

## A Warm Welcome

Dear participants

We would like to welcome you all to St Andrews for the inaugural *European Human Behaviour and Evolution Association* conference. EHBEA was formed only a few months ago, yet already boasts more than 200 members in 15 European countries, and elsewhere. The new society endeavours to capitalize on a series of successful EHBE meetings over the last few years, which have grown steadily in numbers and influence. The rush of interest in presenting at and attending this particular meeting we believe in part reflects the enthusiasm that the new society has engendered. We are very confident that you will not be disappointed, and can promise an exceptionally high-calibre line up of talks and poster presentations. In addition to attending the sessions, we encourage you to make the most of this meeting by talking with as many fellow participants as possible - be they plenary speaker or graduate student - in a constructive and friendly atmosphere. We all share the excitement that evolutionary biology brings to the study of human behaviour, and we have sought to organize this meeting to channel that enthusiasm to good effect.

The meeting also doubles as a flagship conference and celebration of the achievements of the CULTAPTATION project, an EU-sponsored international initiative exploring dynamics and adaptation in cultural evolution. CULTAPTATION is a unique project, bringing together researchers from the sciences, social sciences and humanities in a joint research effort to gain a scientific understanding of the origin and dynamics of human cumulative culture. CULTAPTATION exemplifies a spirit of reaching across academic disciplines and working constructively and collaboratively, which meshes remarkably well with EHBEA values of pluralism and integration. We believe the two organizations are highly complementary, and that together they will deliver a memorable meeting. CULTAPTATION also supports *The Social Learning Strategies Tournament* and, at this conference, the €10,000 prize will be awarded to the tournament winners.

We hope that those of you that are coming from afar will thoroughly enjoy your stay in Scotland, and that all of you will take pleasure in St Andrews' unique cultural and historical legacy. Founded in 1413, St Andrews is the oldest university in Scotland, and the third oldest in the U.K. If you have a spare few minutes, we encourage you to explore the town, with its historic old buildings, and to walk along the beaches or through the lovely surrounding countryside. We would like your visit to St Andrews to be as stimulating and pleasant as possible, so please do not hesitate to approach us if we can help in any way.



Kevin Laland, Gillian Brown, Luke Rendell, Lewis Dean and Tamsin Saxton  
The EHBEA2009 Organizing Committee

## **CULTAPTATION: dynamics and adaptation in human cumulative culture**

Development of a scientific understanding of the origin and dynamics of cultural diversity is a major academic challenge, because a satisfactory solution requires integrating insights from both the natural and social sciences. CULTAPTATION, a scientific project funded by EC 6th FP (NEST-PATH-043434) in January 2007, brings together anthropologists, archaeologists, biologists, economists, historians, mathematicians, and psychologists to work together in generating a rigorous and informed theoretical foundation for the study of cultural change. The projects members draw from four universities in three countries (Stockholm and Marlardalan, Sweden; Bologna, Italy; St Andrews, U.K.). Yet in spite of the different backgrounds of its constituent researchers, CULTAPTATION has proven refreshingly well-integrated and collaborative. The outcomes include the application of mathematical models to data from specific archaeological and historical projects, novel theory informed by findings from experimental economics and biology, and the hosting of a major international multi-disciplinary tournament on the evolution of culture.

CULTAPTATION has proven highly productive. For instance, several papers have been produced that pioneer new mathematical tools for investigating cumulative culture, explore the processes that allow for cumulative culture, and investigate how cultural dynamics are affected by demographic factors such as group size and structure. One important result is that the conditions under which cumulative culture can evolve are far more stringent than the corresponding conditions for simple culture, because in cumulative culture it is more difficult to limit the spread of maladaptive traits. An experimental economics laboratory has shed light on the psychological rules that humans deploy, which determine, for instance, when they copy others, or when they violate social contracts. Two other empirical systems, an archaeological analysis of the cultural evolution of food habits and foraging in Swedish Neolithic and Iron Age populations, and a historical analysis of beliefs and moral codes in laws from different time periods and geographical regions, are revealing patterns in the accumulation (and loss) of cultural knowledge. At the same time, experiments on zoo populations of chimpanzees and monkeys are investigating the processes that hinder the accumulation of cultural knowledge in other species.

The inter-disciplinarity of CULTAPTATION is extremely rare, but vital: in the past the scientific study of culture has been hampered by the insularity of research fields and arcane analysis. A strength of CULTAPTATION has been the production of a rich theoretical framework that both scientists and social scientists admire.

You will find out more about CULTAPTATION during several of the talks at this meeting and by looking at our exhibition of posters. Alternatively, please contact me directly. I hope that you enjoy the conference.



Magnus Enquist, Stockholm University  
<http://www.intercult.su.se/cultaptation/index.php>  
Magnus.Enquist@intercult.su.se

## Programme

### SUNDAY 5<sup>TH</sup> APRIL

16:00 - 20:00 Registration and wine reception at the Bell Pettigrew Museum (Bute Building, School of Biology, Queens Terrace)

### MONDAY 6<sup>TH</sup> APRIL

All talk and poster presentations take place at The Gateway, University of St Andrews, U.K.

08:00 - 08:30 TEA AND COFFEE. Registration at the Gateway (poster boards available)

Chair: Kevin Laland

08:30 - 08:35 *Welcome* Gillian Brown

08:35 - 08:55 *Introduction to EHBEA* Kevin N. Laland

08:55 - 09:55 **PLENARY** Marcus W. Feldman  
School of Biological Sciences, Stanford University, U.S.A.  
*Technology and maladaptation: is scrounging a good thing?*

09:55 - 10:20 Christine A. Caldwell & Ailsa E. Millen  
Department of Psychology, University of Stirling, U.K.  
*Testing hypotheses about cumulative cultural evolution in laboratory microsocieties: which learning mechanisms are necessary?*

10:20 - 10:50 TEA AND COFFEE

Chair: Tom Dickins

10:50 - 11:15 Mhairi Gibson  
Department of Archaeology and Anthropology, University of Bristol, U.K.  
*The impact of water development project on sibling competition in rural Ethiopia*

11:15 - 11:40 Anthony C. Little (1) Benedict C. Jones (2), Lisa M. DeBruine (2) & Christine A. Caldwell (1)  
(1) Department of Psychology, University of Stirling, U.K. (2) School of Psychology, University of Aberdeen, U.K.  
*Bias in social learning of attractiveness in humans: learning is biased towards older and more popular individuals*

11:40 - 12:05 Alex Mesoudi  
School of Biological and Chemical Sciences, Queen Mary, University of London, London, U.K.  
*Simulating human cultural evolution in the lab using the Virtual Arrowhead Task*

12:05 - 12:30 Violaine Llaurens, Charlotte Faurie & Michel Raymond  
Institut des Sciences de le Evolution, University of Montpellier, France  
*Ritual fights and male reproductive success in humans*

12:30 - 14:00 LUNCH AND POSTERS

Chair: Lisa DeBruine

14:00 - 14:20 Magnus Enquist  
Department of Zoology, Stockholm University, Sweden  
*Introduction to the CULTAPTATION Project*

14:20 - 14:45 Kimmo Eriksson & Pontus Strimling (CULTAPTATION)  
Centre for the Study of Cultural Evolution, Stockholm University, Sweden  
*Human social learning: sub-optimality and interaction with social preferences*

14:45 - 15:10 Anna Rotkirch (1) & Kristiina Janhunen (2)  
(1) Population Research Institute, Väestöliitto, Helsinki (2) Department of Social Psychology, University of Helsinki, Helsinki, Finland  
*The 'motherhood myth' and maternal guilt as consequences of conditional maternal investment*

15:10 - 15:35 Robert Barton (1), Russell Hill (1), Michael Burt (2) & Tim Andrews (3)  
(1) Evolutionary Anthropology Research Group, Department of Anthropology, Durham University (2) Department of Psychology, Durham University, U.K. (3) Department of Psychology, University of York, U.K.  
*Seeing red: the effects of colour on agonistic interactions in humans*

15:35 - 16:05 TEA AND COFFEE

## SESSION 1

Chair: Stefano Ghirlanda

16:05 - 16:30 Ian J. Rickard (1), Daniel H. Nussey (2), Andrew M. Prentice (3,4), Anthony J.C. Fulford (3,4), Tim H. Clutton-Brock (5) & Virpi Lummaa (1)  
(1) Department of Animal and Plant Sciences, University of Sheffield, Sheffield, U.K. (2) Institute of Evolutionary Biology, University of Edinburgh, Edinburgh, U.K. (3) MRC Keneba, Medical Research Council Laboratories, Banjul, The Gambia (4) MRC International Nutrition Group, London School of Hygiene and Tropical Medicine, London, U.K. (5) Large Animal Research Group, Department of Zoology, University of Cambridge, Cambridge, U.K.  
*Maternal early conditions modify age-specific offspring birth weight in rural Gambia*

16:30 - 16:55 Laura Fortunato(1) and Marco Archetti(2)  
(1) Department of Anthropology, University College London, London, U.K. (2) Department of Zoology, University of Oxford, Oxford, U.K.  
*Evolution of monogamous marriage by maximisation of inclusive fitness*

16:55 - 17:20 Mary K. Shenk  
Department of Anthropology, University of Missouri, U.S.A.  
*On the importance of arranged marriage: testing the evolutionary significance of joint mating decisions in South India*

## SESSION 2

Chair: Sarah Johns

16:05 – 16:30 Pontus Strimling (CULTAPTATION)  
Centre for the Study of Cultural Evolution, Stockholm University, Sweden  
*Culture cannot be determined by genes and natural environment alone: an empirical study of online game behaviour*

16:30 - 16:55 John Odling-Smee  
School of Anthropology, University of Oxford, Oxford, U.K.  
*Cultural inheritance: a component of human ecological inheritance*

16:55 – 17:20 Michael J. O'Brien  
Department of Anthropology, University of Missouri, U.S.A.  
*Niche construction theory and archaeology: the case of agricultural origins*

17:20 – 18:30 POSTERS AND WINE RECEPTION (SPONSORED BY **W. W. NORTON & COMPANY PRESS**)

## TUESDAY 7<sup>TH</sup> APRIL

08:00 - 08:30 TEA AND COFFEE.

Chair: Gillian Brown

08:30 - 09:30 **PLENARY** Joan Silk  
Department of Anthropology, University of California, Los Angeles, U.S.A.  
*Social security: the adaptive value of social bonds for primates*

09:30 - 09:55 Karl Grammer (1), Elisabeth Oberzaucher (2) & Martin Fieder (2)  
(1) Ludwig-Boltzmann-Institute for Urban Ethology, Department of Anthropology, University of Vienna(2) Department of Anthropology, University of Vienna, Austria  
*Mate selection and outcomes in a real world sample: evolutionary perspectives*

09:55 - 10:20 Ulf Toelch (1,2), Matthew J. Bruce (2) & Simon M. Reader (2)  
(1) Department of Innovation and Environmental Sciences, Utrecht University, The Netherlands (2) Behavioural Biology and Helmholtz Institute, Utrecht University, The Netherlands  
*The emergence of non-conformist social learning strategies in variable environments*

10:20 - 10:50 TEA AND COFFEE

Chair: Kimmo Eriksson

10:50 - 11:15 Ruth Mace (1), Tom Currie (1,2) & Simon Greenhill (3)  
(1) Department of Anthropology, University College London, London, U.K. (2) University of Tokyo, Tokyo, Japan (3) Department of Computer Science, University of Auckland, Auckland, New Zealand  
*The ability of phylogenetic comparative methods to detect correlated evolution in cultural traits when there is some horizontal transmission*

11:15 - 11:40 Jitka Lindova (1), Ales Kubena (1), Hana Sturcova (1), Romana Krivohlava (1), Martina Novotna (1), Anna Rubesova (2), Eva Jozifkova (3), Jan Havlicek (2) & Jaroslav Flegr(2)  
(1) Department of Philosophy and History of Science, Faculty of Science, Charles University, Prague (2) Department of Anthropology, Faculty of Humanities, Charles University, Prague (3) Department of Anthropology and Human Genetics, Faculty of Science, Charles University, Prague, Czech Republic  
*Influence of latent toxoplasmosis on altruistic behaviour of men and women in experimental games*

11:40 - 12:05 Tim W. Fawcett (1), Jessica A. Pass (2), Anahita J. N. Kazem (3), Colin Bleay (4) & Abraham P. Buunk (2,5)  
(1) Theoretical Biology Group, University of Groningen (2) Faculty of Behavioural and Social Sciences, University of Groningen, The Netherlands (3) Institute of Biology, Norwegian University of Science & Technology, Trondheim, Norway (4) School of Biological Sciences, University of Bristol, U.K. (5) Royal Netherlands Academy of Arts and Science, Amsterdam, The Netherlands  
*Previous experiences affect female choice in a speed-dating experiment*

12:05 - 12:30 Sarah E. Johns  
Department of Anthropology, University of Kent, Canterbury, U.K.  
*Predicting the future: teenage motherhood and time perspective*

12:30 - 13:40 LUNCH AND POSTERS

Chair: Anna Rotkirch

13:40 - 14:20 Kevin N. Laland & Luke Rendell (CULTAPTATION)  
School of Biology, University of St Andrews, St Andrews, U.K.  
*The social learning strategies tournament and prize giving*

14:20 - 14:45 Lynda G. Boothroyd (1), Martin Tovee (2) & Thomas Pollet (3)  
(1) Department of Psychology, Durham University, Durham, U.K. (2) Department of Psychology, Newcastle University, Newcastle, U.K. (3) Social and Organisational Psychology, University of Groningen, Groningen, The Netherlands  
*Mechanisms of variation in body preference*

14:45 - 15:10 Gordon P. D. Ingram & Jared R. Piazza  
Institute of Cognition and Culture, Queen's University, Belfast, U.K.

*Cognitive adaptations to the spread of social information via language: recent developmental investigations*

15:10 - 15:35 Helen De Cruz (1) & Johan De Smedt (2)  
(1) Centre for Logic and Analytic Philosophy, University of Leuven, Leuven, Belgium (2) Department of Philosophy and Ethics, Ghent University, Ghent, Belgium  
*Gravettian Venus figurines as ethnic markers*

15:35 - 16:05 TEA AND COFFEE

**SESSION 1**

Chair: Pontus Strimling

16:05 - 16:30 Karolina Sylwester & Gilbert Roberts  
Centre for Behaviour & Evolution, Institute of Neuroscience, Newcastle University, Newcastle, U.K.  
*Rational? Altruistic? Or rationally altruistic? Cooperative contributions provide support for competitive altruism theory*

16:30 - 16:55 Tim Phillips (1) & Eamonn Ferguson (2)  
(1) School of Biology, University of Nottingham, (2) School of Psychology, University of Nottingham, Nottingham, U.K.  
*Is human altruism a sexually selected trait?*

16:55 - 17:20 Karthik Panchanathan, Willem Frankenuis & Joan Silk  
Center for Behavior, Evolution & Culture, Department of Anthropology, University of California, Los Angeles, U.S.A.  
*The bystander effect in a multi-player dictator game*

**SESSION 2**

Chair: Tamsin Saxton

16:05 - 16:30 Anna Goodman (1) & Ilona Koupil (2)  
(1) Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, U.K. (2) Centre for Health Equity Studies (CHESS), Stockholm University/Karolinska Institute, Stockholm, Sweden  
*Social and biological determinants of reproductive success in Swedish males and females born 1915-1929*

16:30 - 16:55 Markus Jokela & Liisa Keltikangas-Järvinen  
Department of Psychology, University of Helsinki, Helsinki, Finland  
*Type-A personality and reproductive success in contemporary humans: revisiting the 'central theoretical problem of human sociobiology'*

16:55 - 17:20 Thomas V. Pollet (1) & Daniel Nettle (2)  
(1) Dept. of Social and Organizational Psychology, University of Groningen, Groningen, The Netherlands (2) Centre for Behaviour and Evolution, Newcastle University, Newcastle, U.K.

*The Trivers-Willard hypothesis goes worldwide: maternal condition and sex-biased investment in Colombia, Cambodia, Kenya, Rwanda and Uganda*

17:20 – 18:30 POSTERS AND WINE RECEPTION (SPONSORED BY **CULTAPTATION**)

**WEDNESDAY 8<sup>TH</sup> APRIL**

08:00 - 08:30 TEA AND COFFEE.

Chair: Magnus Enquist

08:30 - 09:30 **PLENARY** Robert Boyd  
Department of Anthropology, University of California, Los Angeles, U.S.A.  
*How culture transformed human evolution*

09:30 - 09:55 Adam Powell (1), Stephen Shennan (2) & Mark G. Thomas (1)  
(1) Research Department of Genetics, Evolution and Environment, University College London, London (2) Institute of Archaeology, University College London, London, U.K.  
*Demography, skill accumulation and the origins of behavioural modernity*

09:55 - 10:20 Gillian R. Brown (1), Kevin N. Laland (2) & Monique Borgerhoff Mulder (3)  
(1) School of Psychology, University of St Andrews, St Andrews (2) School of Biology, University of St Andrews, St Andrews, U.K. (3) Department of Anthropology, University of California, Davis, U.S.A.  
*Bateman's principles and the evolution of human sex roles*

10:20 - 10:50 TEA AND COFFEE

Chair: David Lawson

10:50 - 11:15 Andrew Whiten (1), Sarah Marshall-Pescini (2) & Nicola McGuigan (3)  
(1) Centre for Social Learning & Cognitive Evolution, School of Psychology, University of St Andrews, St Andrews, U.K. (2) Department of Psychology, Heriot-Watt University, Edinburgh, U.K. (3) Department of Psychology, University of Milan, Milan, Italy  
*Children, chimpanzees and the question of cumulative cultural evolution*

11:15 - 11:40 Sam G. B. Roberts & Robin I. M. Dunbar  
Institute of Cognitive & Evolutionary Anthropology, University of Oxford, Oxford, U.K.  
*Time and cognitive constraints on personal network size in humans*

11:40 - 12:05 Lisa L.M. Welling (1), Benedict C. Jones (1), Lisa M. DeBruine (1), Finlay G. Smith (1), David R. Feinberg (2), Anthony C. Little (3) & Emad A.S. Al-Dujaili (4)  
(1) Face Research Laboratory, School of Psychology, University of Aberdeen, Aberdeen, U.K. (2) Department of Psychology, Neuroscience and Behaviour, McMaster University, Ontario, Canada (3) Department of Psychology, University

of Stirling, Stirling, U.K. (4) Faculty of Health and Social Sciences, Queen Margaret University, Edinburgh, U.K.

*Men report stronger attraction to femininity in women's faces when their testosterone levels are high*

12:05 - 12:30 Nicolas Baumard (1,2), Dan Sperber (1) & Harvey Whitehouse (2)  
(1) Institut Jean-Nicod, CNRS-EHESS-ENS, Paris, France (2) Department of Anthropology, Oxford University, Oxford, U.K.  
*Why do people believe in immanent justice?*

12:30 - 13:45 LUNCH AND POSTERS

Chair: Rebecca Sear

13:45 - 14:45 **PLENARY** Val Curtis  
London School of Tropical Hygiene and Medicine, London, U.K.  
*Mind your manners! Disgust and the evolution of morality*

14:45 - 15:10 Johan Lind (1,2), Patrik Lindenfors (1,2), Stefano Ghirlanda (1,3) & Magnus Enquist (1,2) (CULTAPTATION)  
(1) Centre for the Study of Cultural Evolution, Stockholm University, Stockholm  
(2) Department of Zoology, Stockholm University, Stockholm, Sweden (3) Department of Psychology, Bologna University, Bologna, Italy  
*The age of human culture*

15:10 - 15:35 Monica Tamariz  
Language Evolution & Computation Research Unit, School of Philosophy, Psychology and Language Sciences, University of Edinburgh, U.K.  
*An exaptationist account of the evolution of human communication: a computer model approach*

15:35 - 16:05 TEA AND COFFEE

## SESSION 1

Chair: Luke Rendell

16:05 - 16:30 Alberto Acerbi (1), Heinz Gretscher (2), Claudio Tennie(2) & Charles L. Nunn(3)  
(1) Dipartimento di Psicologia, Università di Bologna, Bologna, Italy (2) Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany (3) Department of Anthropology, Harvard University, Cambridge, U.S.A.  
*Social learning mechanisms influence cultural evolutionary dynamics: modelling imitation and emulation*

16:30 - 16:55 Micael Ehn & Kimmo Eriksson (CULTAPTATION)  
Centre for the Study of Cultural Evolution, Stockholm University, Stockholm and Mälardalen University, Västerås/Eskilstuna, Sweden  
*Why social stratification is to be expected*

16:55 - 17:20 Carrie Ann Theisen (1), Jon Oberlander (1), & Simon Kirby (2)

(1) School of Informatics, University of Edinburgh, Edinburgh (2) Language Evolution and Computation Research Unit, School of Philosophy, Psychology and Language Sciences, University of Edinburgh, Edinburgh, U.K.  
*The cultural evolution of two key design features of language*

## SESSION 2

Chair: Charlotte Faurie

16:05 - 16:30 Gert Stulp (1,2), Thomas V. Pollet (1), S. Verhulst (2) & Abraham P. Buunk (1)  
(1) Department of Social and Organisational Psychology, University of Groningen, Groningen (2) Department of Behavioural Biology, University of Groningen, Groningen, The Netherlands

*Tall and handsome, but mostly rich: male stature is associated with direct fitness benefits*

16:30 - 16:55 Tamsin K. Saxton (1,2), Anthony C. Little (3), Lisa M. DeBruine (4), Benedict C. Jones (4) & S. Craig Roberts (2)

(1) School of Psychology, University of St Andrews, St Andrews, U.K. (2) School of Biological Sciences, University of Liverpool, Liverpool, U.K. (3) Department of Psychology, University of Stirling, Stirling, U.K. (4) School of Psychology, University of Aberdeen, Aberdeen, U.K.

*Adolescents' preferences for sexual dimorphism are influenced by relative exposure to male and female faces*

16:55 - 17:20 Silviu Apostol (1), Alexandru-Ionut Petrisor (2) & Cristina Candea (1)  
(1) Department of Animal Physiology, Biophysics and Ethology, University of Bucharest, Bucharest (2) School of Architecture, Spiru Haret University, Bucharest, Romania

*Voice or face: preferences in assessing attractiveness*

17:30 – 18:15 EHBEA AGM

19:15 – 23:00 CONFERENCE DINNER at Lower College Hall (North Street, St Andrews)

## PLENARY ABSTRACTS

### MARCUS W. FELDMAN

School of Biological Sciences, Stanford University, U.S.A. E-mail: [mfeldman@stanford.edu](mailto:mfeldman@stanford.edu)

*Technology and maladaptation: is scrounging a good thing?*

Technology and maladaptations are part of the culture carried by individuals in a population. We develop a quantitative model for the coevolution of cumulative technology and maladaptation in a 'producer-scrounger' framework that can be viewed in terms of individual and social learning. Producers invent new technology (or cultural innovations) and pay a cost to do so. Scroungers (social learners) copy the technology and the maladaptations generated by producers. The coevolutionary dynamics of producers and scroungers under cultural transmission can be surprisingly complex. Selection-driven cultural innovation and transmission of technology, and its negative consequences, can produce continued population growth or extinction.

