjusting for the number of daughters ( $\beta = -0.48$ ,  $SE = 0.08$ ).

Socioeconomic position of grandparents was unrelated to offspring sex ratio.

Conclusions: Our findings are consistent with a prediction of Grant's hypothesis that females with high testosterone levels produce more sons.

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### **81. Does bondedness increase group synchrony?**

Human group formation typically include's clique's of around 15 people. It is assumed that closer bonding within such a clique will enhance its problem solving skills and group synchrony, yet this question has not been empirically investigated with real-life friends. We investigated (i) whether bonded groups performed better on a collective synchrony task compared to randomly assigned groups; (ii) differences between male and female groups.

Methods: Data comes from the The Fraternity Friendship Study, a longitudinal study of a European student fraternity. Upon joining the fraternity, members are encouraged to form same-sex cliques, which meet 1-3 times weekly throughout membership (N= 26 groups, mean group size = 14,4). In an onsite experiment (N=96) we created groups of four people, some groups of four belonged to the same fraternity clique while others did not. The groups were asked to build a human figure of Legos during 4 minutes. Resulting figures were rated independently by two assessors for symmetry, complexity, creativity and artistic impression.

Results: Measured qualities of the resulting figures strongly correlated with each other and between assessors and varied much. Male groups on average scored better than female groups, indicating either better building skills, higher familiarity with Lego, or both. For female but not for male groups, being in a bonded group significantly enhanced task performance.

Conclusion: As assumed, a bonded (same-clique) group performed better on a problem solving task than did groups from participants who knew each other but did not belong to the same clique. While some evolutionary theories claim that women are not good at clique level coalition building, our results suggest that females pay more attention to group formation and integration than do males and also gain more from being in a bonded group. Another explanation is that men may find it easier to form ad-hoc problem solving groups.

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### **82. Individual choose-to-transmit decisions reveal little preference for high-arousal, threat-relevant content**

Research on cultural transmission suggests that information about social interactions and threats may be preferentially transmitted. Decisions to share information might be driven by arousal that

is experienced as part of the emotional response to information about social interactions and threats or opportunities. The current studies tested whether individual's decisions to share information revealed preferences for high-arousal and threat-relevant information.

Methods: Participants were recruited via for five studies administered online (all Ns > 100). Studies 1-4 involved vignettes, some of which featured social interactions and threats and which were pre-rated for valence and arousal. In Studies 1-2 participants ostensibly received neutral vignettes from a fellow participant and were asked to choose one of four vignettes for a reply. In Studies 3-4 participants indicated their intentions to transmit neutral and emotion-eliciting vignettes to friends, strangers, and disliked acquaintances. Study 5 assessed individual differences in social support and preferences to transmit precautionary advice (about threats) or prescriptive advice (about opportunities, matched for arousal) to a same-sex stranger.

Results: Studies 1-2 showed that participants more often chose to transmit positive, low-arousal vignettes (rather than negative, high-arousal vignettes involving threats and social interactions). Studies 3-4 showed higher intentions to transmit emotional vignettes (triggering disgust, fear, anger, or sadness) to friends in particular. Study 5 showed that low social support was associated with a preference for transmitting precautions among males but not females.

Conclusions: Contrary to previous research, findings revealed no general transmission preference for threat-relevant or high-arousal information. A transmission preference for such information was observed when the recipient was a valued social relation (i.e., friend) or when the sender was low on social support. This suggests that transmission of high-arousal or threat-relevant information may serve social bonding.

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### **83. Male assistance in female competition in Bornean orang-utans**

Female Bornean orangutans (*Pongo pygmaeus wurmbii*) are mainly solitary. They tend to establish home ranges that overlap with those of their mothers and other relatives, but are intolerant of unrelated females. Fights leading to injuries between unrelated females are nonetheless extremely rare. We recently observed the first-ever lethal female-female attack. Its unique feature was that the attacking female received support from a male. We analyze this unique observation to assess the benefits to males of active assistance or interference in female-female competition.

Methods: Detailed behavioral observations on female orangutans have been conducted during nest-to-nest follows at the Tuanan Orangutan Research Area (Central Kalimantan) since 2003 (covering over 26'000 hours of focal data).

