

european human behaviour
and evolution association
annual conference



6-9 April 2014, Bristol UK

venue: at-bristol | at-bristol.org.uk

Full Programme

www.bristol.ac.uk/ehbea2014

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Welcome

Welcome to the 9th Annual Conference of the European Human Behaviour and Evolution Association!

We are delighted to welcome you to Bristol, a unique and bustling city in South West England. The conference venue **At-Bristol** is located in the central area, by the historic harbourside. Most of the attractions are within walking distance: *Bristol Aquarium*, *Brunel's ss Great Britain*, *M Shed (museum of Bristol's history)*, *Bristol Cathedral*, *Bristol Shopping Quarter*, *Bristol Museum and Art Gallery*, and *University of Bristol*. The *Bristol Zoo Gardens* and the world-famous *Clifton Suspension Bridge* are a 40-minute walk (or a short bus ride) from the centre. There are also many green spaces nearby: *College Green*, *Queen Square*, *Brandon Hill*, and *Castle Park*.

For the conference, we are delighted to welcome our plenary speakers *Russell Gray*, *Martie Haselton*, *Daniel Hruschka*, *Annette Karmiloff-Smith*, and *Samir Okasha*. We are also excited to have as our sixth plenary speaker, the 2014 New Investigator Award winner *Willem Frankenhuys*. In addition, we have 46 talks and 104 posters spanning a wide range of topics and approaches from researchers around the world.

On Monday morning, Prof Nick Lieven (Pro Vice-Chancellor, University of Bristol) will open the conference, which will be followed by the first plenary.

The *Poster Session* will take place on Monday evening, but we invite the presenters to have their posters displayed for the duration of the conference starting Sunday evening. The *EHBEA Annual General Meeting* will occur on Wednesday, followed by the conference dinner (for those who have registered) at the *Bristol Marriott Royal Hotel*.

Many sponsors and individuals made this conference possible. We would like to thank the *Galton Institute* and *BrainJuicer*. From the University of Bristol, we would like to thank the *Institute for Advanced Studies*, *Faculty of Science*, and *School of Experimental Psychology*. We are indebted to *Alberto Acerbi*, *Mwenza Blell*, *Poppy Mulvaney* (who provided invaluable input), *Rob Burriss* (who designed the flyer), *Antony Theobald* and *Emily Heseltine* (who managed the website).

We hope you enjoy the conference and your stay in the wonderful city of Bristol!

The Organising Committee of EHBEA 2014,

Alex Bentley
Mhairi Gibson
Fiona Jordan
Justin Park
Ian Penton-Voak

galton
institute



Key Events

6th April 7.00pm	Registration & Welcome Reception
7th April 8.50am	Opening Address
7th April 5.35pm	BrainJuicer Talk – IMPACT: Turning human understanding into business advantage
7th April 6.30pm	Poster Session
8th April 1.00pm	BrainJuicer Breakout Session
9th April 1.00pm	“Journal of Cultural Evolution” Meeting
9th April 6.00pm	EHBEA Annual General Meeting
9th April 7.30pm	Conference Dinner at Bristol Marriot Royal Hotel

Wi-Fi Access: At-Bristol Events **Password:** Max-hertZ!WE11

Schedule at a Glance

(Talks listed by first author)

Monday 7th April

Rosalind Franklin Room

8.50 OPENING ADDRESS: Nick Lieven

9.00 PLENARY: Russell Gray

10.00 Mesoudi

10.25 Tamariz

10.50 *COFFEE*

11.20 Leongomez

11.45 Cobey

12.10 David

12.35 Street

1.00 *LUNCH*

2.00 PLENARY: Annette Karmiloff-Smith

3.00 Flynn

3.25 Grueneisen

3.50 *COFFEE*

Rosalind Franklin Room

4.20 Turner

4.45 Carr

5.10 Trimmer

The Annexe

4.20 Tognetti

4.45 Rauwolf

5.10 Gordon

Rosalind Franklin Room

5.35 BrainJuicer Talk

6.00 Poster Session

Tuesday 8th April

Rosalind Franklin Room

9.00 PLENARY: Martie Haselton

10.00 Lefevre

10.25 Roberts

10.50 *COFFEE*

11.20 Schaffnit

11.45 Mace

12.10 Moya

12.35 Machin

1.00 *LUNCH / BrainJuicer Breakout Session*

2.00 PLENARY: Daniel Hruschka

3.00 Pepper

3.25 Sear

3.50 *COFFEE*

Rosalind Franklin Room

4.20 Watson

4.45 Blancke

5.10 Toelch

5.35 Bone

The Annexe

4.20 Pollet

4.45 Fieder

5.10 Aguilar

5.35 Barthes

Wednesday 9th April

Rosalind Franklin Room

9.00 PLENARY: Willem Frankenhuys

10.00 Colleran

10.25 Rotkirch

10.50 *COFFEE*

11.20 Scott-Phillips

11.45 David-Barrett

12.10 Ellison

12.35 Morin

1.00 *LUNCH / “Journal of Cultural Evolution” Meeting*

2.00 PLENARY: Samir Okasha

3.00 Barton

3.25 Stulp

3.50 *COFFEE*

Rosalind Franklin Room

4.20 Emmott

4.45 Brewer

5.10 Uggla

5.35 Virgo

The Annexe

4.20 Wu

4.45 Launay

5.10 Powers

5.35 Horita

Rosalind Franklin Room

6.00 EHBEA AGM

7.30 Conference Dinner at Bristol Marriot Royal Hotel

7th April 9.00-10.00 Plenary (Rosalind Franklin Room)

Introduction: Fiona Jordan

Language matters: On the centrality of language for our understanding of human history, cognition and culture

Russell Gray (rd.gray@auckland.ac.nz)

University of Auckland

In this talk I will argue that computational evolutionary analyses of language can reveal a great deal about human history, cognition and culture. I will support this claim with examples showing how this approach can resolve long-standing debates about the peopling of the Pacific, putative language universals, and the role of high gods in the evolution of complex societies.

7th April 2.00-3.00 Plenary (Rosalind Franklin Room)

Introduction: Gillian Brown

Is human development triggered by domain-general or domain-specific processes? A third alternative

Annette Karmiloff-Smith (a.karmiloff-smith@bbk.ac.uk)

Birkbeck Centre for Brain and Cognitive Development, University of London

In this talk I will present arguments for an alternative to domain-general and domain-specific processes: domain-**relevant** processes that **become** domain-specific over developmental time. Data illustrating this argument will be taken from the difference between **developed** versus developing brains, i.e., adult neuropsychological patients versus infants/children with neurodevelopmental disorders, as well as from the implications of the mutation of the FOXP2 gene in a family with severe speech and language disorders, a gene which some have linked (in my view incorrectly) directly to human language. The talk will also show how critical it is to trace domain-specific higher-level cognitive outcomes back to their domain-relevant basic-level precursors in infancy.

8th April 9.00-10.00 Plenary (Rosalind Franklin Room)

Introduction: Ian Penton-Voak

Fertile minds: Changes in human social behavior across the ovulatory cycle

Martie Haselton (haselton@ucla.edu)

University of California, Los Angeles

Women's fertility is fleeting, spanning just a few days each month. Because sex can only lead to conception on these few fertile days, important mating adaptations are likely to sensitive to information about location within the ovulatory cycle. A veritable explosion of recent work has tested this general notion, documenting many purported "cycle shifts" in women's behavior and men's responses to women. However, these findings remain controversial – with recent critics asserting a "false positive problem" in this literature. In this talk, I present two meta-analyses that estimate the magnitude of cycle shifts in published and unpublished literatures. I present related analyses that address concerns about sampling bias and the possibility that researchers have capitalized on chance to generate positive findings (i.e., "p-hacking"). The first meta-analysis of 134 effects in 38 published and 12 unpublished studies examined shifts in women's preferences for male characteristics thought to have historically indicated genetic quality. The second meta-analysis of over 90 effects in 42 published and 7 unpublished studies examined whether there are detectable cues of ovulation (e.g., cycle shifts in women's attractiveness). In each case, hypothesized cycle shifts were statically robust, small to moderate in size, and not accounted for by sampling bias. *p*-curves provided evidence that positive effects could not be accounted for by practices that allow researchers to capitalize on chance. I close by discussing competing evolutionary explanations for cycle shifts and other important mysteries that remain.

8th April 2.00-3.00 Plenary (Rosalind Franklin Room)

Introduction: Alex Bentley

In search of cues to altruism: Studying proximate mechanisms to understand the evolutionary origins of costly giving

Daniel Hruschka (daniel.hruschka@asu.edu)

Arizona State University

Humans frequently sacrifice time, effort, and material resources to benefit others. Ensuring that such generosity maximizes future returns requires complex decisions about when and toward whom to be generous. To handle the algorithmic complexity of such altruistic choices, humans rely on numerous internal and external heuristic cues, including emotional closeness, signs of genetic relatedness, and indicators of relative need. Studying how such proximate cues are deployed in diverse contexts and cultural settings can inform current debates about the evolutionary origins of these cues and of human generosity more broadly. Here, I describe current work on the ways that a suite of distinct cues, including emotional closeness, relative need, and relationship category (e.g., friendship, mateship, and kinship) shape willingness to sacrifice, and how the effects of these cues are modified by our social and cultural environments.

9th April 9.00-10.00 Plenary (Rosalind Franklin Room)

Introduction: Daniel Nettle

How does natural selection shape development?

Willem Frankenhuys (wfrankenhuys@gmail.com)

Radboud University Nijmegen

Fused together, evolutionary and developmental science can generate predictions about: (1) what traits to expect at different life stages; (2) what phenotypic variation to expect depending on ecology; (3) what patterns of ontogenetic change to expect depending on ecology. In this talk, I will discuss theory and data bearing on these topics. I will focus on recent models showing that natural selection can result in mechanisms that produce sensitive periods in development. Such models may illuminate the roles of chronological age and previous life experiences in shaping the extent of plasticity (its retention and decline) across the human life span.

9th April 2.00-3.00 Plenary (Rosalind Franklin Room)

Introduction: Louise Barrett

The evolution of social behaviour: Kin selection versus multi-level selection

Samir Okasha (samir.okasha@bristol.ac.uk)

University of Bristol

This paper focuses on two different approaches for studying the evolution of social behaviour: kin selection and multi-level selection. The relation between these two approaches has been a source of controversy ever since it was first broached by W.D. Hamilton in 1975. Though kin and multi-level selection were once regarded as rivals, most recent biologists regard them as ultimately equivalent, on the grounds that gene frequency change can be correctly expressed using either. However this shows only that the two are predictively equivalent, not that they offer equally good causal representations of the evolutionary process. This paper articulates the notion of an 'adequate causal representation' using causal graphs, and then seeks to identify circumstances under which kin and multi-level selection do and do not satisfy the test of causal adequacy. Some possible applications to humans are discussed.

Talk Abstracts

7th April 10.00-10.25 (Rosalind Franklin Room)

Cross-cultural variation in the adaptiveness of information use: Chinese participants show higher levels of social learning than British participants

Alex Mesoudi¹ (a.a.mesoudi@durham.ac.uk), Keelin Murray², Lei Chang³

¹Durham University, ²University of St Andrews, ³Chinese University of Hong Kong

Recent cultural evolutionary models and experiments have explored the adaptiveness of information use across various species. A central question has been the balance between individual and social learning, often analysed in terms of information producer-scrounger models. While models suggest that social learning is adaptive under a wide range of conditions, particularly when copying is targeted to successful individuals, experiments with human participants have found a striking under-use of social information. Here we tested the hypothesis that this under-use of social learning is due to participants in previous experiments coming from WEIRD (Western, Educated, Industrialised, Rich and Democratic) countries. Using the same experimental tasks, we found that participants from the Chao Zhou region of mainland China showed significantly higher copying rates than white British participants, Chinese students studying in the UK, and Chinese participants in Hong Kong. The latter three groups showed no difference in learning style. These findings demonstrate that (i) there is meaningful cross-cultural variation in learning style that cultural evolutionary models must address, and (ii) this variation is not genetically fixed and is instead developmentally or environmentally determined, as indicated by the low rates of social learning in the Western-influenced Chinese immigrant and Hong Kong groups.

7th April 10.25-10.50 (Rosalind Franklin Room)

Culture: Copying, compression and conventionality

Monica Tamariz (monica@ling.ed.ac.uk), Simon Kirby

University of Edinburgh

Repeated cultural transmission to new individuals transforms cultural information towards increased compressibility (Kirby, Cornish & Smith, 2008, PNAS; Smith, Tamariz & Kirby, 2013, CogSci Proceedings). Existing diffusion chain studies include in their design two processes that could be responsible for this tendency: storing a pattern in memory and reproducing it. We manipulated the presence of memory storage: participants in a diffusion chain saw an initially abstract seed drawing for ten seconds, and then had to reproduce it either having the original in front of them (copy condition) or from memory (memory condition). We found that drawings in the copy condition stayed as complex and abstract as the seed drawings, and innovations that were introduced were preserved over repeated productions. The drawings in the memory condition, in contrast, became increasingly compressible in two ways: first, they had lower perimetric and algorithmic complexity values; second, they tended to look increasingly like conventional signals such as letters or numbers, which can be interpreted as them having a shorter description length (“number six” as opposed to “two curved lines superimposed...”). These two aspects of transmission help explain human culture’s fundamental balance between stability and innovation. First, copying can introduce innovations that are random with respect to cognitive biases, and cumulatively retain those innovations across the generations. Second, the study crisply demonstrates that when behavior is transmitted through the bottleneck of learning (even if this is as tiny as remembering a drawing for a matter of seconds), then we see a cumulative increase in compressibility.

7th April 11.20-11.45 (Rosalind Franklin Room)

Vocal modulation during courtship increases proceptivity even in naïve listeners

Juan David Leongomez¹ (j.d.leongomezpena@stir.ac.uk), Jakub Binter², Lydie Kubicova², Petra Stolarova², Katerina Klapilova², Jan Havlicek², S. Craig Roberts¹

¹University of Stirling, ²Charles University

Context-dependent modulation of paralinguistic parameters in human speech is classically demonstrated in ‘motherese’, but we know little about subtle variation during adult speech in other contexts such as courtship. Studying responses to vocal modulation is problematic because listeners understand semantic content, so studies typically confine speech to enunciation of vowels or standard sentences. Here we circumvent this problem by analysing voice messages recorded after viewing attractive or unattractive potential partners or competitors, and testing proceptive responses in naïve monolingual listeners, across a Germanic (English) and a Slavic (Czech) language. First, acoustic analysis revealed striking cross-language similarity in patterns of social context-dependent variability in fundamental frequency (F0), but not in other parameters; both sexes varied F0 most when responding to attractive individuals. Second, forced-choice tests revealed that, despite unavailability of semantic content, speech directed towards attractive individuals was judged more attractive by naïve opposite-sex (but not same-sex) listeners, and did not influence another socially relevant judgment ('friendliness'), indicating the perceptual effect is specific to courtship contexts. Finally, perceptual tests using manipulated recordings demonstrate that these effects are underpinned by F0. Our results demonstrate that modulating F0 is a critical parameter in human courtship, independently of semantic content.

7th April 11.45-12.10 (Rosalind Franklin Room)

Partner choice, relationship satisfaction and oral contraception: The congruency hypothesis

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⁴University of Glasgow, ⁵Newcastle University

Hormonal fluctuation across the menstrual cycle underpins temporal variation in opposite sex attractiveness judgments. Use of oral contraceptives (OCs) results in the suppression of these naturally occurring hormonal fluctuations, which raises the intriguing possibility that OC use may impact partner perceptions. Specifically, OC use could influence initial partner choice, but it also may impact intra pair dynamics at later stages of the relationship if contraceptive use status subsequently changes. To date research on the connection between OC use and relationship satisfaction has focused solely upon current OC use status. We propose that the impact of OC use on relationship satisfaction may be best understood by considering whether current use is congruent with use when the relationship formed, rather than by considering current use alone. Here we test this ‘congruency hypothesis’ in a survey of 335 heterosexual couples. Controlling for potential confounds (including relationship duration, age, children, and income), we find that congruency in current and previous OC use, but not current use alone, predicts women’s sexual satisfaction with their partner. Conversely, congruency was not associated with women’s nonsexual relationship satisfaction, nor with the satisfaction reported by male partners. Our results provide empirical support for the congruency hypothesis and suggest that women’s sexual satisfaction is influenced by changes in partner preferences associated with changes in OC use.

7th April 12.10-12.35 (Rosalind Franklin Room)

Adaptive decision rules underlie mate-choice copying in humans

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¹University of Exeter, ²University of Quebec at Montreal

Social information use lies at the root of cultural transmission. Identifying the evolutionarily adaptive properties of social information use is thus crucial to understand and generate adaptive hypotheses about cultural evolution. However, the adaptiveness of social information use when assessing potential reproductive partners (aka mate-choice copying) remains untested. Here I used a classic mate-choice copying procedure to test several predictions derived from social learning theory in humans. Women relied more on social information when they were provided 1/ with high-quality social information (“who-to-copy” rule), 2/ with little information about potential partners, and 3/ when they were less sexually experienced (both “when-to-copy” rules). These effects were independent of rating criteria used (attractiveness, desirability as a potential sexual partner, and desirability for a long-term relationship). These findings are the first experimental evidence that the social transmission of sexual preferences lies on evolutionarily adaptive decision-making rules. These adaptive rules are thought to have evolved to reduce uncertainty about potential partners’ quality and thus to select a suitable reproductive partner.

7th April 12.35-1.00 (Rosalind Franklin Room)

'Mate-choice copying' in humans may be the result of a domain-general social learning mechanism

Sally Street¹ (ss2264@st-andrews.ac.uk), Tom Morgan¹, Catharine Cross¹, Gillian Brown¹, Alex Thorton², Kevin Laland¹

¹University of St Andrews, ²University of Exeter

Mate choice copying, where mating decisions are affected by the decisions of conspecifics, occurs in both humans and a wide variety of non-human species. However, it is currently unclear whether mate-choice copying is a product of mechanisms specific to the domain of mate choice, versus a product of domain-general social learning mechanisms. To resolve this issue, we investigated the extent to which copying of attractiveness preferences differs between images of human faces, other human images (hands) and non-human images (abstract art). In a networked computer-based task, 4 groups of 5-10 female participants ($n=33$, $n=990$ trials) rated images of male faces, male hands and abstract artwork for attractiveness, both before and after being shown social learning information. Social learning information consisted of live averages of some or all of the other group members' decisions. We used linear mixed models to investigate: a) the extent to which final ratings were influenced by the social information; and b) the effect of stimulus type (faces, hands or art) on the degree of copying. We found that the social information significantly influenced participant's final ratings overall ($\beta=0.1$, $+/-0.01$, $p<0.001$). We found no evidence that participants copied preferences for faces more than they copied preferences for hands or for abstract artwork. Our results suggest that human 'mate choice copying' may be the result of a domain-general copying mechanism, rather than one specific to the domain of mate choice of facial preferences.

7th April 3.00-3.25 (Rosalind Franklin Room)

My way or your way? Investigating the foundations of cumulative culture by establishing young children's preference for learning individually versus socially

Emma Flynn¹ (e.g.flynn@durham.ac.uk), Cameron Turner¹, Luc-Alain Giraldeau²

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Cumulative culture requires faithful replication, as well as modification, of learnt behaviour. The current study examined factors that contribute to children's choice to engage in individual (potential modification) versus social learning (replication). Ninety-six 3- and 5-year-olds were presented individually with two novel artificial fruits one in each of two trials, and told of the apparatus' relative difficulty ('easy' versus 'hard'). For each apparatus children were asked if they wanted to attempt the task themselves or watch an experimenter attempt it first. Children had their preference either met or violated: receiving the learning style they requested (individual or social) or their non-preferred style. This is the first study to demonstrate that a significant proportion of children (75%) chose to learn socially irrespective of task difficulty. Unsurprisingly, this request was adaptive, as observing a demonstration made children significantly quicker and more successful at the task than learning individually. However, children who chose to learn individually were equally quick at the task whichever learning style they received (either chose and undertook individual learning or chose individual learning but undertook social learning). In contrast, children who requested social learning, but in fact learnt individually, were slower at beginning and completing the task, than children who chose and undertook social learning. Task difficulty did not affect children's social learning preference. We conclude that children with social learning preferences are highly reliant on receiving social-input, while children with individual learning preferences are robust in their learning style. Such evidence aids in establishing whom modifies cultural products.

7th April 3.25-3.50 (Rosalind Franklin Room)

“I know you don’t know I know...” Children’s use of second-order false-belief reasoning for peer coordination

Sebastian Grueneisen (sebastian_grueneisen@eva.mpg.de), Emily Wyman, Michael Tomasello

Max Planck Institute for Evolutionary Anthropology

Humans heavily rely on mutualistic collaboration (e.g. Tomasello et al. 2012). Indeed, from early in development human children are remarkably adept at coordinating their behavior with others in the pursuit of joint goals. Here, we explored whether children can solve a coordination problem with peers by using sophisticated mind-reading strategies. Dyads of six-year-olds ($N = 104$) had the chance to win candies by each inserting a ball into the same of four boxes. This had to be achieved without communication and without seeing each other’s choices. One box – which was clearly marked – contained a larger reward making it the obvious solution during training trials. At test, however, children were informed separately that a mistake had occurred when placing the candies and that the largest reward was really in one of the unmarked boxes. Children were either let to believe that their partner did not know of the mistake (i.e. had a false belief) or that their partner did not know that they knew of the mistake (i.e. had a second-order false-belief). Our results demonstrate that children adjusted their decisions both in response to their partner’s false belief, and their partner’s false belief about their own belief – a result that contrasts with other findings on children’s higher-order ‘Theory of Mind’ usage in interaction at this age. Six- year-olds are thus able to use their higher-order Theory of Mind capacities for peer coordination, which marks an important achievement in becoming competent collaborative partners.

7th April 4.20-4.45 (Rosalind Franklin Room)

What role does model reliability play in young children's choice to learn individually or socially?

Cameron Turner¹ (cameron.turner@durham.ac.uk), Luc-Alain Giraldeau², Emma Flynn¹

¹Durham University, ²Université du Québec à Montréal

Evolutionary optimality modelling of social information use suggests that individuals should discriminate in their use of social information; indeed young children show biases in 'who' they copy. Extending current understanding of 'model-based biases', this study investigated how the reliability of a potential model affected children's choice to learn from that model, and the child's subsequent performance on a task. One-hundred-and-twenty 3- and 5-year-old children individually watched a video of a model either correctly (reliable model) or incorrectly (unreliable model) name common objects and describe their function. Children were then asked if they would like to attempt to retrieve a reward from an artificial fruit either on their own (individual learning), or after watching the same model attempt the task (social learning). The artificial fruit had two identical sides; one contained a large reward, the other contained a small reward. During the demonstrations the model always retrieved the small reward, thus we examined how model-reliability affected adherence to the model's goals, as well as actions. In addition, the model's demonstration included redundant actions (i.e., overimitation). A significant proportion of children chose to learn socially rather than individually, irrespective of model reliability. Observing a reliable model lead to greater overimitation and task success, than observing an unreliable model. These findings support evidence of children's strong preference for social information; but that such a preference is mediated by a model's reliability, resulting in a better understanding of how we source information, and how we can improve on the information we receive.