### JOAN SILK

Department of Anthropology, University of California, Los Angeles, U.S.A. E-mail: [jsilk@anthro.ucla.edu](mailto:jsilk@anthro.ucla.edu)

*Social security: the adaptive value of social bonds for primates*

Primates are social creatures. All of the anthropoid primates, except orangutans, live in stable social groups. Comparative analyses indicate that size of social groups is correlated with various measures of brain size, the size of grooming cliques, the prevalence of deception, and the incidence of innovation and social learning. These correlations suggest that selection has shaped the behavior and morphology of individuals in response to the challenges they face and the opportunities they encounter when they live in social groups. These correlations also imply that sociality has had important adaptive consequences for individuals. Some kinds of social interactions, like winning a decisive fight over access to a group of females or killing rivals' offspring, can have dramatic and immediate effects on mating success. But it is much harder to establish the impact of other kinds of social interactions or social relationships on individual fitness. It is very hard to translate the short-term benefits that individuals gain from being groomed, embraced, or supported in a conflict, into long-term differences in fitness. However, primatologists are beginning to gain some traction on this problem. I will draw on analyses of the behavior and life histories of female baboons to illustrate the links between the strength and quality of social bonds that females form, their ability to cope with social stress, and their reproductive performance.

### ROBERT BOYD

Department of Anthropology, University of California, Los Angeles, U.S.A. E-mail: [rboyd@anthro.ucla.edu](mailto:rboyd@anthro.ucla.edu)

*How culture transformed human evolution*

Humans are a paradoxical species. On the one hand we are exceptionally good at adapting. Humans occupy a wider ecological and geographic range than any other species using a much greater range of subsistence strategies and social organizations. On the other hand, much of our behavior seems frankly maladaptive. For example, humans engage in cooperation in large groups of unrelated individuals. In this talk I will try to persuade you that both our exceptional adaptability and our propensity for folly stem from the fact that humans, unlike any other animal, acquire important components of their behavior by observing the behavior of others. This ability allows us to rapidly evolve superb culturally transmitted adaptations to local conditions, but it also necessarily leads to the cultural evolution of maladaptive behavior.

## VAL CURTIS

London School of Tropical Hygiene and Medicine, London, U.K. E-mail: [Val.Curtis@lshtm.ac.uk](mailto:Val.Curtis@lshtm.ac.uk)

*Mind your manners! Disgust and the evolution of morality*

Whilst there is increasing evidence (from economic, social psychological, neuroscientific studies) that disgust plays some role in moral behaviour, it is not yet clear why and how this came to be the case. Here, I provide an evolutionary scenario showing how disgust evolved from humble beginnings in lower animals to provide the foundation for human morality. I first set out how disgust drives behaviour that meets the evolutionary need of reducing disease risk in a wide variety of animals, either by 1) passive avoidance, 2) active expulsion, quarantining or elimination of parasites, or 3) preventatively, through the construction of hygienic niches. I then hypothesize that the psychological mechanisms producing disease avoiding behaviours may have been exapted to punish 'social parasites' that sneakily appropriate an individual's or a group's resources (such as cheats and child abusers) by avoidance, exclusion, imprisonment or elimination. Disgust thus offers low-cost mechanisms for punishing free-riders. Similarly, mental mechanisms to construct disease-free niches could have been exapted to help order social relations -first to construct social norms that reduce contact with pathogens (manners), but later to help police other kinds of norms. Finally, and more speculatively, new types of violation against cultural group identity, such as blasphemy and heresy, could also be punished by avoidance, expulsion, quarantine or elimination. I examine the evidence for and against these hypotheses and propose a research agenda for moral disgust.

## TALK ABSTRACTS (in same order as in programme)

### Christine A. CALDWELL & Ailsa E. Millen

Department of Psychology, University of Stirling, U.K. E-mail: [c.a.caldwell@stir.ac.uk](mailto:c.a.caldwell@stir.ac.uk)

*Testing hypotheses about cumulative cultural evolution in laboratory microsocieties: which learning mechanisms are necessary?*

Cumulative cultural evolution has been suggested to account for key cognitive and behavioural attributes which distinguish modern humans from our anatomically similar ancestors. However researchers have yet to establish which cognitive mechanisms may be responsible for this kind of learning, or indeed whether these could be unique to humans as has been proposed. We have shown that human participants can still engage in cumulative cultural learning even when access to certain sources of social information is restricted. We manipulated the availability of opportunities for: imitation (reproducing actions); emulation (reproducing end results); and teaching. We found that each was independently sufficient for participants to show cumulative culture.

### Mhairi GIBSON

Department of Archaeology and Anthropology, University of Bristol, U.K. E-mail: [mhairi.gibson@bristol.ac.uk](mailto:mhairi.gibson@bristol.ac.uk)

*The impact of water development project on sibling competition in rural Ethiopia*

Existing studies exploring trade-offs between family size and child well-being are contradictory. Evidence from industrial countries suggests a negative relationship between family size and child well-being through increased resource competition, while studies from pre-transitional populations emphasise a positive effect of siblings, through labour-force participation or child-care help. Desai (1995) has suggested that family size has a negative effect on child well-being in countries with better health and education provision, based on the assumption that access to any resources which improve parents' ability to influence child well-being will be competed for more intensively among siblings. However, cross-population analyses are affected by problems of unobserved heterogeneity. Here I test Desai's hypothesis within one Ethiopian community, by identifying whether the introduction of a recent rural development initiative has been the catalyst for increase in sibling competition. Previous research revealed that the intervention scheme which improved maternal health and child survival has underpinned increases in family sizes (Gibson & Mace, 2006). Multi-level logistic modelling techniques reveal a stronger negative impact of siblings on child growth (weight for height) and time spent in school in only those villages with access to the development scheme. Here, earlier born children are prioritised, being on average taller and spending more time in school than later born offspring, reflecting incremental reductions in parental investment in food, health-care and education with each additional child. Increases in sibling competition arising from intervention may ultimately change local

perceived costs and benefits of children, and fuel a preference for smaller family sizes. Refs: Desai, S. 1995. *Population Studies* 49: 195-210; Gibson, M. & Mace, R. 2006. *PLoS Medicine* 3: 476-484.

**Anthony C. LITTLE (1) Benedict C. Jones (2), Lisa M. DeBruine (2) & Christine A. Caldwell (1)**

(1) Department of Psychology, University of Stirling, UK (2) School of Psychology, University of Aberdeen, U.K.  
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*Bias in social learning of attractiveness in humans: learning is biased towards older and more popular individuals*

Social information is available from many individuals. As people differ in their expertise it may be most beneficial to learn only from certain individuals. We might then expect bias in social learning. For example, in fish species younger females are more likely to copy the mate choice of older females. As older females have more experience this may be an adaptive learning strategy. We tested for bias in social learning of attractiveness in humans. Here we show that for women, pairing a photo of a man with a woman presented as his partner positively influences the attractiveness of the man when the woman is presented as older/more popular as compared to when the woman is presented as younger/less popular. Additionally, we found that the age of the female participant influenced their tendency to be influenced by the age of the woman in the photo. Older participants were less influenced than younger participants. Our data suggests bias in social learning whereby women copy the mate choice of older and more popular other women and that older women are less likely to learn from the choices of other older women. These results may then indicate a sophisticated bias in social learning whereby individuals copy the choices of those with most access to information and/or prestige. As older individuals possess their own information on partner quality, our data may also suggest that individuals moderate who they learn from based on their relative level of knowledge.

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*Simulating human cultural evolution in the lab using the Virtual Arrowhead Task*

I will present results from a series of experiments that use the Virtual Arrowhead Task to simulate human cultural evolution in the psychology lab. In this task, participants in small groups each design arrowheads using a simple computer program. They then test their designs by going on a series of 'hunts', during which they receive feedback regarding the effectiveness of their design. Participants can improve their designs either by engaging in individual trial-and-error learning or by copying the design of another member of the group, i.e. engaging in cultural/social learning. Previous experiments (Mesoudi & O'Brien, 2008, *American Antiquity* 73, 3-28) simulated the cultural learning strategy of 'copy-successful-individuals', in which participants copy the most successful group member, finding that (i) patterns of arrowhead variation generated in the experiment matched corresponding patterns of variation observed in the archaeological record, allowing us to infer the learning strategies of prehistoric hunters; (ii) the copy-successful-individuals strategy was significantly more adaptive than individual learning; and (iii) this adaptive advantage was greater when individual learning was costly, in line with theoretical predictions. Subsequent experiments (Mesoudi, 2008, *Evolution & Human Behavior* 29, 350-363) showed that (iv) the adaptive advantage of copy-successful-individuals is only observed in multimodal adaptive landscapes, where individual learners get stuck on globally suboptimal peaks; and (v) allowing participants to set 'informational access costs' that potential copiers must pay in order to view potential models' designs virtually eliminates cultural learning.

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*Ritual fights and male reproductive success in humans*

Ritual fights are widespread behaviours across human populations. However, the evolutionary advantage associated with this behaviour is still unclear, because they often bring no direct benefit such as territory, resources or mates. Here, the reproductive success of men competing in a traditional ritual fighting sport, the Sereer wrestling, was investigated for the first time. The numbers of wives, children and grand-children were recorded, as well as the socio-economic status and the body height and weight. A significant positive effect of weight was detected on the number of offspring alive. The probability to be polygynously married was higher among wealthier men, suggesting that wealth provides a greater access to mates. A significant effect of men's involvement in wrestling was detected both on the number of offspring and on the polygyny status, when controlling for age, weight and socio-economic status. This suggests that the involvement in wrestling competition provides a prestige, further facilitating access to mates and thereby fecundity. The women's preferences for different qualities of men were then investigated. The quality of being involved in wrestling and the quality of being wealthy were lowly ranked, suggesting that women's reported preferences were not in accordance with actual mating. This may arise from familial conflicts between parents and daughters in the choice of a husband.

**Magnus ENQUIST**

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*An introduction to the CULTAPTATION Project*

A summary of CULTAPTATION is given at the front of this booklet.

**Kimmo ERIKSSON & Pontus Strimling (CULTAPTATION)**

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*Human social learning: sub-optimality and interaction with social preferences*

An important part of human culture consists of good solutions to practical problems. Information can be obtained directly, from own exploration, or indirectly, from observation of others. Optimal use of social learning has been studied in mathematical models of gene-culture coevolution for some time. Lately this research has been extended to experimental studies. In the present paper we first review these studies, and find that subjects typically tend to use far from optimal strategies where social learning is used much too little. Second, we discuss the implications of this empirical fact for evolutionary models of social learning, and some possible explanations for why people are so far from optimal. Third, we present a new experimental study on one possible mechanism: interaction with social preferences. We let subjects take the Social Value Orientation test and then play a novel exploration game. By manipulating whether subjects could see each other's exploration or not, we investigated both the optimal use of social learning and its relationship to social preferences. We replicate findings from previous experimental designs: the opportunity to learn socially improves outcomes, but people's behaviour is far from optimal. Importantly, we also find that that "pro-social" subjects indeed earn less than "pro-self" subjects in the social learning treatment, indicating that they forgo some of their earning in order to help the people who learn from them. We conclude that the evolution of social learning and social preferences could be linked in ways that has previously not been studied.

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*The 'motherhood myth' and maternal guilt as consequences of conditional maternal investment*

The emerging evolutionary understanding of human family dynamics stresses that humans have extensive and prolonged maternal investment within a cooperative breeding model that includes paternal, kin and other allomaternal care (Salmon & Shackelford eds 2007). Varying degrees of maternal resources and allomaternal assistance available to mothers make maternal commitment conditional to a larger degree than in other primates (Hrdy 2008, 39). Maternal care has been crucial for infant survival particularly in the first year of life (Sear & Mace 2008). Sarah Hrdy suggests this created selection pressures for infants to 'be adorable' and manipulate mothers into emotional commitment, and for toddlers to actively solicit care from both parents and other adults. Based on solicited texts written by contemporary Finnish mothers with small children (N= 63) we analyze which emotions are perceived by the mothers as 'forbidden'. The results suggest two different but connected consequences of extensive but conditional human maternal investment. First, the so-called motherhood myth that is found in many cultures and depicts mothers as naturally kind and self-sacrificing, can be understood as a cultural projection of the child's position in mother-offspring conflict. Second, the guilt experienced by mothers themselves is related to 'selfish' interests vis-a-vis the child. Maternal guilt can be seen as a commitment-enhancing emotion, a kind of 'child's advocate' in maternal psychology. Refs: Salmon, C. & Shackelford, T. (eds). 2007. *Family relationships: an evolutionary perspective*. OUP; Sear, R. & Mace, R. 2008. *Evol Hum Behav* 29: 1-18.

**Robert BARTON (1), Russell Hill (1), Michael Burt (2) & Tim Andrews (3)**

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*Seeing red: the effects of colour on agonistic interactions in humans*

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

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*Maternal early conditions modify age-specific offspring birth weight in rural Gambia*

In humans, adverse environmental conditions experienced in early life can have detrimental consequences for adulthood health and reproductive performance. Understanding individual variation in such effects and how they are modified by maternal age is fundamentally important, given the large demographic and nutritional changes underway worldwide. However, while the negative effects of young or advanced maternal age on reproduction are well-documented, lack of suitable long-term datasets has meant that little is known concerning why these effects can vary substantially between women and how they are affected by adverse maternal developmental conditions. Here we use detailed longitudinal (1950-2008) demographic and anthropomorphic data from rural Gambian women experiencing seasonal variation in food, disease, workload, pregnancy weight gain and offspring birthweight to test the hypothesis that maternal developmental conditions affect age-specific reproductive performance. We show that women born in the annual 'hungry' season (July-Dec) produce relatively lighter babies in their early reproductive lives compared to mothers born in the first six months of the year, a pattern which is reversed in deliveries to older mothers. We subsequently replicate this finding in a separate sample of infant weights (age <3 months) from this same population. Finally, we show that the influence of maternal developmental conditions on offspring birthweight is present even in mothers born after substantial improvements in morbidity and mortality rates in the population. Our results provide the first evidence that age-specific reproductive performance in humans may be modified by environmental factors operating in a brief period of a mother's prenatal life.

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*Evolution of monogamous marriage by maximisation of inclusive fitness*

The majority of human societies sanction polygynous marriage, and the prevalence of this practice is readily understood in evolutionary terms. Why some societies prescribe monogamous marriage is however not clear: current evolutionary explanations --- that social monogamy increases within-group co-operation, giving societies an advantage in competition with other groups --- conflict with the historical and ethnographic evidence. We show that inclusive fitness theory can account for variation in marriage strategies across societies and provides an explanation for the evolution of monogamous marriage. Where resources are transferred across generations, social monogamy can be advantageous if partitioning of resources among the offspring of multiple wives causes a depletion of their fitness value, or if females grant husbands higher fidelity in exchange for exclusive investment of resources in their offspring. This explains why monogamous marriage prevailed among the historical societies of Eurasia: here, intensive agriculture led to scarcity of land, with depletion in the value of estates through partitioning among multiple heirs. Norms promoting high paternity were common among ancient societies in the region, and may have further facilitated the establishment of social monogamy. In line with the historical and ethnographic evidence, this suggests that monogamous marriage emerged in Eurasia following the adoption of intensive agriculture, as ownership of land became critical to productive and reproductive success.

**Mary K. SHENK**

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*On the importance of arranged marriage: testing the evolutionary significance of joint mating decisions in South India*

Humans are unique in that our mating decisions are often made jointly, either through arranged marriage or through social enforcement of preferential marriage rules. Given the near-ubiquity of such customs in traditional societies, some authors have hypothesized that joint decision-making regarding mating may be an evolved strategy in our species while others have emphasized the role of ecological circumstances in determining the degree of parental influence on mate choice. A key component of the logic of these models is that, while parents and children have overlapping reproductive interests, the greater social status and life experience of parents may make them better at choosing appropriate mates or spouses as well as more effective at negotiating formal mating relationships like marriage. In this paper I hypothesize that joint marriage decisions are evolutionarily beneficial, and predict that (a) joint decisions should produce better spouses than individual decisions, and (b) parents should be more effective marriage negotiators than children or younger relatives. I use data from modern India to investigate whether the presence or absence of a parent, the ages and relationships of the kin who negotiated a marriage, or the degree of parental influence on marriage decision-making (arranged marriage vs. arranged-love marriage vs. love marriage) affects the quality of the spouse obtained. Preliminary data indicate that the absence of a parent negatively impacts spouse quality, that parents are more effective negotiators than children or other relatives, and that arranged marriages are associated with higher quality spouses than love marriages.

**Pontus STRIMLING (CULTAPTATION)**

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*Culture cannot be determined by genes and natural environment alone: an empirical study of online game behaviour*

What are the determinants of culture? Is the outcome path dependent or essentially determined by genes and environment? In this study we exploit the natural experiment on evolution of fairness-related behavior provided by the megapopular online game World of Warcraft. In this game people play on separate but identical servers, to which they are essentially randomly assigned. Hence each server runs the same game, each with a different random sample of players. In World of Warcraft players collaborate to obtain booty that is then nontrivial to share, so there is a natural need for players to develop behavioral patterns with respect to booty-sharing. Through online interviews we have investigated such fairness-related behavior on several servers and found that, whereas there is typically close to no difference between players on the the same server, there are distinct differences between servers. In other word, although servers are identical environments with comparable populations, they end up with different cultures. Thus, we find clear evidence for path dependence in the cultural evolutionary process that determines booty-sharing behavior.

**John ODLING-SMEE**

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*Cultural inheritance: a component of human ecological inheritance*

The theory of niche construction adds ecological inheritance to genetic inheritance in evolution (Odling-Smee *et al.*, 2003). Ecological inheritance is the inheritance of natural selection pressures that have previously been modified by niche-constructing organisms. Descendent organisms therefore inherit both genes, and biotically transformed natural selection pressures in their external environments from their ancestors. The combination is called niche inheritance. Niche inheritance potentially incorporates other genetic and non-genetic inheritance systems that may also be significant in evolution, for instance, epigenetic and maternal inheritance (Jablonka & Lamb, 2005). In humans, the theory of human gene-culture coevolution adds human cultural inheritance to genetic inheritance in human evolution. In combination, niche construction theory and gene-culture coevolutionary theory therefore initially promoted a triple inheritance model of human evolution including genetic, ecological and cultural inheritance systems (Laland *et al.*, 2000). Recently, however, it has become clear that provided the concept of niche inheritance is sufficiently well-defined, human cultural inheritance, including both inherited material culture and inherited cultural knowledge, reduces to a particularly potent component of a more general ecological inheritance in human evolution. I shall argue the case for that. Refs: Jablonka, E & M.J. Lamb. 2005. *Evolution in four dimensions*. MIT. Laland, K.N., F.J. Odling-Smee, F.J. & M.W. Feldman. 2000. Niche construction, biological evolution and cultural change. *BBS* 23. 131-175. Odling-Smee, F.J., K.N. Laland & M.W. Feldman. 2003. *Niche construction. The neglected process in evolution*. PUP.

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*Niche construction theory and archaeology: the case of agricultural origins*

Niche construction theory (NCT) is a relatively new development within evolutionary biology, but one that has important implications for many adjacent fields of research, including the human sciences. Here we present a broad overview of NCT and discuss its application to archaeology. We begin by laying out the basic arguments of NCT, including a historical overview, focusing on how it affects understanding of human behavior and evolution. We then consider how NCT can be used to inform empirical research and how it might profitably be applied in archaeology, using as a case study the origins of agriculture.

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*Mate selection and outcomes in a real world sample: evolutionary perspectives*

We will present data from people actually searching for a mate in a video dating service (N=12400). The theoretical approach is based on evolutionary psychological constraints in mate-selection and the underlying cognitive mechanisms and we describe mate search in terms of offers and demands on a market with specific market values, where personality, life-style orientation, age, status and attractiveness form basic variables. The results indicate that although there is a basic differences in orientation to attractiveness and status between male and females - this gap broadens with age. Other mate selection criteria are not affected by age. In addition we will compare actual search preferences and outcomes of searches from N=1000 married pairs from the same sample. We will show what people want and what they actually get as a mate. In all aspects we tested homogamy and not complementary of traits was the case for stable pairs. We also can show that males and females use different search strategies which can be modeled as Levy's flights with the variables status and age. This analysis is based on 190.000 virtual and real dates. The general conclusion is that adaptations from our evolutionary past are still working and not out ruled by changes in modern society and changes in economic and medical conditions.

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*The emergence of non-conformist social learning strategies in variable environments*

Conformist transmission, the tendency to acquire the most common trait in a population, has been shown to be adaptive in a broad range of conditions. However, solely conformist transmission would prevent the diffusion of novel traits through a population. Conformist transmission may thus be complemented by other social learning strategies. The cues that favour reliance on particular alternate strategies are not well established. Here, we tested the influence of environmental variability, current relative trait frequency, and the temporal progression of trait frequency. Participants received information from players in a multi-armed bandit game, where the aim was to find a high reward option that could change location between rounds. Participants viewed how many players choose each option and how many rounds had elapsed since the high reward option moved. Participants then had to choose the option with the highest pay-off. We manipulated the frequency at which the high option moved and whether participants could see frequencies of player choices in a temporal sequence or in random order. High environmental variability generally led to an unconditional conformist learning strategy, whereas individuals under low environmental variability adjusted their social learning strategy according to the ambiguity of social information and the time since the last change occurred. We discuss the findings with regard to the diffusion of innovation and cumulative cultural evolution.

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*The ability of phylogenetic comparative methods to detect correlated evolution in cultural traits when there is some horizontal transmission*

Phylogenetic comparative methods provide a potentially powerful technique for testing hypotheses about cultural evolution. However, important differences between biological and cultural evolution could have significant consequences for the application of these methods to cultural systems. Here we simulate the evolution of continuous traits under various levels of horizontal transmission of these traits between cultures. We found that the model of horizontal transmission of traits has an effect on the results returned by phylogenetic methods. Importantly, when traits are simulated as evolving independently and are horizontally transmitted between cultures separately, simple regression analyses regularly suggest that the traits are correlated (i.e. Type I errors are inflated), whereas the phylogenetic comparative method accurately report that they are not, even under the highest levels of horizontal transmission. When traits are correlated, then phylogenetic methods generally detect correlated evolution, including correlated transmission, and outperform other forms of regression when detecting co-evolution in terms of eliminating both false positives and false negatives, even when levels of horizontal transmission are high. These results suggest that horizontal transmission is not fatal to the application of phylogenetic comparative methods to cultural data; on the contrary phylogenetic methods remain the most appropriate tools for detecting correlated evolution amongst hierarchically related cultures.