Results: An unflanged male was seen to assist a young female in her attack on an old resident female, resulting in the latter's death, despite the late intervention by a flanged male. Prior to this attack, the unflanged male had been in consortship with the young female for several days. Both attackers inflicted serious wounds on the older female, whose dependent offspring was never a

target of these attacks. A flanged male approached the fight and protected the female from further attacks, but never physically counterattacked the young female.

Conclusions: Competition among unrelated female orangutans is common but never lethal. Male involvement almost certainly caused the attack to become lethal. Both the attacking and defending male provided agonistic support to a female, suggesting that females can coax males into coalitionary support. Thus, even in a species with frequently coercive male-female relationships, females have some leverage over males.

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#### **84. Men's attention to female faces and bodies is a function of context: an eye-tracking study**

Previous research has demonstrated that men's interest in and attention to female bodies (as opposed to faces) increases for short-term (ST) relationship judgments over long-term (LT), presumably as women's bodies change more in response to pregnancy and cyclical fertility than women's faces, thus being a good cue to ST reproductive potential. Additionally, eye-tracking studies show that men's attention to various areas of a woman's body depend on the visibility of these cues (e.g. whether the woman is clothed or naked). Here, we aimed to determine whether eye tracking of the face or body of women in different styles of clothing ("revealin" vs. "modest") was differentially affected by the context of the relationship judgment.

Methods: Young men (age  $M=23.67$ ) were asked to consider the likelihood that they would engage in a ST relationship with one set of female stimuli, and a LT relationship with another set (order counter-balanced between participants). Within each relationship context, participants were presented with 5 images of women wearing modest clothing (shoulders, cleavage, and legs covered), and 5 images of women in revealing clothing (at least one of these regions revealed).

Results: A significant clothing type x region of interest x relationship context interaction was observed, with men spending less time examining the face, and more time examining the breasts and legs of women wearing revealing (vs. modest) clothing in the ST context, but no difference between clothing types for the LT condition.

Conclusions: Men's attention to various body regions, such as breasts and legs, of women depend on the context of the judgment, with the visibility of body areas only affecting dwell time for ST judgments but not LT.

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## **85. Predicting memorable face images**

Why are some faces easier to remember than others? Traditional models of memory emphasise the importance of distinctiveness; distinctive faces tend to be memorable. However, recent work challenges this exclusive focus on distinctiveness, finding that social factors, such as perceived facial dominance, attractiveness and trustworthiness, also contribute to the memorability of faces. Here we sought to replicate this finding.

**Methods:** The memorability of each of 100 frontal face images with neutral expressions was measured using an old-new recognition task. In this task, participants were first shown a slideshow of face images. They were then shown these images again, this time interspersed among previously unseen images, and were asked to indicate whether or not they had seen each image before. A different group of participants were shown the same faces and were asked to rate the images for either one of the measures of distinctiveness commonly used in memory research (e.g., perceived distinctiveness, typicality, familiarity) or one of the social factors commonly used in social perception research (e.g., perceived dominance, trustworthiness, attractiveness, aggressiveness).

**Results:** Following analyses from previous research, hit rates and false alarm rates were analysed separately using regression analyses. Models including only the measures of distinctiveness or both measures of distinctiveness and social factors were compared. Analyses of both hit rates and false alarm rates showed that adding social factors increased the variance in face memorability that was explained.

**Conclusions:** Our results suggest that, although distinctiveness is an important factor in face memorability, social factors also explain a significant proportion of the variability among faces in their memorability. These results suggest that the functions of face memory may be more complex than simply identifying individuals who we have previously encountered.

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## **86. Social support influences preferences for feminine facial cues in potential social partners**

There may be fitness advantages to preferring pro-social individuals of either sex as allies. Prior work in the face perception literature suggests that people show stronger preferences for feminine (i.e. pro-social) social partners in contexts where social support may be at a premium. It is unclear, however, whether perceived availability of social support directly influences our preference for facial femininity. Here, we used experimental priming techniques to explore this issue.

**Methods:** One hundred six individuals were recruited for a two-stage experiment. Each participant was randomly allocated to one of four priming conditions where, using a guided imagination priming paradigm, we manipulated perceived support (high/low) and source of

support (family/friends). Immediately following this, participants were shown 20 pairs of faces manipulated in masculinity-femininity and were asked to indicate which face in each pair was more attractive and how much more attractive they judged that face to be relative to the other face in the pair.