7th April 4.45-5.10 (Rosalind Franklin Room)

You're doing it wrong: Does efficacy of observed behaviour influence innovation?

Kayleigh Carr (kayleigh.carr@durham.ac.uk), Rachel Kendal, Emma Flynn

Durham University

Whilst children gain much from their collective culture, theoretical models of cultural evolution and empirical evidence suggest that it is not always adaptive to learn socially. Acquiring reliable information often necessitates evaluations of its content and source, prompting trade-offs in social and individual learning strategies. This study addressed the age at which children judge it futile to imitate unreliable information, in the form of a visibly inefficient demonstrated task solution, and deviate from unsatisfactory outcomes to produce novel solutions ('innovations'). This was achieved with the introduction of a novel puzzle box task, offering multiple innovation opportunities. 210 children aged 4 to 9 years were assigned to conditions in which eight social demonstrations of a reward retrieval method were provided, with each condition differing incrementally in terms of the method's level of success from 0 to 100%. An additional 47 children were assigned to a no-demonstration control condition. Findings indicated that observed behaviour efficacy influenced rates of innovation, with the mean number of innovative reward extractions from the box increasing with decreasing success of the demonstrated method (collapsing across age; $F(3,205) = 3.98, p = .009$). Whilst four and five-year-olds made significantly more imitation attempts than their older peers (across condition; $F(2,185) = 4.55, p = .012$), emulation and exploratory behaviour was relatively widespread. Overall innovation was rare (12.4% of the sample innovated). These results are consistent with theories of cultural evolution indicating that cumulative culture requires both rare innovations and high fidelity imitation.

7th April 5.10-5.35 (Rosalind Franklin Room)

Depression as an outcome of adaptive learning

Pete Trimmer (pete.trimmer@gmail.com), Andy Higginson, Tim Fawcett, John McNamara, Alasdair Houston

University of Bristol

Depression is a major medical problem affecting an increasingly significant proportion of people; commonly prescribed psychoactive drugs are frequently ineffective. Treatment may instead require the understanding of ultimate causes, and several adaptive reasons for proneness to depression have been proposed. Common to these is that depressive behaviour is a way to avoid costly effort where benefits would be small and/or unlikely. However, a weakness of this viewpoint is the failure to explain why low mood persists when the situation improves. We use a simple model of adaptive learning to consider this problem. We consider a situation in which an individual has repeated choices of whether to invest costly effort that may result in a net benefit. Investing effort also provides information about the likely current state of the environment and how likely the environment is to change with time. By finding the optimal behaviour in a given environment, we identify how learning about a changing world can cause inactivity which appears similar to the effect of depression in that it persists after the situation has improved. Our approach shows that the antecedent factors causing depressed behaviour could go much further back in an individual's history than is currently appreciated. In particular, we find that an initially benign environment can predispose an individual to appear depressed after a relatively mild period of negative experiences.

7th April 4.20-4.45 (The Annexe)

Is cooperativeness readable in static facial features? An inter-cultural approach

Arnaud Tognetti (arnaud.tognetti@gmail.com), Claire Berticat, Michel Raymond, Charlotte Faurie

Institute of Evolutionary Sciences (Montpellier)

There is evidence that non-verbal physical features are used as cues for a propensity to cooperate. However, further studies of the human ability to visually detect cooperativeness are required. In particular, the existence of static facial cues of altruism remains questionable. Moreover, an investigation of both sex differences and cross-cultural applicability with respect to altruism detection skills is crucial in the context of the evolution of human cooperation. In this study, we used both a public good game and a charitable contribution to assess the cooperativeness of 156 men and 172 women in rural Senegal and took facial photographs of these individuals. The second portion of the study was conducted in France. In total, 194 men and 171 women were asked to distinguish the most and least selfish individual from a series of 80 pairs of Senegalese facial photographs, each pair consisting of the highest and the lowest contributor from a group in the public good game. Using mixed modeling techniques, we controlled for facial masculinity, age and socioeconomic status. For male pairs, both male and female French raters were able to identify more often than by chance which individual made the smallest contribution to the public good in each group; however, detection was not successful with female faces. These results suggest that sex-specific traits are involved and that only male facial traits indicating cooperative skills are, at least inter-culturally, readable. The specific facial traits involved are investigated.

7th April 4.45-5.10 (The Annexe)

Cooperation benefits when homophily motivates dishonesty in gossip

Paul Rauwolf (p.rauwolf@bath.ac.uk), Dominic Mitchell, Joanna J. Bryson

University of Bath

When an individual discovers in isolation that a socially-held view is false, a dilemma arises. On the one hand, increased factual accuracy is generally advantageous. However, if the socially-held view has consequences beyond what is purely evaluative, then contradicting it may prove costly. A better strategy may be to feign ignorance and align with the inaccurate social belief. We term this communal dishonesty, and demonstrate contexts of its utility via series of agent-based evolutionary game theory models where cooperation is established by the spread of reputation. Starting from the known result that homophily supports the evolution of cooperation (Axelrod, 1997), we create a model founded upon the donation game which has been frequently employed in the indirect reciprocity literature (Nowak & Sigmund, 2005). We compare the utility of two agent strategies in a homophilic society: 1.) cooperate based on another's reputation, and 2.) cooperate based on another's historic behaviour. We show that contradicting fallacious socially passed reputations with accurate historical information can be maladaptive because signalling one's own status as a community member has greater overall benefit. This is true even when historic information is freely available. It has been empirically shown that a better predictor for whether one will trust and cooperate with an individual is the individual's gossip-spread reputation, rather than an accurate record of the individual's historical actions (Giardini and Conte, 2012). Our work offers an evolutionary explanation for this result. We discuss the relevance of these results to empirical literature on homophily and self-deception.

7th April 5.10-5.35 (The Annexe)

Private gain and the public good: The potential role of dominance in the evolution of third party punishment

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In primate groups, dominant individuals can monopolize group resources and therefore benefit disproportionately from any group success. Such additional resources would lower the relative cost of third party punishment for dominant individual and may provide an incentive to engage in this behaviour. We tested these hypotheses by examining whether receiving an additional benefit from group cooperation would make individuals more willing to punish. 116 participants took part in a public goods game with punishment and were split between stranger- and partner-protocols. Each round, one group member was given the ability to punish at a ratio of 1:1. Punishers either received no additional points, an additional points bonus worth the value of 25% of the group pot, or a 25% 'monopoly bonus'; where $\frac{1}{4}$ of the group pot was allocated to the punisher before the pot was equally divided amongst all members. Punishment was directed at low contributors, and punishers who received any bonus spent more on punishment than those who received nothing. Protocol did not affect overall spending, however punishers in the partner-protocol groups who received any bonus punished more often, with those receiving the monopoly-bonus being the most likely to punish. Therefore, receiving additional benefits from group cooperation resulted in more severe punishment and more acts of punishment, especially when groups were fixed. This may be because the relative cost of punishment was reduced, or because the benefit from encouraging group cooperation was greater. Both are consistent with an evolutionary role of dominance, since dominance impacts on both these factors.

8th April 10.00-10.25 (Rosalind Franklin Room)

Evidence for skin carotenoid coloration as a specific signal of current health

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Recently, the importance of skin colour for facial attractiveness has been recognised. In particular, within ethnicity variation in skin colour linked to dietary intake of carotenoids has been proposed as a signal of health and consequently attractiveness. However, several important questions are outstanding: Are preferences specific to carotenoid colouration and are they specific to faces? Do preferences for carotenoid colouration extend to other social judgements? And, what are the physiological mechanisms underlying carotenoid colouration of the skin? Here, in a series of experiments with Caucasian participants, we investigated the perceptual significance of carotenoid induced skin colouration for attractiveness and trust judgments, as well as associations between this skin colouration and testosterone. We find high carotenoid colouration: (a) is preferred to low carotenoid colouration and to high melanin (suntan) colouration; (b) is preferred in the context of a face but not in the context of scrambled face patterns; (c) is associated with social judgements such as increased trustworthiness; and (d) is associated with low baseline and reactive testosterone levels in men. Taken together these findings are consistent with skin carotenoids providing a colour signal of current condition in humans and indicate an intricate physiological interplay between diet, hormones and immune function in control of carotenoid levels.

8th April 10.25-10.50 (Rosalind Franklin Room)

**Androstenes in human axillary odour reveal mate availability,
not mate quality**

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Body odour influences human mate preferences, but we do not know the chemical basis of such effects. However, one possible candidate is the family of 16-androstene compounds, which are known to produce physiological and behavioural effects in humans, as well as in other mammals. In our study, we tested whether individual variation in expression of androstene compounds predicts variation in other phenotypic indicator traits, but found no evidence that they predict mate quality. However, individual odour profiles were associated with mated status, with odours comprising relatively high proportions of androstenols and androstenones and low proportions of androstadienones being characteristic of unpartnered men. In perceptual tests, axillary odours characteristic of unpartnered men were preferred over odours characteristic of partnered men, and artificial mixtures mimicking odour of unpartnered men induced more proceptive responses in women. Our results suggest that androstenes reveal mating relevant cues of a different kind to that previously believed.

8th April 11.20-11.45 (Rosalind Franklin Room)

Kin effects on women's progression to 2nd births in the United Kingdom: The role of fertility desires

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In high income, low-fertility settings, recent research demonstrates that kin affect women's birth timings and progressions, similarly to natural fertility settings, suggesting that even in this context women perceive kin support as necessary to successfully raise children. We use Millennium Cohort Study data from the UK to further investigate kin influences on fertility by, first, testing whether specific investments from kin (financial support and childcare provisioning) influence fertility, and second, testing the hypothesis that women's fertility desires may interact with kin measures such that kin help women achieve their fertility desires. We measure kin presence by women's parents' survival status and, measure specific kin investments by whether the women's parents provided financial support or childcare provisioning. Women entered the data set at the birth of their first child, and we used event history analysis to analyze the timing of the second birth. The specific investments of maternal kin have no statistically significant effect on the outcome and in fact, there is some evidence that financial support from parents may actually relate to slower birth progressions. We also find that, contrary to our hypothesis, maternal grandmother presence relates to accelerated birth progressions for women who do not want children, while having no statistically significant effect on women who do want children. Our results allow for a discussion of how kin may affect women's fertility, whether through practical help, pro-natal cues or simply through shared genes or shared environments.

8th April 11.45-12.10 (Rosalind Franklin Room)

An application of a reproductive skew models to human marriage and kinship: The case of southwestern China

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We apply ESS models developed to examine co-operation and conflict in communal breeders to model human kinship systems. We use models to predict the patterns of effort put into competition between generations and between siblings in conflict over family resources. Co-resident kin do not necessarily emerge with equal shares of the cake in terms of reproductive output. Who wins in the sharing of reproduction depends not just on which sex disperses but also on the relative competitive ability of all individuals to exploit family resources. Whether younger or older individuals benefit depends not just on residence patterns but also in part on whether male or female competition is more important. Marriage system also has a big impact on the level and nature of conflict predicted, showing the potential benefits of monogamy. We illustrate the models through examples from the literature to support predictions about monogamy vs polygyny. We use our own data from our own study of the matrilineal Mosuo of southwestern China to examine conflict and co-operation between siblings. Our data support the model predictions that older sisters have more offspring than do younger sisters, whereas they also work harder in the fields. Anthropologists have long argued that cultural norms can reduce conflict. These formal evolutionary models help us to quantify the effects of reproductive conflict in families, throwing light on the evolutionary basis not just of patterns of reproductive scheduling, but also human kinship and marriage systems.

8th April 12.10-12.35 (Rosalind Franklin Room)

Inter-generational conflicts over reproductive decisions: A cross-cultural examination of parental presence effects on age at first birth

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Evolutionary theoretical models suggest the importance of intergenerational conflicts in household decisions about resource allocations. Parents may improve their children's reproductive success by reducing grandchild mortality, but they may reduce it by delaying their children's reproductive onset. While the former has been documented cross-culturally, the latter has only been shown robustly in post-demographic transition settings. Using data from over 20 societies – the majority of which are small-scale, pre-industrial, and natural fertility – we test the effects of parental presence on reproduction. We find that parental presence delays age at first birth for daughters, but not sons. There is significant cross-cultural variation in this regard; parents delay first births most in post-industrial contexts and least in foraging-horticultural contexts. Furthermore, parental delays are smaller in ambilocal societies than in matri- or patrilocal ones. These patterns are consistent with at least two pathways of parental influence on age at first birth: 1) the older generation may win conflicts over limited household labor and resources that can be used towards reproduction and 2) parents may encourage children to invest in skill acquisition at the expense of early reproduction, especially in societies where these are more important.

8th April 12.35-1.00 (Rosalind Franklin Room)

Is kinship a schema? Exploring the evolutionary origins of the kinship system

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Human kinship systems, and their associated terminology, are universal and adopted into the individual's worldview at a young age. However, the evolutionary origins of this system have not been explored. Further, the human social network is significantly larger and more complex than our nearest relatives and we are capable of carrying out complicated feats of social cognition despite a limited working memory. We report on a series of studies which test the hypothesis that the kinship system evolved as a schema which reduces the cognitive load of maintaining kin relations, allowing the freeing up of processing power and the expansion of the human social network. Using response time as a proxy for cognitive load we asked participants (n (Study 1)=360 n (Study 2)= 256) to take moral dilemma decisions concerning 12 friends and relatives from across three layers of their social network, those representing the 15, 50 and 150 layers. We present replicated data which supports our hypothesis. Decisions concerning relatives take significantly less time than friends although we have evidence in the outermost layer of the active network (the 150 layer) that where participants refuse to help their relative the schema is being consciously overridden leading to a significant difference in response time in favour of the friends within this layer. We argue that this phenomenon is due to the need to consciously assess the possible repercussions from the wider kin network of refusing assistance to a fellow kin.

8th April 3.00-3.25 (Rosalind Franklin Room)

Extrinsic mortality risk and health behaviour: Observational and experimental evidence

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Evolutionary theory predicts a shortening of time horizons, including reproductive ones, in response to high mortality risk. This prediction is supported by empirical evidence. A related theoretical model (Nettle, 2010) predicted that extrinsic, but not intrinsic, personal mortality risk should alter the payoff from investment in health protection behaviours. The model also predicted that socioeconomic disparities in health behaviour could be caused by differential exposure to extrinsic mortality risk, driving reduced investment in health. We present observational and experimental tests of these predictions. Initially, we surveyed North American adults for reported investment in health, perceived personal extrinsic and intrinsic mortality risks, and measures of socioeconomic status. We found that reported health effort was robustly associated with perceived extrinsic mortality risk. Furthermore, the association between socioeconomic status and health effort was entirely mediated by perceived extrinsic mortality risk. In subsequent online and field experiments, we demonstrated that intrinsic mortality and longevity primes can be used to shift preferences from an unhealthy food reward towards a healthier alternative. Our findings demonstrate the importance of making the distinction between extrinsic and intrinsic mortality. Prior investigations have focussed primarily on the effect of mortality risk on reproductive scheduling. We emphasize that mortality risk should affect a larger range of behaviours involving current versus future trade-offs, including health behaviours.

8th April 3.25-3.50 (Rosalind Franklin Room)

Father absence and age at first birth: What can a review of the cross-cultural evidence tell us about what fathers do for their children?

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There is a large literature on father absence, which demonstrates that children with absent fathers frequently have different reproductive outcomes in later life compared to those with fathers who were present throughout childhood. Several hypotheses have been proposed to explain these findings. The role of fathers varies considerably between populations: both direct and indirect paternal investment can take various forms, and the presence or absence of fathers in childhood has also been argued to be a useful indicator of both (1) the adversity of the environment, and (2) mating strategies common to the population. In order to tease apart these different hypotheses for how fathers may influence their children's subsequent reproductive behaviour, we review the existing literature on whether and how father absence or presence influences their children's age at first birth. We find that studies of WEIRD (Western Educated Industrialised Rich and Democratic) populations consistently show that father absence leads to earlier first births in girls. The evidence for boys is more limited, but suggests a broadly similar pattern of accelerated first births for boys in father absent households. Studies in less well nourished populations, however, show a more variable picture, with father absence sometimes accelerating first births but more often delaying offspring's age at first birth, especially for boys. We conclude that father absent effects are context-specific and that no single hypothesis can be used to explain all findings.

8th April 4.20-4.45 (Rosalind Franklin Room)

Adaptive memory for inconsistent behaviour in social scenarios

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Research has suggested that humans show preferential memory for cheaters in social contracts. Alternatively, humans may show preferential memory for rarer behaviour in an environment, regardless of whether this cheating or cooperating. In previous experiments, participants were presented with targets who were either cheaters or co-operators, but this is unlikely to reflect the real environment where individuals' behaviour is more flexible, cheating on some occasions and cooperating on others. We present results suggesting, when cognitive load is high, rather than showing preferential memory for cheaters or rare behaviour people show preferential memory for inconsistent behaviour. Experiments 1&2 displayed targets that cheated 10, 20, 40, 60, 80 or 90 per cent of the time. The participants were best able to discriminate between the most inconsistently behaving targets and were most accurate recalling the number of times targets had cheated for targets who behaved inconsistently (i.e. targets that cheated 60% and 40% of the time). Experiment 3 displayed fewer targets to examine how demands on memory load affected the results. The results showed increased memory for those targets that cheated the most. We argue when cognitive demand is low individuals who show greatest cheating behaviour are better remembered, however, as demand on memory increases relying on memory becomes difficult and people adopt a heuristic of using immediately preceding behaviour as an indicator of subsequent behaviour. This strategy can only be deployed for individuals who behave consistently and therefore memory has to be deployed for those individuals who are inconsistent.

8th April 4.45-5.10 (Rosalind Franklin Room)

What affects the affect heuristic? An evolutionarily informed proposal

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Traditionally, models of judgment and decision-making started from the assumption that people carefully evaluate the pros and cons of several alternatives and then select the option that serves their best interests. Several considerations and however have undermined this rational choice model. Moreover, in experiments people do not always choose what is best for them, nor do they arrive at their decisions on the basis of a reflective, rational exercise. Instead, their choices turn out to be mostly guided by implicit decision rules, called heuristics, which act fast and automatically in response to specific ecological cues. One important finding that has effectively challenged the rational model is that individuals tend to respond quickly to a particular phenomenon on the basis of a negative or possible feeling without the intervention of any reflective thought. This automatic response has been labelled the “affect heuristic”, which has turned out to be fruitful concept with applications in a broad range of domains. Generally, researchers acknowledge the evolutionary origins of the heuristic, but these considerations seem to play almost no part in their actual research. However, it is unclear how a heuristic with such a broad applicability could have evolved. Instead, we propose that the phenomena that have been traditionally classified under the broad umbrella of the affect heuristic are in fact the result of different domain-specific mental mechanisms. We will illustrate this point by discussing some examples and indicate how research on the affect heuristic might benefit from a more consistent evolutionary approach.

8th April 5.10-5.35 (Rosalind Franklin Room)

The impact of competition on utility estimates in social interactions

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Competitive interactions between individuals occur frequently and are an essential part of human life. In such interactions, individuals frequently make non-optimal decisions, showcased particularly in auctions. Here, individuals overbid the previously unknown common value of a good resulting in the so-called winner's curse.

Explanations usually invoke emotional components like arousal to explain this phenomenon. We investigate an alternative possibility derived from cultural evolutionary theory. Under this perspective, information transmitted via competitors' bids is taken as a valid signal for the common value and influences directly individuals' utility estimates. That is, we experimentally test how the strength of competition in an auction not only affects bidding behaviour but also underlying perceived utility for auction items. For this, participants bid in a repeated all-pay auction game for five different real items.

Crucially, participants had to rank the auction items according to their utility before and after the experiment. When mapping auction dynamics to changes in utility rankings, we find that low competition reduces utility whereas high competition increases utility. Our findings thus support the view that competitors' bids in auction games are perceived as valid social signal for the common value of an item. The findings extend our understanding of social information processing and index competition as a potentially important modulator of cultural transmission.

8th April 5.35-6.00 (Rosalind Franklin Room)

Humans punish to create equal outcomes

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During social interactions, humans willingly pay a cost to punish cheating partners. This behaviour has been shown to promote cooperation. Extensive evidence suggests disadvantageous inequity aversion is an important motivator for punishment. Disadvantageous inequity aversion describes the disutility associated with experiencing lower payoffs than others. However, it is not clear whether the goal of punishment is to create equal outcomes, or alternatively, that punishment simply fulfills the desire to relieve the negative emotions associated with experiencing inequity. We used a two player experimental game to disentangle these two possible functions of punishment. Depending on the treatment, interacting with a cheating partner resulted in either advantageous inequity, equal outcomes or in disadvantageous inequity. In contrast to another recent study, we showed that in the absence of inequity, punishment was triggered by loss aversion alone. We also found that when players experienced disadvantageous inequity; punishment was often used even if it did not affect the distribution of their earnings. This suggests that inequity aversion was not the only motivation for punishment. When, however, players experienced disadvantageous inequity and punishment use did alter the distribution of their earnings, the most popular amount to invest in punishment was the amount that created equal outcomes. Thus, although inequity aversion was not the only motivation for punishment, when players experienced disadvantageous inequity, they typically used the amount of punishment that was required to create equal outcomes as guide to how much they should invest in punishment.

8th April 4.20-4.45 (The Annexe)

What can cross-cultural correlations tell us about human nature?

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Many recent studies in the field of evolution and human behaviour have tested hypotheses by examining correlations between group-level (e.g., country, state, region) variables. Variables collected for each aggregation are often taken to be representative of the individuals present within them, and relationships between such variables are therefore presumed to reflect individual-level processes. There are several reasons to exercise caution when extrapolating from the macro- to the individual-level. We describe four issues that present substantial obstacles to drawing inferences about individual level processes from analyses conducted at the aggregate level. These are (1) the ecological fallacy, whereby relationships apparent at the aggregate level do not accurately represent individual level processes; (2) the use of unequal sample sizes, which gives undue weights to aggregations comprised of smaller number of individuals; (3) non-independence of data points, which violates the assumptions of inferential techniques associated with null hypothesis testing; (4) cross-cultural non-equivalence of measurement (differences in construct validity between groups). We provide examples of how each of these can create problems in the context of testing evolutionary hypotheses about human behaviour, and discuss potential solutions to where they exist.