**Jitka LINDOVA (1), Ales Kubena (1), Hana Sturcova (1), Romana Krivohlava (1), Martina Novotna (1), Anna Rubesova (2), Eva Jozifkova (3), Jan Havlicek (2) & Jaroslav Flegr(2)**

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*Influence of latent toxoplasmosis on altruistic behaviour of men and women in experimental games*

The parasitic protozoan *Toxoplasma gondii* infects all warm-blooded animals including humans. The prevalence of latent toxoplasmosis, which is usually considered asymptomatic, is between 20-70% worldwide. Latently infected rodents show a number of behavioral changes. Several studies also found sex-different behavioural and personality changes of infected humans. These sex-differences could relate to sex-specific coping with stress induced by this long-lasting infection. Different coping styles should arise in social contexts because in contrast to focus orientation in men, women show rather prosocial behaviour under stress. We tested 295 biology students (29/191 women and 27/104 men were *Toxoplasma*-infected) using experimental games - the Dictator Game (where 'the dictator' divides money between himself and a second player) and the Trust Game (where the second player responds to the 'investment' of the first player by returning a part of the amount received), which simulated the non-social and social context, respectively. In accordance with the premise that individuals exposed to long term stress help less and show overall more negative and passive behaviour, both men and women infected by *Toxoplasma* behaved less altruistically in the Dictator Game (gave less money than they obtained in the previous round,  $p=0.048$ ). However, in the Trust Game we found a significant effect of the *Toxoplasma*-sex interaction on the rate of returning money to 'the investor' ( $p=0.016$ ) with women returning more (i.e. behaving prosocially) and men returning less when infected. The study refers to an additional serious consequence of toxoplasmosis and reopens the topic of treatment of its latent form.

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*Previous experiences affect female choice in a speed-dating experiment*

According to traditional views of sexual selection, all individuals should strongly prefer mates offering high-quality genes or plentiful resources. However, evidence from a wide range of species suggests that mate preferences are not fixed and uniform, but flexible and state-dependent. Recent mathematical models suggest that, to enhance their mating prospects, individuals should be sensitive to the degree of interest received from the opposite sex and adjust their mate-choice behaviour accordingly. Here we report the first experimental test of this prediction, using women taking part in 'speed-dating' events. Halfway through the events we informed the women how many of their dates were interested in meeting them again, with this feedback artificially adjusted either upwards ('inflated' treatment) or downwards ('deflated' treatment). Women in the deflated group, who experienced more rejections, subsequently accepted fewer men than those in the inflated group. This confirms the basic prediction that choice is sensitive to feedback from the opposite sex, and suggests that women use this information to assess their chances of finding a suitable partner. Women who receive little interest may perceive that there are few suitable partners in the local environment, and reduce their acceptance rate in anticipation of better prospects elsewhere. We expect such flexibility to be selectively favoured under a wide range of circumstances, and encourage similar experimental tests on other animal species.

**Sarah E. JOHNS**

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*Predicting the future: teenage motherhood and time perspective*

Teenage motherhood may be a rational reproductive strategy: an evolved, adaptive response in environments where the future is unpredictable. Evolutionary life history theory predicts that when mortality risks are high and the future is uncertain, females will trade the benefits of maturation/resource acquisition against the risks of dying before reproducing. Effective decision-making, at a proximate level, regarding the 'reproduce now vs. later' trade-off requires an ability to assess the future based on past or current conditions. It has been hypothesised that a psychological mechanism (time preference/perspective) should exist, in humans, to help us make decisions about the relative value of the future while taking present and past situations into account. Time perspective in this view is an evolved algorithm that allows decision-making about reproductive value in an imagined view of the future. To test this, the Zimbardo Time Perspective inventory was used on a large sample of women, all mothers, from a contemporary, Western population. Results indicate that particular time perspectives are strongly predictive of teenage motherhood: women who view their futures in light of negative past events are more likely to have a younger age of first birth. Results also suggest that past-negative time perspective is a partial mediator in the relationship between measures of environmental risk and uncertainty, and age at first birth. These findings suggest that there are strong links between perceptions and behaviour, supporting the hypothesised function of Time Perspective as a proximate mechanism and the relevance of life history theory to humans in Western populations.

**Luke RENDELL & Kevin N. Laland (CULTAPTATION)**

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*The social learning strategies tournament and prize giving*

Social learning can be a cheap way to get information, but in a changing environment it also carries the risk of individuals acquiring outdated or incorrect information. Formal theory leads to the expectation that individuals will use social learning selectively by deploying 'social learning strategies' - rules about when and whom to copy. But which strategies perform best? Which win out in an evolutionary struggle? Various potential strategies (e.g. conformist learning, copy successful individuals, copy when asocial learning is costly) have been explored empirically, and in theory, but these represent just a tiny subset of the universe of possible strategies. We will describe how, to make headway with these questions, we organized an open computer-based tournament in which entrants each submit a strategy, and all strategies compete against each other in computer simulations. Agents in the simulations could, on each turn, either learn for themselves (INNOVATE), learn by copying others (OBSERVE), or deploy an act they already knew to reap a fitness payoff (EXPLOIT). Tournament entrants specified a set of instruction on how agents should behave (i.e. when to play INNOVATE, OBSERVE or EXPLOIT). The tournament attracted 104 entries from 16 countries and a wide range of academic disciplines. One strategy, entitled DISCOUNTMACHINE, emerged as a clear winner. In this talk we will present details of the winning strategy, together with analyses to help understand why it won and what this tells us about social learning. We will end by presenting the 10,000 Euro tournament prize to its authors, Dan Cownden and Tim Lillicrap of Queen's University, Ontario, Canada.

**Lynda G. BOOTHROYD (1), Martin Tovee (2) & Thomas Pollet (3)**

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*Mechanisms of variation in body preference*

Although previously preferences for female body shape had been considered a cross-cultural universal, more recent evidence has shown systematic differences between certain populations. For instance, preferences for female BMI are lower in Western Europeans than other populations such as Zulus resident in South Africa (Tovee *et al.*, 2006). Different hypotheses can be suggested to explain these differences. Firstly, differences may arise as a result of 'visual diet' whereby repeated exposure to thin bodies in the media distorts an individual's perception of 'normality' and thus re-aligns their preferences relative to the perceived norm. This phenomenon has been shown to operate with facial preferences. Alternatively, the differences between populations may represent an adaptive learning mechanism, whereby cues to health or status (larger bodies in South Africa, but thinner bodies in the West) in the local population are internalised and affect body preferences. Here we use experimental methods to test these two explanations of body preference variation. Reference: Tovee *et al.*, 2006. *Evol Hum Behav* 27: 443-456.

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*Cognitive adaptations to the spread of social information via language: recent developmental investigations*

Humans are adapted to life in a social world, and develop a social intelligence which enables them to navigate and manipulate that world. A unique feature of human social life is the ability to spread information about social behaviour and relationships using language, leading to the formation of reputations. Here we present empirical results from three developmental studies, which addressed two questions: whether children are biased towards spreading reputationally relevant information via language; and whether older children change their behaviour to reflect the possible impact on their reputations. Study 1 was an observational study of preschool children's reporting of norm violations by peers. Children were biased towards the truthful reporting of negative behaviour by peers, especially those which involved physical harm or property disputes, and their reporting frequently led to punishment of the alleged perpetrator by adults. Study 2 attempted to determine whether the bias for reporting negative behaviour is caused by attention and memory biases, using a simple experiment which compared children's recall of asocial, prosocial and antisocial actions in stories. Study 3, part of an ongoing project investigating the links between supernatural beliefs and normative behaviour, has the potential to uncover differences in the cheating behaviour of children at different ages, based on the presence of a third party who might report their behaviour to an experimenter. Preliminary results from these studies are consistent with the hypothesis that advanced theory-of-mind abilities evolved in humans in response to selective pressures caused by the spread of social information via language.

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*Gravettian Venus figurines as ethnic markers*

*We will investigate whether the Gravettian Venus figurines (28,000-22,000 BP) served as ethnic markers.* Our analysis will draw on game theoretical models, archaeological data from Upper Palaeolithic Europe and mtDNA, Y-chromosomal and autosomal DNA studies of extant and fossil Europeans. Our analysis indicates that the Gravettians were not only culturally, but also genetically homogeneous, and that they maintained wide social networks in the face of very harsh and unpredictable climatic conditions. Studies of the role of art and body decoration in recent hunter-gatherer societies indicate that widespread, highly stylized art objects often serve as ethnic markers, i.e. tokens of membership of a social security network on which members can rely in times of hardship. The homogeneity of Venus figurines across space and time makes their role more compatible with formal models of ethnic markers than with other models of altruistic behavior (e.g., green beards, which would require rapid stylistic turnover). In the face of the severe climatic conditions of the Gravettian period, close to the Late Glacial Maximum (22,000 BP), the voluptuous shape of Venus figurines might be interpreted as culturally significant, perhaps a token of plenitude in a population frequently faced with starvation. As the climatic conditions deteriorated with the onset of the Last Glacial Maximum, the population collapsed, and the Gravettian culture came to an end. Ethnic markers can provide a reasonable answer to the question why these hunter-gatherers bothered to make such elaborate art objects, given their highly mobile lifestyle and limited material culture.

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*Rational? Altruistic? Or rationally altruistic? Cooperative contributions provide support for competitive altruism theory*

Reputation building underlies a considerable amount of cooperative behaviour observed in humans. Competitive altruism, the theory which treats cooperative acts as signals, is one of the least explored concepts that try to explain

human cooperation. Individuals are expected to build up cooperative reputation by being generous in order to acquire valuable partners in future interactions and in consequence make profits. We tested the idea that humans exhibit higher levels of cooperation when the conditions for competitive altruism are present, that is when cooperative behaviour is public to others and when individuals are able to choose partners. We also predicted that when future interactions can potentially yield higher profit the incentive to build up reputation will increase and will be reflected in the level of contributions. 60 student participants played two stages of a public goods game. We found that participants contributed significantly more in the first stage of the game when they knew that their contributions were going to be revealed to other players in the second stage in comparison to a condition when the contributions remained anonymous. Moreover, the contributions were even higher when participants knew that they would be able to choose partners for the future game. Surprisingly, we did not find a significant difference in contributions when we manipulated the potential profit of the game. We discuss these findings considering different strategies that humans adopt to choose partners and play economic games.

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*Is human altruism a sexually selected trait?*

Evidence for altruistic or selfless behaviour is an abiding problem for biology and evolutionary psychology. Here we examine a hypothesis that human altruism towards non-relatives evolved as a result of sexual selection. We outline an evolutionary scenario in which the expanding human brain would have substantially increased the parental investment required to raise offspring successfully while language and advanced cognitive skills would have made evaluation of the behaviour of potential mates more rigorous. Under these conditions we see it as likely that intersexual selection would have favoured displays of altruistic traits, particularly where these displays correlated with sustained parental investment and/or 'quality' genes. If valid, we predict that, in modern populations, we would expect to find (a) stronger female mate preference towards altruistic traits and (b) evidence that mate choice on the basis of altruistic traits is occurring in both sexes. We employ self-report psychometric scales to measure mate preference towards altruistic traits and 'altruistic personality' and find evidence to support both predictions. Finally we propose that a key test of whether any trait has been subject to intersexual selection is (c) whether mate preference and preferred trait are subject to genetic influence. We use a twin study to estimate the effects of genotype and environment on variation in responses to both psychometric scales. The results are consistent with the hypothesized link between human altruism and sexual selection.

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*The bystander effect in a multi-player dictator game*

Why are we sometimes nice to one another? Is it because we want to help those in need, or because we want to see them helped? While this question is not a new one, amongst evolutionary-minded social scientists, the debate has taken on a specific flavor: on the one side, people help because they have other-regarding social preferences, valuing the welfare of others; on the other, people help so as to maintain a good reputation. In this talk, I will present experimental results from a modified Dictator Game, a tool from behavioral economics, that reconfirm the Bystander Effect, a well-established fact in social psychology, in which, maybe counter-intuitively, those in need are less likely to receive help as the number of potential helpers increases. As I will argue, these data are difficult to reconcile with a purely reputation-based explanation; the observed patterns of helping behavior suggest at least some genuine other-regarding preferences. In a laboratory study, with real monetary stakes, I find a strong diffusion of responsibility; as the number of dictators increases, recipients earn less money. In an online replication, with hypothetical stakes, recipients' earnings increase with the number of dictators.

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*Social and biological determinants of reproductive success in Swedish males and females born 1915-1929*

Studying biological and social determinants of mortality and fertility provides insight into selective pressures in a population and the possibility of trade-offs between short- and long-term reproductive success. Limited data is available from post-demographic transition populations. We studied determinants of reproductive success in a unique multi-generational dataset, using a population-based cohort of 13 666 individuals born in Sweden between 1915 and 1929. We studied the effects of birthweight for gestational age, preterm birth, birth multiplicity, birth order, mother's age, mother's marital status and family socio-economic position upon reproductive success, measured as total number of children and grandchildren. We further tested the hypothesis that number of grandchildren would peak at intermediate family size, as predicted by some life history explanations for fertility limitation. Reproductive success was associated with the early life characteristics of cohort members in a gender

specific pattern. In both sexes, a higher birthweight for gestational age, a term birth and a younger mother were independently associated with a greater number of descendants. A married mother and higher family socio-economic position were also associated a greater number of descendants in males (but not females), while in females (but not males) higher birth order was associated with higher reproductive success. The predictors of marriage also showed large gender differences. Number of grandchildren increased with increasing number of children in both sexes, providing no evidence for a trade-off between quantity of offspring and their subsequent reproductive 'quality'.

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*Type-A personality and reproductive success in contemporary humans: revisiting the 'central theoretical problem of human sociobiology'*

Human motivation for social status may reflect an evolved psychological adaptation that increased individual reproductive success in the evolutionary past. However, the association between status striving and reproduction in contemporary humans is unclear. It may be hypothesized that personality traits related to status achievement increase fertility even if modern indicators of socioeconomic status do not. We examined whether four subcomponents of type-A personality - leadership, hard-driving, eagerness, and aggressiveness - assessed at age 12-21 predicted the likelihood of having children by the age of 39 in a population-based sample of Finnish women and men (n=1313). Survival analysis models indicated that high adolescent leadership increased adulthood fertility in men and women, independently of education level and urbanicity of residence. The findings suggest that personality determinants of status achievement may predict increased reproductive success in contemporary humans.

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*The Trivers-Willard hypothesis goes worldwide: maternal condition and sex-biased investment in Colombia, Cambodia, Kenya, Rwanda and Uganda*

More than thirty-five years ago, Trivers and Willard (1973) posited that parental condition should influence biased investment in one sex over another. Even today the hypothesis remains highly debated in evolutionary biology. With respect to humans, at best the evidence for the Trivers-Willard hypothesis is mixed. Here we use demographical data from five developing countries (Colombia, Cambodia, Kenya, Rwanda and Uganda), covering more than ten million mothers to further investigate the effect of maternal condition on sex ratio biasing and resource allocation biasing. This is the largest cross-national set ever used to examine the hypothesis among humans. We investigated whether maternal condition (education, marital status) predicted sex ratio biasing and resource allocation biasing by use of multilevel modelling. Results showed that maternal education positively relates to son bearing. Married mothers were also significantly more likely than single mothers to bear sons. Mothers in poor condition, namely divorced, single or low educated had relatively less surviving sons (compared to daughters) than mothers in good condition. The effects of maternal condition (education, marital status) were significantly stronger for postnatal investment than for sex ratio biasing. For example, the effect for maternal education is nearly double for postnatal investment than for sex ratio biasing. These results appear in line with the Trivers-Willard hypothesis. Results are discussed with reference to the current literature on Trivers-Willard effects and possible alternative explanations for the documented effects. Reference: Trivers, R.L. & Willard, D. (1973) *Science* 179: 90-92.

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*Demography, skill accumulation and the origins of behavioural modernity*

The Upper Palaeolithic Transition, sometimes referred to as the origin of behavioural modernity, is associated with the appearance of a package of increased symbolic and technological complexity. It occurred around 45,000 years ago in Europe and western Asia but somewhat later elsewhere in the old world. However, many of its features appear transiently some ~45 to 25,000 years earlier in sub-Saharan Africa. Proposed explanations for this significant cultural shift include: biological / cognitive change, innovations in social structure and language, fluctuations in ecological / socio-economic conditions and the effects of population size increase on inter-group interaction / competition. However, none of these mechanisms adequately explain the spatiotemporal structuring of markers of behavioural modernity in the last ~50,000 years or their earlier appearance in sub-Saharan Africa. We present a cultural learning simulation model that reflects key features of Pleistocene human demographic conditions. We show that the level of a cultural skill that can be maintained is related to the level of migratory activity amongst subpopulations but not to the number of subpopulations, when greater than ~50. We also show that geographic heterogeneity in local subpopulation density or migratory range leads to stable spatial structuring of skill accumulation in contiguous space. Genetic estimates of population size change over time indicate that population densities in early Upper Palaeolithic Europe were similar to those in sub-Saharan Africa when the markers of

behavioural modernity first appear. We conclude that demography is an important variable in explaining accumulation of loss of markers of behavioural modernity.

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*Bateman's principles and the evolution of human sex roles*

In 1948, Angus J. Bateman reported a stronger relationship between mating and reproductive success in male compared to female fruit flies, and concluded that selection should universally favour 'an indiscriminating eagerness in the males and a discriminating passivity in the females' to obtain mates (Heredity 2, 349-368). The conventional view of promiscuous, indiscriminating males and coy, choosy females has also been applied to our own species. We challenge the view that evolutionary theory proscribes universal stereotyped sex roles in human beings. Firstly, we review recent sexual selection theory, which shows that a number of factors, such as sex-biased mortality, population density and variation in mate quality, are likely to impact upon mating behaviour in human populations. Secondly, we review data on variance in reproductive success and mating success, and the shape of the relationship between these variables, in both sexes in current human populations. More specifically, we present data on the relative variance of male and female reproductive success for 22 human populations. We consider the implications of variation between populations for our understanding of human sex roles and argue that human mating strategies are unlikely to conform to a single universal pattern.

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*Children, chimpanzees and the question of cumulative cultural evolution*

Although there is debate about whether cumulative cultural evolution has occurred in species other than our own, the gulf between humans and other animals in this respect is undeniable. What explains this gulf? The most common explanation offered in the literature appeals to lack of a human-like capacity for fidelity of cultural transmission, even in our closest ape relatives (and by inference, our common ape ancestors). In the past some of us have challenged this hypothesis (e.g. Whiten *et al.* 2003. *Evol Anthropol* 12: 92-105) because of results indicating greater fidelity than hitherto recognised, in ape social learning. Here, we summarise more recent social diffusion experiments that reinforce this view. However, other of our recent experiments suggest that a 'social learning deficit' hypothesis may have merit, although in a more particular form. In these experiments, young chimpanzees and children first learned, through observation, a technique to extract honey or other rewards through a hatch in a small box. They then witnessed the same model use a more complex technique that subsumed the first, to gain yet greater rewards. A majority of children assimilated this approach, thus exemplifying cumulative cultural acquisition on a small scale. Chimpanzees, by contrast did not: they remained 'stuck' on the first technique, apparently conforming to a 'satisficing' rule. We discuss the implications of these results, together with other recent findings concerning conservatism in ape social learning, for cumulative cultural change in humans, apes and our common ancestor.

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*Time and cognitive constraints on personal network size in humans*

Group size in non-human primates is constrained by two independent variables, cognitive abilities which limit the number of relationships an individual can keep track of, and time constraints which limit the time that is available for servicing social relationships. In humans, time and cognitive constraints also act to constrain the number of relationships an individual can maintain at a given level of emotional intensity, but exactly how these constraints operate is not well understood. In this study, we examined how the size and composition of personal networks in humans are affected by constraints on network size. There was a negative relationship between mean emotional closeness and network size - thus smaller networks contained fewer individuals, but at a higher level of emotional closeness than large networks. Further, there was a distinct upper bound on total network size, with the number of family members in the network constraining the number of friends in the network. The mean upper limit on network size was 136-150, which is very close to the group size of 150 predicted for modern humans, based on the relationship between neocortex ratio and group size in primates. Finally, there was a close relationship between the frequency of communication between two individuals and their emotional closeness. Thus, in modern humans, time constraints may act to limit the frequency of communication between network members, whilst cognitive constraints may limit the number of complex social relationships that can be mentally tracked at any one time.

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*Men report stronger attraction to femininity in women's faces when their testosterone levels are high*

Many studies have shown that women's judgments of men's attractiveness are affected by changes in levels of sex hormones. However, no studies have tested for associations between changes in levels of sex hormones and men's judgments of women's attractiveness. To investigate this issue, we compared men's attractiveness judgments of feminized and masculinized women's and men's faces in test sessions where salivary testosterone was high and test sessions where salivary testosterone was relatively low. Men reported stronger attraction to femininity in women's faces in test sessions where salivary testosterone was high than in test sessions where salivary testosterone was low. This effect was found to be specific to judgments of opposite-sex faces. The strength of men's reported attraction to femininity in men's faces did not differ between high and low testosterone test sessions, suggesting that the effect of testosterone that we observed for judgments of women's faces was not due to a general response bias. Collectively, these findings suggest that changes in testosterone levels contribute to the strength of men's reported attraction to femininity in women's faces and complement previous findings showing that testosterone modulates men's interest in sexual stimuli.

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*Why do people believe in immanent justice?*

When someone does something bad and then is the victim of a misfortune, we have the intuition that the misfortune has 'something to do' with the misdeed. Here, we suggest that this intuition is a by-product of the way our moral sense works. Indeed, many theories have argued that our moral sense is an adaptation aiming to equilibrate everyone's interests (Trivers 1971, Rawls 1971). In our example, our moral sense would construe the misfortune as a way to equilibrate the misdeed. Following recent theories of religion (Sperber 1996, Boyer 2001), we suggest that this intuition contributes to the cultural success of beliefs in immanent justice. To test this hypothesis, we designed a set of studies in which we show that people who do not believe in immanent justice are nonetheless implicitly influenced by immanent justice. Participants were asked to say whether two events in a story were causally related. In conditions where the events were not causally related, participants were slower to answer that there was no causal relationship in a moral condition (where the two events could be morally matched: i.e., a misdeed and a misfortune, a good deed and a good fortune) than in a control condition (a morally neutral action and a misfortune). Strikingly, this effect disappears when the misfortune is disproportionate compared to the misdeed: In this case, the equilibrium of interests is indeed not achieved and participants lose the intuition of immanent justice. Refs: Boyer, P. (2001) *And Man Creates God: Religion Explained*. Basic Books. Rawls, J. (1971) *A Theory of Justice*. Harvard University Press. Sperber, D. (1996) *Explaining Culture: a Naturalist Approach*. Blackwell. Trivers, R. (1971) Evolution of reciprocal altruism. *Quart. Rev. Biol.* 46, 35-57.

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*The age of human culture*

All humans have abilities like thinking, planning and a great potential for social learning. These abilities are required for our cultural capacity which dramatically sets us apart from other animals. However, the time when this capacity evolved remains controversial. Some argue that our cultural capacity evolved recently, about 40 000 years ago, as evidenced by the alleged simultaneous demographic and cultural explosion at that time. Others argue that our cultural capacity has a common and ancient origin in humans and thus is much older. A third contingency argues that cultural capacity evolved several times in parallel across the world. To distinguish between these hypotheses we use observations from molecular biology, linguistics and archaeology. The parallelism hypothesis is rejected due to parsimony as it requires several identical changes in multiple lineages, a highly unlikely series of events. Early morphological adaptations for language, and archaeological evidence of fire and tool use that by far predates the first split in the modern human lineage enable us to also reject the late origin hypothesis. We conclude that the first modern humans had the same unique cultural capacities as we do today. That the events that sometimes are described as the 'cultural explosion' comes a long time after the emergence of cultural capacity is better explained by inherent aspects of the cultural evolutionary process. The new interesting question is therefore how the cultural evolutionary process can be limiting and how many earlier hominids that may have shared the cultural capacity with us?