Results: Individuals randomly allocated to low social support priming conditions demonstrated stronger preferences for feminine shape cues in own- and opposite-sex faces than did individuals randomly allocated to high social support priming conditions. Moreover, in a pilot study, people perceived men and women displaying feminine characteristics as more likely to provide them with high-quality social support than those displaying relatively masculine characteristics.

Conclusions: These findings suggest that social support influences face preferences directly, potentially implicating facultative responses whereby people increase their preferences for pro-social individuals under conditions of low social support.

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## **87. Facial shape correlates of age in adults**

Throughout life, an individual's facial shape changes systematically: growth, display of hormone-triggered secondary sexual traits during maturity, and senescence. Despite variation in life-style and environment, there is agreement that the first signs of facial ageing show between the ages of twenty and thirty. Despite some recent efforts, evidence including facial soft-tissue is still mostly qualitative. Thus, we set out to study age-related facial shape features in adults using a powerful morphometric approach.

Methods: Our Austrian sample consists of 63 women (aged 20-97 years) and 61 men (aged 20-90 years). Their facial shapes were parametrized using 40 landmarks and 34 sliding semilandmarks, which were digitized on standardized frontal photographs. A geometric morphometric approach (shape regressions including permutation tests) was then used to quantify the association of age and facial shape.

Results: With increasing age, the eyes become relatively smaller and the lips thinner. The nose gets larger due to acromegaly, and the jaw line widens. These patterns were found for both sexes and were statistically significant (women: 3.9% var. expl.,  $p = 0.019$ ; men: 9.2 var. expl.,  $p < 0.001$ , 10000 permutations).

Conclusions: Our results confirm the mostly qualitative descriptions in the existing literature, and fit to common practices in facial surgery and rejuvenation (eye lid lifts, elimination of sagging soft tissue "face-lift", lip filling). These results are a first step towards a sociopsychomorphospace, where it is possible to quantify the association of age-related facial features and social judgments at zero-acquaintance, such as dominance and leadership, which might or might not

differ for the sexes.

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## **88. Social structure and cooperation in human populations**

Cooperation is a central feature of human social life ensuring their survival and reproduction. As an adaptation to their environment, humans have various social structures, which are the result of co-residence patterns after marriage. Evolutionary models have predicted that dispersal patterns can influence local relatedness, and hence the nature of altruism and competition observed in populations. Age and sex-biased dispersal patterns can influence the predictions of who is co-operative to whom within populations.

Objects: To test the hypothesis that social structure influences altruistic behaviour in a diversity of populations in southwestern China, where the local kinship norms are either for females to disperse at marriage or in some societies (a minority) stay in their natal household throughout life.

Methods: Using economic games to measure cooperation, and multilevel regression to analyse the predictors of cooperation.

Results and conclusions: We find that social organisation does influence levels of donations in both public goods and dictator games; both males and females are less cooperative in matrilineal societies where dispersal by both sexes is low. Age is also a relevant predictor, with older females being more co-operative in societies where females disperse at marriage, as predicted. This study shows that local dispersal norms influence co-operative behaviour in real world human populations.

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## **89. An evolutionary and individualistic perspective on visual search performance**

In our experiment, we investigated with a newly developed own method, how emotional stimuli influence visual search performance depending on what level of valence and arousal the stimulus has. We measured cognitive attentional performance while emotional distractors also appeared in the field of view and state anxiety previously in order to demonstrate that individual differences provide a new angle on the problem.

Method: We examined the effect of arousal (high, medium) and the type of threat (evolutionary/non-evolutionary) in the mirror of anxiety. Each item of the stimulus set was a

combination of a picture from the International Affective Picture System and a visual search matrix with numbers from 1 to 35. Participants were also asked to fill out the State-Trait Anxiety Inventory.

Results: We have found a significant interaction of stimulus and arousal. That is, the two types of snakes had a different effect on visual search performance: participants showed the lowest performance in the case of medium arousal snake, while the high arousal snake did not decrease the visual search. Regarding the guns, there was no significant effect. However participants with different anxiety levels differed: low level arousal patients showed better performance at highly arousing pictures and high level arousal participants showed impaired performance in this case.

Conclusion: Neither the level of valence and arousal, nor the content of the picture is enough, one has to integrate these and take individual differences into account. This means we need to open up and broaden our perspectives to other fields of psychology to get an accurate view on evolutionary mechanisms.

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