8th April 4.45-5.10 (The Annexe)

Integrating genomic data in the research on evolution and human behavior

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Within the last 10 years, the data bases providing human genome data have been tremendously increasing and most of these databases can be accessed completely free. For instance, the complete in depth sequenced genomes of several hundred individuals from different populations have been published by the “1000genomes” project (www.1000genomes.org/). This holds also true for the recent published DNA sequence data of Neanderthals and Denisovian as well as for our closest “primate relatives”. Additionally an increasing number of genome wide association studies (GWA) has been published identifying genes and genomic variations that contribute to human behavioral variation. Both the growing number of data bases of human and primate genomic variation and GWA studies provide the possibility to estimate “selection pressures” on the level of DNA sequences using a variety of well-established statistical tools from population genetics. Here we aim to demonstrate on the example of the human Oxytocyn (OXTR), Vassopressin (AVPR1a) and Dopamin DRD1- DRD4) receptor gene “family”, how to make use of human genome data bases, GWAs and population genetic tools for estimation selective pressures on human behavioral traits. We assume that integrating genome data in the design of behavioral experiments (as has been successfully demonstrated in the case of human cooperation) in addition to the very fast developments in human and primate genetics will soon lead to a more profound understanding of the evolutionary forces shaping human behavior and human adaptation.

8th April 5.10-5.35 (The Annexe)

On the theory of cultural genealogies

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The mathematical study of genealogies has yielded important insights in population biology, such as the ability to estimate the time to the most recent common ancestor (MRCA) of a sample of genetic sequences or a group of individuals. Here we introduce a model of cultural genealogies that is a step toward answering similar questions for cultural traits. In our model individuals can inherit from a variable, potentially large number of ancestors, rather than from a fixed, small number of ancestors (one or two) as is typical of genetic evolution. We first point out that, for any sample of individuals, a cultural common ancestor does not necessarily exist. We then introduce a more general concept: the most recent ultimate ancestor (MRUA), i.e., the most recent individual who is the original source of information for a cultural trait. We show that, under neutral evolution, the time to the MRUA can be smaller or staggeringly larger than the time to MRCA in a single ancestor model, depending on the average number of ancestors per individual. Our results suggest that culture-specific population processes are important for the construction and interpretation of cultural phylogenies.

8th April 5.35-6.00 (The Annexe)

Male homosexual preference: Where, when, why?

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Male homosexual preference (MHP) has long been of interest to scholars studying the evolution of human sexuality. Indeed, MHP is partially heritable, induces a reproductive cost and is common. MHP has thus been considered a Darwinian paradox. Several questions arise when MHP is considered in an evolutionary context. At what point did MHP appear in the human evolutionary history? Is MHP present in all human groups? How has MHP evolved, given that MHP is a reproductively costly trait? These questions were addressed here, using data from the anthropological and archaeological literature. Our detailed analysis of the available data challenges the common view of MHP being a “virtually universal” trait present in humans since prehistory. The conditions under which it is possible to affirm that MHP was present in past societies will be discussed. Furthermore, using anthropological reports, the presence or absence of MHP was documented for 107 societies, allowing us to conclude that evidence of the absence of MHP is available for some societies. A recent evolutionary hypothesis has argued that social stratification together with hypergyny (the hypergyny hypothesis) are necessary conditions for the evolution of MHP. Here, the link between the level of stratification and the probability of observing MHP was tested using an unprecedented large dataset. Furthermore, the test was performed for the first time by controlling for the phylogenetic non-independence between societies. A positive relationship was observed between the level of social stratification and the probability of observing MHP, supporting the hypergyny hypothesis.

9th April 10.00-10.25 (Rosalind Franklin Room)

Community level education accelerates the cultural evolution of fertility decline

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Explaining why fertility declines as populations modernize is a profound theoretical challenge. It remains unclear if the fundamental drivers are economic or cultural in nature. Cultural evolutionary theory suggests that community-level characteristics, such as average education, can alter how low fertility preferences are transmitted and adopted. These assumptions have not been empirically tested. Using data from 22 high fertility communities in Poland, I show that community level education accelerates fertility decline in a way that is neither predicted by individual characteristics, nor by the level of economic modernization in a community. Fertility converged on a smaller family size as average education in the community increased – indeed community level education had a larger impact on fertility decline than did individual education. This convergence was not driven by educational levels becoming more homogenous, but by less-educated women having fewer-than-expected children, and more highly-educated social networks, when living amongst more highly-educated neighbours. Average education in a community may influence the people women choose to interact with, both within and beyond their immediate social environments, altering the reproductive norms they are exposed to. Given a critical mass of highly-educated women, less-educated neighbours may adopt their reproductive behaviour, accelerating the pace of demographic transition. Individual characteristics alone cannot capture these dynamics and studies relying on them may systematically underestimate the importance of culture in driving fertility declines. The results suggest that rational optimization of reproduction is partly driven by cultural dynamics beyond the individual.

9th April 10.25-10.50 (Rosalind Franklin Room)

Triumph of monogamy? Multiple spouses do not increase reproductive success in contemporary Finland

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Sexual selection theory predicts that males benefit more than females from having multiple partners. The variance in the number of mates and offspring is expected to be greater, and the correlation between mating success and number of offspring stronger, in males relative to females (Bateman 1948). However, monogamy is also predicted to favour reproductive success if e.g. paternal investment or the costs of divorce and repartnering are high. The few existing studies on the effects of serial monogamy on fitness in contemporary societies have confirmed Bateman's predictions, however they all lack data on cohabitations. Here we explore sex differences in reproductive success (i.e., numbers of children) and mating success, measured as the cumulative number of married/cohabiting spouses. The data is from Finnish registers featuring detailed information on 276,270 adults born in 1930-80, their spouses, children, and socioeconomic indicators, analysed with linear regressions. Results show that the sex ratio of variances in numbers of children were 1.01 and in numbers of spouses 1.10 ($p<0.001$). Multiple spouses were not associated with higher fertility in men or women. For both sexes, one spouse was optimal with a predicted means of 1.99 children for men and 2.05 for women, followed by a slight decrease with subsequent spouses to 1.76 children for men and 1.89 for women who had three or more spouses. This study suggests that men living in a developed and egalitarian contemporary society do not gain additional children by having more spouses. We discuss possible socioecological explanations for the negative Bateman gradient.

9th April 11.20-11.45 (Rosalind Franklin Room)

The ease and extent of recursive mindreading

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Recursive mindreading is the ability to embed mental representations inside other mental representations e.g. to hold beliefs about beliefs about beliefs. Given the importance of sociality in human cognitive evolution, we might expect that humans are able to recursively mindread to many levels of depth. Indeed, high levels of recursive mindreading are argued to be involved in several distinctive human behaviours and institutions, such as communication, religion, story-telling, and culture. However, despite this central role in human life, a wealth of research on first-level mindreading under the term Theory of Mind, and the clear adaptive benefits of recursive mindreading, the full extent of the human ability for recursive mindreading is not known, in part because previous research has significant methodological flaws. I will present experimental research that shows that this ability is far more advanced than has previously been assumed or shown. Specifically, I will show that humans are able to mindread to at least seven levels of embedding, both explicitly, through linguistic description, and implicitly, through reading social interactions. This ability is likely an adaptation to the demands of social living.

9th April 11.45-12.10 (Rosalind Franklin Room)

Language evolution bypasses the collective action paradox

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Humans are unique among animals in their propensity to cooperate with non-kin in large groups. This trait is thought to be instinctive, and based on an inherited preference towards reciprocity, fairness, and in-group support. The origin of this behaviour is a conundrum as cooperation with non-kin on large scale is invariably at risk of freeriding (a problem known as the public goods dilemma or collective action paradox). Hitherto, research on this topic has been concerned mainly with how the collective action paradox is resolved either spontaneously, via peer or pool punishment, via reputational mechanisms, or via costly communication signals. A major problem, however, has been that it is not clear how the human propensity to form the groups that produce public goods from the costly contributions of the individuals evolved the first place. Here we introduce a model of collective action based on behavioural synchrony, which uses behavioural synchronisation on structured social networks, to show that communication efficiency provides a natural pathway to the evolution of costly cooperation among unrelated individuals. We show that this process is especially likely to take place if the coordination method that facilitates the group's collective action is language-like. Our model sheds a new light on the evolution of human cooperation, for the first time showing that the emergence of language and the human propensity to cooperate must have co-evolved, thereby providing a mechanism whereby the extraordinary human propensity to cooperate with non-kin evolved.

9th April 12.10-12.35 (Rosalind Franklin Room)

Systematicity is triggered by semantic proximity not density

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A representational system exhibits systematicity if similar meanings are expressed by similar signs. In language, systematicity can be morphological ('dog' and 'dogs') or not ('shirt' and 'skirt'). One of the key questions in the origins of language is what drives the development of systematicity (Kirby, Cornish and Smith 2008). One potential driver for systematicity is semantic crowding: the more distinctions needed in conceptual space, the more likely signs will develop overlapping structure. We tested this hypothesis in an experiment in which participants pairs communicated 18 concepts back and forth to each other, using a vector graphics drawing tool. The 18 concepts were 6 groups of 3 related meanings. The final signs drawn by participants showed more similarity within meaning-groups than between them. The semantic crowding explanation, however, needs further refinement. Is it the density, i.e. number of meanings in the area, or the proximity, i.e. that the meanings are close to each other? We performed another experiment in which the semantic groups each contained 2 concepts before being increased to 3. We found the in-group similarity similar for both sizes of group, supporting a semantic proximity rather than semantic density trigger for systematicity. Our conclusion is, therefore, that the number of concepts to communicate is not the trigger for shared representational structure. Instead, it is the semantic similarity of those concepts. This concurs with animal findings in which Diana monkeys interpret spaces with as few as 4 signs as exhibiting structure sharing (Zuberbuhler 2002).

9th April 12.35-1.00 (Rosalind Franklin Room)

Functional complexity without cultural evolution: The case of cardinal lines in writing systems

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It is often assumed that technologies owe their functional features to the influence of cultural selection. This hypothesis has been used to explain the fact that, in many cultures, writing systems are designed to exploit our visual biases. This assumption has not been tested, and there are reasons to doubt it. Many scripts are idiosyncratic inventions or 'frozen accidents'. Others change for reasons that have little to do with visual appeal. Yet previous research on letter topology shows that scripts all over the world are efficiently designed. Did they evolve to catch our eye? This paper addresses the issue by investigating a new aspect of the visual appeal of letters: the dominance of horizontal and vertical (i.e. cardinal) lines. Vision in humans and most other vertebrates is affected by orientation anisotropy: cardinal orientations are easier to process. We show that the orientation of letter traits, in 116 writing systems, massively favours these directions. The bias is organized in such a way as to make letter recognition easier. Cardinal and oblique traits tend not to mix inside a given letter: pure cardinal letters (like 'E') or pure obliques (like 'W') are much more common than chance would allow. Cardinal dominance increases with the number of characters used in scripts, thus adjusting the readability of letters to the risk of confounding. This set of complex, functional traits is unlikely to be a result of the last 3000 years of cultural evolution, having been forgotten and reinvented many times during that period.

9th April 3.00-3.25 (Rosalind Franklin Room)

Rapid cerebellar expansion as the basis of human cognitive evolution

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Most accounts of the neural basis of cognitive evolution focus on the expansion of the forebrain, particularly the neocortex, in lineages such as primates. The cerebellum, however, contains about four times more neurons than the neocortex, has complex cognitive and learning functions, and yet has been largely ignored by comparative studies. We show that the cerebellum underwent explosive directional size increase in the great apes, including hominins, and expanded more rapidly than the neocortex. These results suggest that cerebellar specialization was a far more important component of human brain evolution than hitherto recognized, that it started early and proceeded rapidly in parallel in separate great ape lineages reaching its greatest extent in humans, and that technical intelligence was likely to have been at least as important as social intelligence in human cognitive evolution. Given the role of the cerebellum in sensory-motor control and learning complex action sequences, our results suggest an ancient origin for humans' technological capacities and, congruent with recent evidence for overlap between brain areas involved in tool making and speech, a possible cerebellar contribution to language evolution

9th April 3.25-3.50 (Rosalind Franklin Room)

Pushing the limits: Natural selection favours taller stature among the tallest people on earth

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The Dutch are the tallest people on earth. Over the course of the last 200 years, they have gained 20 cm in height: a rate of increase that points to an environmental cause. This secular trend in height is echoed across all Western populations, but seems to have come to end, or has at least levelled off, in every population apart from that of The Netherlands. Could it be that natural selection also promotes tall stature among the people of the lowlands? Using the LifeLines study, which follows a large sample of the population of the north of the Netherlands (N=94,516), we examined how height was related to measures of fitness. Across four decades (1935-1975), height was consistently related to the number of children, favouring taller men and slightly above average height women. This was despite the later age at first birth for taller individuals, and the later menarche of taller women. Furthermore, even in this low-mortality population, taller women experienced higher child survival, which contributed positively to their increased reproductive success. State-of-the-art genomic analyses, taking into account the relatedness of 'unrelated' people (i.e., the overlap in SNPs between individuals), shows that the association between height and fitness is partly genetic, implying actual evolution of increased height in this population. These findings stand in stark contrast to US populations, where shorter height seems favoured by natural selection. The Dutch are famous for their height, and here we show that their extreme height may well be a consequence of natural selection.

9th April 4.20-4.45 (Rosalind Franklin Room)

Do grandparents substitute parental investments? Contact with grandmothers reduce maternal direct investments, while financial assistance from paternal grandparents increase paternal direct investments in the UK

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Grandparents are often identified as allomothers across cultures, where they provide direct and indirect investments to help rear children in a cooperative breeding system. Recent studies in traditional populations suggest that allomothers may substitute direct care, allowing mothers to invest more in subsistence activities, or substitute subsistence activities, allowing mothers to invest more in direct care. However, this should be contingent on how "substitutable" the investments are, in that some behaviours such as breastfeeding are restricted in their substitutability. So far, previous research on grandparent effects on investments have focused on maternal investments in subsistence societies. Here, we explore the effects of grandparents on maternal and paternal direct investments in the UK. Following previous research, we predict grandparent direct help to decrease maternal and paternal direct investment behaviours, and grandparent financial assistance to increase maternal and paternal direct investment behaviours. We use the Millennium Cohort Study to investigate how grandparental contact frequency and financial assistance affects maternal breastfeeding, maternal parenting and paternal parenting. Generally in line with predictions, we find that frequency of contact with maternal and paternal grandmothers predict lower rates of breastfeeding initiation and breastfeeding length, frequency of contact with paternal grandfathers predicts lower levels of maternal parenting, and financial assistance from paternal grandparents predict higher levels of paternal parenting. We discuss potential reasons behind why certain grandparents affect maternal and paternal direct investments differently, and comment on the substitutability of various investment behaviours in the UK.

9th April 4.45-5.10 (Rosalind Franklin Room)

Contemporary and historical evidence to suggest that women's preference for age at birth of first child remains consistent across time

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Women's ability to reproduce is restricted by menarche and menopause. First children are however not typically born until some years after the onset of puberty. Other factors therefore contribute towards this delay. In this context women's hips do not reach full adult form until they are in their mid-20s. Therefore, physiological and morphological factors appear to determine an optimum age-range for reproduction. The following studies were conducted in order to investigate this hypothesis. Study 1 asked nulliparous women questions about ages at which particular life events related to reproduction should ideally occur. This revealed their preferred age at birth of first child to be approximately 27 years old. Study 2 replicated these findings and further showed that women with children actually had their first child at a very similar age [27.93(+0.79)]. Findings from Study 3 were also remarkably consistent [28.15 (+0.39)]. Study 4 examined the 1901 UK Census record and incorporated an analysis of the influence of wealth. Middle class women were on average 24.88 (+ 0.22) years old at the birth of their first child. Poor women were on average 23.50 (+ 0.20) years old. These figures at least approximate to findings from Studies 1-3, which is noteworthy given that modern contraceptive methods were not widely available at the time. It is concluded that female strategies to delay giving birth to their first child until they are of an age that approaches or coincides with their full hip maturation are enduring across time.

9th April 5.10-5.35 (Rosalind Franklin Room)

Ecological effects on timing of first birth in Northern Ireland

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Life history theory predicts that extrinsic mortality should favour younger ages at first birth. In developed countries lower socioeconomic status (SES) and higher area deprivation are strongly associated with earlier onset of reproduction. However, other important ecological cues that might be related to deprivation are rarely explored directly. Here we attempt to tease apart different aspects of the local ecology on the probability of early first birth by testing the effects of local “unpreventable” mortality rate, morbidity, crime and the operational sex ratio (OSR). Using data from the Northern Ireland Longitudinal Study we run Cox models for progression to first birth among 14-23 year olds, whilst adjusting for differences in individual SES, family structure and other potential confounders. We find that ward level “unpreventable” mortality rate, morbidity and crime strongly and independently increase the risk of birth, while male biased OSR decreases risk of birth. The ecological effects were attenuated after individual SES was adjusted for, but young people residing in areas with the highest level of unpreventable mortality still have higher risks of birth than their peers in areas with the lowest mortality levels. Results suggest that although individual SES accounts for a large proportion of the variation in risk of early birth, it is vital to also consider the role of ecological factors.

9th April 5.35-6.00 (Rosalind Franklin Room)

Do health inequalities predict population-level abortion behaviours?

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London School of Hygiene and Tropical Medicine

UK research shows that aggregate- and individual-level socioeconomic deprivation predicts lower likelihood of pregnancy termination and greater related stigma. Both life history theory and demographic transition theory propose that fertility responds to changes in mortality, with established population-level links. Controlled experiments show that people faced with cues of mortality express increased/accelerated fertility preferences and reduced support for birth control policies. Health inequalities might mean that poorer people experience decreased motivation to terminate pregnancy when young, as proposed by the 'weathering hypothesis'. Do area-level morbidity and/or mortality then predict abortion patterns, particularly for those under 25, for whom termination may be seen chiefly as a means of fertility postponement? Associations between ward-level mortality (life expectancy) and morbidity (age-standardised long-term limiting illness prevalence) and the proportion of conceptions ending in abortion were tested, using data centred on 2001 for England and Wales. Adjusting for ward-level education, housing tenure, income, unemployment, and population density, elevated mortality and morbidity significantly predicted lower abortion proportion in the under-25 age band as predicted; and higher abortion proportion in older age bands (except for morbidity in the 35 and over age band). Investigation of marginal effects show very small effect sizes. Akaike's Information Criterion indicates that although for the under-25 age band the model using just morbidity and covariates offers best fit, models are virtually indistinguishable. For other age bands, the covariate-only models have the best fit. Interpretation is made in the light of ecological fallacy.

9th April 4.20-4.45 (The Annexe)

Economic games as measures of co-operation in different kinship systems in southwestern China

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Kin selection is one of the key mechanisms for the evolution of cooperation, but few researches have examined the role kin selection play in cooperative behaviour in real world settings. According to Johnstone and Cant (2010), different dispersal patterns determine different resident pattern, thus leading to different relatedness for an individual to his/her household, which gives us a frame work of comparing different kinship system. In this study, we used multiple games (e.g. dictator game, public goods game, gift game) and examined ecological and kinship determinants to investigate variation of cooperative behaviour in matrilocal and patrilocal household in different ethnic groups in south western China, two resident patterns with female dispersal for one and no dispersal for the other. We find the correlation of relatedness for an individual to one's household and individual's cooperative behaviour in multiple games differs in matrilocal and patrilocal household for females and males respectively, which shows that kinship system determines who would like to cooperate with whom more.

9th April 4.45-5.10 (The Annexe)

Large-scale bonding through shared traits

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University of Oxford

Traditionally humans have belonged to small social networks, and have evolved characteristics that allow engagement with approximately 150 people. However, in an increasingly globalised world it is important to identify with larger groups, and reputation helps determine when strangers can be trusted. Here we examine whether shared traits are used as a heuristic to determine who is part of ones network, and is therefore trustworthy and more likeable (i.e. homophily). Using online studies in which participants interacted with similar or dissimilar strangers we have identified three properties of homophily suggesting it can help create communities. The first is that some traits (e.g. musical taste, religion) act as more reliable predictors of homophily than other traits, such as occupation. Secondly we demonstrate that traits relating to more exclusive groups evoke more homophily; more inclusive groups (i.e. when traits are shared by large numbers of people, e.g. interest in pop music) do not demonstrate homophily. Finally we show that despite exclusivity being important, people dramatically overestimate how rare their own traits are. When explicitly told how much traits are shared with others homophily no longer occurs; homophily is recovered when people are told they share traits with less than five other people. Homophily is a useful way to harness social identity to encourage individuals to identify with one another, but may rely on people's belief in their uniqueness. Despite human's evolved capacity for socialising with small networks we can engineer community in a global world through identification with abstract group categories.

9th April 5.10-5.35 (The Annexe)

The transition from leadership to despotism in Neolithic human groups

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The Neolithic was marked by a transition from small and relatively egalitarian groups, to much larger groups with increased social stratification. Yet, the question of how leadership and stratification co-evolve with increased group size has been largely unaddressed by formal modelling. Here we present a cultural evolution model that explains both why individuals would initially choose to follow a leader, and why despotism would increase under the ecological conditions of the Neolithic. We assume groups face coordination problems which, if resolved, allow for the production of surplus resources. This can raise carrying capacity. But as group size increases, successful coordination becomes less likely without a leader. We then model evolution of three traits: 1. whether the individual chooses to follow a leader; 2. how much of the surplus the individual will let its leader keep for itself (despotism threshold); 3. when in the leader role, how much of the surplus the individual will keep for itself. If an individual's leader takes more resource than its despotism threshold, then the individual disperses to a different group. However, dispersal is costly. We show that a preference for following a leader can readily evolve when surplus production increases carrying capacity. If dispersal costs are low then much of the surplus is shared with followers, leading to relatively egalitarian groups. However, as dispersal costs increase leaders divert more of the surplus into their own reproduction, creating marked stratification. Because dispersal costs likely increased with agriculture, this can explain the increased despotism during the Neolithic.

9th April 5.35-6.00 (The Annexe)

Pathogen stress and collectivistic institutions governing cooperation

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Regional variation in historical pathogen prevalence is known to correlate with the level of collectivism of the regions. This is argued to be evidence of that collectivism is an adaptive cultural value system promoting group-level cooperation for preventing infectious diseases (Fincher et al, 2008). However, Hruschka & Henrich (2013) found that the effect of pathogen stress on the collectivism disappeared when controlling the effectiveness of government institutions, which negatively correlates with the level of collectivism. This study raises a doubt to the argument that cultural variation on collectivism-individualism is adaptive response to ecological environments. In this study, we argue that both studies capture different parts of the truth and found that collectivistic form of cooperation, not collectivism per se, is correlated with the regional variation in pathogen prevalence even after controlling the effectiveness of government while the latter is correlated with individualistic form of cooperation, not individualism per se, after controlling pathogen stress. Yamagishi (2011) suggested that cooperative society takes one of the two different forms – one based on non-centralized mutual monitoring and punishment system and the other based on modern centralized authority cultivating general trust to the people. We obtained two sets of items representing two forms of cooperation from cross-cultural surveys and found that the regional prevalence of pathogens had a significant effect on the former but the government effectiveness had on the latter after controlling each other. Our results support the hypothesis that pathogen prevalence cultivated psychological processes underlying collectivistic form of cooperation but not so-called collectivism.