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*An exaptationist account of the evolution of human communication: a computer model approach*

Recent approaches to the evolution of human communication propose that the hominin lineage evolved unique biological adaptations leading to a cognitive capacity including sociocognitive (Tomasello, 1999), symbolic (Deacon, 1997) and purposefully imitative (Donald, 1991) aspects. This capacity in place would allow individuals to understand preexisting non-communicative behaviour as a reflection of others' meanings or intentions. This paper is concerned with the origin of the preexisting shared non-communicative behaviour system that could have been exapted for communication. Specifically, it explores the separate and joint effects of arbitrary imitation (imitation of a behaviour, irrespective of whether it is functional or not) and of a pattern-completion bias on the coordination of the behaviour system in the population and the regularity of the system. A series of agent-based computer simulations shows that a shared behavioural system emerges in a population from arbitrary imitation and pattern-completion behaviour. Moreover, in a structured environment, the system develops regularities that can afford generalisation. Finally, such systems develop even with little contact among members of the social group. This study highlights the potential role of arbitrary imitation for pattern completion in the evolution of communication. The behavioural system resulting from these biases may have posed selective pressures for the evolution of (sociocognitive, symbolic, imitative...) biological capacities usually assumed to be required for communication. Refs: Deacon, T. (1997). *The symbolic species*. London: Penguin. Donald, M. (1991). *Origins of the modern mind*. Cambridge: Harvard University Press. Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge: Harvard University Press.

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*Social learning mechanisms influence cultural evolutionary dynamics: modelling imitation and emulation*

Recent empirical studies have shown that social transmission of behavior can be realized through multiple mechanisms in humans and non-human primates. Current primate social learning studies make a distinction between two forms of extracting information from a model: copying actions, such as body movements, which is broadly defined as imitation, or copying only the consequential results, such as changes in the environment brought about by these actions, defined as emulation. We present an individual based model in which individuals orient their search for optimal behavior based on their learning mechanism in an abstract space describing fitness, results and actions, as they relate to a particular task defined by the user. In particular, imitators orient their behavior using the position of the model in the actions space, while emulators orient their behavior using the position of the model in the results space. Individual learners have information only about their fitness. Analysis of data generated in this model reveal that the relative effectiveness of these mechanisms depends on some critical features of the space: for example, when similar actions combinations produce similar results and similar fitness, the effectiveness of the learning mechanisms is comparable. On the contrary, actions copying is useful when similar actions combinations produce different (if any) results.

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*Why social stratification is to be expected*

Social stratification exists in many species, including humans. However, through cultural evolution humans have developed systems where individuals can greatly improve their lot through strategies such as education. Thus social stratification in modern societies presents us with a dilemma: why don't people with low income simply change their strategies to mimic the high earners? Several solutions to this question has been suggested, such as inherited resources (e.g. land) that generate money, coercion, individual differences in skill, or societal subdivision into semi-isolated groups with limited interaction and possibility to change group. While all of these explanations may have merit, a good understanding of their respective explanatory power can only be reached through a null model in which all people are equal in skill, inherited resources and social contacts. This paper uses a mathematical model with minimal assumptions that show how social stratification might evolve from education when people are equal and discount their future payoffs. The model is shown to fit well with statistical data on income and education in Sweden and the United States, suggesting that the kind of social stratification that we observe is to be expected to appear endogenously, whether or not individuals have equal chances. Furthermore, the results yield concrete suggestions on how to increase the proportion of educated people in society.

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*The cultural evolution of two key design features of language*

Language is a complex human trait that shows the appearance of design for efficient communication. Two design features - apparently unique among animal communication systems - are of particular interest. First, human languages use vast numbers of learned, arbitrary signal-meaning mappings. Second, many complex signal-meaning mappings are not arbitrary, but rather systematically related to each other in that signals for similar meanings share a component. How did these two properties - arbitrariness and systematicity - evolve? While previous work has explored the evolution of the two independently - implicitly assuming a two-stage process - we present a communication experiment in which both can evolve simultaneously. Pairs of participants play a game in which, each trial, one has an item (such as 'school') and draws on a shared whiteboard, and the other guesses what the item is. Use of symbols is prohibited, so participants must invent their signs for the items from scratch. To allow systematicity to evolve in the sets of signs, the items were carefully chosen to share semantic features with each other. Each item is drawn many times throughout the game, so that one can watch each sign evolve. Pairs are rewarded for quick, accurate guesses. We found that signs adapt to these pressures by becoming more arbitrary and also (sometimes) highly systematic. Further experiments probe the transmission of these sign systems to new participants. We discuss the implications for current theories of the evolution of systematicity, which assume sets of arbitrary signs as their starting point.

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*Tall and handsome, but mostly rich: male stature is associated with direct fitness benefits*

Tall men attain higher levels of education and income than shorter men. Furthermore, tall men are perceived as more sexually attractive and have more reproductive success. However, why taller men are perceived as more attractive and attain more reproductive success is still largely unknown. Tall men might be attractive because of the indirect benefits (e.g. 'good genes') or direct benefits (e.g. material resources) associated with height. We used the Wisconsin Longitudinal Study, a longitudinal study of men and women who graduated from Wisconsin high schools in 1957, to examine the relation between male height and reproductive success (N=2,498 men). By Structural Equation Modeling, an analytical tool for modeling the relationships among multiple independent and dependent constructs simultaneously, we determined the relationships between height, education, income, and reproductive success (number of children). Our model confirmed the previously reported positive associations between height, education and income. The model also confirmed the negative association between education and reproductive success, and the positive association between income and reproductive success. Controlling for income (+) and education (-), height had no significant direct effect on reproductive success. A (minor) total positive effect of height on reproductive success was found, but this effect was fully mediated by income. These results suggest that taller men are attractive (at least partly) because of the direct fitness benefits associated with male stature: money.

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*Adolescents' preferences for sexual dimorphism are influenced by relative exposure to male and female faces*

Although people agree broadly on what constitutes an attractive face, individual differences in attractiveness judgments remain. Exposure to a particular population of faces can increase ratings of the normality and attractiveness of similar-looking faces, and can lead to a refinement in the perceived boundaries of that face population, such that other faces are more readily perceived as dissimilar. We predicted that relatively less exposure to opposite-sex faces, as experienced by children at single-sex compared with mixed-sex schools, would decrease ratings of the attractiveness of sexual dimorphism in opposite-sex faces (that is, boys at single-sex school would show a decreased preference for feminised faces, and girls at single-sex schools would show a decreased preference for masculinised faces). Consistent with this prediction, boys at single-sex compared with mixed-sex schools demonstrated significantly stronger preferences for facial masculinity in female faces, and girls at single-sex compared with mixed-sex schools demonstrated significantly stronger preferences for facial femininity in male faces. These effects were also found when rating same-sex faces. These data add to the evidence that long-term exposure to a particular population of faces can influence judgments of other faces, and contribute to our understanding of the factors leading to individual differences in face preferences.

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*Voice or face: preferences in assessing attractiveness*

Among the features that receive the highest attention when judging physical attractiveness, faces and voices are among the most meaningful signals (Rhodes, 2006). Previous research suggests that for both sexes face and voice provides similar information regarding mate value (Saxton *et al.*, 2006). Based on the assumption that in a typical social situation the face and the voice are perceived simultaneously, we investigated which of the ratings of the two stimuli presented separately is a better predictor of the ratings of the simultaneous presentation. For evaluation, we used recordings of vowels and frontal face photos from 35 participants. The stimuli were presented to 109 participants. They were asked to rate the stimuli (face, voice, face and voice together) on a 5 point scale with respect to attractiveness. We computed averages for each stimulus ratings and used them to test the hypothesised correlations. Analyses indicated differences between face and voice ratings. This pattern was identified in the analysis of the whole sample ( $r=-0.15$ ,  $p=0.38$ ), as well as for separate analyses of men ratings of women stimuli and women ratings of men stimuli. When women rated men, only the ratings of voices were significantly correlated with the joint ratings of the two stimuli ( $r=0.67$ ,  $p=0.01$ ). It seems that for women it is the voice that matters more when judging men attractiveness. Whether this is an adaptation relevant to mate choice or this is a side effect of the perception systems of the two sexes, remains to be addressed in following studies. Refs: Rhodes, G. 2006. *Ann Rev Psychol* 57: 199-226. Saxton, T., Caryl, P. & Roberts, S. 2006. *Ethology* 112: 1179-1185.

## POSTER PRESENTATIONS

### SOCIAL LEARNING STRATEGIES TOURNAMENT WINNERS

**Daniel COWNDEN (1) & Timothy P. LILICRAP (2)**

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*When is innovation worthwhile? Insights from a social learning strategies tournament*

Despite widespread belief in the benefits of innovation in a colloquial sense, the results of the Social Learning Strategies Tournament suggest that innovation, as it exists in the tournament, is a waste of time. Given the structure of the tournament, in virtually all situations, it is preferable to observe and copy what others are doing, over striking out from the pack and innovating. What characteristics of the tournament cause this divergence from common sense? Preliminary analysis of the tournament's winning strategy led us to the following insights: 1. The tournament lacked payoff density dependence (i.e. where payoff for an action depends on the number of creatures performing that action). Density dependence would mean substantial reward for the first critter to discover a new high payoff action, and a reduced reward for copiers. 2. Even in situations where some level of innovation is desirable, if this level of innovation is below the level of accidental innovation resulting from failed copying, then there is no need for intentional innovation. 3. The strategic game element of the tournament was subtle and small, essentially creating an optimal control problem in which the strategies of others could be neglected. Without game theoretic subtleties observation is always preferred because, when looking for a new action to perform the payoffs of observed actions in a competent population will, on average, be higher than those of innovated actions. Future formal work on the copy versus innovate tradeoff should take these insights into account.

## CULTAPTATION EXHIBITION

**Magnus ENQUIST (1,2), Kimmo Eriksson (1,3), Stefano Ghirlanda (4) & Kevin Laland (5)**

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*CULTAPTATION: dynamics and adaptation in human cumulative culture.*

**Pierluigi CONTUCCI, Micaela Fedele**

Department of Mathematics, University of Bologna. E-mail: [contucci@dm.unibo.it](mailto:contucci@dm.unibo.it)

*Emergence and disappearance theory for a two group social system*

**Lewis DEAN (1), Rachel Kendal (2) & Kevin Laland (1)**

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*An analysis of cumulative culture in captive chimpanzees (*Pan troglodytes*)*

**Micael EHN (1,2), Pontus Strimling (2) & Magnus Enquist (2,3)**

(1) School of Education, Culture and Communication, Mälardalen University, Sweden. (2) Centre for the Study of Cultural Evolution, Stockholm University, Sweden. (3) Department of Zoology, Stockholm University, Sweden.  
*The role of specialization in cultural cumulation*

**Magnus ENQUIST (1,2)**

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*Error explosion in cumulative culture.*

**Elin FORNANDER (1,2), Sven Isaksson (1,2), Gunilla Eriksson (1,2), Kerstin Lidén (1,2).**

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*Divers attitudes towards the introduction of farming in Scandinavia: cultural evolution and food*

**Stefano GHIRLANDA (1,3), Matjaz Perc (2) & Magnus Enquist (3,4)**

(1) Department of Psychology, University of Bologna, Italy. (2) Department of Physics, University of Maribor, Slovenia. (3) Centre for the Study of Cultural Evolution, Stockholm University, Sweden. (4) Department of Zoology, Stockholm University, Sweden. E-mail: [stefano.ghirlanda@unibo.it](mailto:stefano.ghirlanda@unibo.it)  
*Sustainability of culture-driven population dynamics*

**Sven ISAKSSON (1,2), Elin Fornander (1,2), Gunilla Eriksson (1,2) & Kerstin Lidén (1,2)**

(1) Department of Archaeology and Classical Studies, Stockholm University, Sweden. (2) Centre for the Study of Cultural Evolution, Stockholm University, Sweden. E-mail: [sven.isaksson@arklab.su.se](mailto:sven.isaksson@arklab.su.se)  
*Norm and practice in early medieval Sweden: cultural evolution and food*

**Luke RENDELL, Laurel Fogarty & Kevin Laland**

School of Biology, University of St Andrews, St Andrews, U.K. E-mail: [ler4@st-andrews.ac.uk](mailto:ler4@st-andrews.ac.uk)  
*Rogers' in Space: Rogers' Paradox recast and resolved*

**Jonas SJÖSTRAND (1,2), Fredrik Jansson (1,2) & Kimmo Eriksson (1,2)**

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*The distribution of cultural preferences. How often are popular traits replaced?*

**Pontus STRIMLING (1), Magnus Enquist (1,2) & Kimmo Eriksson (1,3)**

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*Repeated learning makes cultural evolution unique*

**Mark TANAKA (1), Jeremy Kendal (2) & Kevin Laland (3)**

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*From traditional medicine to witchcraft: why medical treatments are not always efficacious*

**Maria WALLENBERG-BONDESSON (1,2) & Arne Jarrick (1,2)**

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*Cultural evolution and law. The regulation of human action in law codes: a comparative study*

**POSTER ABSTRACTS (alphabetical order)**

**Isabel AREND (1), Martin Giese (2), Robin Kramer (1) & Robert Ward (1)**

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*Effects of sexual dimorphism on perceived attractiveness from biological motion*

Attractiveness is a trait with high social and biological relevance, as a cue to guide mate choice. To date, attractiveness has been studied mainly with face stimuli. A robust finding is that attractiveness and femininity go

together in women's faces: women with feminine faces are consistently rated as more attractive, both by male and female raters. This finding is frequently explained on the basis that femininity within the female face is an indicator of sex hormone levels, and ultimately, of reproductive value. However, the face is but one source of potential fitness-related information. Body motion can also convey a variety of socially-relevant information, such as age and sex. Here we investigated the role of sexual dimorphism on attractiveness from body motion. Participants were asked to rate the attractiveness of walkers with standardised and natural body geometry using a 7-point likert scale. The relationship between sexual dimorphism and attractiveness from judgements of gait was different from that previously found in faces: Highly feminine gaits were perceived as less attractive than more neutral ones. These results suggest that body motion may signal different aspects of an individual's biological condition, possibly reflecting different selection pressures from those found on the evolution of facial features.

**Piet van den BERG (1), Tim W. Fawcett (1), Franz J. Weissing(1) & Abraham P. Buunk(2)**

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*A theoretical approach to the parent-offspring conflict over mate choice*

In prevailing sexual selection approaches, mate choice is usually considered to be determined by male traits and female preferences alone. These approaches ignore the fact that human mate choice is often heavily influenced by parents, a phenomenon that appears to be ubiquitous across cultures. It is particularly important to investigate this phenomenon because there exists a conflict over mate choice between parents and their offspring, so that varying degrees of parental influence on mate choice may lead to different evolutionary outcomes. Previous research confirmed that parents have a relatively stronger preference for individuals with characteristics that suggest high parental investment and cooperation with the ingroup, whereas children have a stronger preference for traits signalling high heritable fitness. Our research is dedicated to the development of an individual-based theoretical model that investigates the effect of parental influence on the outcome of sexual selection. All individuals possess a genotype determining heritable fitness, investment in a trait indicating good genes (only expressed in males), the degree of preference for this trait in a partner (only expressed in females), and the degree of preference for this trait in a partner of a daughter. Both trait and preference are assumed to have a fitness cost and evolve through time. Additionally, a trade-off between investment in the indicator trait and parental investment is assumed. The degree of parental influence is a fixed variable that is varied across simulations. We hypothesize that evolution will increasingly favour males with the indicator trait with decreasing parental influence.

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*Sex specific survival of offspring dependent on socio-economic status: the Trivers-Willard effect in humans*

According to the Trivers-Willard (1973) hypothesis parents will invest more in offspring of the sex that has the best reproductive prospects. In species where the reproductive success is dependent upon status and more variable for males than for females, it is hypothesized that high status parents invest more in male offspring because high status males have high reproductive prospects. Although the Trivers-Willard effect has been found in many mammal species, there is ongoing controversy whether it is also present in humans. We studied the effect of socio-economic status on sex specific survival in a polygynous natural fertility population in Ghana, where (if applicable to humans) the Trivers-Willard effect is expected to be maximally apparent. During a four year follow-up of 25,184 participants, we found that male reproductive success was much more variable than female reproductive success and strongly linked to socioeconomic status. In the survival analysis up to reproductive age, survival of the different sexes was strongly dependent upon socio-economic status. In poor families, daughters had a better survival than sons, whereas in families of average wealth the survival of sons and daughters was comparable and in rich families sons had a much better survival than daughters. These observations are in line with the predictions of Trivers and Willard, suggesting that the Trivers-Willard effect, well known in many mammal species, is also apparent in this polygynous natural fertility population in Ghana. Reference: Trivers, R.L. & Willard, D. 1973. *Science* 179: 90-92.

**Erin BROWN & Monica Tamariz**

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*Representational tools acquired from extensive training increase sensitivity to regularity in an artificial musical language learning task*

Modern, industrialised societies provide access to the products of generations of cultural invention and innovation, which serve as scaffolding for the intellectual achievements of individuals and institutions. The reliable presence of such tools can obscure their causal role in human experience, which is a critical factor to consider when studying the evolution of behaviours. Recent studies on the influence of learning and transmission on language structure indicate that highly systematic languages are preferentially learned over holistic ones. An appropriate interpretation of these results from an evolutionary perspective remains indeterminate, as participants' learning has likely been greatly affected by experience with written language. Research on the cognitive effects of literacy suggests the bias may result from metalinguistic knowledge gained from this experience. To test the impact of additional representational

tools on learning, we designed a musical language learning experiment that provides analogous conditions for comparing the effects of implicit knowledge versus explicit, metaknowledge of a system. Musicians and nonmusicians were trained on languages varying in degree of compositionality. The behaviour of musicians mirrored that of literates in orthographic tasks, showing significantly more expectation for and generalisation of systematicity than nonmusicians. These results suggest that access to abstract representations is at least partially responsible for the systematicity bias. This work demonstrates the need for researchers to fully understand and consider the consequences of literacy on linguistic behaviour. An awareness of these issues will ensure that research on highly enculturated individuals is properly related to the processes involved in language evolution.

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*Selection for variation: evolutionary processes affecting dominance, social structure and female mate choice*

In seeking parsimonious, individually-beneficial explanations for all extant behaviour, we may forget that multiple selective pressures often operate on a single trait. A capacity once evolved can often be exploited for a new purpose. Priest *et al* (*Evolution*, 2007) have shown that female fruit flies produce increasing amounts of variation in offspring by increasing recombination in response to previous reproductive success. Primate females may also favour variation as an implicit goal in mate choice, which trades off with fitness. This could explain results presented by Newton-Fisher *et al* (IPS, 2008), showing that while the most dominant few animals in a troop have reproductive success proportional to their rank, for the remaining majority of males there is no further reproductive advantage in rank. Females may allocate some proportion of their fecundity to males demonstrated 'fittest', while allocating the remaining proportion to males possessing different attributes, which are possibly more adaptive in future contexts. From the fruit fly results, we might predict the drive for variant males to be lower for less reproductively-successful females. This theory implies that it is generally not worth the risk for mid-to-low-ranking males to dispute dominance, unless they can challenge top-ranking males. This would explain rank patterns in egalitarian primate species. Thus this theory supports the idea that despotic species reflect an additional selective force leading to a need for greater rank discrimination. One possible such pressure is increased predation leading to rank instability, or to impracticality for gross sexual dimorphism in alpha males.

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*Do we have double standards for health and attractiveness?*

Mate choice is based primarily on the perceived reproductive potential of the prospective partner. People are therefore expected to choose partners that are both healthy and fertile. In modern times the media might have skewed these preferences by their portrayal of increasingly skinnier women. Western media also portrays a slimmer standard of attractiveness for women than for men. The purpose of the two studies reported here is to determine what people judge as optimally healthy and attractive in male and female faces. In the first study, participants rated 84 full colour face images for health, attractiveness and weight. We find that the most attractive female face is much slimmer than the most healthy looking face. In males, the most attractive face is only slightly slimmer than the most healthy looking. In the second study, participants transformed African and Caucasian faces to make them optimally healthy and attractive. The results show a significant difference between optimal health and attractiveness in women, but no clear association in men. We propose that perceptions of the ideal weight of female attractiveness has been lowered by the media and fashion industry, to the extent that women who are no longer considered healthy are judged most attractive.

**Hannah CORNISH**

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*An iterated learning experiment exploring whether cultural evolution is driven by pressure to generalise to novel stimuli, or imperfect learning*

Computational simulations show languages adapt to become structured and learnable through repeated cycles of learning and use over generations (iterated learning). Many of these models employ a learning bottleneck, forcing agents to generalise by presenting them with novel meanings they have not been trained upon. The presence of this bottleneck is vital to the outcome - if pressure to generalise is too strong or weak, adaptive structure does not emerge (Kirby, 1999). Recently the predictions of these models have been tested experimentally in populations of humans in the laboratory (Kirby, Cornish & Smith, 2008). With a generalisation bottleneck in place it was shown that initially unstructured mappings between meanings and signals evolve to become structured through cultural transmission. However, not all iterated learning models contain this explicit pressure to generalise. Batali (1998) gets a similar result using a population of agents that have access to all meaning-signal pairs from the outset, but receive multiple different signals for each meaning. I propose that the explanation for Batali's result is that his agents are imperfect learners. Thus there may actually be two pressures contributing to the evolution of adaptive structure in language: one arising from encountering novel meanings, and one arising because of imperfect acquisition of meanings

already encountered. This paper presents the results of a new human iterated learning study exploring this hypothesis by removing the generalisation bottleneck present in Kirby, Cornish & Smith (2008), and examining the systems that emerge when the only pressure is provided from imperfect learning. Refs: Kirby, S. 1999. *Function, Selection and Innateness: the Emergence of Language Universals*. OUP. Kirby, S. Cornish, H. & Smith, K. 2008. *PNAS* 105: 10681-10686.

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*Cross-modally bootstrapping proto-language: reconsidering the evidence*

Arbitrariness is accepted to be a major feature of all natural languages. However, modern languages are the result of tens of thousands of years of language evolution, and language may not have always been arbitrary. The present research investigates the claim that modern arbitrary language evolved from an iconic proto-language, which relied on common cross-modal associations in order to express a variety of sensory information through linguistic sound alone. We examine one such theory of cross-modal language evolution, Ramachandran & Hubbard's (2005) 'synaesthetic bootstrapping theory of language origins' (p. 178). This theory of an iconic cross-modal proto-language attempts to demonstrate empirical evidence suggesting that object naming is based on matching features of visual objects with features of linguistic sound. Despite the plausibility of the theory as a whole, this empirical data is confounded. Using an altered experimental design, we demonstrate that non-arbitrary naming of objects does arise, but that orthographic, not phonological, features guide this non-arbitrary naming. However, this unsatisfactory experimental evidence does not detract from a theory of an iconic, cross-modally bootstrapped proto-language. Rather, this should be a call for finding new empirical evidence. We discuss improved experimental paradigms which can avoid orthographic confounds, focusing not only on cross-modality and language, but also on the evolution of cross-modal abilities in general.