Poster Abstracts

1. The effects of extra-somatic weapons on the evolution of human cooperation towards non-kin

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Human cooperation towards non-kin is a major evolutionary puzzle, as is 'strong reciprocity' where no present or future rewards accrue to the co-operator. Here, we tested the hypothesis that the development of extra-somatic weapons could have had an important indirect effect on the evolution of distinctively human cooperative behaviour (Trivers 1971, 1985; Boehm 1999). Such weapons could have made disputes within hominid groups far more lethal and thus represented a major new threat to individual fitness. In such a cultural niche, non-co-operators might well have become involved in such disputes at a higher frequency than co-operators, thereby increasing the relative fitness of genes associated with cooperative behaviour. We employed two versions of the evolutionary Iterated Prisoner's Dilemma (IPD) model – one where weapons use was simulated and one where it was not. We then measured the performance of 25 co-operative and non-co-operative IPD strategies and found that cooperative strategies performed significantly better and non-cooperative strategies significantly worse under simulated weapons use. Importantly, the performance of an 'Always Cooperate' (AIC) strategy improved significantly more than that of all other cooperative strategies. An AIC strategy is equivalent to 'strong reciprocity' in that it never defects despite repeated defection by other players and is always prepared to inflict costly punishment on 'cheats' or non-co-operators. Its outstanding success therefore throws new light on the origins of 'strong reciprocity'. This past cultural niche might thus have favoured genes associated with distinctively human cooperation towards non-kin which would subsequently have come to be expressed in modern populations.

2. Male facial appearance and offspring mortality in two traditional societies

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It has been hypothesised that facial traits such as masculinity and a healthy appearance may indicate heritable qualities in males (e.g. immunocompetence) and that, consequently, female preferences for such traits function to increase offspring viability and health. However, the putative link between paternal features and offspring health has not previously been tested empirically in humans. Here we present data from two traditional societies with little or no access to modern medicine and family planning technologies. Data on offspring number and offspring

survival were gathered from the Agta of the Philippines and the Maya of Belize, and archive facial photographs were assessed by observers for attractiveness, healthiness and masculinity. While there was no association between attractiveness and offspring survival in either population, a quadratic relationship was observed between masculinity and offspring survival in both, such that intermediate levels of masculinity were associated with the lowest offspring mortality, with both high and low levels of masculinity being associated with increased mortality. There was weak evidence from the Maya that healthier looking men experienced lower offspring mortality while no facial traits related to fertility (offspring number) in either population. These data are not consistent with, and therefore present challenges to, current theories of female-choice in facial attraction. Consequently, further research and replication in other traditional societies should be a key priority for the field.

3. Religious-commitment signaling and impression management amongst Pentecostals: Interaction effects predict salivary cortisol but not alpha-amylase

Christopher Lynn¹ (cdlynn@ua.edu), Jason Paris², Cheryl Frye³, Lawrence Schell⁴

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Scholars have long sought to understand religio-cultural behaviors that incur non-survival costs to individuals. Costly honest religious behaviors are considered culturally relative indicators of willingness to cooperate. Religious-commitment signaling is a sub-type thought to indicate willingness to cooperate with a religious group. It follows that a desire to signal affiliation and reap concomitant benefits would lend itself to acting in socially desirable ways. Success or failure in such areas, especially where there is conscious intent, should correspond to proximal indicators of well-being, such as psychosocial or biological stress. To test this model, we assessed religious-commitment signaling and socially desirable responding among a sample of 52 Pentecostals at two churches in New York, USA, with respect to salivary biomarkers of stress and arousal on a worship and non-worship day. A religious-commitment signaling metric was assembled from questionnaire items ex post facto and used with respect to the Balanced Inventory of Desirable Responding. Results indicate that cortisol levels on worship and non-worship were significantly influenced by religious-commitment signaling when moderated by impression management, a conscious form of socially desirable responding. No significant influences on salivary alpha-amylase were detected. These findings are important for understanding how religious-commitment signaling mechanisms may influence stress response when moderated by socially desirable responding and the role

of communal orientation to psychosocial health and suggest that religious commitment practices are by-products of the evolved human tendency toward affiliative behavior.

4. The importance of descriptive versus injunctive norms in promoting cooperative behaviour in an online Dictator Game

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Human behaviour is influenced by social norms but norms can entail two types of information. Descriptive norms refer to what others do in this context, while injunctive norms refer to what ought to be done to ensure social approval. In many real-world situations these norms are often presented concurrently meaning that their independent effects on behaviour are difficult to establish. Here we used an online Dictator Game to test how descriptive and injunctive norms would influence dictator donations when presented independently of one another. In addition, we varied the cost of complying with the norm: by stating that \$0.20 or \$0.50 cent donations from a \$1 stake were normal or suggested, respectively. We found that both descriptive and injunctive norms were effective at motivating people to conform to the norm but that injunctive norms were slightly more effective than descriptive norms in this setting. As expected, people were less likely to conform to the norm when it involved giving \$0.50 than when it involved giving \$0.20. Finally, the inclusion of the word 'generous' in the norm manipulation had a large positive effect on norm compliance. These results suggest that injunctive norms may be generally more likely than descriptive norms to promote cooperation but that large effects can also be achieved by including generosity primes.

5. Sex differences in sensation-seeking: A meta-analysis

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Men consistently score higher than women on measures of sensation-seeking (defined as a willingness to pursue novel, intense experiences). This sex difference might reflect interactions between evolved psychological predispositions – related to sex-specific selection pressures – and culturally transmitted social norms that prescribe behaviour according to gender. If these gender roles have become more similar in recent years, a corresponding decline in sex differences in sensation seeking might be predicted. To test this prediction, we conducted a meta-analysis of 72 studies (323 effect sizes) that have used Zuckerman's Sensation Seeking Scale (version V, SSS-V) since the scale was introduced in 1978. Sex differences in total SSS-V scores have not diminished significantly since 1978 ($\beta = -0.002$, SE = 0.002, n.s.) nor have sex differences in the Disinhibition ($\beta = -0.001$, SE = 0.003, n.s.)

or Boredom Susceptibility subscales ($\beta = -0.001$, SE = 0.003, n.s.). Sex differences in the Experience Seeking subscale have been consistently absent. The sex difference in Thrill and Adventure Seeking, however, has declined ($\beta = -0.005$, SE = 0.002, $p = .02$). Our results indicate a stable sex difference in the general tendency to report sensation-seeking personality characteristics. However, the data on Thrill and Adventure Seeking indicate that sex differences in behavioural manifestations of sensation-seeking may vary considerably over time. We argue that, while meta-analyses provide an important tool for examining sex differences in behaviour, the results require careful interpretation, and our sensation-seeking analyses highlight the importance of integrating evolutionary psychology and social role approaches.

6. Facial dimorphism in individuals with autistic spectrum disorder symptomatology

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Baron-Cohen's extreme male brain theory proposes that autistic spectrum disorder is the consequence of elevated prenatal testosterone levels. Here we assess possible correlated effects of hypothesised androgen exposure on adult morphology, such as the development of facial features associated with masculinity. In this three-part study, we assessed correlations between perceptions of facial masculinity and autistic-spectrum quotient (AQ) scores. From a database of neutral facial photographs we created composite images capturing statistical regularities in facial appearance associated with high- and low-AQ scores. In Experiment 1, observers picked the male high-AQ image as more masculine in appearance in 69% of trials. In Experiment 2, we created a new database, used a new method of image creation, and recruited new observers. Again, observers selected the high-AQ male images as more masculine. There was no association of masculinity and AQ scores for women's faces in either study. In our final Experiment we demonstrated similar findings when additional stimuli were created from each of the five AQ sub scales.

7. Creating a communication system from scratch: Gesture beats vocalization hands down

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How does modality affect people's ability to create a communication system from scratch? The present study experimentally tests this question by having participants communicate a range of pre-specified items (Emotions, Actions, Objects) to a partner using either repeated non-linguistic Vocalization, Gesture or a combination of the two.

Gesture-alone outperformed Vocalization-alone both in terms of communication success and in terms of the creation of a common inventory of sign-meaning mappings. Combining Vocalization with gesture did not improve performance beyond Gesture-alone. In fact, for Action items Gesture-alone outperformed the Combined modality. Contrary to the biblical story of the Tower of Babel, people who do not share a system for communication can quickly create one, and Gesture is the best means of doing so.

8. Cad men: Evidence for alternative mating strategy phenotypes in both men and women

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In all analyses of mammalian mating systems, humans invariably fall midway between monogamous and promiscuous species. While there is a widely recognised qualitative division in human males between 'cads' (males who mate promiscuously and invest little in their offspring) and 'dads' (males who are more monogamous and invest paternally), these two 'phenotypes' are usually assumed to be opposite ends of the same continuum. Although an analogous distinction has sometimes been drawn for females, this is even less well researched and not widely recognised. Here we use behavioural and anatomical indices to examine the distributions of intra-sex mating strategies in two populations. Our results provide persuasive evidence for two distinct phenotypes in both sexes, with a monogamous/promiscuous ratio that approximates 52:48 in females and 43:57 in males. The presence of two phenotypes suggests that mating strategy might be under frequency dependent selection, with directional selection favouring promiscuity in males (but not females). These findings indicate that the human mating system is more complex than previously thought, and may explain why humans typically fall on the borderline between monogamy and promiscuity in most comparative analyses.

9. Testing the bond

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Social bonding is important for many organisms, including humans, to establish trust before they cooperate. But this behaviour raises the question why would two or more organisms who are about to engage in a cooperative venture waste their resources on acts of expensive bonding? Why not just cooperate? Following from Zahavi (1997), we argue that such a behaviour is a means of protecting yourself against cheating by gathering information about the intentions of your partner, and at equilibrium, can actually be a cost saving device. We present this theory as a mathematical model and offer many examples of where humans use it, focussing primarily on ritualistic warfare.

10. Stress alters facial preference

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In several species, mating preferences are context-dependent, and can be altered by environmental factors. Under stress, for example, female stalk-eyed flies and mice become less choosy, preferring to mate with a wider range of male partners. In humans, stress seems to widen men's preferences for female body shapes and increase their attraction to non-resembling faces. However, little is known about the effects of stress on women's preferences. We investigated the effect of physiological stress on facial preferences. 47 participants were randomly assigned to a cold-pressor task that induced stress ($n=23$) or a control condition which did not induce stress ($n=24$). Both groups rated the attractiveness of 30 faces, and their preference for masculinised or feminised faces. There were no differences between the conditions in the average attractiveness ratings given. However, stressed women preferred more masculine male face than unstressed women ($t[29]= 2.426$, $p=0.022$). Furthermore, there was a tendency for men who experienced worse discomfort during the task to rate female face as less attractive, whereas women who experienced worse pain rated female faces as more attractive ($F[1,16]= 3.818$, $p=0.068$). These finding suggest that under stress, women may discount the negative affordances of a masculine man and find him more attractive. Furthermore, women may find female faces more attractive as part of a tend-and-befriend response to stress.

11. The butterfly effect: The role of eyespots for aesthetics and conservation attitudes

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VU University Amsterdam

Humans are fascinated by face-like patterns in their environment. Objects that resemble a face capture human attention, elicit aesthetic responses and are considered precious or special. Eyespots, circular markings that strongly resemble eyes, are typical morphological features of several animal taxa, including butterflies. While there has been work on eye cues and human prosocial behavior, little is known about human perceptual responses to eyespots and eyespot-bearing species. We explored the effect of eyespots on: (a) aesthetic responses to butterflies of the genus *Bicyclus*, and (b) attitudes and behaviors towards the protection and conservation of *Bicyclus* butterflies. In three online experimental studies, involving 564 US participants ($M_{age}= 32.34$ years), we manipulated eyespots within-subjects (Study 1) and between-subjects (Study 2 and 3) by displaying images of spotted wing surfaces (eyespotted condition) and images of spotless wing surfaces (control condition) of *Bicyclus anynana* samples. All three studies provided consistent evidence that spotted *Bicyclus* butterflies are rated as more

beautiful than spotless (control) ones. Furthermore, spotted wing patterns positively influenced conservation attitudes towards *Bicyclus* butterflies (Studies 1 and 2). Interestingly, aesthetics mediate the eyespot effect on conservation attitudes (Study 2). We found no evidence for an association between eyespots and actual conservation behavior targeting *Bicyclus* butterflies (Study 3). We conclude that eyespots, a minimal visual cue, can serve as a potent elicitor of differential preferences for an animal species. We discuss implications for biodiversity conservation and draw attention to the role of minor features of organisms in sensitizing humans.

12. Biological constraints do not entail cognitive closure

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From the premise that our biology imposes cognitive constraints on our epistemic activities, a series of prominent authors – most notably Fodor, Chomsky and McGinn – have argued that we are cognitively closed to certain aspects and properties of the world. Cognitive constraints, they argue, entail cognitive closure. I argue that this is not the case. More precisely, I detect two unwarranted conflations at the core of arguments deriving closure from constraints. The first is a conflation of what I will refer to as ‘representation’ and ‘object of representation’. The second confuses the cognitive scope of the assisted mind for that of the unassisted mind. Cognitive closure, I conclude, cannot be established from pointing out the (uncontroversial) existence of cognitive constraints.

13. Sex ratio and contribution to a public good

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Sexual selection could possibly be implicated in maintaining cooperation, as indicated by some observations in animal species. Some studies suggested that generosity could be used in humans as a signaling strategy, and that social reputation acquired by cooperative behavior could play a major role in mate choice. We therefore suggest that cooperation could constitute a mating effort, enhancing the attractiveness of the cooperator, and that cooperative behavior with non-kin individuals evolved partly by increasing access to mates. Sequential public good games were played in groups of four players of all possible sex compositions. Men average contributions varied significantly across group compositions: men in groups of three men and one woman or two men and two women were more cooperative than men in groups of four men or three women and one man. These results suggest the existence of competitive altruism among men, in the presence of women.

14. Empirical evidence for the role of beta endorphin in the maintenance of longterm human relationships at the dyadic and group level

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The human social network is characterized by its size and complexity. We maintain relationships over long time periods with kin, friends, romantic partners and children. There has been considerable attention paid to the role of oxytocin in the maintenance of human relationships but much of this research has used inappropriate rodent-based models and cannot explain how the short-lived influence of oxytocin can maintain this range of relationships. A more appropriate model would be non-human primate. Here beta-endorphin, released as a result of social grooming, maintains relationships between group members. Its influence is decoupled from sexual intercourse or parturition and, as such, it is able to motivate individuals to maintain friendships and alliances in a range of contexts. We present data from a range of empirical studies to support the role for beta-endorphin in the maintenance of human dyadic and group relationships. Studies related to singing, dancing, exercise and laughter, using a pain proxy for endorphin release, provide indirect evidence of this phenomenon in humans. Further, we present the first direct evidence that close human dyadic interaction leads to endorphin release. Using PET we have carried out a pilot study to assess the extent of mu-opioid receptor activation during human dyadic interaction. Our data show significant activation of the ACC and ventral striatum during such interaction. We explore the implications of this study for relationship maintenance in the media age and discuss avenues for future PET-based research including the effect of group interaction and the medium of communication upon activation.

15. Mortality selection, heterogeneity, and the difficulties of measuring the rate of ageing

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The risk of death often rises with age in a well-known process called ‘senescence’. This rising risk of death can be modelled with the Gompertz function, $a \cdot \exp(b \cdot x)$, which fits mortality data quite well for many species. A curious feature of the Gompertz is that the parameters $\log(a)$ and b tend to be negatively correlated. As $\log(a)$ captures initial mortality and b captures ageing (senescence), or the rate that the risk of death increases with age, the correlation implies that when initial mortality is high the population ages more slowly. A recent hypothesis proposes that higher initial mortality removes vulnerable subsets of a population via mortality selection, leaving a more robust subset at later ages. If this is true then a model designed to account for this unobserved heterogeneity should either lower the slope of the correlation or remove it

altogether. To test this hypothesis, we fit the Gamma-Gompertz model to several populations and assess the correlation before and after accounting for heterogeneity. The steepness of the correlation is unaffected. This result led to further analysis of the mortality model. We show analytically that the correlation is actually an inherent property of the Gompertz distribution; a point further illustrated with simulations. Our conclusion is that the correlation does not have a useful biological interpretation. However, mortality selection and the lowering of mortality in recent generations likely have many as-of-yet misunderstood consequences on age-specific mortality, both within and among populations. We briefly discuss what some of these might be.

16. Paternal age effects on offspring survival and fertility as indicators of the strength of purifying selection in early Québec and Krummhörn

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Paternal age at conception has been found to strongly predict the number of new genetic mutations that offspring carry (Kong et al., 2012). A larger load of new mutations can be expected to be detrimental for evolutionary fitness and to accumulate over generations. We examined the effect of paternal age on offspring fitness. Preliminary results show robust negative effects on offspring survival to reproductive age, marriage and number of children and grandchildren. Effects replicated in historical genealogies from the rapidly expanding founding population of Québec ($N = 401.482$) and from the stable population of the Krummhörn ($N = 39.154$). The effects seem to be robust to using sibling comparisons, controlling for maternal age, birth order and parental loss.

The association between paternal age and fitness will also be discussed as a possible gauge of purifying selection under varying conditions in historical and modern times. Understanding historical fluctuations in the strength and maybe even direction of selection will shed light on the genetic architecture of traits that are assumed to have been under directional selection for a long time.

17. Partner choice drives cooperation via indirect reciprocity

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Helping those who help others provides an appealing way in which cooperative systems might work. However, image scoring presents a dilemma: individuals withholding help from those of low repute harm their own reputation, yet giving to defectors erodes cooperation. Explaining how indirect reciprocity could evolve is therefore problematic. In all previous treatments, individuals have been assigned potential recipients

and then decided whether to cooperate or defect. A second way of achieving discrimination that has not so far been considered is through partner choice. Here, I present a model in which individuals can choose to donate to anyone within their group, or to none. I hypothesized that partner choice will facilitate indirect reciprocity since individuals can now simply avoid defectors. I found that whereas partner assignment produced cycles of cooperation and defection, with partner choice there was almost maximal cooperation and almost perfect contingency. This provided the correlation between giving and receiving required for cooperation. I also present an experiment in which participants were allowed to choose any one (or none) within their group to donate to. In line with the model, I found that participants were more likely to give to those with better reputations, and that this discrimination was maintained even by those who gave frequently. I conclude that choice of recipient facilitates much higher and more stable levels of cooperation through image scoring than previously reported and provides a simple mechanism through which systems of helping those who help others can work.

18. Combining spatial and phylogenetic models of cultural variation and change

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Recent work on cultural evolution has successfully applied phylogenetic methods from biology to comparative cultural and linguistic data to test hypotheses about cultural ancestry, chronology and sequences of change. However, relatively little attention has focused on explicitly modeling a combination of phylogenetic and spatial processes of cultural change. Here I report results from collaborative research that uses tools from population genetics and phylogeography to analyze spatial information derived from a number of different comparative cultural datasets. This work identifies phylogenetic and spatial signal in the data that can be used to shed light on the drivers of human cultural variation.

19. Solidarity, synchronization and collective action

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For people to act collectively in actual situations--in contrast to public goods experiments--goal ambiguity, diversity of interests, and uncertain costs and benefits stand in their way. Under such conditions, people seem to have few reasons to cooperate, yet the Arab revolutions, as conspicuous examples, show that collective action can take place despite the odds. I use the Kuramoto model to show how people in a cohesive network topology can synchronize their salient traits (emotions, interests, or other), and that synchronization happens in a phase transition, when group solidarity passes a critical threshold. This yields

more precise predictions of outbursts of collective action under adverse conditions, and casts a new light on different measures of social cohesion. The implication for group selection is that k-connective groups, which synchronize easier, can outperform similar groups that lack a cohesive structure to synchronize.

20. Stereotype consistent and inconsistent scenarios in a new experimental game: The Third-party Punishment and Reward Game (TPRG)

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According to Dion, Berscheid and Walster (1972) people tend to assume that highly attractive individuals possess more socially desirable personality traits (e.g. "altruistic") than those of lesser attractiveness. In a game involving trust and reciprocity Wilson and Eckel (2006) found that attractive trustees were viewed as more trustworthy; should they fail to reciprocate however, participants inflict larger punishments on them than on less attractive cheaters ("beauty penalty"). In our study we intended to analyse how attractiveness affects the social norm enforcement in a third-party punishing and rewarding context. The Third-party Punishment and Reward Game (TPRG) consisted out of two steps. First the participants had to observe a short "Public Goods Game" between two fictitious individuals, and then they had the opportunity to punish and/or to reward either just one or both players. Interfering in the game was costly for the participants. Among the eight rounds of the game there were stereotype consistent (attractive co-operators with unattractive free-riders) and stereotype inconsistent (attractive free-riders with unattractive co-operators) scenarios. All of our 64 participants (28 females and 36 males) were volunteer undergraduate university students, aged between 18 and 31 years (mean = 21,69; SD = 2,315). In line with Wilson and Eckel (2006) we found that attractive free-riders were punished more severely than unattractive ones. Additionally participants rewarded unattractive co-operators more than those of higher attractiveness. Thus we can conclude that stereotype inconsistent scenarios evoke more extreme interventions than stereotype consistent scenarios do.

21. Evidence for emotional content bias in the cultural transmission of urban legends

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This study used urban legends to examine the effects on recall of a bias for content which evokes high levels of emotion. As with previous research into content biases, a linear transmission chain design with 120 participants aged 16-52, was used. Participants were asked to read and then recall urban legends that provoked both high levels and low levels

of emotion and were both positively and negatively valenced. The product of this recall was presented to the next participant in a chain of three generations. A significant effect of emotion level on transmission fidelity was found with high emotion legends being recalled with significantly greater accuracy than low emotion legends. The emotional valence of a legend was found not to have any effect on transmission; thus emotional biases in recall go beyond disgust and can incorporate other emotions such as amusement, interest and surprise.

22. If meat made us moral, can vegetarians be more virtuous?

Investigating the relationship between meat consumption and attitudes towards animal concern and human welfare

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Evidence accumulates to assume that the acquisition and consumption of meat has helped distinguish man from other hominids in terms of both physical and psychological features, human morality in particular. This “meat made us moral” hypothesis contrasts the “vegetarian are more virtuous” hypothesis that has been supported by perception studies within social psychology. People perceive vegetarians to be more virtuous overall. Yet little is known if this perception bias holds a kernel of truth. In a survey study (N=299), it is tested if any support can be found for one or both of these theories by linking diet patterns (vegetarian, semi-vegetarian, fulltime meat eater) to moral attitudes and behavior (Animal Attitude Scale, Moral Foundations Questionnaire). Results reveal that vegetarians score higher on the AAS, while meat eaters score higher on the MFQ, and flexitarians balance in between. Focussing on the five moral foundations (MFQ) separately, diet pattern hardly predicts the “individual” dimensions, with all groups scoring equally high. It is only with regards to the true “moral” foundations that fulltime meat eaters significantly score higher than vegetarians and flexitarians. There appear to be no significant moderation effects of age, gender or educational level on these relationships. In sum, the data indicate that vegetarians regard it most important not to hurt any animal. Yet vegetarians are not more virtuous overall. Even today the consumption of meat and human morality appear to be connected. The more meat is being consumed, the more value is put towards in-group loyalty, authority and respect.

23. Women's eye-gaze patterns for facial masculinity in harsh and benign environments

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Previous studies have found that female preference for male masculinity is contingent on the environment. In harsh environments, women prefer less masculine, high-investing males especially in long-term, serious relationships. Presumably, this is because of the need for high-investing partners in insecure circumstances. We tested the eye-gaze patterns of women evaluating masculine and feminine male faces for long and short term relationships under conditions of environmental harshness or environmental stability. The women ($n = 48$) read a vignette prime of either harsh or benign environment. After that, they viewed masculine and feminine male faces in a standard two-alternative forced choice (2AFC) trials, choosing the faces as potential long and short-term partners. We found a near-significant interaction between prime and relationship content on fixation count. When evaluating masculine faces in the insecure prime condition, women fixated slightly more in short rather than long-term relationships. When analysing the first fixation duration, we found that women fixated most in the short-term relationships when evaluating feminine faces. Further, in the insecure prime condition, women had a longer first fixation on the feminine rather than the masculine faces when evaluating long-term partners. In the secure prime condition, women fixated more on feminine faces for long rather than short-term relationships. Our results mostly support previous 2AFC studies, suggesting that women's subconscious mating preferences favour more feminine characteristics in men. Environmental priming had a small effect on the eye-gaze, indicating that in harsh conditions, masculine faces were viewed more in the short-term context rather than in long-term context.

24. Diversity of morals in human cooperation

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Human cooperation can be sustained when help is channelled towards those with a good reputation. Evolutionary models of 'indirect reciprocity' show that conditioning help on recipients' recent behaviour alone cannot stably support cooperation. Stable reputation-based cooperation requires that individuals consider the motivation behind the past behaviour of their interaction partners, and distinguish justified from unjustified decisions to help. Empirical evidence that people actually use such strategies is weak. Here we show experimentally that people do consider their peers' motivations, and reward those individuals who refuse to help defectors. Moreover, we report pronounced differences in individual strategies: a majority bases their decisions to help merely on the past actions of their interaction partners, but a substantial proportion of individuals additionally considers the motivation behind these actions.

25. Influences of childhood and current environmental stress on women's mate preferences

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Women's mate preference varies a lot under different circumstances. Many contributing factors have been emphasized by evolutionary psychologists, including women's own condition, environmental factors such as pathogen prevalence and mortality rate. However, these studies lack a developmental view that adult behaviors, including mate preference can be calibrated into broader rearing environments. In this research, we consider women's mate preference under a framework of life history theory. We aim to investigate how environmental stress experienced in childhood and concurrently interactively affect women's mate preferences. Based on online response from 450 Chinese women, we find that poor child-parents bonding during childhood and lacking social support concurrently would lead to reduced female mate preference for good-gene, good-provider and good-father male attributes, whereas some other stress experienced during childhood rather than concurrently, including incidents of disasters and accidents, residential change, death of family members, parental divorce and long period of father absence are associated with reduced desire for good-provider and good-father attributes. To some extent, the relationship between environmental stress and women's mate preferences is mediated by women's life history strategy. Moreover, childhood environmental stress interacts with current life stress. Women raised in low social economic status environments or raised with parental absence would be more sensitive to current life stress. These findings support life history theory that early life experiences may result in different life history strategies and certain ways in which individuals respond to environmental stress present later in life.

26. Ideal family size and variation in sexual orientation amongst heterosexual women predict preferences for male facial masculinity

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The ultimate function of mate choice is reproduction, yet mate preferences are not often studied in the context of women's reproductive plans. Hetero-, bi- and homosexual categories are commonly differentiated but little is known about the variation in sexual orientation within the heterosexual category and its impact on mate preferences or family goals. We therefore studied women's preferences for male facial masculinity in relation to reports of sexual attraction and reproductive plans. In 2 studies of Caucasian nulliparous women aged 18-25 (N1=704, N2=22,403), those who identified as heterosexual varied considerably in

sexual attraction to both men and women. Greater sexual attraction to men and lower sexual attraction to women was related to preference for increased masculinity and higher ideal number of children. Furthermore, wanting more children was associated with a greater preference for masculinity. Such overlap between desire for men and children provides evidence for a general reproductive drive.

27. A comparison of looking strategy and verbal descriptions in English and Chinese

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Descriptions allow individuals to share information about individuals' reputations (Sommerfeld et al., 2007). Previous research has found cultural differences in eye movement strategy for facial recognition tasks, with East Asians using a configural processing strategy, while White Caucasians use a more featural strategy (Blais et al., 2008). Bilinguals tend to provide different responses to an identical task when speaking in two different languages (Hong et al., 2000), a phenomenon in line with the Sapir-Whorf Hypothesis (Whorf, 1956) that language influences cognition. The present study aims to examine if using language (English/Chinese) as a cultural prime can induce changes in looking and description strategies, and whether looking and description patterns follow similar patterns. The experiment was conducted in two language blocks (i.e. English and Mandarin) on 40 Malaysian Chinese participants who were fluent in both languages. In each language block, they read information and consent forms in the target language, watched a music video and described a series of East Asian (EA) and Western Caucasian (WC) faces presented on a Tobii T60 eye tracker monitor unit.

28. Evidence to suggest that women's sexual behavior is influenced by hip width rather than waist-to-hip ratio

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Waist-to-hip ratio (WHR) is an important ornament display that signals women's health and fertility. Its significance derives from human development as a bipedal species. This required fundamental changes to hip morphology/musculature to accommodate the demands of both reproduction and locomotion. The result has been an obstetric dilemma whereby women's hips are only just wide enough to allow the passage of an infant. Childbirth therefore poses a significant hip width related threat to maternal mortality/risk of gynecological injury. It was predicted that this would have a significant influence on women's sexual behavior. To investigate this, hip width and WHR were measured in 148 women (M age = 20.93 + .17 years) and sexual histories were recorded via

questionnaire. Data revealed that hip width per se was correlated with total number of sexual partners, total number of one night stands, percentage of sexual partners that were one night stands, number of sexual partners within the context of a relationship per year sexually active and number of one night stands per year sexually active. By contrast, WHR was not correlated with any of these measures. Further analysis indicated that women who predominantly engaged in one night stand behavior had wider hips than those who did not. WHR was again without effect in this context. Women's hip morphology has a direct impact on their risk of potentially fatal childbirth related injury. It is concluded that when they have control over this, women's sexual behavior reflects this risk and is therefore at least in part influenced by hip width.

29. Male preferences for female breast shape and size in cross-cultural perspective

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Morphology of human female breasts appears to be unique among primates due to their permanent fat deposits. It has been previously suggested that breast morphology arose as a result of sexual selection. More specifically, breast shape changes with age and parity, becoming more pendulous, and could thus serve as a marker of residual fertility. Further, it has been shown that women with larger breasts show higher levels of estrogen and breast size may therefore serve as an indicator of potential fertility. Thus, cross-culturally, males are hypothesized to prefer breast morphology indicating high residual and potential fertility. To test these hypotheses we performed a survey on men's preferences for breast morphology in 4 different cultures (N = 215), namely Brazil, Cameroon, Czech Republic and Namibia. As stimuli, we used two sets of images varying in level of pendulosity (a marker of residual fertility) and size (marker of potential fertility). Across all tested cultures, we found unequivocal preferences for breast shape with low pendulosity. Regarding breast size, preferences were relatively variable, but a majority of raters preferred medium sized breasts, followed by large breasts. Our results support the idea that breast morphology may serve as a residual fertility indicator and, to some extent, also support the potential fertility hypothesis. Future studies should focus on potential interaction between the two parameters, which together may help explain relatively large variation in women's breast size.

30. Men prefer women with late expected age at menopause

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Why some women have more attractive face than others has been the focus of many studies. For short-term mating, males are expected to prefer females at the age of peak fertility. In fact, facial fertility cues have been linked to female attractiveness. For long-term partnerships, a high residual reproductive value - the expected future reproductive output - becomes more pertinent; thus, young age and late menopause are expected to be preferred. However, the extent to which facial features provide cues to the likely age at menopause is unknown. Our study shows that expected age at menopause influences facial attractiveness of young women. As menopause is heritable, we used the mother's age at menopause as a proxy for the daughter's expected age of menopause. We found that men judged facial photographs of women with a later expected age at menopause as more attractive than those of women with an earlier expected age at menopause. This result holds when age and other components of facial and non-facial attractiveness were controlled. Additionally, we found that the expected age at menopause was not correlated with any of the other variables considered (including fertility and developmental cues). Our results show the existence of a new component of women's facial attractiveness, expected age at menopause, which is independent from previously documented components of attractiveness.

31. Content or prestige bias? Potential proximate and ultimate causes of art appreciation

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Art may have evolved as a non-adaptive byproduct of human evolved psychology by pushing otherwise functional “pleasure buttons” (Pinker 1997). However, this process may be overridden by adaptive prestige bias in two distinct ways. Appreciating prestigious art may lead to becoming prestigious oneself (“arbitrary prestige”), which, yielding deference, may increase fitness. Alternatively, by appreciating prestigious art, “good cultural variants” may indirectly be acquired (Henrich & Gil-White 2001). In case of arbitrary prestige, sensitivity to prestige should increase with art expertise as only those who invest in becoming prestigious in the art domain would benefit. In case of good-cultural-variants prestige, sensitivity to prestige would decrease with art expertise as novices would benefit the most from this shortcut to adaptive information. To test these predictions we manipulated the intrinsic appeal (i.e., depicting moderately vs. highly attractive faces) and prestige context (MoMA vs. control). We assessed art appreciation, art expertise, pleasurableness of content, and admiration of artist (as proximate mechanism of prestige bias). We found a strong main effect of content on art appreciation, mediated by pleasure. There was no significant effect of prestige nor of its interaction with expertise but

prestige decreased the correlation between pleasure and art appreciation. At first glance our results mainly support the pleasure-buttons hypothesis. However, since the subjects in our samples turned out to be very low on art expertise, our findings may also be consistent with arbitrary prestige. To check whether the latter indeed operates, we are running the study again including participants high on expertise.

32. The age of exploration and exploitation: Younger leaders endorsed for change and older leaders endorsed for stability

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The current contribution extends theorizing on leadership and the exploration-exploitation dilemma and builds theory by incorporating a biological and cultural evolutionary perspective. A theoretical connection is made between the exploration-exploitation dilemma and age-biased leadership preferences in times of exploratory change versus stable exploitation. For the vast majority of human evolution (approximately 2.3 million years) our species was semi or entirely nomadic and the crucial tradeoff between exploration versus exploitation had substantial physical- and experience-based requirements which align with leadership opportunities as moderated by age. Thus, given the consistency and importance of correctly assigning leadership for the exploration-exploitation dilemma, human biological and cultural evolution has likely selected for age-biased leadership endorsement. Across three experiments we find: 1) younger leaders are endorsed for times of exploratory change and older leaders for stable exploitation, 2) this pattern of endorsement is replicated in a management context, and 3) our results also indicated that older leaders are endorsed for leading conservative exploitation of nonrenewable resources and younger leaders for exploration of renewable alternatives (i.e., green leadership). The results provide additional clarity to the exploration-exploitation dilemma, unify a number of proximate theories, and introduce an age-biased leadership endorsement hypothesis.

33. The effect of aging, encoding order, and race in contextual face recognition

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The ability to recognize faces of cooperators and cheaters is essential to social exchanges. This study investigated the effect of age, encoding order, and race in the recognition of groups of faces tagged with different reputations (trustworthy, untrustworthy or neutral) using an “old/new” recognition task. The encoding duration for each group of four faces was brief (6 s). Participants showed lower hit rates and longer reaction time for untrustworthy than trustworthy and neutral faces (all Caucasian faces),

but no primacy or recency effects. The second experiment showed that young (18-29 years old) and intermediate-age adults (30-59 years old) had lower hit rates for untrustworthy faces than trustworthy ones, whereas seniors (≥ 60 years old) were equally sensitive to all faces. As expected, RT and false alarm rates increased with age. In the third experiment half of the faces to be memorized were Caucasian and half were African (avatars generated with FaceGen software). Participants (34 Caucasian, 36 Afro-Caribbean) recognized the Caucasian faces significantly more accurately than African ones, and trustworthy faces better than untrustworthy ones. Participants tended to recognize faces of their own race better than the other race. Untrustworthy faces of the same race of the participants were better recognized than the other race. The findings suggest that face recognition is not solely based on a stereotypical evolutionary response, but rather on flexible cognitive processes that are sensitive to aging and race, and finely tuned to the changes in the context in which faces were encoded.

34. Good genes, good providers, and good fathers: The factors involved in how women select a mate

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Human male mate values are defined in terms of three broad categories – good genes, good providers, and good fathers. Female mate choice over these male mate attributes depends on personal and ecological conditions of the women. Based on three samples of 935 Chinese women, we found that women in general and those of high social economic status in particular preferred good-father over good-provider and good-gene mate attributes, and ovulating women preferred a low-pitched male voice as an indicator of good genes only when it was not pitted against good-father attributes. These findings show that in modern day living where a woman spends the same amount of time and energy on education and employment and acquires about the same amount of resources as men, her mating strategy shifts because her reproductive success depends more on a paternal helper at the nest than his provisioning in the chest.

35. Regional variation in male and female face preferences

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Evidence from cross-cultural, correlational and experimental research suggests systematic links between ecological factors and human mate preferences. However, which ecological factors drive these effects remain controversial. For example, while some studies have found that regional variation in women's preferences for masculine male faces is better predicted by measures of health than by measures of male-male

violence, other studies have found the reverse. Here we investigated this issue using multilevel modeling of data from a cross-national sample of more than 13,000 men and women. We found that preferences for masculine versus feminine face shapes were predicted by a measure of pathogen stress, but not by homicide rate. We also found that ecological factors were more important for variation in preferences for male than female faces. Together, these findings suggest that pathogen-related factors are more important for face preferences than violence-related factors, at least for variation at the regional level.

36. Cultural transmission and the evolution of human behaviour: A general approach based on the Price equation

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Transmitted culture can be viewed as an inheritance system somewhat independent of genes that is subject to processes of descent with modification in its own right. Although many authors have conceptualized cultural change as a Darwinian process, there is no generally-agreed formal framework for defining key concepts such as natural selection, fitness, relatedness and altruism for the cultural case. Here, we present and explore such a framework using the Price equation. Assuming an isolated, independently measurable culturally-transmitted trait, we show that cultural natural selection maximizes cultural fitness, a distinct quantity from genetic fitness, and also that cultural relatedness and cultural altruism are not reducible to or necessarily related to their genetic counterparts. We show that antagonistic coevolution will occur between genes and culture whenever cultural fitness is not perfectly aligned with genetic fitness, as genetic selection will shape psychological mechanisms to avoid susceptibility to cultural traits that bear a genetic fitness cost. We discuss the difficulties with conceptualizing cultural change using the theoretical framework of evolutionary theory, the degree to which cultural evolution is autonomous from genetic evolution, and the extent to which cultural change should be seen as a Darwinian process. We argue that the non-selection components of evolutionary change are much more important for culture than for genes, and that this and other important differences from the genetic case mean that different approaches and emphases are needed for cultural than genetic processes.

37. Evolutionary preparedness and social learning interact to promote fitness in dangerous environments

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Humans and other animals are “prepared” to fear evolutionary recurrent dangers. However, in many species, social learning might be a more flexible and efficient way to avoid danger. Indeed, previous work has shown that social learning is favored when asocial learning is costly or dangerous. Here, we explored the relationship between preparedness and social learning in dangerous and stochastic environments. We used evolutionary agent-based modeling of an environment based on a 10-armed bandit. The rewards associated with the options were stochastically changed, and d options were probabilistically associated with deadly outcomes. All agents could learn about the environment asocially (Rescorla-Wagner algorithm). Using random heritable mutations, we introduced both preparedness and three types of social learning: (i) observational conditioning, (ii) teaching, and (iii) advanced, the combination of (i) and (ii). In a set of non-evolutionary simulations, the fitness of populations with and without preparedness was compared. Social learning was favored in stochastic and relatively non-dangerous environments. The fraction of asocial learners increased with d, the level of danger. The non-evolutionary simulations showed that preparedness attenuated the effect of both danger and environmental stochasticity. Only advanced social learning had equal fitness with and without preparedness. Our model suggests that preparedness is important, also in the presence of social learning. Social learning was less selected for in highly dangerous environment. However, once evolved, advanced social learning had the highest fitness also in the absence of preparedness, suggesting that preparedness is less important in species with advanced social learning, such as humans.

38. Children’s and adults’ perceptions of individuals low and high in prestige- and dominance-based status

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Physical size is related to status in many species – including humans – and may affect both real and perceived status. Here, we investigate the relationship between social status and assessments of physical size in humans. We distinguish between different aspects of physical size (height and muscularity) and different pathways to obtain status in groups with implications for the association between perceived status and perceived size. Across five studies, we find that perceived height and muscularity are associated with status perception in different ways. Status obtained through coercion (dominance) differently affects size perception than status obtained through voluntary deference (prestige). In general, we find that adults positively associate height with both dominance and prestige, but that muscularity is more strongly related to dominance than prestige (2 studies, n = 74 and 141). Additionally, we find that children aged 6 to 12 (2 studies, n= 57 and 237) also associate height and muscularity with high status based on dominance. However,

the children differ from the adult samples in that they do not positively associate height with prestige. Finally, we find that adults associate perceived height and prestige-based status across several contexts, while muscularity is related to increased prestige only in a conflict situation but not in a peaceful/cooperation context ($n = 418$). Together these results shed light on how height and muscularity are used as cues to infer dominance and prestige-based status in different contexts, and how such associations develop across the lifespan.

39. Formidability predicts outcomes in wars of attrition

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The paper shows how the formidability of males, measured by upper-body strength, predicts outcomes in wars of attrition. Previously, this effect has only been found among animal species, but never before among human beings. The paper consists of two experimental studies. The first replicates the study from Sell et al. (2009) with one crucial addition. It shows that formidability can be predicted solely via the silhouette of a body. This is important information because it indicates how it is possible to combine an effective stimulus with maximal anonymity of participants. Utilizing this finding, participants in the second study played a two-player war of attrition game in an experimental setup where they were exposed to a body silhouette of their opponent before each round. It is observed that whenever the difference in formidability between two contestants increases, the duration of the fights decreases. In the control group, where participants were not exposed to a body silhouette before playing war of attrition games, no effect of difference in formidability was observed.

40. The deep rationality of dark consumption: Unhealthy behaviour as signalling behaviour

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Despite the many health campaigns targeted at young people, high levels of smoking, drinking, and reckless driving are being persisted, even though youngsters are often well aware of the negative consequences. Moreover, young men engage more in these behaviours as compared to women. To explain this pattern, this study explored the possibility that unhealthy behaviour can be seen as a male short-term mating strategy, in which self-presentational concerns surpass health concerns. As indicators of good genes gain attractiveness in short-term mating contexts, and since most of the unhealthy behaviours have considerable physical costs, this behaviour may be regarded as signalling behaviour directed at potential short-term mates. We conducted a between-subjects experiment ($n = 462$) in which 2

hypotheses were tested. To be considered a short-term mating strategy, unhealthy behaviour should enhance male attractiveness in short-term mating contexts and short-term mating intentions should be derived from the behaviour. For women, the predictions remained unclear. In the study, participants rated the attractiveness of written profiles of opposite sex peers in several contexts, with various degrees of unhealthy behaviour. They were also asked to indicate how these fictional peers would score on the Sociosexual Inventory. The experiment showed that women, but also men, interpret a high prevalence of smoking, drinking and reckless driving as being interested in short-term mating. Furthermore, unhealthy behaviour appeared more attractive in short-term mating contexts compared to long-term contexts. Overall, these findings suggest that male as well as female unhealthy behaviour may be part of a short-term mating signalling strategy.

41. Testosterone levels are positively related to a more authoritarian leadership style in men

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It has been suggested that dominance based leadership evolved first and was then supplemented with leadership styles based on charisma and prestige. The hormone testosterone could be a biological marker of this more ancient form of leadership style as testosterone levels are associated in a wide variety of species with status and dominant behaviors. However, to our knowledge, no study has investigated if leadership styles are related to baseline testosterone levels in adult humans. This study investigated if baseline testosterone levels were associated with leadership styles in a sample of 126 white-collar workers (97 men and 29 women, 22 to 67 yrs. old). These workers provided a saliva sample to determine their testosterone level and they filled in a questionnaire measuring their leadership style. A factor analysis showed the three leadership styles already defined by Lewin (1939): democratic, authoritarian and laissez-faire leadership. Furthermore, results showed that, only in male workers, higher salivary baseline testosterone levels were related to a more authoritarian leadership style ($r = 0.21$, $p = 0.05$). These results suggest that high baseline testosterone levels may stimulate a more evolutionary old leadership style based on dominance.

42. The impact of specific developmental stages on the establishment of face preferences

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Much research has documented how people's face preferences vary, but we do not know whether there is a specific sensitive period during development when some individual differences in face preferences

become established. Here, we test whether some face preferences may form during specific phases within childhood and adolescence, and persist in adulthood. To test this, we designed a study based on the established finding that people tend to be attracted to facial features that resemble those of their opposite-sex parent, particularly if they report an emotionally close relationship with that parent. Accordingly, if adulthood preferences for facial features are predicted by emotional closeness to one's parents during only some developmental stages, this would suggest that those developmental stages may be particularly important in establishing adult facial preferences. Our study found that women had significantly stronger preferences for partners whose eye colour matched that of their father if they reported receiving more emotional support from their father during late puberty, and if they reported receiving less emotional support from their father during early puberty. There were no significant relationships between the women's eye colour preferences, and their report of the emotional support they received from their mother at different stages during childhood and adolescence. The results show that specific childhood and adolescent developmental periods may have longstanding effects on individual differences in human facial preferences. The results may also help tease apart the various adaptive explanations put forward for the established finding that people prefer partners who resemble their opposite-sex parent.