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*Who will win the competition? Personality, strategy and success in competitive game*

From the evolutionary perspective, goods gained in the competition can increase the individual's prospect for surviving and mating, resulting in a higher genetic representation in the next generations. Our aim was to investigate, how personality traits, conflict solving methods, and Machiavellianism influence the benefits earned from and strategies applied to a competitive game that was played for real money. In the experimental settings university students played the Public Goods game, transformed to a competitive situation. In order to obtain information about the subjects' personality and character profiles and their typical conflict solving strategies we used Temperament and Character Inventory by Cloninger, the Thomas-Kilman Conflict Mode Inventory, and the Mach IV. Test. Furthermore, at the end of the experiment participants reported the main motives underlying their decisions during the game which enabled us to classify them as 'individually-oriented' and 'group-oriented' players. Significant difference was found between the female and male participants in the amount of benefit they gained: the women's contribution to the public goods was significantly higher, therefore they earned less money, than men did. The amount of benefit negatively correlated with Reward Dependence, suggesting a substantial effect of reputation on the players' decisions. High-Mach persons were likely to gain higher benefit than low-Machs, although the difference did not reach the level of significance. Finally, significant differences were revealed between individually-oriented and group-oriented players in the strategy they played, and the amount of benefit they gained.

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*Amusing ourselves to death? Superstimuli and the evolutionary social sciences*

Some evolutionary psychologists (Sperber, Miller) claim that humans are good at creating superstimuli, and that the created pleasure technologies are detrimental to our reproductive fitness. Most of the evolutionary psychological literature makes use of some version of Lorenz' and Tinbergen's largely embryonic conceptual framework to make sense of supernormal stimulation and bias exploitation in humans. However, the early ethological superstimulus concept was intimately connected to other erstwhile core ethological notions, such as the innate releasing mechanism, sign stimuli and the fixed action pattern, notions which nowadays seem mostly discarded by ethologists, or at any rate appear to go unused by most of them. Hence, it almost goes without saying that many problems lurk behind the current use of the superstimulus-idea in the evolutionary study of human behaviour. The purpose of this presentation is twofold. First, we will reconnect the discussion of superstimuli in humans with more recent theoretical ethological literature on stimulus selection and supernormal stimulation. This will allow for a reconceptualisation of, and important corrections and additions to Sperber's formulation of (supernormal) stimulus selection in terms of domain-specificity and modularity. Second, we will argue that bias exploitation in a cultural species differs substantially from bias exploitation in non-cultural animals. We will explore several of those

differences, and explicate why they put important constraints on the use of the superstimulus concept in the evolutionary social sciences.

**Lisa M. DEBRUINE (1), Benedict C. Jones (1), Joshua M. Tybur (2), Debra Lieberman (3) & Vidas Griskevicius (4)**

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*Women's preferences for masculinity in male faces are predicted by pathogen disgust, but not moral or sexual disgust*

Because women's preferences for male masculinity reflect tradeoffs between indirect benefits of greater genetic health and direct costs of lower paternal investment, variables that affect the importance of these costs and benefits also affect masculinity preferences. Concern about disease and pathogens may be one such variable. Here we show that disgust sensitivity in the pathogen domain is positively correlated with facial masculinity preferences, but disgust sensitivity in the moral and sexual domains are not. Our findings present novel evidence that systematic variation in women's preferences for masculine men reflects factors that influence how women resolve the tradeoff between the indirect benefits and the direct costs associated with choosing a masculine partner.

**Shelli L. DUBBS (1) & Abraham P. Buunk (1,2)**

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*Replication of parent-offspring conflict over mate choice using a parent sample*

A feature that sets *Homo sapiens* apart from extant species is that kin (especially parents) play a large role in determining the mate-choice of individuals. Drawing on the logic of parent-offspring conflict, inclusive fitness, and evolutionary trade-offs, we hypothesized that parents' mate preferences (for their children's mates) will differ from the mate preferences of their children. Specifically, it was predicted that parents prefer children's mates to have characteristics that suggest high parental investment and cooperation with the ingroup (e.g., same ethnic background), whereas children will prefer mate characteristics which indicate high genetic quality (e.g., attractiveness). Previous studies (Buunk, Park, & Dubbs, 2008) and (Park, Dubbs, & Buunk, in press) have supported these hypotheses using culturally diverse samples of children of mating age. In this research, the results were replicated using a sample of Dutch parents: mothers (n= 234, mean age= 48.16, SD=5.54) and fathers (n=240, mean age= 52.91, SD= 5.6). Parents were asked to indicate whether specific negative characteristics in a child's potential mate would be more unacceptable to themselves or to their child. Parents found characteristics such as not being from a good family, having a different ethnicity, being divorced, and coming from a low social class as more unacceptable to themselves, and characteristics of being physically unattractive, being overweight, having a poor physical condition, and not being creative as more unacceptable to their child.

**Lara ESCHLER & Melissa Hines**

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*Female coital orgasmic ease, sociosexuality and 2D:4D*

Aim. Sociosexuality and coital orgasmic capacity have previously shown sex differences, and both traits have been associated with sex hormones, however, the two have never been previously linked. The aim of this study was to explore the relationship between variation in the orgasmic response (from coital and non-coital activities) in women and its behavioural/psychosexual correlates (sociosexuality, number of sexual partners, etc). In addition, the link between pre-natal androgen exposure (indirectly assessed using finger ratios) and both sociosexuality and orgasmic ease was explored. Results. As predicted, women who reported being able to orgasm from coitus reported a higher lifetime number of sexual partners, a higher number of one-off sexual encounters and a higher number of extra-pair partners after controlling for age. These women also had higher scores on the sociosexuality inventory (SOI), i.e. had a more permissive sexual attitude. However, while being orgasmic from coitus was linked to sociosexual variation, actual coital orgasmic frequency was not. Both orgasmic capacity and sociosexuality were also significantly linked to sexual desire. In addition, coital orgasmic ability was significantly correlated to 2D:4D. Conclusion. In sum, the current findings suggest that female sexual reward (orgasmic ease) may contribute to variation in socio-sexual orientation and number of sexual partners. Further research is needed to replicate these findings, to establish possible common underlying mechanisms linking those traits, such as androgenisation, and also to pinpoint the modulatory effects of differential orgasmic ease on sexual behaviour and attitudes (i.e. sociosexuality).

**Daniel FARRELLY**

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*Signals of altruism in mate choice - good genes or good parent?*

Previous research has highlighted the potential role that altruistic behaviour can have in signalling quality as part of mate choice. However, such research has not been able to identify what is actually being signalled - is altruism signalling good genetic quality or good parenting quality? This study examined this issue by exploring female preferences for altruistic traits in males during different stages of the menstrual cycle. If females in the ovulatory phase show a stronger preference for altruistic males (particularly for short-term partners) than non-ovulating females, then this supports the view that altruism signals genetic quality, whereas if there is no such difference in preferences, this suggests that altruism signals good parenting qualities. This study consisted of different pairs of vignettes, each describing a high altruistic male and a low altruistic male. Females then had to select which male of the pair they preferred for a relationship (short-term and long-term) and also to rate each male's desirability for short-term and long-term relationships. High altruism in the vignettes was signified as generous donations to charity, whereas low altruism was varied, so that it signified differently between pairs to control for other variables altruism may signal (namely conspicuous consumption and resource holding potential). Therefore this research is the first to fully explore the value of selecting altruistic mates for females' reproductive success. The results are discussed in terms of furthering our understanding of the evolution of human cooperative behaviours, as well as interpreting the signals such behaviours may provide.

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*Enhanced memory for cooperators in a face-in-the-crowd task*

The evolved architecture of the human brain is argued to contain algorithms to deal with human social exchanges, with a subset specialized in the detection of cheating. Indeed, several studies have reported an enhanced memory for faces of cheaters, although other studies failed to find any biases. To investigate in more detail possible memory biases for faces in social exchanges, pictures of faces (XM2VTS database) were grouped according to a brief history of cooperation, cheating or irrelevant behaviour towards a hypothetical person. Observers (n= 180) had to: (i) memorise 3 sets of 6 faces with their moral status, (ii) complete a distracter task in the memory retention period, followed by the (iii) detection of any familiar face in a crowd of unfamiliar faces. Observers showed higher accuracy and lower reaction times for faces associated with an acquired history of cooperation rather than cheating or irrelevant behaviour. Enhanced memory for cooperators was also found with single stimulus presentations. Accuracy for faces of cooperators presented to the left visual field was higher than for faces presented to the right visual field. Our results are consistent with Singer and colleagues (2008) and point to a good ability to remember cooperators, even when time allowed for memorisation and/or retrieval was limited. Since cooperation and cheating are usually conflicting behaviours, an efficient detection of cooperators is vital to the strengthening of social exchanges. Reference: Singer, T, Kiebel, SJ, Winston, JS, Dolan, RJ, & Frith, CD (2004) *Neuron*, 41, 653-662.

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*Mate choice and health: the effect of spouse's income, age and body height on an individual's health feeling*

Partner characteristics such as age, income and body height are important criteria for mate selection. We show that mate selection in line with these criteria not only affects reproductive success but also may improve a person's health feeling. On basis of a sample of 397445 married US-couples, obtained from the 'Integrated Health Interview Series' (IHIS) of the years 1982-2003, we examined whether these mate selection criteria affected a spouse's self estimation of health, a reliable indicator of general health. In both men and women, health estimation increased with increasing own as well as spouse's income and decreased with increasing own and spouse's age. In women, their spouses' income is an even better predictor of health estimation than their own income. Men estimated their health higher if they were married to a spouse younger as opposed to a spouse older than themselves. Health feeling was also affected by own as well as spouse's body height: women felt significantly less healthy if they were married to a spouse smaller than themselves (corrected for own body height and age), but increasingly more healthy if married to a taller spouse. In men, health feeling also increased with own body height, whereas the effects of spouse's height were less significant. We speculate that improved health feeling may be a proximate mechanism to foster mate selection along certain criteria that in turn leads to an increase in an individual offspring count.

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*Network-based diffusion analysis: A new method for detecting social learning*

Social learning has been documented in a wide diversity of animals. In free-living animals, however, it has been difficult to discern whether animals learn socially by observing other group members or asocially by acquiring a new behavior independently. We addressed this challenge by developing network-based diffusion analysis (NDBA), which analyzes the spread of traits through animal groups and takes into account that social network structure directs social learning opportunities. NDBA fits agent-based models of social and asocial learning to the observed data

using maximum-likelihood estimation. The underlying learning mechanism can then be identified using model selection based on the Akaike information criterion. We tested our method with artificially created learning data that are based on a real-world co-feeding network of macaques. NBDA is better able to discriminate between social and asocial learning in comparison to diffusion curve analysis, the main method that was previously applied in this context. NBDA thus offers a new, more reliable statistical test of learning mechanisms. In addition, it can be used to address a wide range of questions related to social learning, such as identifying behavioural strategies used by animals when deciding whom to copy.

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*Evolution of parochialism by multilevel selection*

The evolution of parochial altruism, which is altruistic behavior limited to ingroup members, is not well understood. In this paper we study how altruistic behaviours might have evolved in a way that makes them conditional on group membership. We consider a prisoner's dilemma game with four group contingent strategies: altruists who cooperate unconditionally; parochialists who only cooperate with members of their own group; traitors who only cooperate with outgroup individuals; and egoists who do not cooperate with anyone. We first show that parochial behavior cannot evolve in a large unstructured population. Next, a group structure is imposed which allows for assortment and conflict between groups. Individuals discriminate between ingroup and outgroup members; the importance of contacts with members of other groups is a feature of our model that facilitates empirical application to the evolution of early humans. We examine the roles of assortative interactions, as well as direct benefits in an unassortative version of the model where only conflict plays a role. While assortment and group conflict allow for the evolution of conditional and unconditional helping; discriminate behavior creates an advantage for parochialists over altruists, as the latter waste help on outgroup members when there is direct conflict between groups. Using computer simulations to study the multilevel selection dynamics, we show that this advantage peaks when interactions with outsiders and group conflicts are frequent.

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*Beauty and the ad: the impact of evolutionary psychological cues of physical attractiveness on advertising processing*

Recently, evolutionary psychology (EP) is profiling itself as a useful perspective for studying consumer behaviour (e.g. Gad Saad's *Evolutionary Bases of Consumption*, 2007; Geoffrey Miller's *Spent: Sex, Evolution and Consumption*, in press). In line with this development, we are currently investigating if advertising processing theory can benefit from an EP perspective. In this paper, we illustrate our project from a theoretical and empirical perspective. Our theoretical starting point is that recent models of advertising processing (such as elaboration-likelihood-model or scanning-focusing-model) are 'in essence' dual-processing models. Therefore, these models can profit from evolutionary inspired theories of information processing and decision making such as those of LeDoux, Gigerenzer or Kahneman. Although, up till now, this link has never been made explicit, this can throw new light on implicit advertising processing aspects (hot topic in consumer theory). In line with this thinking, we set up an experiment to investigate this implicit processing (in terms of attention and primary affective reactions) from an evolutionary perspective. 150 respondents were exposed to 26 sets of two ads. In each set, one ad had enhanced 'cues' of physical attractiveness (in line with EP theory) and the other had not. The manipulation was created using Photoshop. Using eye-tracking to measure attention, and ad-likeability testing to measure primary affective reactions, our findings clearly revealed the (positive) impact these cues had on implicit ad processing. This means that ads containing cues in line with EP insights, clearly seem to 'work better' than ads that ignore these findings.

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*The tailor makes the man: The effect of subculture dress on attractiveness ratings – preliminary results*

Some research indicated male dominance in a local hierarchy is a primary determinant of attractiveness to women. We conducted a pilot study to identify local hierarchies [subcultures] recognized by university students. We also assessed the effects of subculture costumes on attractiveness, and their interaction with gender. We expected women's judgment of male attractiveness to be more influenced by costume variation, whereas men rather stress physical traits. Four locally well established subcultures with distinctive dress codes were identified, and labeled as Techno, Ethno, Outdoor, and Barbie/Shampoo. Standard images of 4 models of each sex in all 4 dresses were taken and their validity verified by qualitative ratings. The images were rated for attractiveness by thirty-two females and

32 males. Each subculture represented by each model was rated by each rater only once. We found significant differences among the ratings of subcultures when rated by both genders. Women rated the 'Outdoor' style most attractive compared to 'Techno'; men rated 'Barbie' and 'Outdoor' more attractive compared to the other two subcultures. No differences were found among the ratings of individual female and male models. Our preliminary results suggest perception of attractiveness in both genders is modulated by the dressing styles carrying numerous social messages. Moreover, high attractiveness of the 'Outdoor' style in both genders suggests reference to healthy life style and thus to the relation between attractiveness and health. Our follow-up study will explore the effect of the raters' attitude toward individual subcultures on their attractiveness judgments-as well as the models' physical attractiveness.

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*Infidelity and emotional manipulation: evolutionary correlates of coerced first sexual intercourse in Chinese dating relationships*

Sexual coercion is an important research problem which has been investigated within evolutionary perspectives. This study aims to explore the evolutionary correlates of coerced first sexual intercourse (CFSI) in Chinese dating relationships. Total 895 Chinese college students from 7 universities in 5 cities who are currently in a dating relationship attended the study, in which 162 (18%) participants experienced CFSI. Specific hypotheses derived from sperm competition theory have been tested. We hypothesized that 1) men's CFSI is related positively to his partner's perceived infidelities, and 2) men's CFSI is related positively to their mate retention behaviors (behaviors designed to prevent a partner's infidelity, like emotional manipulation in this study). The results from 69 male participants (self-reports) significantly supported the hypothesis 1 and the results from 93 female participants (partner-reports) marginally supported the hypothesis 1 and significantly supported hypothesis 2. The limitations of this study and the future directions for research on sexual coercion in intimate relationships will be addressed.

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*From whom should we learn?*

During early human evolution, natural selection must have strongly favoured individuals with the ability to learn useful information from others and pass it on to their descendents. Given that social learning has become essential in humans, the question is not whether to learn, but from whom. Information acquired vertically from our parents is subject to natural selection in the same way as genes; hence it is likely to be beneficial. Information acquired horizontally from unrelated individuals is not subject to this kind of selection and might be harmful. Nevertheless, most new ideas that arise in a population will come from unrelated individuals. Horizontal learners are favoured because they more rapidly acquire new information, whereas vertical learners get left behind. I will present an evolutionary model of a population in which each individual has a number of learning opportunities, of which a fraction  $h$  is horizontal and  $(1-h)$  is vertical. If it is possible to learn preferentially from high fitness donors, the optimal strategy is  $h = 1$  (solely horizontal). If the unrelated individuals are chosen randomly, the optimal strategy is  $h = 0$  (solely vertical). I will then consider a population that is split into social groups (e.g. competing tribes of early humans). Individuals learn a fraction  $H$  of information from 'foreign' groups, and a fraction  $(1-H)$  from their own group. The model predicts a small non-zero value of  $H$ , i.e. there should be a strong but not exclusive bias towards learning from within one's own group.

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*Gestural communication in the wild chimpanzees of Budongo Forest*

This study aims to look at the nature of intentional gesturing in a wild population of chimpanzees in Budongo forest, Uganda. My basic method will be the detailed analysis of videotaped observations. A particular issue is to what extent the findings on gestural communication identified in captive groups generalize to a wild population. Specific attention will be paid to i) the recipient's attentional state; ii) a gesture's modality (auditory, silent, contact); iii) the composition and length of the gestural communication; and iv) the response of the recipient. While the use of intentional gesture will be examined across all contexts; observations will focus on play, boundary patrols and consortship behaviour. In captivity, subadult play represents the context within which the greatest quantity and variety of gestures and gestural sequences are produced, and have shown sensitivity to audience (Tomasello *et al.* 1994). Gesturing during boundary patrols and consortships represent unstudied areas; however, a strong pressure towards inaudible forms of communication can be expected during these potentially risky behaviours, so use of gesture rather than vocalization is predicted. By examining the nature of gesture and its importance for communication, in a chimpanzee population living under naturally adaptive conditions, I hope to provide information relevant to the origin of human language. Ref: Tomasello *et al.* 1994. *Primates* 35: 137-154.

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*An evolutionary investigation of attitudes and beliefs regarding consanguineous marriage in a Dutch population*

Most animals tend to avoid mating with close kin. This tendency is also present in human beings. It is thought to be an innate response that is regulated by the emotion of disgust. When presented with the suggestion of sexual relations with an immediate family member such as a brother or sister, most people react with extreme disgust. Individuals also report a similar reaction to other kin members such as cousins. This extreme reaction to immediate kin members seems to be a human universal. However, there are areas of the world in which the rates of consanguineous marriages are quite high and a cousin is the preferred marriage partner. Previous research has demonstrated that in certain environments mating with a kin member may prove to be beneficial, this may help explain the discrepancy in disgust reactions. Using a questionnaire, we examine the attitudes and beliefs regarding consanguineous marriage in a Dutch sample (n = 167). Preliminary results show that participants were very disgusted at the suggestion of any type of intimate relationship with a cousin.

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*The dynamics of smiles and brow movements*

The meanings attributed to facial expressions are often ambiguous. The perception of smiles, for example, varies greatly and can range from aggressive intentions and mockery to pleasant feelings and seduction. From an ecological view, facial expressions seem to have been decoupled from their original motivational states in the course of evolution, and turned into more general signals which are used to control interactions. Research on emotion has been focused on static facial expressions for the last decades, the ambiguity in meaning could be due to different dynamics. These dynamics could exploit the mirror system in humans and thus take a multi-meaning multi-message function in human interactions. The first experiment on the influence of muscular dynamics on perception focused on brow raising, the second investigated Duchenne smiles. We used 3D Avatars for construction of movies where the dynamics of onsets, apex and offsets were varied systematically. A short onset of brow raises is associated with high arousal and pleasure. A long apex conveys coyness and low pleasure. In smiles, long onsets convey pleasure, genuineness and low aggression, whereas short onsets were perceived as negative, coy and aroused. A short apex communicates aggression and negativity and is rated as unhappy and false. Our study shows that the dynamics of facial expressions add information lacking in static configurations, which can lead to different perceived meanings. This indicates that dynamics do not only influence the attribution of an underlying emotion, but might be essential in decoding facial expressions.

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*Children learn more effectively from a demonstration by an adult than a 'ghost' display of a tool task.*

Recently there has been much research investigating whether children learn through observation, yet how such learning occurs is still an open debate. This experiment follows from one previously conducted with chimpanzees, which employed a 'ghost' display of a two-action 'Pan-pipes' task. When one of two methods (lift or poke) for operating the Pan-pipes was demonstrated to children by an adult human model nearly all the children subsequently used the particular method they had witnessed. However when children were shown a ghost display of either method, whereby the apparatus was moved discretely with fishing-line, fewer children responded and only three replicated the movements of the apparatus, two using a novel manner to that demonstrated, suggesting emulative learning (object movement reenactment). A trend towards learning by emulation was further shown because, unlike the chimpanzees who made no useful responses after a ghost display, the children did appear to learn about the affordances of the task as 9/20 were able to retrieve the reward, whether using the method demonstrated or not. A fifth group of children acted as controls and were presented with the Pan-pipes with no formal demonstration. Only the children who saw an adult demonstration were able to operate the Pan-pipes significantly more than those in the control. That fewer children were able to operate the apparatus after seeing a ghost display, compared to a human demonstration, suggests the importance of social learning through imitation rather than emulation. The results are discussed from the wider perspective of human culture.

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*Socio-economic status and reproduction – the female perspective*

A positive association among status, resources and reproduction has been demonstrated in pre-modern and modern men, whereas in modern women the association is typically negative. In line with that, in modern Sweden, we find a positive association between status (indicated by income and educational level attained) and average offspring count

in men, but a negative association between income, education and average offspring count in women. On basis of a large sample from contemporary US, we further investigated whether the association between socio-economic status and reproductive output in women varied depending on the source of status and resources. We find that a woman's as well as her spouse's income are positively associated with her education. A woman's education and income, however, are negatively associated with her offspring count. Thus, a woman's investment in education increases the chances to get access to resources via own as well as spousal income but may lead to a lower birth rate due to the costs coming along with resource acquisition and higher education. On the other hand, the association between a woman's offspring count and her spouse's income turns from positive to increasingly more negative with decreasing woman's educational attainment and increasing family size, indicating that rather than maximizing offspring count, women appear to adjust offspring number and investment based on family size and resource availability.

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*A model of factors generating fission-fusion social dynamics*

Human behaviour is motivated biologically. For example, our probability for seeking company depends on an individual propensity modulated by recent social satisfaction. Understanding the evolution of primate social structure may help us understand our own social needs and constraints. Here we present a theory of fission-fusion (FF) social dynamics and examine its consequences through simulation. We focus on FF as found in chimpanzees; characterised by well-defined larger 'communities' whose members generally travel in small 'parties', the membership of which change frequently. Ultimate limits on group size are generally thought to be first predation (determining a lower bound due to safety) and second environmental carrying capacity (determining a higher bound by resource constraints). FF species display rapidly-varying group (party) sizes, which may track local variation in factors contributing to optimal group size, for example current food distribution. Our simulations show that FF behaviour requires very little from individual actors. They need only: 1. a capacity to track at least one of two varying levels: danger and / or feeding opportunities, and 2. a drive for socialisation that responds appropriately to the current conjunction of these values. These factors alone lead to FF dynamics, but not to discrete communities. If we augment the model with an affiliation budget (a limited number of conspecifics an agent can consider 'safe') then communities also become well defined. Given the simplicity and generality of this model we discuss the question of why more species do not utilise FF organisation.