43. Religion and cooperation: A case study of the Catholic and Protestant communities in Northern Ireland

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The widespread existence of religious beliefs in human societies suggests a functional explanation for the evolution of religion. Models of cultural group selection have been put forward to explain the rise of religion as a group adaptation to increase in-group cohesion in situations of inter-group conflict, and empirical studies have demonstrated how religious individuals are more cooperative than non-religious individuals. However, existing studies conflate measures of in-group and unbiased altruism, and the evolution of religion as a group beneficial adaptation requires altruism to be directed towards in-group members and not be indiscriminately applied. Here we present results from field experiments based on naturalistic measures of biased and unbiased cooperation (school/charity donations and lost letters' returns) in two religious groups with an on-going history of inter-group conflict – Catholics and Protestants in Belfast, Northern Ireland. While we find a positive association between individual and neighbourhood levels of religiosity and cooperative behaviour, we find no evidence that this behaviour is specifically aimed towards the in-group. Furthermore, the association between religiosity and cooperative behaviour is not significant when controlling for socio-economic variables. The findings from this study

question the validity of current theoretical models for the evolution of religion and point to the importance of environmental constraints in explaining the variation in human cooperative behaviour.

44. Pathogen cues condition aversions of meats, but not vegetables

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Humans exhibit a strong ambivalence toward meat consumption, with narrowly prescribed animals and preparation techniques highly valued as food, and other animals and preparation techniques tabooed and avoided. This ambivalence toward meat consumption might reflect cultural and psychological adaptations that function to mitigate the pathogen threats posed by meat consumption while simultaneously capitalizing on the valuable nutrients contained in animal flesh. Such psychological adaptations would presumably contain learning mechanisms for adjusting meat preferences and avoidances based on pathogen-relevant information. This hypothesis was tested across two laboratory studies. In the first study, participants ($N=160$) were randomly assigned to see either images of meat dishes paired with cues to pathogens, non-meat dishes paired with cues to pathogens, or beverages paired with cues to pathogens. After the learning trial, participants rated how appealing the dishes were. Pathogen cues affected ratings of meat dishes, but not ratings of non-meat dishes or of beverages. In the second study ($N=150$), participants viewed either images of raw meats or images of raw vegetables paired with pathogen cues during a learning phase before rating how appealing the raw meats and raw vegetables were. Participants who saw meats paired with pathogen cues decreased their ratings of meat, but not vegetables; participants who saw vegetables paired with pathogen cues did not decrease their ratings of either food. These results suggest that attitudes toward different foods are differentially shaped by pathogen-avoidance psychology, and that future efforts to shape public meat consumption could harness this aspect of human psychology.

45. Does functional epigenetic inheritance respond to famines? A case study of the Finnish Famine 1866-68

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Background:

Epigenetic inheritance may be an important determinant of health in several mammals, however, evidence for such a mechanism in humans is weak. In order to investigate whether functional epigenetic inheritance operates in humans, I analyze the mortality of siblings conceived and born at different levels of famine exposure. Under functional epigenetic inheritance, I expect that those who were conceived during high levels of famine will have lower mortality during later epidemics.

Methods:

I use a sub dataset from the Demographic Data Base covering the historical population of Skellefteå in Northern Sweden (1720-1900). Children born between 1858 and 1873 are grouped according to their level of exposure to the Finnish Famine (1866-68) when conceived, as well as when born. The Finnish Famine was followed by a mortality crisis in 1873-74 caused by a smallpox epidemic. The subsequent period of 1874-80, in turn, was characterized by a relatively low mortality. Using proportional hazard Cox regression models with multivariate adjustment and with fixed-effects approach that compare siblings, I analyze whether the different mortality rates between 1873-74 and 1874-80 were affected by exposure to the Finnish Famine.

Results:

Children who were conceived and born before the peak of the Finnish Famine exhibited no significantly different mortality during the smallpox epidemics, but a higher mortality during the period of 1874-80.

Conclusions:

The results do not support the existence of functional epigenetic inheritance mechanism that responds to famine. Alternative explanations for the mortality patterns are discussed. Selective mortality appears to be the most likely cause.

46. Common heritable effects underpin concerns over norm maintenance and in-group favoritism

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Research has shown that in-group favoritism is associated with concerns over the maintenance of social norms. Here we present two studies examining whether genetic factors underpin this association. A classical twin design was used to decompose phenotypic variance into genetic and environmental components in two studies. Study 1 used 812 pairs of adult U.S. twins from the nationally representative MIDUS II sample. Study 2 used 707 pairs of middle-age twins from the Minnesota Twin Registry. In-group favoritism was measured with scales tapping preferences for in-group (vs. out-group) individuals; norm concerns were measured with the Multidimensional Personality Questionnaire—Traditionalism (Study 1) and Right-Wing Authoritarianism (RWA; Study 2) scales. In Study 1, heritable effects underlying traditionalism were moderately (c. 35%) overlapping with the genetic variance underpinning in-group favoritism. In Study 2, heritable influences on RWA were entirely shared with the heritable effects on in-group favoritism. Moreover, we observed that Big Five Openness shared common genetic links to both RWA and in-group favoritism. These results suggest that, at the genetic level, in-group favoritism is linked with a system related to concern over normative social practices, which is, in turn, partially associated with trait Openness.

47. Dynamic displays of bodily attractiveness

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Body shape is a salient biological cue that contains considerable social information, and is usually accompanied by body motion in most normal social encounters. In aid of ecological validity, we designed an information-rich dynamic stimulus set consisting of volunteers walking on treadmills. We were interested not just in the physical and psychological correlates of signaller attractiveness, but in signal manipulation attempts and the effect of these on receiver perceptions. The volunteers were filmed from multiple viewpoints and their motion was recorded using a three-dimensional infrared motion capture system. Extensive anthropometric and psychometric measures were also taken. In addition, the volunteers performed different walks that varied by imagined social context (i.e. different receiver audiences). We discuss results using online participants as stimulus raters.

48. The evolution of Bantu kinship terminology: A phylogenetic comparative approach

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The classification of kin into structured groups is a diverse phenomena which is of universal importance in human culture. For populations which are organized into large agricultural groupings of sedentary residency but not governed by a state, such as our study sample of historical Bantu-speaking groups of sub-Saharan Africa, kinship organization guides all aspects of everyday life; who one eats with, works with, marries or cares for. Kinship rules dictate the interpersonal behaviour and social obligations of individuals within a cooperative network, in part through the use of differing terminological systems of relationship. Although the cross-cultural study of kinship terminology was foundational in Anthropology, few modern studies have made use of statistical advances to further our understanding of the structuring and diversification of systems of kinship over time. Here, we use Bayesian methods of phylogenetic comparison to investigate the evolution of Bantu kinship terminology over time, reconstructing its ancestral state, and exploring its relationship to other components of kinship organization such as descent and rules of residence.

49. Dissolving the evolutionary puzzle of human cooperation

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An influential line of theoretical modeling and analysis is directly motivated by the perception of human cooperation as an “evolutionary

puzzle.” This research paradigm asks how human cooperative behaviors can be understood as the outcome of an evolutionary process, and so appears superficially similar to a research strategy in theoretical biology known as the phenotypic gambit. By comparing and contrasting it with the phenotypic gambit we reveal critical flaws in the “evolutionary puzzle” approach to human cooperation. First, “evolutionary puzzle” models define cooperation, the very behavior to be explained, in terms of fitness costs and benefits. In contrast, the phenotypic gambit is typically used to understand the evolution of a phenotype by deriving its fitness costs and benefits from a careful consideration of how it interacts with the evolutionary process. Second, “evolutionary puzzle” models take cooperative behaviors to constitute an adaptive unit whose evolutionary history can be studied in isolation from that of other behaviors. This is a necessary assumption when making the phenotypic gambit and it is justified for some phenotypes but not all. For behaviors defined in terms of fitness costs and benefits, we argue that this is an unjustified assumption. We also discuss why the “evolutionary puzzle” paradigm cannot be salvaged by conceiving of the evolutionary process as cultural rather than genetic. We conclude that this approach to human cooperation is a red herring and that valuable ideas for future work can be gained from questioning rather than accepting its tacit assumptions.

50. Evolutionary cyberpsychology 2.0: Revisiting earlier hypotheses in the age of social networking software

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Human interactions are changing in far-reaching ways due to recent developments in internet and mobile communications technologies, including the widespread uptake of Facebook, Twitter, and other online social networks. Evolutionary psychology has much to contribute to our understanding of the likely effects of these changes, because while new technologies do not obliterate our evolved tendencies to behave in certain ways, they can modulate the expression of such tendencies, by creating new forms of interaction that differ from those that were typical of our environment of evolutionary adaptedness. With this in mind, Piazza and Bering (2009) noted the lack (at that time) of evolutionary psychological research in cyberspace, and made some hypotheses, based on evolutionary theory, about behavioural patterns that might be found there. Five years later we revisit these hypotheses. We review relevant research published in the interim, to see how Piazza and Bering’s predictions have fared and determine what still needs to be done to address them. We give particular attention to research on online social networking—an area of cyberpsychology that was in its infancy in 2009—and offer some new hypotheses that reflect the newer technologies. The paper is organized around seven broad topics of evolutionary psychological inquiry: intersexual competition; intrasexual

competition; kinship; parenting; friendship; trust and social exchange; and personal information management. In each section, we briefly discuss the nature of each topic as it applies to Internet behavior, review the relevant hypotheses and research that bears on them, and offer directions for future research.

51. The effects of pathogen cues on intergroup bias in a minimal group paradigm

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Recent research has suggested that the behavioral immune system – a suite of psychological mechanisms that function to mitigate threats posed by pathogens (Schaller & Duncan, 2007) – might be at the root of interpersonal prejudice and intergroup bias (e.g. Schaller & Neuberg, 2012; Navarrete & Fessler, 2006; Faulkner, Schaller, Park, & Duncan, 2004). This perspective posits that out-group membership might serve as a useful cue to pathogen threat, since outgroups carry pathogens from different ecologies. The present research uses the minimal group paradigm to investigate whether pathogen primes and individual differences (perceived vulnerability to disease and disgust sensitivity) related to pathogen-avoidance affect prejudice in arbitrarily categorized groups. In the first study (N = 178), we tested explicit and implicit intergroup bias in a minimal group setting following exposure to pathogen or neutral primes. There were no effects of pathogen primes or individual differences in pathogen-avoidance psychology on explicit or implicit intergroup bias. In a second study (N = 83), we repeated our investigation of the effect of pathogen primes on implicit intergroup bias. Again, pathogen primes did not increase intergroup bias. Based on these results, it does not seem that the behavioral immune system can account for bias between minimally defined groups. Instead, a richer set of social contextual cues may be required to trigger pathogen-avoidance based bias.

52. Machiavellianism in long-term relationships: Competition, mate retention and sexual coercion

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Machiavellianism is characterised by a manipulative interpersonal style and willingness to exploit others (Christie & Geis, 1970). Those with high levels of the trait prefer short-term relationships (Jonason, Webster, Schmitt, Li & Crysel, 2012), which via increased reproductive opportunities may confer an evolutionary advantage. The current study investigates Machiavellianism within long-term romantic relationships. Heterosexual men (N = 65) and women (N = 141) aged 18 – 59 yrs were recruited online. Participants completed Machiavellianism, Intrexual

Competition, Mate Retention and Sexual Coercion scales. Linear regressions revealed that Machiavellian men were more likely to compete with same sex rivals and directly guard a mate whilst Machiavellian women were more likely to compete with same sex rivals and employ intersexual or intrasexual negative inducements than those with low levels of the personality trait. In addition, Machiavellianism predicted men's willingness to sexually coerce a partner. These findings demonstrate the importance of Machiavellianism within long-term committed romantic relationships.

53. How did our ancestors survive without Facebook?

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Social networks facilitate cooperation and their maintenance has been imperative throughout hominin evolution. At higher latitudes resources are less dense and social networks are spread over greater distances, limiting the frequency of face-to-face interaction. Key questions, then, are whether and how high latitude hunter-gatherers manage to sustain social relationships between distant bands. By comparing archaeological obsidian transfer distances to ethnographic data I suggest that Upper Palaeolithic modern humans could sustain tribal connectivity at all latitudes. Using a gas model, I show that although incidental inter-group encounters during the foraging round assist tribal cohesion at lower latitudes, in the Subarctic and Arctic biomes additional bonding mechanisms, such as material representations of social obligations and identities, are likely to be required. I argue that the model predictions are supported by the geographic distribution of symbolism in the archaeological record, and might explain why only modern humans, and not the Neanderthals, made art.

54. Individual differences in pathogen disgust predict men's, but not women's, preferences for facial cues of adiposity

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Previous research suggests that people who score higher on measures of pathogen disgust demonstrate (1) stronger preferences for healthy individuals when assessing their facial attractiveness and (2) stronger negative attitudes about obese individuals. The relationship between pathogen disgust and attractiveness judgments of faces differing in perceived adiposity has yet to be investigated, however. Here we found that men's, but not women's, pathogen disgust was positively correlated with their preference for facial cues associated with lower levels of adiposity. Moreover, this effect of pathogen disgust was independent of the possible effects of moral and sexual disgust. These data implicate pathogen disgust in individual differences in preferences for facial cues

of adiposity, at least among men, and suggest that the sex-specific effects of pathogen disgust on preferences for facial cues of adiposity may be different to those previously reported for general negative attitudes about obese individuals.

55. Regional differences in mating strategies: Region-level variation in the availability of women as mates predicts American men's and women's sociosexual orientation

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Previous studies have variously linked regional variation in sociosexual orientation (i.e., openness to uncommitted sexual relationships) to operational sex ratio, health-related factors, and measures of wealth. However, since these variables are often interrelated, it is unclear which of these sets of variables best predicts regional variation in sociosexual orientation. To address this issue, we investigated regional variation in the sociosexual orientation of over 4,000 American men and women from 50 US states and Washington DC. For these 51 regions, factor analysis of the predictors used in previous studies of regional variation in sociosexual orientation identified three orthogonal factors: availability of women as mates, health, and wealth. Individual participants' scores on the revised Sociosexual Orientation Inventory were then analysed using Hierarchical Linear Modelling, with the availability of women as mates, health, and wealth factors entered as predictors at the region level, and participant age and sex entered as predictors at the individual level.

Availability of women as mates was positively correlated with openness to uncommitted sexual relationships in both men and women. By contrast, neither health nor wealth predicted men's or women's sociosexual orientation. These results complement previous research that linked variation in sociosexual orientation among countries to factors such as operational sex ratio.

56. Individual differences in the motivational salience of infant facial cuteness

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Many researchers have suggested that individuals who respond more positively to cute infant faces are those who would also be particularly willing to care for offspring. However, support for this proposal comes largely from studies in which women responded more positively to cute infant faces than did men. To explore the issue further, we investigated the relationship between (1) the extent to which nulliparous women expended more effort to view high-cuteness versions of infant faces than they did to view low-cuteness versions (i.e., the motivational salience of

infant facial cuteness) and (2) these women's responses on a questionnaire assessing their willingness to care for hypothetical offspring. Consistent with previous studies, the women in our study expended more effort to view high-cuteness versions of infant faces than they did to view low-cuteness versions. However, this effect of infant cuteness was more pronounced in women reporting greater willingness to care for hypothetical offspring. These data are consistent with the proposal that systematic variation in adults' responses to infant facial cuteness may, at least partly, reflect individual differences in their willingness to engage in parental behaviors.

57. Is there teaching in golden lion tamarins?

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There is currently considerable interest in animal teaching, including in primates. There are, at present, only three nonhuman species that fulfil Caro and Hauser's (1992) definition of teaching behaviour, a definition that allows the behaviour to be quantifiable. None of these three species are primates. The study in progress investigates evidence of teaching behaviour in the golden lion tamarin (*Leontopithecus rosalia*), a species in which there is highly suggestive evidence of this behaviour in two contexts: food offering and food calling. The goal of this study is to test the hypothesis that 1) once young forage independently they are more likely to incorporate in their diet food that has been offered to them previously (social learning), compared to food that they have foraged on their own (individual learning), and 2) the young are more likely to forage independently at sites where they have previously foraged in association with a food call compared to sites where no food calls were present. In doing so, we are also looking at whether both behaviours vary according to the juvenile's age. In both cases, the first two criteria of Caro and Hauser's (1992) definition have been fulfilled, but evidence is still lacking for the third: whether pupils learn from the potential teaching behaviour, or not. The project in progress addresses this issue by combining experimental and observational work in wild populations of golden lion tamarins in Brazil, as well as the application of cutting-edge statistical modelling which will facilitate the detection of this behaviour.

58. More cultural transmission of social-threat information than physical-threat information

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Research on cultural transmission has shown a bias in favour of social information vs. non-social information (Mesoudi, A., Whiten, A., & Dunbar, R. [2006]. A bias for social information in human cultural transmission.

British Journal of Psychology, 97, 405–423). Other research suggests that transmission is biased in favour of threat-relevant information. This suggests that transmission might be biased in favour of information that is both threat-relevant and about social interactions. A limitation of some previous research is that it (a) examined memory recall of participants who were unaware of any transmission, or (b) measured transmission intentions but not actual transmission. To test whether transmission is biased in favour of social threat-relevant information, the current study analysed data from the Google Ngram corpus (usage frequencies for short phrases in a large sample of digitized books), which constitutes data of actual cultural transmission. Analyses compared transmission (i.e., usage frequency in 1997–2000) of deadly events ($N = 40$) that had occurred between 1812 and 1994 and that were either social (i.e., human-caused, wars) or non-social (i.e., non-human caused, natural disasters). Samples were matched for number of casualties, year of occurrence, and continent, whilst blind to the names of the events. Results showed that social threat-relevant events (i.e., wars) were mentioned more often than non-social threat-relevant events (i.e., natural disasters). These results extend previous observations of biases in human memory and transmission intentions, by showing a consistent bias in actual transmission about deadly historical events.

59. Competitive behaviour fluctuates as a function of relationship and parental status in males but not in females

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The Challenge Hypothesis suggests that testosterone levels drive dominance behaviours in the sex with the minimal obligatory offspring care in various species to secure mating opportunities at the expense of subordinate competitors. Previous research has demonstrated that testosterone levels fluctuate in accordance with relationship and parental status, and in accordance with competitive behaviours, congruent with this hypothesis; single non-fathers have higher testosterone levels than fathers and/or males in committed relationships, and testosterone levels are higher during or in anticipation of competition. Furthermore, research demonstrates testosterone levels remain high in partnered males with extra-pair interests (ExPI). Therefore the current research examined whether competitive behaviour fluctuated according to relationship and/or parental status, and whether males who were partnered remained competitive despite their relationship and/or parental status according to their ExPI. Results showed single non-fathers scored significantly higher than fathers and/or males in committed relationships in a competitive task, and reported feeling significantly more competitive than fathers and/or males in committed relationships, a finding which was not echoed in females. Additionally, the research demonstrates that in partnered

parents, competitive performance differs according to levels of ExPI; it increases from low to medium levels of ExPI then decreases with high ExPI whereas it continues to increase in partnered non-parents with high ExPI. These findings support the Challenge Hypothesis, suggesting that competitive behaviour serves to maximise reproductive success, and parenthood has the biggest depressing effect on male competitive behaviour, perhaps as an attempt at protecting the interests of offspring.

60. Cross cultural variation in men's preference for sexual dimorphism in women faces

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Although humans have universal standards of beauty, there is considerable geographic variation in mate preferences. We investigated whether men's preference for femininity in women's faces varies between 28 countries with diverse health conditions by analysing responses of 2142 heterosexual men world-wide. Based on participants' choices we calculated an average femininity preference index per country. The index was strongly positively correlated with the health of the nation as quantified by the National Health Index. We suggest that the decrease of men's preference for femininity with decrease in health conditions is facilitated by the trade-off between good quality of putative partners vs. high parental investment. In worse health conditions choosing less feminine women could be adaptive due to partner's lower risk of cuckoldry. Alternative explanations are lowered testosterone level and predominance of long-term mating strategy in men living in harsher health conditions. To our knowledge this is the first study quantifying geographic variation in men's preferences for facial femininity.

61. Anxiety disorder as a product of an adaptive threat detection system

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Anxiety disorder is usually assumed to be a product of a malfunctioning cognitive system. Adaptive reasons that a cognitive system may be disposed to anxiety disorder have rarely been considered. We modelled a Bayesian forager that learns about the presence and density of predators in its environment. The forager decides the proportion of its time to look for predators rather than food and what level of false alarms to tolerate. This optimal learning system results in a significant proportion

of individuals behaving as if the environment is dangerous even when predators have been rare for a long time, which we consider to be operationally analogous to anxiety disorder in humans. This suggests that anxiety disorder can result from environmental influences, even when the cognitive system is performing perfectly.

62. The motivational salience of faces: Which faces will we “pay to view”?

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Previous studies have found that people will expend effort to view attractive adult faces, suggesting that facial attractiveness has motivational salience. However, it is unclear whether other perceptual characteristics also influence the motivational salience of faces. For example, previous research with macaques suggests that facial cues of dominance have motivational salience. To investigate how different social dimensions of faces influence motivational salience in humans, we assessed the amount of effort that participants were willing to expend to view male and female face images on a standard key-pressing task. The same faces were also rated for thirteen traits (e.g., attractiveness, trustworthiness, dominance, aggressiveness) by a different group of participants. In common with prior work on the social dimensions of faces, factor analysis of these ratings revealed two orthogonal factors ('valence' and 'dominance'). The first factor ('valence') explained the majority of the variance in ratings and was highly correlated with traits such as trustworthiness and attractiveness. The second factor ('dominance') was highly correlated with traits such as dominance and aggressiveness. Importantly, both factors were positively and independently correlated with the motivational salience of faces, suggesting that attractiveness alone does not explain the motivational salience of faces.

63. The relative contribution of facial shape and surface information to dominance perceptions

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Although many studies have investigated the facial characteristics that influence dominance perceptions, the majority of these studies have focused on the effects of shape information alone. Relatively few studies have investigated the effects of facial surface information for dominance perceptions, and those that have did not typically also consider the role of shape information. Consequently, the relative contribution of facial shape and surface information to dominance perceptions is unclear. To address this issue, we investigated the relationships between dominance ratings of color-calibrated faces and versions of these faces in which

either surface information had been standardized (i.e., shape-only versions) or shape information had been standardized (i.e., surface-only versions). For both male and female faces, dominance ratings of the shape-only and surface-only versions independently predicted dominance ratings of the original images. Additionally, ratings of the shape-only and surface-only versions explained similar proportions of the variance in the rated dominance of the original faces. These results indicate that both facial shape and surface information contribute to dominance perceptions, suggesting that it may be important to consider both sources of information in studies of dominance perception.