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*Domain-specific variation in women's preferences for masculine men*

Many studies have investigated whether preferences for putative cues of mate quality, such as symmetry and averageness, are best explained by domain-specific preferences for these cues in mate choice-relevant stimuli or by domain-general preferences for these cues in stimuli of any kind. It is not known, however, whether women's preferences for masculine men are best explained by domain-specific or domain-general preferences for perceived masculinity. We show that women's preferences for masculinity in men's faces and bodies are positively correlated, complementing previous findings for correlated female preferences for different markers of men's masculinity. Importantly, these correlations were not weakened when we controlled for women's preferences for perceived masculinity in mate choice-irrelevant stimuli (cars, dogs, patterns, watches). These findings show that variation in women's preferences for different markers of men's masculinity can be dissociated from variation in women's preferences for perceived masculinity in mate choice-irrelevant stimuli, demonstrating domain-specific variation in women's preferences for masculine men. Additionally, we show that ratings of the masculinity of men's faces and the same men's bodies are also positively correlated. Collectively, these findings support explanations of women's preferences for masculine men in which different markers of men's masculinity are thought to signal a common underlying quality for which women's preferences vary systematically.

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*Evolution of the postmenopausal lifespan in humans - testing implications of the Grandmother Hypothesis using agent-based modeling*

It is assumed that life history traits, which reflect how organisms invest energy into growth, maintenance, reproduction, and survival, are shaped by natural selection. Given this context, the long postmenopausal lifespan observed in human females presents an interesting evolutionary problem - why do women regularly outlive their reproductive period? Although rhetorical models based on the grandmother hypothesis propose that the direct fitness

costs associated with forfeiting one's ability to reproduce are outweighed by the inclusive fitness benefits gained by helping one's kin, the selective significance of helpful grandmothers remains unclear. Our work aims to elucidate some of the factors that may have been crucial for the evolution of postmenopausal lifespan in humans through the application of evolutionary agent-based models. We test the central assumption of the grandmother hypothesis: that by increasing their grandchildren's survival and/or shortening their daughters' interbirth interval, help provided by postmenopausal females can account for the evolution of the postmenopausal lifespan in humans. Moreover, we investigate the influence of (1) the relative importance of the resources collected by older women, (2) the type of help (i.e., nutritional vs. social support) provided by grandmothers, and (3) to whom they provide help (i.e., only to kin vs. to all kids in the group). Our results quantify the extent to which the evolution of the postmenopausal lifespan could have been influenced by the helping behaviors of postreproductive females in different types of social and ecological paleoenvironments.

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*An investigation of the relationship between innovation and cultural diversity*

In spite of extensive theoretical investigation into cultural evolution, the relationship between the rate of behavioural innovation and the level of cultural diversity remains comparatively unexplored. Here we use reaction-diffusion models to investigate how both independent invention and the modification and refinement of established innovations impact on cultural dynamics and diversity. We go on to investigate these relationships in the presence of biases in cultural learning. We find that the introduction of new variants typically increases cultural diversity substantially in the short term, but may actually decrease long-term diversity, depending on the frequency of existing variants. While equilibrium levels of cultural diversity typically increase with innovation rate, this increase can be surprisingly modest, particularly when innovation occurs through refinements of earlier variants, or when conformist social learning is operating. Independent invention generally supports higher levels of cultural diversity than refinement. Repeated patterns of innovation through refinement generate characteristic oscillating trends in diversity, with increasing trends towards greater average diversity observed for medium but not low innovation rates. Conformity weakens the relationship between innovation and diversity. The level of cultural diversity, and pattern of temporal dynamics, potentially provide clues as to underlying process, which can be used to interpret empirical data. We go on to show that external factors as environmental heterogeneity or habitat shape can alter the relationship significantly.

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*Perceptions of homosexuality among UK ethnic groups*

Factors such as an individual's education levels and political beliefs can predict their attitudes towards homosexuality (Shackelford & Besser, 2007). Previous research in the US has also documented a clear effect of ethnicity on such perceptions, with those from ethnic minority groups demonstrating more negative attitudes towards homosexuality (Lemelle & Battle, 2004). The aim of the current research was to investigate the differences between two UK ethnic groups with regard to their perceptions of male homosexuality. Data was collected from samples of heterosexual individuals identifying themselves as either 'Indian' (N = 46) or 'White' (N = 47) in terms of their ethnic background. All participants completed modified versions of The Sexual Attitude Scale (Hudson, Murphy & Nurius, 1983), the Index of Homophobia (Hudson & Ricketts, 1980), the Knowledge about Homosexuality Questionnaire (Harris, Nightengale & Owen, 1995) and the Evaluation Thermometer Measure for assessing attitudes towards homosexual men (Haddock, Zanna & Esses, 1993). Individuals from the self-identified 'Indian' ethnic group demonstrated significantly less knowledge about homosexuality, held more conservative attitudes towards homosexuality and held significantly more negative attitudes on male homosexuality than participants from the self-identified 'White' ethnic group. Across both ethnic groups, males also demonstrated more negative attitudes to homosexuality than females. The implications of this finding for evolutionary models of homophobia, as well as implications for social policy decisions, are discussed.

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*The evolution of social learning rules: payoff-biased and frequency-dependent biased transmission*

Humans and other animals do not use social learning indiscriminately, rather, natural selection has favoured the evolution of social learning rules that make selective use of social learning to acquire relevant information in changing environments. We present a gene-culture coevolutionary analysis of a small selection of such rules (unbiased social learning, payoff-biased social learning and frequency-dependent biased social learning, including conformism and anti-conformism) in a population of asocial learners where the environment is subject to a constant probability of change to a novel state. We find that payoff-biased social learning may evolve under high levels of

environmental variation if the fitness benefit associated with the acquired behaviour is either high or low but not of intermediate value. In contrast, both conformist and anti-conformist biases can become fixed when environment variation is low, whereupon the mean fitness in the population is higher than for a population of asocial learners. Our examination of the population dynamics reveals stable limit cycles under conformist and anti-conformist biases and some highly complex dynamics including chaos. Anti-conformists can out-compete conformists when conditions favour a low equilibrium frequency of the learned behaviour. We conclude that evolution, punctuated by the repeated successful invasion of different social learning rules, should continuously favour a reduction in the equilibrium frequency of asocial learning, and propose that, among competing social learning rules, the dominant rule will be the one that can persist with the lowest frequency of asocial learning.

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*Is the social learning of a foraging task, by chimpanzees, influenced by demonstrator age?*

Animals face the choice of using costly but reliable personal information and relatively cheap but potentially unreliable social information. When faced with a two-option extractive foraging task, will chimpanzees be more likely to forego their personal information when social information is provided by an older conspecific compared to a younger one? Captive chimpanzees (n = 48) were individually tested with an apparatus from which protruded two rods which, when baited, could be pushed to release a food reward. Subjects were presented with the apparatus in one of two conditions; social-information only (SI) or personal and opposing-social information (POS). In the SI condition, after a no-personal information phase, chimpanzees were provided with social information via video-footage of an unfamiliar chimpanzee operating the apparatus 30 times and were then given free-access to the apparatus. In the POS condition, during the personal information phase, one rod was baited and, when given free-access to the box, the chimpanzees learnt to push this rod (to criterion of 30 times). After a delay, subjects received social information, as above, excepting that the demonstrator successfully operated the apparatus using the opposite rod to that baited in the personal information phase. Subjects then had free-access to the apparatus with both rods baited. To determine the role of demonstrator, chimpanzees shown in the video-footage were either older adults (male/female) or juveniles (female). Results are discussed with reference to social learning strategies; in particular whether when one copies is influenced by who is copied.

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*To use or not to use? The influence of hormonal contraception on female sexuality in the context of long-term relationship*

Previous research shows mixed evidence concerning the effect of hormonal contraception (HC) on female sexuality. To explore the reasons for the discrepancies, we tested in two samples the influence of HC on both women's and their partners' sexual behaviour, and the quality of the relationship in HC-users and compared them with couples of regularly cycling women. Sample 1 consisted of 45 long-term cohabitating couples using HC and 25 couples not using HC participating in a longitudinal sexuality research. We found no significant between-group differences in overall relationship satisfaction, sexual satisfaction (assessed by the Questionnaire of Dyadic Assessment) and extramarital tendencies of both partners (assessed by the Sociosexual Orientation Inventory). Sample 2 consisted of 200 women living in permanent relationship (122 using HC and 78 not using HC). The data were collected for the purposes of the Czech national research of sexual behaviour. We found no significant differences in sexual appetite, frequency of autosexual, dyadic and extra-pair sexual activities, frequency and quality of orgasms between HC-users and non-users. However, HC-users referred significantly lower self-perceived sexual satisfaction than non-users. Our data suggest no effect of long-term infertility on both the females' and her partners' sexual behaviour and the quality of the long-term relationship. On the other hand, HC could negatively affect self-perception of sexual satisfaction with their long-term relationship.

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*Outgroup mating threat affects men high in perceived disease vulnerability*

Groups that pose different threats to ingroup resources evoke functionally relevant reactions. Potential mates can be considered a 'resource', to be protected from outgroup rivals. Indeed, humans have a long history of abduction and rape of outgroup females. An outgroup posing a mating threat should evoke negative reactions. These reactions should be especially pronounced among males, as males compete for mates and engage in intergroup rivalry more than do females. In addition, males who perceive themselves as being vulnerable to disease may show stronger negative reactions, as an outgroup posing mating threat is a possible source of harmful pathogens. In a first study (39 males; 108 females), we manipulated outgroup mating threat by presenting outgroup same-sex members as mating

with ingroup opposite-sex members frequently and being preferred by the ingroup members as mates. Male participants who scored high in perceived vulnerability to disease showed significantly stronger implicit negative attitudes in the outgroup mating threat condition than males who scored low in perceived vulnerability to disease. Among females, no significant interaction or main effects were found. In a second study (83 males; 49 females), both outgroup mating threat and vulnerability to disease were manipulated. Male participants primed with high disease prevalence showed significantly more implicit negative attitudes towards the outgroup in the high mating threat condition than in the low mating threat condition. Participants primed with low disease prevalence condition did not react to outgroup mating threat with more implicit negative attitudes. No effects were found among female participants.

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*Changes of odour preference during puberty*

It is generally thought that odour preferences develop in response to individual experience. However, perception of mate choice relevant odours might also be systematically related to sexual maturation. Thus, one might expect changes in preferences to bodily odours but not other odours (e.g. flowers). One hundred and twenty pubescents (aged 11-15, 54 boys) of various demographic backgrounds were recruited from mixed-sex general education schools. Pubertal development was determined by a self-assessment questionnaire using gender-specific line drawings of the Tanner puberty stages. Biologically relevant chemicals (androstenes, components of human axillary odour) and essences (2 drops of odorant on paper strip) of animal (castoreum, a musky odour originally from the beaver's anal gland, perceptually similar to human steroids), herbal (mint), floral (jasmine), drink (coffee) and food (garlic) origin were judged for its pleasantness on 7-point scale. We found significant difference in ratings of coffee odour pleasantness between the groups of different pubertal stage. The prepubertal and early pubertal subjects judged the coffee odour as less pleasant compared to the late pubertal and postpubertal subjects. There were no differences of pleasantness ratings of other examined odours during the pubertal development except the androstenol. The prepubertal and early pubertal boys rated the androstenol as more pleasant than midpubertal and late pubertal and postpubertal boys. This suggests that some gender-specific changes in preferences are not restricted to bodily odours.

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*Biological motion predicts voter preferences*

Body motion appears to be a valid signal of socially relevant traits. Observers can use motion alone to identify traits like the sex, age and even the genetic quality of actors. Body motion information may therefore facilitate various social judgments. By examining ratings and voting decisions based on motion from political candidates, we considered whether movements signalled personal characteristics, and how the candidates' motion affected people's judgments and subsequent voting behaviour. For example, participants viewed stick figure displays of US presidential candidates Barack Obama and John McCain while unaware of the stimulus identities. The motions alone were sufficiently distinctive to produce different impressions of social traits: the Obama figure was rated as more trustworthy and dominant, whereas the McCain figure was rated as more anxious. Further, health was the single best predictor of vote choice, and a two-factor model of physical health and leadership was suggested by regression analyses. Notably, although attractiveness correlated with voting behaviour, it provided no additional explanatory power to a single-factor model of health alone. Our results demonstrate for the first time that motion can produce systematic vote preferences. This result has important practical and theoretical consequences. Practically, modern media ensures that the motion of candidates is now almost as readily available as their more carefully controlled still images. More generally, the influence of perceived health from motion suggests that motion may be a valid and readily observed signal of health and neural integrity, which can communicate important social qualities.

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*Capturing dynamics of cumulative culture in a wave-land model*

In fluid dynamics, a principle force that causes waves to rise and crash is the gradual ascent of land, a phenomenon called wave shoaling. Mapping this dynamic onto models of triple inheritance in the Homo genus enables us to compress five dimensions into a single conceptual frame: (1) evolutionary time on the x-axis, (2) brain volume ascending on the left side y-axis, (3) cultural cumulation ascending on the right side y-axis, (4) genomic and epigenomic sea waves reacting to the rise, and (5) individual differences on the z-axis. I show the utility of this model by applying it to the symbolic niche (human language, mathematics, and religion). Here the model captures the dynamic feedback of cultural cumulation inherent to the Baldwin effect, while revealing how variation of genetic polymorphisms in the dopaminergic system contribute both to human brilliance and its spill-over in mental illness. Dopamine serves a vital role in the symbolic niche by enabling one of its mammalian-wide functions, the

assignment of salience to perceptual stimuli, to the unprecedented function in humans of assigning salience to abstract ideas such as 'ancestor', pi, or spatial coding like higher is better'. Finally, the model helps account for variance in contemporary escalations of (a) certain forms of intelligence (e.g., systemising) and (b) specific varieties of mental illness. Following a cliff-edged fitness function, traits assigning salience to ideas steadily increase fitness, yet make some people vulnerable to a crash in to psychosis, autism, etc.

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*Look who's watching: explicit information, cuing, and the presence of known peers in an anonymous economic game*

There is mounting evidence that cues of being watched can enhance pro-social behaviour (Bateson et al. 2006; Burnham & Hare 2007; Haley & Fessler 2005). This questions the validity of using 'anonymous' economic games as an empirical measure of pro-social behaviour in humans. Here we test whether people playing an ultimatum game can use explicit information about experimental conditions to override any effects of cuing in a public context, when faced with both simultaneously. The aims of our study were to investigate whether, (1) individuals respond to experimentally imposed anonymity within a public context and (2) the presence of 'known' others affects pro-social behaviour over and above merely the presence of others. We find that proposer offers did not vary with changes in context but did vary with degree of actual anonymity and the specific presence of 'known' others. Responder behaviour did not vary with changes in context, degree of anonymity or the presence of 'known' others suggesting that responders may use one uniform strategy as long as the payoff-structure remains constant. Hence while proposers respond specifically to the presence of those known to them, responders appear concerned only with relative payoffs. We discuss the implications of these findings for the evolution of fairness norms in humans. Refs: Bateson, M., Nettle, D. & Roberts, G. 2006. *Biology Letters* 2, 412-414. Burnham, T. & Hare, B. 2007. *Human Nature* 18, 88-108. Haley, K. J. & Fessler, D. M. T. 2005. *Evolution and Human Behavior* 26, 245-256.

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*Reputation: defining features and design features*

Reputation is the property of individuals responsible for the working of indirect reciprocity. Those with a reputation for generosity are rewarded when others seek relationships requiring cooperation. I delineate the defining features of reputation formation and reputation quality and this allows the full and precise specification of the design features of reputation; that is, the ways in which generosity is expected to respond adaptively to the environment in order to maximize a generous reputation, and thus maximize the benefit of indirect reciprocity. Reputation formation has the following defining features (requirements): A. Behavioural 1. MEET/MEET AGAIN with other individuals 2. OBSERVE others interacting 3. INFORM third parties of identity and behaviour of others B. Cognitive 4. KNOW/IDENTIFY person about whom one receives reputational information 5. RECOGNISE other individuals 6. RECALL information about reputation Reputational quality is a function of the following features: 1. PRIOR reputation of actor and beneficiary 2. GENEROSITY shown: QUANTITY and APPROPRIATENESS to requirement 3. HISTORY of relationship between actor and beneficiary Reputation formation and quality are also subject to accidental and deliberate error in these features. The analysis reveals where evidence is required to test for the design features of reputation, and thereby of indirect reciprocity. For example, generosity is expected to increase with meeting frequency, recognition probability and appropriateness of generosity. Other features, such as prior reputation and relationship history, raise unsolved problems for the specification of design features.

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*Ontogeny of social communication in free-ranging chimpanzees*

One of the characteristic features of human speech is its highly flexible pattern of acquisition through learning within a social group. In contrast, most animal communication is considered genetically hardwired, apart from some songbird species that also rely on social and auditory feedback to develop normal vocal behavior. It is important to remain somewhat cautious when trying to apply the songbird model to other species, especially primates, as the psychological mechanisms involved in vocal production are likely to be fundamentally different. Surprisingly little research has been conducted on the question of how our closest living relatives, the chimpanzees, learn to produce and comprehend their own natural vocal repertoire from early infancy. In this study, we present data on vocal development in a community of free-ranging chimpanzees at Budongo Forest, Uganda. We were particularly interested in the patterns that underlie the emergence of a vocal signal used during social interactions, the pant-grunt vocalisation. In adults, pant grunts function as a greeting signal, produced by lower-ranking individuals encountering a higher-ranking group member. The call is important in regulating social interactions and grunts are some of the earliest vocalisations produced by infant chimpanzees. The question of how this call type develops in infants is of broad relevance in our understanding of how social and communicative competence develops and interacts in these primates living in their natural habitat.

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*Do perfumes mask or interact with body odour?*

Recent research suggests that human axillary odours play an important role in various social contexts. Interestingly, people have used perfume to modulate their body odour since ancient times. Yet little is known about the interaction between individual body odour and perfume usage. One possibility is that perfume masks body odour and reduces odour variance between individuals. Alternatively, body odour might retain its own unique signature even when mixed with perfume. These hypotheses were tested in two independent experiments (E1 and E2). Male students (E1 = 7, E2 = 10) applied a standardized amount of perfume to one, randomly chosen, armpit and subsequently fixed cotton pads in both armpits and wore them for 24h while adhering to dietary and activity restrictions. Female raters (E1 = 29, E2 = 20) evaluated the axillary samples on 7-point scales for pleasantness, attractiveness, intensity, and masculinity. General Linear Model analysis with 'odour donor' and 'perfume' as independent variables found significant differences in odour quality among individual donors in all rated variables in both experiments. Additionally, perfumed samples were rated as more pleasant and attractive in both experiments. We further found highly significant donor-perfume interaction in attractiveness, pleasantness and intensity. According to power analysis, the interaction showed stronger effect compared to the effect of the perfume alone. This suggests that perfumes interact with body odour rather than cover it.

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*Effects of delaying first reproduction on probability of reproductive failure in humans*

Life history theory predicts that female age at first reproduction (AFR) is determined by a trade-off between benefits and costs of delaying reproduction for maximising individual fitness. The increasing delay in AFR after adulthood onset documented in many countries over the last centuries thus poses a question of whether the costs incurred are smaller than the benefits. Here we evaluate costs and benefits of delayed AFR in human females by, first, constructing a theoretical model using the probability of reproductive failure - no children recruited to breeding population - as a criterion to judge maladaptation. We show that mother's reproductive failure probability will increase with delaying AFR if the possible benefit from any improvement in offspring quality indexed by their expected recruitment probability to breeding population cannot offset the cost from the decline of offspring quantity indexed by expected lifetime number of children. Second, we test the prediction using detailed pedigree records of historical Finnish women over three generations. We show that along the whole scale of AFR (16~42), with delaying AFR, mother's lifetime number of children declines significantly with no significant improvement in offspring recruitment probability. Conversely, offspring recruitment probability declines significantly with delaying AFR after age 30. Consistent with prediction from theoretical model, reproductive failure probability increases significantly with delaying AFR along the whole AFR scale and this increase accelerates after AFR of 30. Our results from a pre-demographic transition society thus suggest considerable costs of increasingly delayed AFR, a typical feature of demographic transition and subsequent post-transition in developed countries.

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*Integrating gaze direction and sexual dimorphism of face shape when perceiving others' dominance*

Although gaze direction and face shape have each been shown to affect perceptions of others' dominance, studies have not yet investigated whether gaze direction and face shape have independent main effects on perceptions of dominance, or if these effects interact. We used two different tests to investigate 1) the effect of sexual dimorphism of face shape on the perceived dominance of direct versus averted gaze and 2) the effect of gaze direction on the perceived dominance of masculinized versus feminized faces. In the first test, we found that the extent to which direct gaze was perceived as more dominant than averted gaze was greater when judging masculinized faces than when judging feminized faces. In the second test, we found that the extent to which masculinity was perceived as more dominant than femininity was greater when judging male faces with direct gaze than when judging male faces with averted gaze. No equivalent effect was found for female faces. Collectively, these findings show an interaction between the effects of gaze direction and sexually dimorphic facial cues on judgments of others' dominance, presenting novel evidence for the existence of complex integrative processes that underpin social perception of faces.

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*Behavioural mimicry of positive emotional cues as a proximate mechanisms to social bonding in humans*

The acquisition of adaptive information about group members is crucial in species where reproductive outcomes heavily depend on social success. In primates, humans in particular, non-verbal behaviour is believed to be a major source of social information. Although it is adaptive for individuals to disclose reliable information about themselves they also need to avoid giving away information that could lead to social exploitation. It will be argued that the constant feedback that people give to each other during interactions, behavioural mimicry, allows a gradual build-up of mutual trust and leads to the development of relationships. To substantiate that claim, behavioural observations of dyadic interactions were conducted in two conditions: while people were engaged in a natural conversation and while people were sharing material resources (money). People's personality (the big five), emotional experience, and altruism were measured through self-report. Since the sharing condition is socially more risky, a higher degree of mimicry is expected in that condition. Moreover, the cues that are subject to strong mimicry should be related to the personality dimensions necessary to the development of social bonding. Discussion will focus on the role of emotional cues as reliable indicators in the mutual advertisement of adaptive traits and dispositions.

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*Evaluation of own face with different hairdos of less attractive females is more similar to raters' opinion: an alternative mate choice tactic*

There's a selectional pressure connected to intrasexual competition can work among women with different phenotypic qualities, which results in different individual strategies in order to increase their genetic success. We hypothesize less attractive women to compensate their unbecoming biological traits of their faces with other behavioral features, which improves the judgment of facial attractiveness, and with styling attitude favoured by men, which can increase their matechoice value. Testing our hypothesis we made portraits of volunteer young women (n= 49), and let their beauty be judged by young men (n= 39) on a scale of seven. The portraits were completed by 15 different hairstyles using a computer program, and (female and male) participants were asked to rank the portraits from best to least suiting hairstyles. So, two strings of data were obtained concerning each woman: (1) their own opinion on their faces with different hairstyles, (2) the averaged opinion of men on the same faces. Analyzing the two hierarchy ranking, we found out whose decision is in accordance with preferences of men, and who form their opinion on their physical appearance independent from male preferences. Our results confirm our prediction and underline the theory of alternative matechoice strategies. We suggest that female hairstyling is embedded in the broader context of own phenotypical condition (communicated by the face). After evaluating biologically given markers of beauty, individuals use alternative strategies, which can help them maximize their matechoice success. Hair and hairstyling attitudes altering attractiveness of the face can be a means of it.