64. Developmental changes in aggression and body size in boys: Size does matter

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Aggressive behaviour emerges at an early age in most children but its subsequent trajectory through childhood and adulthood can vary markedly between individuals, influenced by a complex interaction between genetic and environmental factors. Evolutionary theory predicts that aggression should depend on body size, with bigger individuals being more aggressive because they are more likely to win fights or intimidate others. Whether this can explain developmental changes in human aggression remains unclear. Numerous studies have used longitudinal data to relate aggressive behaviour to height, weight and BMI, but most have confounded the effects of these correlated measures and have failed to control for other age-dependent behavioural changes that are unrelated to body size. Moreover, previous analyses have relied on either cross-sectional methods, which ignore age-related changes, or group-based trajectory methods, which discard a vast amount of information on individual differences. Here we present the results of a fully longitudinal analysis, using repeated-measures multilevel models, investigating the relationship between body size and physical aggression in a large sample of boys growing up in the Canadian province of Québec. After controlling for age-related changes, weight was the strongest predictor of aggressive behaviour: boys who were heavier than expected for their age and height were more likely to get into fights or physically attack other children. This effect appeared to strengthen with age, consistent with evolutionary models. We believe that our findings offer the strongest evidence yet for a link between body size and aggression in humans.

65. Own attractiveness moderates the relationship between face preference and mate choice

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Whether experimentally assessed face preferences predict actual mate choices is a contentious issue and evidence to date has been mixed. However, people's own attractiveness may moderate the link between their preference and choice if individuals with higher market value are better able to obtain mates with characteristics that they prefer. We tested this hypothesis in a sample of real couples by investigating the interrelationships among (1) participants' preferences for colour and texture cues associated with perceived health in opposite-sex faces, (2) their own facial attractiveness and (3) the perceived health of their partners' facial appearance. Own facial attractiveness and partner facial health were both assessed from independent ratings. As predicted, multilevel modelling showed that the relationship between health preference and partner facial health was indeed moderated by own attractiveness; partner facial health predicted health preference better in more attractive individuals. These results suggest the existence of systematic individual differences in the relationship between face preference and mate choice.

66. Sex differences in chimpanzee pant-hoot vocalisations

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Pant-hoots are a commonly produced long-distance chimpanzee vocalisation. They are used by all individuals across a wide variety of contexts, and made up of a complex combination of elements and phases. Previous research has examined their contextual variation, community variation and possible functions; however, nearly all analyses have been restricted to male usage. Female pant-hoots, when recognised at all, were considered too variable, too infrequent and, as females were more likely to call in chorus with each other, too difficult to distinguish in individual recordings. We provide the first full description of female pant-hoots from the Sonso community in the Budongo forest reserve, Uganda. We compare these with pant-hoots from the males of the same community. Female pant-hoots are more variable than male pant-hoots, with increased grading at phase boundaries. However, they do contain a regular, discernable structure. The female build-up phase is longer; contains more elements, and elements of a higher frequency than in a typical male build-up. The female climax phase is also longer; and again contains more elements, but these are at a lower frequency than the typical male climax. A discriminant function analysis was performed resulting in 97.9% correct classification of sex. Future research into chimpanzee vocalisations needs to acknowledge the use of these calls

by individuals of both sexes, along with the presence of sex differences within a single call-type.

67. Facial structure as an indicator for social aggression in woman and its interrelation with endogenous testosterone level

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There is growing evidence for a relationship between facial structures and behavioural traits such as aggression and dominance. This association between face structure and behaviour may be induced by testosterone. We present two studies examining the face-behaviour-hormone link in females. Our results indicate that average facial characteristics of women with high testosterone (T) levels are judged to be more dominant, more aggressive and less feminine than average facial characteristics of women with low T levels (Study 1). Additionally, we measured female aggression as operationalized by the number of rejections of unfair offers in the ultimatum game and found that testosterone was associated with increased punishment following social provocation (Study 2). Finally, we constructed prototype faces of females with high and low rejection rates of unfair offers. New female faces were then shape transformed towards the high punishing prototype (high rejection rates) and towards low punishing prototype (low rejection rates). The high and low versions of the same female face were paired and participants were asked to choose the more antisocial or the more aggressive looking face using a forced-choice paradigm. We found that faces that were transformed towards the high punishing prototype were judged to be more antisocial and more aggressive. These findings are in line with the notion that testosterone levels function as a biological link between female face structure and behavioural traits.

68. Does self-resemblance increase the appeal of infant faces?

Evidence from a couple-study

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Parental investment is typically larger for children of own kin. Whereas men can never be absolutely sure about paternity, mothers usually can. One way for men to minimize the risk of cuckoldry is by assessing paternity based on the degree to which the child resembles him. Previous research has yielded inconsistent findings whether or not people prefer self-resembling infant faces. In the present study we asked romantic couples to choose from pairs of infants that were shape-transformed to look more like one person or the other. Specifically, participants chose the cuter of two infant faces that resembled either (a) the male or female of the couple, (b) an average adult female or average adult male, (c) the male of the couple or an average adult male, and (d) the female of the couple or an average adult female. Interestingly we

found no differences between choices of men and women. In the boyfriend-girlfriend condition, neither the male nor female of the couple showed any preference for one of the two faces. In the other male - other female condition, both men and women preferred the infant face that resembled the average adult female. In the boyfriend–other male condition both preferred the infant that resembled the boyfriend. In the girlfriend–other female condition there was no preference for either resemblance. These findings suggest that resemblance plays a role only if it challenges the fatherhood of the male partner.

69. Sexual selection and generosity: Are we more generous and cooperative towards those we are attracted to?

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According to the principles of Darwin's Sexual Selection Theory, cooperative and generous behaviour may have evolved because they increase an individual's mate value, encounters and successes. This may be a possible explanation for why recent research has found that when playing economic games, males are more generous towards females they consider attractive than those they consider unattractive. Three studies aimed to investigate this hypothesis under a range of game theoretic situations. In the first study, ninety participants played a two-round, face to face, two-person ultimatum game with ten chocolate coins. It was found that attractiveness and dating intention has no impact on in-game generosity and cooperativeness. In the second study, twenty participants played a two-person dictator game with increased anonymity between participants through a one-way mirror, also using ten chocolate coins. Again, attractiveness had no impact on generosity. In the third study, thirty participants completed a three-person quiz in which they had the chance to earn five pounds. This manipulation was introduced as it was thought that participants may behave differently when they have actually earned the monetary value. Attractiveness again had no impact on generosity. The results indicate that attractiveness had no influence on in-game generosity and cooperation. Fairness and niceness, as opposed to attractiveness and selfishness appeared to be major drivers when it came to how generous and cooperative people were, even when anonymity and the monetary incentives were manipulated.

70. When (body) size matters: Facial cues to height and weight predict men's facial masculinity

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Recent studies suggest that judgments of facial masculinity reflect more than sexually dimorphic shape. Here, we investigated whether the perception of masculinity is influenced by facial cues to body height and

weight. We used the average differences in 3D face shape of 40 men and 40 women to compute a morphological masculinity score, and derived analogous measures for facial correlates of height and weight based on the average face shape of short and tall, and light and heavy men. We found that facial cues to body height and weight had substantial and independent effects on the perception of masculinity. Our findings suggest that men are perceived as more masculine if they appear taller and heavier, independent of how much their face shape differs from women's. We describe a simple method to quantify how body traits are reflected in the face and to define the physical basis of psychological attributions.

71. The effects of women's social status on mate preferences

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Much research has demonstrated female preference for mates with resources, which is argued to stem from sex-specific constraints that limit females' access to resources (Trivers, 1972). However, more recent correlational work has demonstrated that women are flexible with their priorities in response to, for example, control of resources (Moore & Cassidy, 2007; Moore. et al., 2010). The present study attempts to replicate the findings of this correlational work using experimental manipulation of women's perceptions of their social status. The manipulation was based on associations between gender and social status: high social status confers financial independence, personal control and personal choice (Snibbe & Markus, 2005; Stephens, Markus & Townsend, 2007) whereas low social status confers less personal control, financial independence and dependence upon others (Argyle, 1994; Domhoff, 1998). In order to experimentally replicate, female participants engaged in competitive game playing where the participants' perceived social status depended upon whether they won or lost. Participants then answered a series of questions that probed preferences and priorities in their partners. It was hypothesised that women in the high social status condition should exhibit stronger preferences for physically attractive mates and weaker preferences for resources compared to those in the low social status condition. The results are discussed with regard to mate-selection theories.

72. A face to be reckoned with: The relationship between facial, psychological and behavioural dominance

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Dominance is an essential social action, ubiquitous amongst humans, and facial dominance constitutes an important cue in social cognition. However, a clear link between the two has not been established yet. Based on some previous findings, a positive association between facial,

behavioural and dispositional dominance was hypothesized. 80 participants (18-67 years, 39 males) were approached in a main shopping street. Behavioural and dispositional dominance was assessed by Mehrabian's (1996) Dominance-Submissiveness Scale, signature size and a version of the Ultimatum Game. Additionally, a Big 5 inventory was employed. Photos of participants' faces were taken, their facial dominance was rated by five independent coders and facial width-to-height ratio (fWHR) was measured using software. A within-subject correlational design revealed positive associations between rated facial dominance and scores on the dominance questionnaire, signature size and both rated facial dominance and fWHR. Moreover, for females a link between facial dominance and one measure of the Ultimatum Game emerged. Finally, the personality dimensions agreeableness, conscientiousness, neuroticism and openness to experience were negatively related to at least one aspect of facial dominance. Hence, this study provides direct and multifaceted support for the link between facial characteristics and behavioural and dispositional dominance; implications and prospects for further research are discussed.

73. Who is guilt-prone and why? An evolutionary perspective

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People differ in their propensity to experience guilt after transgressions. Previous research seems to assume that guilt-proneness is invariably an adaptive personality trait. The present paper challenges this assumption by adopting an adaptationist approach to individual differences in guilt-proneness. Assuming that guilt evolved as a psychological mechanism that enables individuals to derive benefits from opportunities for direct reciprocity, we outline social and individual conditions that should affect individual differences in guilt-proneness. Specifically, we posit that guilt-proneness increases with people's opportunities to engage in repeated (as opposed to one-shot) interactions, and with the relational utility of their interaction partners. We present preliminary support for our premise that adolescents adapt their levels of guilt-proneness to social-structural environmental cues that are related to engagement in repeated interactions (i.e., indicators for high familiarity with local residents) and related to a high relational utility of people's interaction partners (i.e., indicators for low social status and an indicator for having a small core network of friends). Congruent with our hypotheses, we find that knowing locals by name predicts higher levels of guilt-proneness; high social status and a large core network size (measured by the frequency of meeting up with friends in various places) predict lower levels of guilt-proneness. We find no significant associations for neighborhood characteristics (population density and residential mobility) and two additional indicators for social status (popularity and parental

employment). We control for sex, primary and secondary socialization influences, educational year (age), and ethnicity.

74. Finding your soulmate: Age preferences for dating in a sample of heterosexual and homosexual men and women from “The Guardian’s Soulmates” dating site

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Heterosexual age preferences are often understood in terms of evolutionary benefits. Less is known about such preferences in homosexual men and women. Nearly two decades ago, Kenrick and colleagues (1995) examined heterosexual and homosexual mating preferences for age in men and women. Here, we aimed to replicate these findings by examining age preferences in a larger UK online dating sample (<https://soulmates.theguardian.com/>). Dating advertisements of 996 male and female heterosexuals and homosexuals were coded. Age preferences were assessed via Generalized Linear Models with robust standard errors and bootstrapping. Based on model fit (AIC), the relationship between own age and preferred age differed substantially between the groups. With increasing age heterosexual men preferred younger partners. Older heterosexual men (>50 years) exclusively sought (much) younger women than themselves, whereas younger heterosexual men sought both older and younger women. Male and female homosexuals followed this general trend of preferring increasingly younger mates with increasing age. However, they displayed a higher upper age tolerance and greater range of acceptable ages than both heterosexual men and women. Female heterosexuals' age preferences were distinct from the other groups, in that they displayed a male older norm with no substantial interest expressed in males younger than themselves. Our findings thus largely corroborate those of Kenrick and colleagues, with some exceptions, such as a larger tolerance of age ranges in homosexual men and women compared to heterosexual men and women. Results are discussed with reference to the current literature on similarities and differences in heterosexual and homosexual mate preferences.

75. The differential rates of loss of Bantu noun classes

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This poster presents findings of a diachronic study of Bantu noun class systems using phylogenetic comparative methods. The question I focus on is why some noun classes are lost more frequently than others. The Bantu data is taken from Maho's (1999) study of Bantu noun classes. Currie et al.'s (2013) set of 500 phylogenetic Bantu trees is used as a model of Bantu language evolution. Phylogenetic comparative methods

are used to quantify statements regarding the presence of noun classes and noun class pairings in Proto-Bantu. In addition, I show that individual noun classes merge or are lost at different rates. An explanation for this phenomenon is found in the semantics of the different noun classes: those relating to humans and their attributes (classes 1/2; 7/8) and for creating abstract nouns (14) are among the least likely to be lost (as also stated by Demuth 2000). However, the classes for plants, fruits, and body parts (3/4; 5/6) and animals and inanimates (9/10) are stable over time as well. Saliency as well as frequency seem to influence individual noun class maintenance.

76. An evolutionary based relation between men's second sets of children and the Women's Rights Movement

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Starting point is that Western monogamy was an evolutionary trade-off (w.r.t. r/K strategies, parental investment, inclusive fitness, and reciprocity and resource distribution) between male and female reproductive strategies. The trade-off in case of monogamy in Western society means that males have children with one female. Both females and males possess guardianship over their children in terms of care (females) and resources (males). Because males are the sole owners of the resources husbands could control their wives and so this set-up reduced paternity uncertainty. The Women's Rights Movement representatives protested against the (resource) depended role of women. Their success reduced male control. The female freedom gave women access to resources and the possibility to raise the children on their own. However, it also increased paternity uncertainty. The divorce rate increased, resulting in serial monogamy. Men in serial monogamy do on average have more children than monogamous men because males often pair with younger spouses, giving them a second set of children. When some males take more than an equal share of the female reproduction, other males get nothing, thus increasing male competition, in which powerful males seem to win. Hence an evolutionary based relation between the Women's Rights Movement and men's second sets of children can be defended.

77. The Golden Years: Men from the Forbes 400 have much younger wives when remarrying than the general US population

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A common stereotype is that richer men have wives who are substantially younger than themselves. However, some research suggests that large age gaps are actually more common with low male

income, at least in the general population. Here, we examine spousal age differences among the super wealthy (Forbes 400 list – the richest 400 individuals in the U.S.). Men from the Forbes 400 on average had a spouse who was seven years younger, which is significantly different from the mean age difference between spouses in the U.S. population. Furthermore, when these men remarried, their subsequent spouse was substantially younger, twenty-two years younger on average. Again, this is markedly different from the general population. Wealthy women did not differ from the general population in terms of spousal age differences. We conclude that based on these data the stereotype that rich men (re)marry younger wives holds a kernel of truth, at least for a sample of the super wealthy.

78. What women want: the role of environmental quality on female preferences for male risk-takers

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Research has consistently shown risk-taking asymmetry across the sexes. The current research proposes that if males have evolved risk-taking proclivities then females should have coevolved a desire for risk-takers, suggesting that male risk-taking is a costly signal (CS) which functions as a cue of genetic quality. It has been proposed that females have an evolved 'mate value calibration' adaptation which operates to raise or lower their preferences depending on their own perceived mate value, which may be influenced by environmental factors. Despite consistent findings that females tend to prefer high-risk males in a short-term romantic context and risk-avoiders in a long-term context, the role of environmental quality (EQ) remains unclear. The current research tests the hypothesis that when an environment lacks quality, females will calibrate their preferences and primarily seek out good genes indicators. Eighteen examples of male risk-taking were used alongside the MacArthur scale of subjective social status to establish the role of environmental quality on female desire for risk-takers. Results show that when selecting a long-term partner, risk-avoiders are preferred and socioeconomic status (SES) has no effect. Conversely, high-risk males are preferred by females of low and high SES when selecting a short-term partner, with the higher SES females giving greater desirability ratings to high-risk males than the low SES females. These findings suggest that regardless of EQ, females prefer risk-avoiders as long-term mates and are inclined to seek out risk-takers in a short-term romantic context. These results suggest that risk-taking is an indicator of good genes.

79. An evolved memory for rarity in social exchanges? Incongruent autobiographical information affects face recognition

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Our ability to detect cheats in social contracts, possibly due to evolved, domain-specific modules, is one of the best known examples of early research in evolutionary psychology. However, an alternative perspective is that we are actually better at detecting rarer events, rather than cheats specifically. This suggests that cheater detection is more general than previously considered, and responds to cues of rare or unusual behaviours as these are fewer in number and therefore less cognitively demanding to remember. A particular example of this would be when our expectations of individuals' trustworthiness are violated, we should remember them better. This study therefore examined how the congruency of information about individuals that can vary in trustworthiness (their occupation and behaviour) affected how well they are remembered. Here participants were presented with faces of individuals with either a high or a low trustworthy occupation, paired with either a high or low trustworthy behaviour. Participants are then asked to identify the individuals they have seen previously as well as their occupations. Results show that faces (but not occupations) were better remembered when presented with incongruent rather than congruent information. Furthermore, these findings were compared with similar ones for congruency of information about individuals for another trait (intelligence). These findings provide further support for an evolved ability to remember rarer or unusual events (such as when expectations were violated). Also as this ability was unique to information that helps identify individuals specifically (faces), it suggests it plays an adaptive role in social exchanges only.

80. Absence of face recognition biases related to hand-washing behaviour in a hazardous health scenario

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One of the main routes for the cross-transmission of infectious microorganisms is by the hands of health care workers (cf. Pittet et al., 1999). Recent health campaigns have highlighted the importance of hand-washing behaviour, especially in high-risk environments. Hence, this study used a hypothetical medical scenario to investigate face recognition linked to hand-washing behaviours (e.g. subject imagined she was a patient with an exposed injury in a hospital ward and observed the hand-washing habits of its medical staff). It was hypothesized that subjects would recognize the faces of the staff who did not wash their hands better than the ones who washed them. There were 12 faces to be memorized in three conditions (washed hands, dirty hands, and neutral—i.e. unknown hand-washing behaviour). Experiment 1 (faces memorized individually) revealed that subjects ($N = 29$) remembered faces of staff

who washed and did not wash their hands better than the neutral ones. Experiment 2 (group memorization) showed that subjects' (N = 31) accuracy to the faces in the three hand-washing conditions was statistically similar. No biases in reaction times were observed in the two experiments. In short, subjects did not attend differently to the hand-washing behaviour of medical staff. Since hygiene has strong biological roots (cf. Curtis, 2005), the lack of attention to hand-washing behaviours in a hazardous hypothetical scenario may be linked (among other reasons) to fact that infectious microorganisms are invisible to the naked eye.

81. Two cultural selection pressures underlying technological evolution

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Studies on language evolution demonstrate that learnability and expressivity becomes a selective pressure for the evolution of structural features of language (i.e., compositionality, systematicity). The aim of this study is to experimentally demonstrate that the same logic can be applied to the evolution of technology. For this purpose, we have reanalyzed the data in Takezawa & Suyama (2012) that attempted to replicate Caldwell & Millen (2008)'s laboratory experiment on cumulative cultural evolution. Takezawa & Suyama (2012) manipulated the selective pressure for learnability by controlling transmission in one of the two conditions. In the transmission condition, technology was transmitted using the replacement method (i.e., replication of Caldwell & Millen, 2008). In the non-transmission condition, in order to exclude the process of transmitting information, two participants repeatedly tried to improve technology. In this experiment, the goal was to make a tower as high as possible and every time a tower was made, photos were taken for further analysis. We hypothesized that three effects would be observed if two forces work in the cultural evolution of technology; emergences of simplicity, tradition and convergence. Pressure for learnability would omit complex structure during the course of successive generation. Learnability would select a tower that is easier to learn, creating persistence in structure. Structure of towers would converge as a result of these two processes. All three results were supported in the analyses. We discuss that the two selective forces underlying language evolution may also play a key role in the evolution of technology.

82. Intergenerational conflict: Does ethnic-group postnuptial residence predict age at menopause?

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Human menopause remains an evolutionary puzzle as early termination of reproduction does not seem adaptive. One proposed hypothesis is that intergenerational conflict in populations with female-biased dispersal can favor the termination of female fertility. This model predicts that women should experience menopause earlier in groups with a history of female-biased dispersal compared to male-biased dispersal. Using data from 2400 women aged 40-62 from the Indonesia Family Life Survey, we find little evidence that ethnic groups with a history of patrilocal residence have earlier age at menopause. In contrast, ethnic groups with a history of multilocal residence (either ambilocal or neolocal) have the slowest progression to menopause, while matrilocal and patrilocal ethnic groups have similar progression rates. These findings do not support the intergenerational conflict model and we discuss potential reasons for this result.

83. Herding and plasticity of combined decisions in an online 3-armed bandit game

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Mathematical models of collective foraging by ants present that majority of workers in a colony cannot switch from a former optimal food patch to a current optimal one (i.e., ‘herding’) when the recruitment process is intense. Because both the recruitment in ants and conformity in humans generate a similar positive feedback process for the collective behaviour, we can expect such a herding dynamics to emerge in human combined decisions if humans show hyper conformity bias. We conducted a series of online experiments where participants each faced a 3-armed bandit problem with social information. Participants each had three opportunities, and could see former cumulative choice frequencies by all participants at each choice stage. The environmental state was changed secretly from ‘environment_1’ to ‘environment_2’ in the middle of each session. In environment_1, rewards from three aligned boxes were \$0.1, \$0.1 and \$0.8 respectively while those were \$0.1, \$1.6 and \$0.8 respectively in environment_2. We investigated whether majority of participants’ choices could switch from the former optimal (\$0.8) to the new optimal (\$1.6). Nine groups out of 12 successfully converged on the \$0.8 box in environment_1, and all of those 9 groups couldn’t switch their majority to the optimal box in environment_2. However, an estimated conformity bias of a typical participant was not so strong (i.e., weak conformity). At the individual-level, human conformity bias was not so strong; nevertheless herding phenomena were observed at the collective-level. Further discussions about underlying mechanisms will be presented at the conference.

84. Experimental comparison of three types of reciprocity

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Reciprocity is a fundamental principle sustaining cooperation in human society and three different types of reciprocity exist; direct reciprocity in which helping is reciprocated to the helper from the beneficiary; reputation-based reciprocity in which helping good people increases good reputation of the helper and invites helping from the third party; pay-it-forward reciprocity in which who is helped repay it to the third party. While conducting a series of vignette experiments on these three types, we obtained quite intriguing findings – people believe they act on the principle of pay-it-forward reciprocity but actually do not as they believe. In the experiments we asked participants whether to take a costly action for helping a person (X) in need. By manipulating a preceding event, we created three different types of reciprocity (i.e., direct: X helped a protagonist, reputation-based: a protagonist observed X helped the other person, pay-it-forward: the other person helped a protagonist). We also manipulated whether helping or non-helping preceded. In total, we had 3×2 between-subject conditions. Experimental results showed that direct and reputation-based reciprocity occurred (i.e., participants intention of costly helping was higher when cooperation preceded than when non-cooperation preceded) while there was no tendency of pay-it-forward reciprocity. However, when participants were asked whether they would help X if non-cooperation (or cooperation) had preceded, people believed they would act on the principle of reciprocity in all the three types. Results will be discussed in connection to the evolutionary game theoretical studies on the evolution of three types of reciprocity.

85. Sociocultural determinants of language structure: Population size and morphological complexity

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A number of authors (e.g. Wray & Grace 2007, Trudgill 2011) have suggested that languages adapt to the sociocultural environments in which they are learned and used. A recurrent claim is that languages spoken by larger groups are less morphologically complex than smaller languages (Lupyan & Dale 2010), although the mechanism by which group size could have this effect is yet to be identified. Of the proposed mechanisms, maturational differences in learning are currently considered the most likely (Nettle 2012). Larger languages are thought to have a greater proportion of non-native speakers, who introduce simplifications through increased analysis and transmission errors. Alternatively, it has been suggested that the variability of the input from which learners acquire their language is a plausible means by which

group size can influence linguistic complexity (Hay & Bauer 2007, Nettle 2012). In order to test this hypothesis, we asked 60 adult participants to learn a miniature language which involved morphologically-complex case marking on its nouns, and manipulated whether learners received their input from a single or multiple speakers. The accuracy of their oral production when presented with both familiar and novel stimuli was then assessed. All participants were able to acquire the noun stems with similar levels of success, while the acquisition of the morphological system was much more variable. There were no significant differences in performance between the conditions. We therefore find no support for the hypothesis that variation in learner input should be considered a plausible source of differing levels of linguistic complexity.

86. Transmission infidelity and cumulative cultural evolution (1): Theoretical demonstration

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Though capacity of social learning is widespread across species, accumulation of culture is unique to human beings. A shared view among researchers is that this is because only the humans possess sophisticated cognitive ability enabling faithful cultural transmission. In this study, we demonstrate a phenomenon challenging this widely shared view – transmission infidelity promotes cumulative cultural evolution. In order to show the seemingly puzzling phenomenon, we focused on a class of multi-modal fitness landscape problems that is theoretically and empirically well studied in the field of adaptive decision making – the cue order learning problem. Gigerenzer, Todd & the ABC research group (1999) found that people in the real world use a simple lexicographic decision heuristic which is called Take The Best. Performance of this heuristic critically depends on how to order cues that is used for making decisions. However, finding an optimal cue order is known to be NP-complete and it is empirically shown that human participants who do not have any prior knowledge about usefulness of cues show difficulty in finding reasonably good cue orderings in learning-while-doing settings (Dieckman & Todd, 2004; Garcia-Retamelo, Takezawa & Gigerenzer, 2009). We investigated this learning problem in the context of cultural evolution where learning outcome in the previous generation is culturally transmitted to the successive generation. We show that in this class of multimodal fitness landscape problem, perfectly faithful cultural transmission of learning outcome results in getting stuck in local maxima and unfaithful transmission help escaping from there and promotes continuous cumulative cultural evolution.

87. Transmission infidelity and cumulative cultural evolution (2):

Computer simulations

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Transmission fidelity is considered to be essential for cumulative cultural evolution. However, in the other presentation at the EHBEA 2014 (Takezawa & Nakawake), we demonstrated a certain level of infidelity in transmission rather drives cumulative cultural evolution. In this presentation, we show complete details of computer simulations supporting the argument. As the simulation task, we used the cue order learning task investigated well in the field of adaptive decision-making (Gigerenzer, Todd & the ABC research group, 1999). In our simulations, agents solved a series of binary choice problems with a lexicographic decision making strategy using ordered multiple cues. After each choice, agents get feedback and update cue ordering with a simple learning rule (Dieckman & Todd, 2012). We introduced transmission chains: firstly acquire information from the last generation, then update through individual learning, and finally transmit to the successive generation. We considered three ways of transmission that differ in amount of information transmitted: 1) all the information acquired in the previous generation (perfect mirroring), 2) information about cue ordering and confidence about learned outcome (nearly complete transmission), and 3) information about only the cue ordering (incomplete transmission). We found that on the early generations perfect mirroring and nearly complete transmission performed higher than incomplete transmission. Nevertheless, as generation progressed, incomplete transmission started outperforming the others. The results were robust against modifications in key parameters. All the results support the argument of Takezawa & Nakawake (EHBEA2014) that transmission infidelity favors cumulative cultural evolution in a class of multimodal fitness landscape problem.

88. Regional differences in disgust

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Recent research shows positive correlations between frequency of illness and disgust sensitivity at the individual level. This may lead to links between regional variation in health and disgust sensitivity. Here, we test the existence and specificity of this relationship using data from the three domain disgust scale completed by more than 10,000 American men and women from 50 US states. Scores for each domain of disgust (pathogen, moral and sexual) were analysed using Hierarchical Linear Modelling, with participant age, participant sex, and scores on the other two domains of disgust entered as predictors at the individual level and the overall health variable from the 2013 America's Health Rankings as a predictor at the state level. State health significantly predicted pathogen

disgust, but not moral or sexual disgust. Individuals in states with poorer health had higher pathogen disgust than individuals in states with better health. This research confirms a link between health factors and disgust sensitivity and provides new data on the domain-specificity of the link between health and disgust.

89. The impact of early childhood environmental stress on adolescents' risk taking propensity: A life history analysis

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We examined the association between early childhood environmental stress and life history strategies of adolescence. Based on 650 junior middle school students in rural China, we used an objective environmental measure, a self-report risk-taking propensity measure and a self-report future-orientation questionnaire, and a laboratory-based risk-taking propensity measure (the BART) to test their early childhood environmental stress and present life history traits. Environmental parameters of harshness and uncertainties during early childhood have concurrent effects on life history development in adolescence. Analyses indicated that early childhood stress parameters, including disasters and accidents, death of family members, low parental investment indicated by parental absence, and family relocation, were associated with fast life history strategies, represented with early onset of puberty especially for girls, high impulsivity, short future orientation, low risk-taking perception, and high risk-taking tendency and behavior. Future orientation also mediated some of the relations between early childhood stresses and risk taking behavior during adolescence. These findings provide an evolutionary explanation of adolescents' risk taking tendency as an adaptive strategy to race with environmental adversities.

90. Pathogen disgust predicts men's perception of facial disgust

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While influential models of the psychology of disgust identify separate dimensions, such as moral, sexual and pathogen disgust, research on the perception of facial expressions often treats disgust as reflecting a unitary concept. Here, we investigated the relationship between the perception of disgust in faces and individual differences in sensitivity to moral, sexual and pathogen disgust. Participants classified the emotional expression of composite faces showing varying levels of anger, disgust, fear, happiness, sadness and surprise. Participants also completed the Three Domains of Disgust Scale (Tybur et al., YEAR). Only pathogen disgust predicted facial disgust perception. However, this main effect of pathogen disgust was qualified by an interaction with sex of participant, whereby men, but not women, with higher levels of pathogen disgust

were more likely to classify faces as disgusted. In men, this effect of pathogen disgust also interacted with judgment accuracy, such that pathogen disgust better predicted the percentage of faces that were correctly, rather than incorrectly, judged as disgusted. These results show that men with greater concern about pathogens are more sensitive to the facial expression of disgust, suggesting that perception of disgust from faces may be driven by inferences about others' pathogen disgust, at least in men.

91. Behavioral evidence that pathogen disgust functions as a contagion avoidance mechanism

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Using a key-press paradigm, we tested the proposal that pathogen disgust functions to reduce exposure to sources of infectious disease. We also examined whether participants with recent infections would be more motivated to reduce interactions with contagion cues. Participants were shown images of buildings, people brandishing guns, and people displaying cues of infectious disease. Participants could increase or decrease the viewing time of these images by repeatedly pressing designated keys on the computer keyboard. People reporting higher levels of pathogen disgust, but not sexual or moral disgust, were more willing to expend effort to remove images of infectious disease from the screen. By contrast with these findings for pathogen disgust, reported recent infections did not predict viewing time for infectious disease images. Together, these findings support the hypothesis that pathogen disgust functions to reduce exposure to sources of infectious disease but also suggest that the relationship between pathogen disgust and contagion avoidance is not driven by experience of recent infections.

92. Multiple-order mindreading revisited: Error rates increase only in “true” statements and after third order

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The complexity of human social interactions requires the mental capacity to reason at different levels of intentionality (1). Previous studies from English-speaking countries have shown that normally developed adult humans are well able to handle mindreading tasks involving up to four levels of intentionality, but when five or six levels are involved error rates increase drastically. In a survey conducted with 220 Dutch participants we have replicated as well as complemented this finding. After reading short stories featuring characters involved in complex social situations, participants were asked to judge truth-values of statements requiring them to reason at varying levels of intentionality (Penny thinks Pete

hopes that Sheila believes...etc.). Results showed that overall error rates increased drastically after fifth order, replicating earlier studies. However, when distinguishing between factually “true” statements and “false” statements, error rates only increased in true statements and after third order. Detecting that a strand of intentional reasoning is incorrect may thus be easier than seeing that it is correct: for incorrect statements a participant has to find only one mistake at any level; for correct ones s/he has to match with the “reality” of the story at every level. We conclude that our natural capacity to reason intentionally may be lower than previously argued, and suggest that when processing intentionality, our minds may be geared towards detecting the single false bell, rather than processing every strand syntagmatically by default.

1. For an overview see R.I.M. Dunbar, ‘Mind the Gap’, Proceedings of the British Academy 154: (2008): 403-23.

93. Can we share pain with other people? Physiological synchronization during face-to-face interaction

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Objective: Automatic synchronization of action and body movement has been widely observed (e.g., yawn, footsteps, etc.). This phenomenon is considered as a building block of human communication, especially playing a key role in mutual understanding. There is also some evidence to show that people often synchronize their facial expression, which is thought to reflect ‘emotional connection’. Yet there are few studies that directly assess emotional synchrony. In this study, we aimed to demonstrate synchrony of physiological change in face-to-face interaction. **Methods:** Two participants were facing each other in a room. Thermal stimuli gradually increased from moderate to hot temperature were applied 13 times simultaneously to the participants. To assess temporal physiological responses, blood volume pulse (BVP) in their peripheral blood vessels were recorded. We calculated physiological synchrony index from BVP responses. **Results:** Participants’ physiological arousal in response to the thermal pain was significantly correlated with each other where no significant correlation was found in crosscheck condition (i.e., cross correlation results after random shuffling of participants). In addition, averaged scores of ‘Self-Oriented Emotional Reactivity’ of the pair showed significant negative correlations to the synchrony index, indicating that the person who shows more tendency to the self-regard (without regard to other), who shows less the synchronies. **Conclusion:** We demonstrated that the physiological arousal temporally synchronized in face-to-face situation in experiment. Furthermore, correlations between the physiological synchrony increase and the score of self-regard support that the increased physiological synchrony could be a marker of other-regarding sympathetic responses.

94. Disgust in pregnancy and foetus sex – longitudinal study

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The emotion of disgust serves as a first line defence against infection, causing behavioural avoidance of pathogens. As such behaviour may involve cost, the aversive reaction should be stronger when the immunocompetence is low. A particular time of lowered immunological function is pregnancy. The aim of this research was to study longitudinal changes in disgust sensitivity in pregnant women, and to test if disgust sensitivity is related to the sex of a foetus. 85 pregnant women completed a three-stages longitudinal research. Participants completed the Disgust-Scale-Revised at each trimester of pregnancy, followed by questions on the demographic data. The Total Disgust and the Core Disgust domain was highest in the 1st trimester and decreased during pregnancy in women bearing daughters. Women bearing sons had relatively high disgust sensitivity both in the 1st and in the 2nd trimester. We confirmed that only the disgust sensitivity in the Core Domain related to food is at its highest in the first trimester of pregnancy i.e. when maternal immunosuppression is also the highest. High disgust sensitivity in the 2nd trimester only in mothers bearing male, can be explained by the need to "keep the shield up" for a longer time, when bearing more ecologically sensitive foetus. Due to faster male grow rate in the 2nd trimester, male placenta is less efficient than a female one. This foetus sex-dependent disgust sensitivity in the 2nd trimester may be evoked by differences in maternal testosterone and cortisol concentrations (higher when carrying male) in this stage of pregnancy.

95. Grounding abstract knowledge

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Dinosaurs, medieval times, desire. How do we acquire linguistic knowledge of absent or intangible referents? The answer to this question exposes whether acquisition of linguistic knowledge is bottom up or top down controlled i.e. if linguistic knowledge is biologically (i.e. unintentionally) or socially (i.e. intentionally) determined. Current neuroscience studies subscribe to the first interpretation when pointing to a close relation between direct experiences and 'higher' cognitive processes. Here, acquisition of linguistic knowledge is decidedly co-determined by the environment as claimed by the theory of 'situated conceptualisation' (e.g. Barsalou, 2009). Drawing on 'grounded cognition' studies, I claim that whereas situated conceptualisation depends on material anchors (Hutchins, 2005) unintentionally bottom-up controlled, abstract knowledge acquisition depends more on the interlocutor and is therefore to a larger extent top-down controlled. Why? And how? The absence of direct experiences forces the interlocutor, through language,

to attain comprehensibility by eliciting mental imagery in the child (Schilhab, 2012). While the adult in situated conceptualization furnishes the on-line world, for instance holds up a cup, points to the cup and exclaims 'cup', in abstract language acquisition, the interlocutor furnishes the off-line world. Linguistically, he or she makes mental tableaus to elicit images to which the child intentionally associates the concept.

96. Do women obtain adaptive benefits from short term relationships with 'bad boys'? Examining menstrual cycle variation in women's preferences for the Dark Triad personality

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The Dark Triad is a cluster of three positively correlated personality traits: narcissism, Machiavellianism and psychopathy. Previous research has found that men score higher on all Dark Triad traits, and the sex difference in short term mating is partially mediated by this sex difference in the Dark Triad. It has been argued that the Dark Triad facilitates a short term mating strategy which is exploitative of women. This is adaptive for men due to their high fitness variance. However, this account implies there is no benefit to women associated with mating with high Dark Triad men. Using fictional personality profiles of high and low Dark Triad males developed from the items comprising the Dirty Dozen measure of the Dark Triad, the present study examines the attractiveness of the Dark Triad personality profile to women. Additionally, the role of female fertility is examined; a preference for Dark Triad males as short term mates in the fertile phase of the menstrual cycle may indicate that the Dark Triad is indicative of good genes, and that a preference for high Dark Traid males as short term mates may provide adaptive benefits for women.

97. Menstrual cycle phase does not predict political conservatism

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Recent authors have reported a relationship between women's fertility status, as indexed by menstrual cycle phase, and conservatism in moral, social and political values. We conducted a survey to test for the existence of a relationship between menstrual cycle day and conservatism. 2169 women provided data about both their menstrual cycle day and their political views. Cycle day was used to estimate day-specific fertility rate (probability of conception); political conservatism was measured via direct self-report and via responses to the "Moral Foundations" questionnaire. We found no evidence of a relationship between estimated cyclical fertility changes and conservatism. Our findings were robust to multiple inclusion/exclusion criteria and to different methods of estimating fertility and measuring conservatism. In summary, a relationship between cycle-linked reproductive parameters

and conservatism, as documented by prior authors, was not evident in our data.

98. Evolutionary corollaries of momentum-based language change

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Like many other cultural traits influenced by trends and fashions, the conventions that make up human languages are also constantly undergoing replacement, with dynamics that suggest that changes are not just the result of random drift. How and why would an entire population of speakers replace an existing convention with a different one that “says the same thing”? Work in the historical and sociolinguistic literature has focussed on social prestige of variants as being responsible for their preferential replication, a view that ties in with evolutionary explanations of linguistic variation as a source of social markers. While recent modelling work has established that only replicator selection (differential replication of competing linguistic variants) exhibits the dynamics observed in language change, it doesn’t solve the underlying logical problem of how a population can make a rapid directed shift in the absence of any adaptive advantage for the new variant. How this arbitrary choice is taken is not addressed but instead relegated to social prestige, itself an arbitrary choice not accounted for within the theory. Based on Gureckis’ 2009 model of the popularity of baby names we study a momentum-based model of language change where the popularity of a variant is modulated by the popularity’s momentum, i.e. its change in use in the recent past. The model does not just capture the dynamics of language change, a momentum-based account also suggests that the role of language change might not be to provide short term social marking but to guarantee long-term divergence of languages.

99. Evidence of contagious scratching in capuchin monkeys (*Sapajus apella*)

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While the study of social learning has tended to focus on higher cognitive constructs like imitation and empathy, it is likely that simpler mechanisms play important roles in the relay of social information throughout a wider range of taxa (Watson & Caldwell, 2010). Examples of behavioural and emotional contagion have been observed in a number of group-living species and can facilitate adaptive group coordination. Self-directed scratching has long been considered a behavioural indicator of psychosocial stress (Maestripieri et al. 1992), however, recent evidence suggests scratching behaviours are transmitted contagiously between individuals (at least in humans and Old World primates). Here, we examined whether scratching is also contagious in a species of New

World primate. Ten capuchin monkeys (*Sapajus apella*) were separated from their social groups and were presented with videos of their conspecifics scratching and videos of their conspecifics in neutral scenarios. Observer capuchin monkeys scratched significantly more often when watching conspecifics scratching (Mdn = 1) than when watching non-scratching monkeys (Mdn = 0; Wilcoxon signed-ranks test: T = 0, p = .046, r = -.48). This evidence of contagious scratching has implications for the study of animal welfare and the use of self-directed behaviours as measures of stress. While scratching may indeed be an indicator of an underlying physiological or emotional state, further study is necessary to understand whether this relationship persists within the context of contagious scratching.

100. Highly affiliative and prosocial dyads of group-living common marmoset show synchronized oxytocin fluctuations

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Oxytocin is a key regulator of social bonding and is positively linked to affiliation and prosocial behaviour in several mammal species. In chimpanzees, this link is dyad-specific because grooming increases urinary oxytocin only in strongly bonded partners. However, the functions of oxytocin were mainly studied in isolated dyads and little is known about the role of oxytocin in social bonding, affiliation, and prosociality in highly cohesive and cooperative social groups, where individuals interact closely with multiple partners at high frequencies. Aim of this study was to identify dyad-specific oxytocin signatures linked to affiliation and proactive prosociality in groups of cooperatively breeding marmoset monkeys (*Callithrix jacchus*) that show high levels of cohesion and cooperation. For 69 marmoset dyads in seven family groups, we measured urinary baseline oxytocin over six weeks and analysed the link to dyadic affiliation (n=30) and prosocial tendencies (n=39). Highly affiliative dyads showed synchronized longitudinal fluctuations of oxytocin, and oxytocin synchrony was also characteristic of highly prosocial dyads. These findings show that dyad-specific oxytocin effects can also be traced in a group context and in a strictly interdependent species. Our results suggest oxytocin synchrony as an indicator of relationship quality and support the role of oxytocin as a mediator for social bonding.

101. Romantic rejection: Love hurts.... Really?

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Social pain has been related to physiological changes, including changes in the brain that correspond to experience of physical pain (Eisenberger, Lieberman, & Williams, 2003). The effect on salivary cortisol levels has

been found to alter in response to rejection by social peers (Blackhart, Eckel, & Tice, 2007). The effect of rejection at the initiation of relationships has not been explored in relation to romantic relationships. A common method to look at social pain utilises the ball toss paradigm (Williams et al, 1997), whilst this provides a practical solution to assessing social pain particularly there are some limitations of this approach: it lacks ecological validity of face-to-face interactions and investigation into effects of romantic rejection. The methods used in this study employ an ecological, quasi-experimental technique, whereby the participants are those attending a speed-dating event. Physiological (including cortisol) and psychological measures will be recorded prior to the study and repeated during the experimental phase. In the experimental condition half of the participants will be told that no one within the speed dating study wishes to pursue them further (romantic rejection intervention group) whilst the other half will receive their actual results (control group/acceptance group). It is predicted that those who hold themselves in high regard (higher perceptions of own attractiveness) will experience a greater effect of rejection than those with lower self-esteem, based on the evidence that cortisol response to rejection is moderated by defensiveness (Blackhart et al., 2007). The evolutionary implications of the results will be discussed.

102. Survival processing advantage for location memory

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It has been suggested that human memory is 'tuned' to process and retrieve information relevant to our survival (Nairne, Thompson & Pandeirada, 2007). Few studies have explored survival processing in memory for location, and those that have report conflicting findings with Nairne et al. (2012) demonstrating a survival processing effect in location memory and Nairne et al. (2010) reporting no effect of location. The aim of the current study is to replicate survival processing in location memory and to explore whether the type of stimuli used (food or threat) affects the accuracy of location memory judgements. Forty participants were randomly assigned to a group and asked to read either a survival (stranded in a grassland environment) or a leisure scenario (photography scavenger hunt). Clip art images of 4 food and 4 potentially dangerous animals were presented in various locations in relation to the participant's campsite/hotel (marked at the centre of the screen). Participants were asked to rate each item with regards their usefulness in the survival or leisure condition using a Likert scale (1-9). Participants were then given a surprise recall test and asked to use the mouse to place the pointer and click where they thought the stimulus had previously been presented. The results indicated that the participants were significantly more accurate at locating the target objects in the survival scenario providing further evidence for the survival processing effect in location memory.

103. How do assortative grouping and information about others' cooperativeness affect cooperation?

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Both theory and empirical data indicate that assortative grouping increases cooperation among conditional cooperators, i.e. individuals who are willing to cooperate if others are not deceiving. The decision whether to cooperate or not depends on individual's personal preferences, and on expectations about the behavior of other subjects. Information about the past behavior of others can have a strong effect on these expectations and on cooperativeness. We used computer implemented Public Goods social dilemma Game to study how information of other players' previous cooperativeness modifies the effect of assortative grouping on cooperation. We manipulate the way groups are formed (assorted according to cooperativeness vs. random) and the availability of information about past cooperativeness of others (information available vs. no information available).

104. Induced anxiety has no affect on social judgements

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We investigated whether acutely induced anxiety modifies people's social judgements and social decision making. Participants ($N=28$) rated neutral faces on formidability and trustworthiness – two dimensions that capture considerable variance in social trait attribution – before choosing how to behave in a dual-choice ultimatum game. Participants completed the task twice against different faces, once during a 20-min inhalation of medical air and once during a similar inhalation of air enriched with 7.5% CO₂, which is a validated method for inducing acute anxiety. Anxiety was found to have no affect on social judgements, nor did it change how people chose to behave towards the faces in the ultimatum game task. These finding suggests a strong degree of robusticity social judgements. Crucially, they also show that people's decision making towards individuals remains consistent, regardless of their levels of anxiety.