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*Menstrual cycle is associated with preference for proceptive but not masculine facial movement*

Women's preferences for facial structure vary over the menstrual cycle. Little is known, however, as to how preferences for behaviour may be influenced by hormonal factors. Here, we demonstrate that social properties of facial motion influence attractiveness judgments in the absence of other cues, and that women's preferences for these displays vary over the menstrual cycle, as has been demonstrated for structural traits of faces. We produced shape-standardized facial models that were animated with male movement and assessed for proceptivity (flirtatiousness). In fertile phases of the menstrual cycle, women showed stronger preferences for proceptive movement, but not for absolute movement. These data show that women a) recognize specific mating-relevant social cues in male facial movement and b) are differentially influenced by these cues at different phases of the menstrual cycle. This preference for proceptivity may promote the adaptive allocation of mating effort towards men who are, in turn, likely to respond positively.

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*Testing the sociometer hypothesis: the effect of mate value on self esteem*

Research has shown evidence of assortative mating on mate value and suggested a possible relationship between self-esteem and mate value such that self-esteem acts as a gauge or sociometer that varies depending on the self-perceived mate value of the individual. This study aims to explore these relationships further using self-rated measurements of mate value, both for the self and for the participant's partner, and self esteem. However, in general the ratings of mate value and self-esteem used in previous studies are subjective measures and so this study incorporated more objective, biological measures of mate value such as fluctuating asymmetry and waist-hip ratio. In a mixed design 62 participants (31 romantically involved couples) with an average age of 21 and 90% of who

were white British completed 2 short versions of the Mate Value Inventory (MVI-7) that measured self-rated mate value and partner-rating mate value. Self-esteem was measured on the Rosenberg Self-esteem Scale. Body Mass Index (BMI), Waist-Hip-Ratio (WHR) and bodily Fluctuating Asymmetry (FA) measurements were also taken. The results found no evidence of assortative mating on mate value. Support was found for the sociometer hypothesis of self-esteem with both FA and self-rated mate value acting as predictors of self-esteem. From the biological measures only FA was found to strongly correlate with self-rated mate value and only for females ( $r = -0.649$ ,  $p < 0.001$ ). Possible explanations for the results will be discussed in line with evolutionary theory and the validity of the Mate Value Inventory will be explored.

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*Modernization and the problem of global-scale cooperation*

'Modernization' (the series of cultural changes that occurs when a society develops economically) is the latest chapter in the human story of the evolution of larger group size. Culturally evolving the means of increasing the size of a group of co-operators has made our species very successful. Can understanding the cultural evolutionary processes at work during modernization increase the chances of global scale cooperation continuing to develop? Cross-national measures of behaviour, attitudes and personality that began in the last century allow us to observe trends and compare modernizing populations. Among the cultural changes reliably associated with modernization are a collapse in fertility and an explosion in consumption. There are, however, many other changes. Members of modernizing populations become more tolerant of some behaviours (e.g. adultery) and less tolerant of others (e.g. nepotism). They become more individualistic and narcissistic. We have argued that these changes are not the direct result of individuals responding to the economic changes brought by development. They are more likely to be the result of changes in the composition of communities (Newson & Richerson, in press). Social psychology research has shown that humans infer cultural norms from the behaviour of the people around them. The new kinds of communities and sources of social influence created by economic development are likely to initiate a process of cultural evolution that will cause many of the changes observed. If the mechanism we propose is correct, cultural evolutionists can offer some cautious predictions about future changes.

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*The female face signals ovulation through subtle shape and texture change*

In many old-world primate species, the prominent sexual swellings indicate the most fertile stage. In humans, on the other hand, no such obvious signals are known. In recent years, evidence of subtle changes throughout the female cycle has accumulated. In this study we investigated which changes actually occur during the menstrual cycle and how they affect attractiveness. 20 women with a regular menstrual cycle were photographed daily for 30 days under standardized conditions. In a forced choice task, 50 male and 50 female subjects had to pick out the more attractive, healthy, sexy, and likeable, of the two presented pictures (ovulation and luteal). Skin patches sized 150\*150 pixels from the cheek were subjected to a forced choice task with slightly modified adjectives. Our findings confirm earlier evidence of increased attractiveness during the fertile phase. We set 72 anthropological landmarks and semilandmarks on the facial photographs for analyses with Geometric Morphometrics. The Procrustes shape coordinates were calculated with a General Procrustes Analysis. A shape space matched-pair principal component analysis identified the main direction and size of the shape changes between luteal and ovulatory state. We show that jaw is broader and the distance between eyes and eyebrows is larger in the luteal phase. In the ovulatory phase the lips are fuller and the whole face is less robust. We analysed the texture of the skin patches calculating co-occurrence and colour parameters. Findings indicate slight colour and texture changes.

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*Relative cognitive evaluations of friendship and kinship*

In non-human animals, cooperation is usually due to kinship, interpretable within inclusive fitness theory (Hamilton, 1964), which predicts that closer relatedness fosters greater altruism. Humans are unusual in that we extensively cooperate with non-kin and are capable of assorting into groups of non-related yet like-minded individuals (Sheldon, Sheldon, & Osbaldiston, 2000). A challenge to the latter is that individuals have different genetic interests that can often be maximised by selfish behaviour. Indeed, individuals are not necessarily averse to cheating kin and so any relationship ideally should be based on prior experience and expected future interactions (O'Gorman, Wilson, & Miller, 2005). A solution to the cheating problem is to form reliable long-lasting relationships based on ongoing evaluation. Such relationships represent an effective means to achieve stable groups that are not resistant to cheating. Friendship may represent a category that is likely to be psychologically important for humans and potentially equivalent to kinship. I shall present data from two related studies examining dispositions toward friends

and family. In one study, a questionnaire approach is used to quantify various relationships between participants and their friends and relations of varying closeness, incorporating past relationship duration and quality, expected future interactions, and perceived similarity. The second study uses an Implicit Association Task methodology to examine attitudes toward family and friends with regard to general attitudes, similarity, and perceived ingroup membership. Using different methodologies and building on previous research, these two studies should shed further light on kinship versus friendship.

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*Interconnections between adult theory of mind and Machiavellism and their effect on the Public Goods game*

Theory of mind - the ability to attribute independent mental states and processes to others - plays an important role in our social lives. It enables us to engage in manipulation, and supposedly has a strong connection with Machiavellism, the tendency to use others in order to reach our own goals. In the present, ongoing study, we intend to explore this connection with the use of the computerized version of the Public Goods game with punishment condition. Our hypothesis is that different levels of theory of mind and Machiavellism lead to the use of different strategies of decision-making and thus different levels of financial success in this game. Theory of mind is examined by asking adult participants to analyze stories; Machiavellism is measured by using the MACH IV Questionnaire developed by Christie and Geis. Our results so far indicate that there is a positive correlation between the level of Machiavellism and the level of financial success; we plan the further, detailed analysis of the connections between theory of mind, Machiavellism and the various decision-making and punishment strategies used in the Public Goods game.

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*Effects of long-term and short-term relationship interests on actual mate choices in the Berlin Speed Dating Study*

Research on romantic attraction and mate choice usually relies on self-reports, reactions to isolated cues, or observations in artificial laboratory situations. In contrast, speed dating offers a unique environment to systematically observe initial romantic attraction, mate choice, and courtship in real life. In the Berlin Speed Dating Study, a community sample of 382 singles with broad age range participated in speed dating events under experimentally controlled conditions. Individual characteristics were assessed and two follow-up studies were conducted after 6 weeks and 1 year. Here I will present multilevel Social Relations Model (SoReMo) analyses, which are able to separate actor, partner and relationship-specific effects, on the role of long-term vs. short-term relationship interests in actual mate choices and their long-term consequences. Results indicate that being generally more popular at speed datings (partner effects) was mainly predicted by various attractiveness components, though status indicators had incremental effects in men. Both general long-term and short-term interests, which reflected sociosexual orientations and shyness, influenced general choosiness (actor effects) in men and women, as well as relationship outcomes in the following year. However, effects on choosiness were moderated by self-perceived mate value in men and disappeared in women who are in the fertile phase of their menstrual cycles. Instead, choices of fertile women appeared to become more specific (i.e., driven by relationship effects) and guided by similarity on certain characteristics as well as interactions between female sociosexuality and male attractiveness.

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*Effects of outbreeding between nomadic Sami and agriculturalist Finns on life histories and fitness in the 18-19th Century Finland*

Breeding with distant genetic relatives (i.e., outbreeding) is generally believed to lead to fitness-benefits. However, outbreeding may also break down locally coadapted gene complexes, resulting in reduced fitness. Previous studies on the fitness-related consequences of breeding with genetic relatives have yielded mixed results in humans, probably because many cultural characteristics also affect our reproductive success. We examined the fitness-consequences of extreme outbreeding between nomadic indigenous Sami and settled agriculturalist Finns, who inhabited the same geographic area in historical Finland. In addition to markedly different lifestyles, these two groups differed in their genetic background. By contrasting also several life-history traits between outbred and non-outbred marriages, we tried to assess whether the potential fitness-effects of outbreeding were more associated to traits likely related to biological or cultural variation. We found that the fitness, the number of offspring raised to adulthood, of agricultural Finns exceeded that of the nomadic Sami, likely due to their shorter mean inter-birth intervals, later age at last reproduction, fecundity and higher offspring survival to adulthood. The fitness of outbred marriages between Sami and Finns was also higher compared to Sami but not when compared to Finns. Outbreeding

thus seemed to be beneficial only for the fitness of indigenous Sami, indicating that cultural and socioeconomic factors rather than the direct genetic effects of outbreeding were likely behind this result.

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*The assessed femininity of women and the relationship with Cattell's personality traits*

Evolutionarily based theories predict that feminine morphological features should correspond to female fertility and reproductive success, simultaneously some authors suggested that cues of masculinity or femininity could constitute signals of dominance and non-dominance. In our study, we focused on the association between facial femininity of women and their psychological characteristics using the Cattell's psychological questionnaire. In previous studies, female femininity was assessed by subjective ratings or by photogrammetric methods. Yet these methods can meet with confounds such as individual rater variability or methodological limitations of photogrammetric techniques. Therefore, femininity in our study was assessed by more 'objective' methods as head measurement and anthroposcopy. The anthroposcopy method included qualitative assessment of 16 the most distinctive sexually dimorphic features by scientific literature (forehead height, profile, tubera frontalia etc). We computed Femininity Index (FI) as a sum of these individual features which numerically expressed level of femininity in women face. Subsequently we correlated FI with nine Cattell's primary and two secondary factors and found negative correlation with the factor the Power of Superego and positive with the factor High tension and secondary factor Anxiety. Finally, we correlated FI with the anthropometric measurements. We found a negative correlation with face width, jawbone angle width, depth of jawbones, cheekbone and jawbone arch. These results indicate that femininity in woman face is connected with psychological characteristics from area of non-dominance more closely. Therefore we can confirm suggestions of previous authors. We suppose both might develop under the control of steroid hormones.

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*An examination of female mating signals in male-orientated erotica from 1948 to 2008*

Research suggests that the body shape of females in Western cultures, as exemplified by Playboy centrefolds, is becoming increasingly androgynous (e.g., Garner et al., 1980; Powell & Kahn, 1995; Van Lennin & Vanwesenbeeck, 2000). Recent data has also shown that higher stakes in the mating market are likely to lead to greater resource advertisement across the sexes in times of poor resource availability (Hill, Donovan & Koyama, 2005). This research investigated female waist-to-hip ratio (WHR) measurements and skin exposure in male oriented erotica published from 1948 to 2008 in relation to UK Gross Domestic Product (GDP) figures from the same period. Three separate forms of erotica were studied: erotic comics (published between 1948 and 2008), 'lads mags' (published between 2000 and 2008) and Hentai (published between 2000 and 2008). Hentai is a Japanese form of erotic comic and was included as a cross-cultural measure of erotica consumed by the same audience (i.e., U.K. males). The findings of this research suggest that female WHR in U.K. male-oriented erotica has not altered over the course of several decades, consistent with the view that optimum WHR is not subject to temporal change (Voracek & Fisher, 2002). The level of skin exposure was significantly higher in Hentai publications compared to the other forms of erotica studied.

**Nicholas PREUS**

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*The Evolutionary Jane Austen: Later-life sexual behaviour in the novel, Persuasion*

In her last novel, Persuasion, Jane Austen investigates an area of human behavior that neither literature nor evolutionary psychology has examined thoroughly. She leaves behind the usual terrain of sexual attraction and fertility to explore the problem of human sexual behavior after the prime moment of sexual fitness, or the 'bloom' of youth. Protagonist Anne Elliot confronts an adaptationist challenge: her mother is dead, her father has wasted the family resources, her dismissive siblings compete for dominance, and her 'stepmother' has eliminated her only sexual choice. Anne is neither a sexual partner nor a potential mother; she is what the later Victorians would call a 'redundant woman'. The novel interrogates the place of male-female relationships in the post- or late-reproductive, but still sexually active, period of life. After the signal time of sexual fitness and choice in youth, what is the status of desire between males and females? What guidelines are there for behavior regarding attraction in middle age? When reproduction is not the goal, is older male/female attraction simply a vestigial impulse of a sexual module - a dead-end - or is there a way to understand it in a Darwinian sense? Austen acknowledges the role of inclusive fitness: Anne has nieces and nephews, detects cheaters, acts altruistically, and is a moral decision-maker. Yet it seems she will leave this behind, and perhaps go to sea with her husband. In this novel Austen is wondering about evolved second chances for sexual desire, personal independence, and mutual solicitude.

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*The role of intergroup competition in collective action: an experiment with two types of cultural traits*

One explanation for the human capacity to participate in large-scale cooperation with non-kin is cultural group selection. It has been suggested that as a result of this selection process, people should be more willing to engage in within-group cooperation when cooperation increases the chance to win a group conflict. We utilized the Intergroup Prisoner's Dilemma (IPD) to model intergroup competition and replicated previous findings that intergroup competition increases within-group cooperation compared to the (single group) n-person Prisoner's Dilemma. Further, in line with the cultural group selection hypothesis, we expected that participants would be more inclined to contribute to the group's welfare in a competitive setting when the opposing group consists of cultural outgroup members, compared to a situation in which the opposing group consists of cultural ingroup members. We tested this hypothesis in two experiments, one using nationality (Dutch and German) and one using the political left-right dimension as trait category. For the experiment using nationality, we find that the German participants behave in accordance with the hypothesis, but Dutch participants don't. For the experiment using the political trait, participants do not contribute more playing against an outgroup than when playing against an ingroup. Results are discussed in light of the cultural group selection hypothesis.

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*Does learning accelerate evolution?*

Does learning accelerate evolution? Why do some species learn more than others? Learning (or any form of phenotypic plasticity) has long been conjectured to have a significant impact on evolutionary dynamics (a Baldwin Effect). Baldwin Effects may range from simply preserving species in difficult environments long enough for genetic adaptation, to actively 'guiding' evolution towards ('Expediting' Effect) or away from complex genetic adaptations ('Halting' Effect). There have been substantial recent advances in both empirical and theoretical treatments, which have particular relevance to human evolution (where the interactions between evolution and learning may be particularly significant). Hinton and Nowlan's seminal paper, "How Learning Can Guide Evolution" (1987), was the first to present a clear computer simulation of an Expediting Effect, but subsequent simulations found both Halting and Expediting Effects. Paenke et al's (2006-8) Gain Function framework and Borenstein et al's (2006) Landscape Drawdown model predict the effect of any given individual learning algorithm operating on single- and multi-peaked fitness landscapes, respectively. The Gain Function framework shows that learning accelerates (decelerates) evolution insofar as it increases (reduces) the lifetime fitness difference between different genotypes undergoing directional selection. Drawdown reflects the depth of the deepest valley that must be crossed to reach the global optimum and places a lower bound on the average transit time - learning accelerates (decelerates) evolution insofar as it reduces (increases) the drawdown in a landscape. These results clarify conditions conducive to selection for individual plasticity, including the cognitive plasticity and social learning shown in humans and other primates.

**Felix RIEDE**

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*The Comparative Method in archaeology: Tools for studying human niche construction in prehistory*

Human niche construction has recently been proposed as a powerful, but hitherto neglected, force in human biological and cultural evolution. Building on recent advances in evolutionary archaeology - in particular, the building of material culture phylogenies using morphometric artefact design data - this paper presents a method for studying human niche construction in prehistory. Drawing on the Bayesian analytical techniques of the comparative method it is demonstrated how ecologically inherited traits can be studied taking into account the history of human populations as reflected by their shared craft traditions. A brief illustrative case study from the Late Glacial of Southern Scandinavia is presented where the adoption of domesticated dogs as hunting and transport aids is argued to co-evolve with specialised reindeer-hunting economies. Although the quantitative substantiation of the niche construction feedback between these two (ecologically inherited) features is confounded by past demographic fluctuations and data incompleteness, it is tentatively suggested that the use of dogs is causally implicated in the development of specialised reindeer economies, i.e. that it was a necessary and constructed component of the human niche prior to the adoption of specialised reindeer hunting. It is suggested that this method is potentially applicable across many different datasets and that it is effective in examining the kinds of feedback processes argued to play an important role in human niche construction.

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*The question of third party punishment in Chimpanzees (Pan troglodytes)*

Cooperation on the scale exhibited by humans appears to be unique. A crucial factor for maintaining cooperation is punishment. While animals will punish others for personal harm, it remains to be shown whether species other than humans will engage in altruistic punishment, namely punishing noncooperators such that others benefit while the punisher alone bears the costs. To test whether people will pay a cost to punish violations of cooperative norms rather than simply return a harm for a harm done, experimental economists have applied dictator and ultimatum games with a third observer. This individual can pay a personal cost to punish unfair behaviour. Since the observer receives no benefit and is not affected by the interaction, this is referred to as third party punishment. Chimpanzees (*Pan troglodytes*) will punish harmful behaviour such as food theft. However, there is considerable debate about the evolutionary antecedents of sensitivity to norm violations (e.g., fairness) and the factors that motivate punishment. To determine whether our closest living relatives are sensitive to harmful behaviours directed toward others (and are potentially averse to violations of cooperative norms), we are giving chimpanzees the opportunity to punish acts of food theft committed by a conspecific on a third member of the group. We will present data from this ongoing study and will discuss the possible role of dominance and kinship on third party punishment. This study will aid in our understanding of the social behaviour of chimpanzees as well as the evolution of human cooperation.

**Gareth ROBERTS**

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*Linguistic divergence in an alien language: an artificial language experiment into the role of social selection in language change*

Human beings exploit variation in cultural systems to create markers of affiliation, a behaviour that is important to the development and maintenance of complex social networks based on reciprocal exchange (Enquist & Leimar 1993). The creation of markers, moreover, leads to a selective pressure in the evolution of the cultural systems involved. Since language is a particularly good source of markers, we should expect this behaviour to influence the course of language change. Computational simulations have confirmed that this exploitation of linguistic variation can lead to stable populations that cannot be invaded by "cheats", and to high levels of linguistic diversity (Nettle & Dunbar 1997; Nettle 1999). Livingstone and Fyfe (1999), and Livingstone (2002), however, have challenged the claim that social selection plays an important role in encouraging diversity. Their simulations suggest that drift and varying levels of contact are sufficient. This issue is familiar to sociolinguists. While his 1963 Martha's Vineyard study showed that local identity can play an important role in motivating sound change, Labov (2001: 506) has expressed scepticism as to how widespread this is, suggesting that "the simpler and more mechanical view [is] that social structure affects linguistic output through changes in the frequency of interaction." This talk presents a series of experiments that placed human participants in the simulated environment of a computer game. Results suggest that, while frequency of interaction plays an important role, social selection and the pressure to protect resources from outsiders have a significant impact on the course of language change.

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*Trade-offs between markers of absolute and relative quality in human facial preferences*

Individuals are attuned to cues of quality in potential mates. Mate quality is assessed on both an absolute scale, independent of the observer ('good genes') and on a relative scale, dependent upon attributes of the observer ('compatible genes'). Much research has focused on how individuals respond to either absolute or relative quality in mate choice, but how these dimensions are weighted during mate choice decisions is poorly understood and has recently attracted much theoretical interest. Here we examine the interplay between women's facial preferences for a measure of absolute quality (sexual dimorphism) and one of relative quality (self-resemblance). Women rated the attractiveness of male faces that had been simultaneously manipulated along the dimensions of masculinity and self-resemblance in short-term and long-term relationship contexts. Sexual dimorphism had a greater positive effect on ratings than self-similarity, and masculinity and self-similarity had positive combinative effects on ratings of attractiveness in the context of short-term relationships. Women's co-expressed preferences for masculine faces combined with their lesser preference for subtly self-similar faces may reflect selection of good genes, promote optimal outbreeding, and give rise to directional selection even in the presence of a general self-similarity preference.

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*Welsh mutation and lexical dispersion*

The initial consonants of Welsh nouns, verbs and adjectives change in certain lexical and syntactic contexts. One would expect many homonyms to occur because of this process. An analysis of a phoneticised Welsh word list found there were far fewer instances of this than might be expected. It's hypothesised that day-to-day use of language puts a selective pressure on the lexicon to minimise ambiguity. Over time, a lexicon emerges that minimises the opportunity for mutation to cause homonyms. It's also suggested that the ability to mutate has been hypertrophied in certain forms of Welsh poetry ('cynghanedd') which have rules that restrict the use of consonants.

**Anna RUBESOVA (1), Vera Pivonkova (1), Jitka Lindova (1), Jaroslav Flegr (2) & Jan Havlicek(1)**

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*Accuracy of judgements of Cattell's personality factors made on basis of composite pictures*

Using composite pictures allows researchers to capture the common physical traits, while minimizing the presence of individual facial characteristics. Two studies aimed to find out whether beholders are able to perceive personality differences in composites created from photographs of people scoring high and low on Big Five Factors. They agreed that composites of people high/low on Extraversion were perceived accurately on the congruent trait. We focused on more specific traits and used Cattell's 16 PF questionnaire to assess the target's personality. Forty-four composites were created, each made of 15 facial images of men or women scoring highest or lowest on one of the 11 chosen traits. The composites were presented to 72 raters (39 females) who judged them on 10-point scales for each congruent trait. The raters correctly perceived personality differences between the composites high and low on eight traits in males: Warmth, Emotional Stability, Dominance, Liveliness, Rule-Conscientiousness, Social Boldness, Abstractedness, and Extraversion; and two traits in females: Liveliness and Abstractedness. Surprisingly, Dominance and Reasoning in females were judged significantly erroneously. Cattell's 16 PF questionnaire showed to be a suitable tool for assessing target's personality. The results provide further evidence that personality can be judged accurately merely on the basis of facial appearance. Such ability could be hardly explained by trial-error learning alone and thus points to evolutionary importance of correct estimation of other people's personality. The sexual differences found (females judged more traits correctly) imply higher evolutionary significance of this ability for women, probably mainly related to mate choice.

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*Paid care work as a behavioural strategy: an example of the utility of applying an evolutionary model to address issues of social policy*

Social care is the support of an individual with specific needs (e.g. personal, social or domestic) by another person or group of persons. The main consumers of social care in contemporary Britain are older-adults, and the population demographic in Britain is 'ageing' (Select Committee on Economic Affairs, 2003). While some social care is provided by family and friends, the demand for paid, formally-provided social care is increasing. In 2007 the government set up the National Social Care Recruitment Campaign in response to high vacancy rates in the sector, particularly among low skill level care workers. But in order to produce effective policies to address the problems of recruitment and retention in the care sector, a better understanding of why certain individuals would be motivated to participate in paid care work is needed. This poster will outline preliminary findings and a theoretical model which applies a more integrated approach to understanding individual differences between care workers and other occupational groups. It will demonstrate the relationship between personality, demography, and local ecology that influences the decision to engage in care work, and the impact this has for policy. For example, one would expect care workers to share a similar demography (Census, 2001; General Household Survey, 2001), and commonalities on certain personality traits suited to high levels of social interaction and care-giving, such as empathy and agreeableness. Essentially, engaging in care work is presented as a behavioural strategy in response to a particular ecology, and examining it as such has great predictive utility.

**Peter SCHAUER**

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*Narratives and the null hypothesis: How the neutral model contributes to our understanding of Greek figure-painted pottery*

Variation in Greek figure-painted pottery has previously been unsystematically described as the result of social, political and art historical influences. In my recently completed PhD research, I proposed that variation arises from the process of copying itself. The neutral model states that if there are no other forces at work, at time t the frequency of a variant in a population of variants will be in proportion to its frequency at time t-1, modified by the probability that new variants might be invented and old ones might fail to be copied each time there is a copying

event, a process known as drift. I tested the degree to which variation in figure-painted pottery can be explained by the neutral model using evolutionary approaches to archaeology and culture change (Neiman 1995, Bentley et. al. 2004, Bentley et. al. 2007). In this talk, I will present some of the results from this work, and will discuss what is explained by the neutral model, how it compares with previous explanations and how it can be used as a baseline test for variation in cultural artefacts.

**Elisabeth SCHEINER & Julia Fischer**

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*Recognition of spontaneous and play-acted vocal expressions of emotions by listeners of different cultural background*

The human voice transmits nonverbal information about the emotional state of the speaker via innate vocal patterns such as crying and via the emotional prosody underlying speech. Comparative studies have shown that the vocal expression of emotions has deep phylogenetic roots. In contrast to nonhuman primates whose vocalizations are largely fixed from birth on, humans are able to learn new acoustic patterns and to play act vocal emotional expressions. This raises two questions: firstly, to which extent cultural learning influences the encoding and decoding of emotions in the human voice, and secondly whether there are cultural differences in the identification of spontaneous vs. play-acted emotions ('authenticity'). We studied the identification of emotions and authenticity in German and Romanian listeners who rated spontaneous and play acted context-free emotional German speech samples. In general, the ratings in the two countries revealed a similar pattern, with significantly lower recognition rates for the Romanian listeners. Interestingly, listeners in both countries were good at identifying authentic stimuli and poor at identifying play acted stimuli as such. Whether or not stimuli were authentic or play-acted influenced the emotion recognition rates: While anger was recognized more frequently when play acted, sadness was recognized at higher rates when authentic. The results suggest that emotion recognition follows a general pattern that is modulated by cultural learning. Moreover, results of studies that exclusively rely on the recognition of play-acted stimuli should be interpreted cautiously.

**Susanne SCHMEHL, Iris Holzleitner, Elisabeth Oberzaucher, Karl Grammer, Wiebke Alscher, Lena Pflager, Leander Steinkopf & Leonie Altheld**

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*The signal quality of head movements*

Human communication is not limited to verbal messages, but is complemented by nonverbal signals. Nonverbal messages play an important role, especially in regard to feedback and feedback signals. Feedback consists of methods to exchange information about four essential communicative functions: The recipient informs the contributor about his/her ability and willingness to communicate, to perceive and to understand the information, and whether s/he accepts the information. Nonverbal signals also convey emotional states and relative dominance. In this project, we investigated the communicative function of head movements. We filmed interactions between two people and analyzed their behavior in Anvil. We focused on head movements as feedback signals and translated them into head movements of a female avatar in Poser. Then, 62 participants (32 women and 30 men) assessed the stimuli with Russel and Mehrabian's (1974) 18 items for pleasure, arousal and dominance. Each participant evaluated ten movies. We had 41 movies, which included single and repeated nods and jerks. A principal component analysis of the 18 items revealed the three dimensions pleasure, arousal and dominance. Jerks are perceived as more dominant than nods. Moreover, arousal is linked to the speed of the head movements - the faster a movement is, the more aroused it appears. Our findings show that head movements are suitable signals for the dimensions pleasure, arousal and dominance. The preliminary data allow for the construction of a testable model, which can be implemented in virtual human agents to simulate appropriate non-verbal feedback in different kinds of interactions.

**Thomas C. SCOTT-PHILLIPS**

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*The inevitability of relevance in the evolution of human communication*

Essential to much human communication, and ubiquitous in linguistic communication, is pragmatic fluency, the ability to be relevant in conversation. Moreover, the assumption that speakers are relevant helps listeners resolve ambiguity. There are a number of approaches from within linguistics that seek to explain these phenomena, but evolutionary considerations are seldom invoked. This talk will provide a basic evolutionary foundation that can be used to constrain hypotheses about the psychological mechanisms that help shape communication. It will work from first principles. Biological communication occurs when one behaviour causes another, and where both the caused and causing behaviours are evolved for that reason. This definition captures the interactivity that is inherent in communication, and also allows us to distinguish between communication, cues and coercive behaviour. It is then used to generate a simple game-theoretic model that gives rise to a number of very basic qualities that evolved communication systems will necessarily satisfy. These qualities are then observed to predict, with remarkably accuracy, to the two principles of relevance that lie at the heart of Relevance Theory, an explicitly cognitive

approach to communication, and one of the major candidate theories from within pragmatics. The results thus offer an evolutionary explanation for our pragmatic fluency, and provide a formal evolutionary foundation for Relevance Theory.

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*Waist-hip ration, but not BMI, influences women's preferences for masculine male faces*

Women with high self-rated attractiveness, other-rated attractiveness, and low waist-hip ratio (WHR) prefer masculine male faces more than relatively unattractive women. Such condition-dependent preferences may occur because attractive women can more easily offset the costs associated with choosing a masculine partner, such as lack of commitment and less interest in parenting. Alternatively, if attractive women are treated better than relatively unattractive women by masculine men, then attractive women may perceive masculine men to have more positive personality traits. Here, we measured attributions of both attractiveness and trustworthiness to masculine versus feminine male faces in order to determine if the association between women's attractiveness and masculinity preference was driven by differences in the attribution of prosocial traits. We also measured both WHR and body-mass index (BMI) in order to determine which body measurement was the better predictor of masculinity preferences. Consistent with other reports on condition-dependent preferences, women with a low, attractive WHR had stronger preferences for masculine male faces than did women with a relatively high, unattractive WHR. This result remained when controlling for BMI, but no effect of BMI controlling for WHR was found. There was no association between attributions of trustworthiness to masculine male faces and either WHR or BMI. This finding provides evidence against the hypothesis that attractive women prefer masculine men more than unattractive women do because attractive women are less likely to perceive masculine men as having negative personality traits.

**Brian R. SPISAK & Mark van Vugt**

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*Judging a book by the cover: facial cues affect leadership emergence*

Humans are likely to have evolved psychological adaptations for solving social coordination problems. Leadership is one probable solution to a range of coordination problems (e.g. group movement, warfare and peacekeeping) and we expect humans to be good at estimating leadership potential in others based on physical and behavioural cues that are reliably associated with leadership effectiveness in ancestral times (van Vugt, 2006). We argue that evolution has shaped leadership-followership dynamics to the extent that humans have evolved certain cognitive prototypes of leaders across different situations (i.e., if at war vote for someone who looks like a warrior). We tested this idea in two face morphing experiments. Participants were asked to imagine they were voters in presidential elections and asked to choose a president in different situations, based on three facial cues (i.e. age, sex, masculinity/femininity). Faces were created using EFIT-V (a facial composite system). In each study, the faces were paired in all possible combinations and we counted the percentage of votes for each. As predicted in exp 1 we found, regardless of the target's sex, a preference for masculine faces during the war scenario perhaps because masculine looking faces elicit cues of aggression and dominance. Conversely, voters preferred feminine looking faces in peacetime. In experiment 2, as expected, voters preferred a younger looking male face during a period of transition. Conversely, an older male was preferred during times of stability. We speculate on the evolutionary and cultural origins of these leadership prototypes, and discuss avenues of future research. Ref: van Vugt, M. 2006. *Pers Soc Psychol Rev* 10: 354-372.

**Ian D. STEPHEN (1), Vinet Coetzee (1), Miriam Law Smith (2) & David I. Perrett (1)**

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*Carotenoids provide perceptible colour cues to health in human faces*

Many birds and fish display colourful, sexually selected, health signalling ornaments based on dietary carotenoids - pigments that also benefit immune and reproductive systems and contribute to human skin yellowness. Melanin yellows and darkens the skin, and is important in photoprotection, but inhibits vitamin D production. Melanin and carotenoids may therefore provide a cue to health in humans. We show that human skin yellowness tracks natural variation in carotenoid intake from fruit and vegetables. By allowing participants to manipulate the skin portions of colour calibrated facial photographs along empirically-derived carotenoid and melanin axes, we show that skin carotenoid coloration strongly affects perceived health in humans, and that the apparent health benefit derived from increased melanin colour may be due to the yellowness of melanin mimicking carotenoid colour. We show, therefore, that pigments controlling human skin colour provide a cue to health, are perceived as healthy in a way that is relevant to mate choice, and are likely to be subject to sexual selection.

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*Robust' male facial width predicts exploitation of trust*

The bizygomatic width of human skulls (corrected for overall size) is sexually dimorphic. Variation between males in bizygomatic width is related to androgen induced bone growth and has been shown to predict reactive aggression in the lab and the number of penalty minutes obtained during varsity and professional ice hockey games. In study one we tested whether bizygomatic width related to cooperative behaviour in economic games. We found that males with higher bizygomatic width were more likely to exploit the trust of their counterparts than were males with lower bizygomatic width. In study two we tested whether participants responded to bizygomatic width variation in faces when making social judgements of trustworthiness. Participants were more likely to perceive as untrustworthy males with high bizygomatic width when compared with males with low bizygomatic width. Bizygomatic width predicts trustworthiness of behaviour in economic games and, perceived in facial configuration, bizygomatic width modulates perceptions of trustworthiness.

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*Short- and longterm consequences of early epidemiological stress*

Based on the theoretical concept of Life History Theory, this study attempts to investigate the impact of early epidemiological stress experience (smallpox epidemic) on human life histories. We use historical family data from the 18th and 19th century Krummhörn population (Eastfrisia, Germany). By using Kaplan-Meier-plots and t-tests we analyse survival times and other Life-History-parameters (e.g. number of children). We separate cohorts with regard to the time of stress into in utero and postnatal and compare them with individuals not exposed to smallpox during early development. Our analyses show gender specific differences in the reaction to epidemiological stress in utero. During the first year after birth, the mortality risk for boys among these stressed individuals exceeds the girls' risk. The negative impact of stress on girls' survival begins to rise at the age of ten and persists for the rest of their life. Male subjects experience a significantly increased mortality risk up to age 40, but this negative impact is compensated later on. Both sexes suffer from a higher mortality risk when stressed in infancy or early childhood. But there are interesting differences: the results show that men cannot compensate for early stress experiences and women show their highest mortality risk during their reproductive years (25-40 years). Concerning the reproductive Life-History-parameters, there are no significant differences among the tested groups. Up to now, our results suggest a trade-off between early and late survival for both sexes. But other developmental scenarios (e.g. Barker hypothesis, DOHaD phenomenon) will be tested, too.

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*Measuring human intonational similarity deserves strong links with quantification of non-human vocalisations*

Human intonation may be evolutionarily older than vowels/consonants and bears a closer connection to the communication systems of other species (McMahon 2007). However, measurement of similarity in language has until now eschewed intonation. My task in this paper is to show how related techniques to those used in the quantification of non-human vocalisations can be successfully applied to intonation. First, I outline how we measure similarity in vowels/consonants, with specific reference to a small-scale study I did using discrete distance measures and articulatory (vocal tract) comparison. I then contrast this with the very different approaches needed for intonational quantification. Here we are dealing with continuous acoustic measurements, which may be analysed in two main ways. The multidimensional approach isolates several acoustic parameters (e.g. aspects of fundamental frequency, amplitude and duration) and obtains measurements for each. This kind of approach was used in Delgado jr's (2006) study of Orangutan Long calls and de Kort et al's (2002) of Long-necked dove vocalisations. The alternative approach is a linear one using techniques such as Dynamic Time Warping. Fundamental frequency contours of Killer Whales have been compared in this way (Brown et al 2006), as can human intonation contours. I have been using both of these approaches in comparing intonation contours of 5 English varieties. The central hypothesis being addressed is that rises found in specific varieties are actually more similar to falls than to other intonational rises. Grappling with the basic rise/fall distinction has implications for the analysis of non-human vocalisations too.

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*What is symmetrical is beautiful? The effects of shape and colour symmetry on the aesthetic value of Dayak tribal masks*

In both human and non-human species, as well as in artistic designs, symmetry has been found to enhance judgements of attractiveness. To explore the effects of symmetry on tribal designs, I designed a set of stimuli using Dayak tribal masks from Borneo, in which shape and colour symmetry were manipulated. When undergraduates rated the images, there was a significantly greater preference for symmetrically-shaped over asymmetrically-shaped masks, but not for symmetrically-coloured masks. However, in a two-alternative forced-choice experiment, the

symmetric mask was significantly preferred for both shape and colour manipulations. The result suggest an evolved role for symmetry in the perception of aesthetic designs.

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*Do people have the memory system dedicated to indirect reciprocity?: Indirect reciprocity with the information recalled from the memory*

Evolutionary game theoretical models revealed that the success of indirect reciprocity critically depends on how individuals evaluate recipients and several strategies for assigning reputation to the others have been proposed. One major dimension categorizing the strategies is whether to use second-order information (i.e., reputation / behavior of past recipients of current recipients) and theoretical analyses found that the information should be used for discriminating justified from unjustified defection. However, results of the experiments that investigated whether people actually use the second order information are rather mixed (Wedekind & Milinski, 2000; Milinski et al., 2001; Bolton et al., 2005; Mashima & Takahashi, 2008). In this study, we investigated the same question under a novel experimental setting where people need to store the information of the others' past actions in their memory. Differently from the previous studies where experimenters explicitly presented both the first and second order information to participants, participants in the current study need to recall the information from their memory when they need to evaluate others' reputation. First experiment revealed that, although people seem to be able remember both the behavior of the current recipient (first-order information) and the behavior of the recipient of the current recipient (second-order information), participants used only the first order information for making a decision whether to help the current recipient. Other experiments are ongoing and further results will be presented at the meeting.

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*A little magic brings together Boyer and Wilson on religion*

Pascal Boyer's and David Sloan Wilson's accounts of religion are seen as contradictory and competing. My aim is to show that they are complementary and, by supplementing each other's shortcomings, give a much more complete picture of religion. Boyer argues that religion is to be explained in terms of particular by-products of human cognitive development such as concepts that become memorable by being minimally counterintuitive. David Sloan Wilson, however, thinks that it is best understood as a group-level adaptation, his major focus being the ways religious institutions stimulate co-operation. The two accounts present very different aspects of religion and neither is very good at capturing what the other focuses upon. Clearly, these they could benefit from each other, yet, given how different they are, it might seem it would take magic to combine them. And, in a sense, that is precisely what is required. The vital step is to recognise the cognitive by-products Boyer discusses as part of a larger group of superstitious beliefs, only some of which happen to be connected to religion. Superstitious beliefs are particularly appropriate for motivating religious practices due to their physiological plausibility and the functional flexibility afforded by their relative independence from empirical evidence. This leads to the thesis that religion has exapted superstition by taking up individual superstitions as well as by making use of the underlying mechanisms to help maintain group cohesion.

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*Human culture vs. ape traditions*

Accumulation appears not to be a prominent feature of great ape traditions, and here we will explore some reasons for why this may be the case. We will present the view that great ape 'inventors' merely act as catalysts for others' individual learning rather than as demonstrators or teachers in a strict sense, because ape observers basically re-invent the observed product(s), while they do not seem to copy the process leading to it. We propose that the best explanation for this phenomenon is that apes learn socially only within the problem solving potential of the individual (and we call the scope for such learning the 'zone of latent solutions'). In contrast, inventions in human societies produce and, at the same time, rely on accumulated knowledge across generations ('ratchet effect'). This process of human cultural accumulation contains cooperative aspects such as norms and is fueled not only by detailed copying (imitation and all that it entails: i.e. process copying) but also by teaching. Teaching, process copying (via precise action copying), social mimicry and human normativity all lead to the stabilization and accumulation of culture - as well as to enhanced human cognition ('cultural intelligence hypothesis'). Together, these unique processes of social learning and cooperation allow for human cultural evolution. We also present some of our data which supports this view.

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*Categorical perception of the attractiveness of female bodies*

We have found evidence of a categorical perception of female physical attractiveness and enhanced sensitivity to differentiating between bodies across the attractive-unattractive categorical boundary. We performed three experiments; Experiments 1 and 2 measured how the position of individual stimuli on a continuous feature dimension (the amount of body fat) altered the perception of a body's attractiveness. In experiment 1, the observers rated attractiveness on a scale of 1 to 7. In experiment 2, the observers categorised the images as either attractive or unattractive in a 2-alternative forced-choice task. In Experiment 3, we measured the sensitivity of discrimination between pairs of the bodies from experiments 1 and 2. The results of experiments 1 and 2 suggest that the bodies falling along the body fat continuum were perceived as falling into distinct sections separated by a categorical boundary. In the discrimination experiment, the observers' performance demonstrated significantly better discrimination across this putative categorical boundary than within a category; that is, two bodies identified as falling into different attractiveness categories (e.g. attractive and unattractive) were easier to discriminate than two bodies of equal physical difference identified as being in the same attractiveness category (e.g. both attractive). This is a pattern of response diagnostic for categorical perception. So although there is a linear physical continuum in the set of bodies, there is not a linear perceptual continuum. Instead there is a perceptual discontinuity at the categorical boundary, where the differences in shape change are represented in greater perceptual detail than within the categories.

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*Some impacts of Baldwin effects on the evolution of stabilizing conditions for socially created codes*

A specially powerful form of social learning is typical of humans and the human plasticity provided by culture. Nevertheless social learning and culture in the form of animal traditions also exist in other non-human species. What is more rare or perhaps uniquely human is the presence of traits whose relevance and value is based upon the very fact that they are shared. Linguistic forms, social norms, and many other human forms of coordination are of this kind. Strong forms of social learning such as observational learning, emulation or true imitation possibly existed well before the emergence of socially created codes as it can be plausibly inferred from the archaeological record (Chase 2005). Thus it is likely that some strong dispositions for social learning were a form of precursor for the appearance of the capacities for socially created codes. A way in which social learning can influence the evolution of cognitive capacities is the Baldwin effect. Baldwin effect is the process by which individual and social learning actively define the fitness landscape of an evolving population. In this work we explore some possibilities and constraints of this evolution towards certain forms of tribal dispositions through simulations.

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*Circum-menopausal effects on women's judgements of facial attractiveness*

The marked change in a woman's hormonal profile that happens at menopause affects many aspects of behaviour. We investigated circummenopausal women's preferences for femininity in the faces of young adult men and women. Post-menopausal women demonstrated stronger preferences for femininity in same-sex faces than pre-menopausal women did. This effect was independent of possible effects of participant's age and suggests that dislike of feminine (i.e. attractive) same-sex competitors decreases as fertility decreases. No significant difference between pre- and post-menopausal women was observed for men's faces, potentially because circum-menopausal women do not necessarily view young adult men as potential mates. To our knowledge, this is the first study to demonstrate circum-menopausal changes in women's face preferences.

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*The persuasive impact of evolutionary psychological cues in advertising and product design*

Recently, evolutionary psychology (EP) is profiling itself as a useful perspective for studying consumer behaviour (see e.g. Gad Saad's *The Evolutionary Bases of Consumption*, 2007; Geoffrey Miller's *Spent: Sex, Evolution and Consumption*, in press). Currently, we are investigating if advertising processing theory - as part of consumer behaviour theory - can equally benefit from this perspective. Here, we present three studies investigating the impact of both EP cues of physical attractiveness and evolutionary aesthetic cues (EA cues) on ad-likeability and product-likeability. In the first study, 395 Belgian respondents (195 males and 192 females, age 18-56) were exposed to 35 sets of 2 ads of which one contained EP cues that enhanced the ad model's sexual attractiveness. Respondents had to choose the most appealing one. The second study is a Spanish-Belgian collaborative project in which we measured

the impact of these EP and EA cues on the consumer's attitude-toward-the-ad, attitude-toward-the-brand and purchase intention. 18 ad sets were created and 643 Spanish consumers (319 males and 324 females, age 18-50) took part. In the third study, we measured the likeability of different product designs. Reactions of 290 Belgian respondents (age 16-65) to 21 sets of products (in which EA cues were inserted) were measured. All three studies clearly show that ads or product designs containing cues that are in line with EP insights, seem to 'work better' than ads or designs that ignore these findings. This, however, also raises serious moral questions that evolutionary psychologists will have to deal with.

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*Who cries the most? Birth weight, breast-feeding and sibship size are associated with children's negative emotionality*

Negative emotionality, as a temperamental trait, is thought to be present from birth and determined genetically to a large extent. Here we report that negative emotionality is associated with environmental factors acting early in child's development - quality of prenatal environment, breastfeeding and family size. Psychological, anthropometric and demographic data collected from a rural population from Southern Poland were subjected to an analysis of variance. Children with low birth weight, who were breastfed for a short time, were particularly negatively emotional later in life, especially in large families with 6 or more siblings. These findings suggest that negative emotionality may be treated as an adaptive response, whose function is to draw parental investment to the child who has high needs, due to its poorer biological condition, and who is at an increased risk of not receiving enough resources, due to intense sibling competition.

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*Perception of human body modifications*

The enhancement of physical attractiveness through body modifications, such as tattoos is evident in a wide range of cultures and has recently become popular also in Westernized societies. Evolutionary psychologists have suggested that these invasive body modifications could possibly act as handicap signals in sexual selection. However, knowledge about the actual signalling quality of body modification and its perception is still scarce. In this present study a sample of 278 men and women rated images of tattooed and non-tattooed virtual human characters for perceived aggression, attractiveness, dominance, health, masculinity (male figures), and femininity (female figures). Tattooed male characters were perceived as more dominant, and tattooed female characters as less healthy compared with their non-tattooed counterparts. Female raters were more likely to perceive tattooed men as healthy than male raters. We discuss these results in view of a potential biological signalling function of tattoos.