

## ABSTRACTS

### Invited talks

BAREN-COHEN, Simon ( [sb2o5@cus.cam.ac.uk](mailto:sb2o5@cus.cam.ac.uk) )

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#### **Autism: Characterizing the Cognitive Phenotype**

Autism is considered to be the most severe of the childhood psychiatric disorders. It is thought to lie on a spectrum of conditions. The autistic spectrum includes Asperger Syndrome. Autism spectrum conditions are thought to be largely genetic in origin. Diagnostic symptoms include abnormalities in social and communicative development, as well as narrow obsessional interests. This talk considers how to characterize the cognitive phenotype of the autistic spectrum. I propose that a profile of impaired folk psychology in combination with intact or superior folk physics may define this phenotype. Folk psychology and physics are core domains of causal cognition, which develop universally and which enable Homo Sapiens to make sense of human action (intentionality) and physical-causal events, respectively. Small discrepancies between these domains also characterize the male brain, which raises the possibility that autism is an extreme form of the male brain. Evolutionary pressures that may have selected such a cognitive phenotype are discussed.

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#### **The Ethology of the Beauty Myth?**

The notions that standards of female beauty are arbitrary and culturally determined, that the current fashion for the thin female physique is imposed on women by the media, and that men are somehow involved in a conspiracy to use the beauty myth to exploit and control women has become the common wisdom of our time. I briefly review the role of fluctuating body asymmetry and waist-to-hip ratio as indicators of beauty in women. My main focus is on the reproduction suppression model of anorexic behaviour. I then discuss the role of female-female competition and stressful male attention as stresses as ancestral cues that could have signaled the need for delay of reproduction. I argue that the thin media image of women is a result of current women's stress-caused need for alleviation of these and other stresses.

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#### **The Divided Self**

We often have the subjective experience of struggling with ourselves, of a conflict between powerful internal voices in which neither side yields or gives up the debate. These internal conflicts often seem maladaptive; consuming time, energy, and repose. If we are the adaptive products of natural selection, why should our minds work in this way? One might argue that internal conflicts are in some sense illusory; that the 'contending parties' have the same ultimate ends; and that natural selection has simply adopted an adversarial system as the best mechanism of arriving at useful truths. One might argue that internal conflicts arise from constraints on the perfection of adaptation; that evolved mechanisms work well on average but occasionally malfunction. An analogy would be to the 'system conflicts' that occasionally cause my computer to crash: multiple functional programs are running simultaneously and occasionally make contradictory or ambiguous demands on the operating system; neither programmers nor natural selection have been able to eliminate all opportunities for malfunction. The principal subject of my talk will be the third possibility that internal conflicts are 'real' and reflect a disagreement over ultimate ends between different agents that contribute to mental activity. The talk will emphasize two sources of such conflict: conflicts between different genetic agents within the genome, and conflicts between memes and genes. Conflicts between different memes is another source of conflict, but will not be addressed.

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#### **Biological Contributions to Sex Differences in Human Cognition**

There are reliable differences in cognitive pattern and skills between human males and females, with males better at certain spatial abilities, targeting accuracy and math reasoning; whereas females excel at verbal fluency, verbal memory, fine motor skills and perceptual speed. Some of these differences have been found across cultures and before puberty. Most researchers in this area view these differences as

an outcome of the division of labour between the sexes throughout our long evolutionary history as hunter-gatherers. This paper will focus on proximate mechanisms. There is evidence for the early organizational influence of androgens on spatial ability which lasts into adulthood. The optimal level of androgens for spatial ability, as measured in young men and women, appears to be in the lower half of the normal male range. Women with higher-than-average, and men with lower-than-average levels of testosterone perform better than their same-sex counterparts on spatial tasks. Moreover, in adult men, the seasonal and diurnal fluctuations of testosterone are associated in a predictable way with changes in spatial ability, but not in female-favoring tests or sex-neutral tests. In women undergoing the natural fluctuations of the menstrual cycle, high estrogen periods are associated with enhanced female-favoring skills—fine motor and articulatory efficiency, and verbal fluency; whereas low estrogen periods are associated with enhanced spatial ability. Sex differences in brain morphology and function have been reported for certain hypothalamic nuclei, commissural systems, lateral asymmetry, and anterior-posterior organization. However, none of these has yet been convincingly related to these sex differences in cognitive pattern.

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## Contributing talks

AIKEN, Nancy E.

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### **Unity in Variety Ultimate explanations contribute to proximate explanations for art making behavior.**

Recent work by Ellen Dissanayake and Nancy Aiken demonstrate that several, apparently universal, behaviors are likely to contribute to art making. These include

- the propensity to make things special
- the need for self-satisfying movement
- the ability to make cross-modal correspondences
- the ability to differentiate among melodies
- the ability to react appropriately and reliably to biologically significant stimuli.

Together, these ultimate explanations for art making account for the basic tools with which the artist works and, thus, they provide for unity in art. Proximate explanations for art making behavior include individual talent, cultural convention and style, medial limitations, and social and economic pressures. Proximate explanations account for some of the variety of artistic expression. Thus, art has unity in variety.

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### **Is False Belief Understanding in Young Children Associated with Peer Interaction?**

Increasing evidence suggests that child-child interaction is significantly associated with the early development of Theory of Mind (TOM). Much of the evidence comes from sibling interaction. Compared to our knowledge of sibling interaction we know much less about the relationship between false belief understanding and peer interaction. To investigate this relationship we observed 36 three to five year-old preschool children during play interaction with peers, and tested them on tasks of false belief explanation and prediction. Sociometric interviews and focal observations of free-play served to assess the children's peer relationships and social activity. Based on earlier findings we predicted that age as well as having an older sibling would positively affect performance on the false belief tasks. In addition, we predicted that false belief understanding would be positively associated with cooperative play and close relationship with peers. The findings will be discussed within the framework of the principal theories that drive current research on TOM in cognitive ethology.

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### **Hormonal Changes Underlying Sexual Responses in Women and Men**

Men respond to erotic pictures with a very fast testosterone-peak, which implies sexual readiness and arousal. Viewing erotic stimuli, more women report the physiological sensations associated with sexual arousal than directly report being sexually aroused. This may be explained by evolutionary theory in that women should not be arousable too easily in order not to risk their reproductive success. To compare female and male sexual arousability testosterone and estrogen were measured before and after exposure to erotic pictures. Amount, speed and duration of hormonal responses will be discussed.

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### **Relationships of Early Separation and Intimacy on Sibling Incest**

This was a follow-up of an earlier study by the authors of the Westermarck hypothesis applied to the nuclear family, which suggested that separation during early childhood inhibits later sexual acts between siblings of a procreative nature (completed or attempted genital intercourse), but does not deter other sexual activity. Using telephone and mail surveys, respondents reporting postpubertal procreative sexual contacts with siblings were compared with those reporting other postpubertal sibling sexual activities, and a matched sample reporting no postpubertal sibling sexual behavior. Consonant with expectations, prolonged separation during early childhood was significantly associated with procreative postpubertal sexual activity, but not with other postpubertal sexual activity. Contrary to predictions, however, both sexual activity groups reported significantly more nudity and physical contact with siblings during childhood than no sex control subjects. The various findings are discussed in terms of their implications for revisions of customary interpretations of the Westermarck hypothesis.

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### **Signaling Benevolence: An Evolutionary Perspective on the Encoding and Decoding of Altruism**

Emotions associated with benevolence can be viewed as evolved commitment devices that help solve social dilemmas which require trust (Frank, 1988). Non-kin altruism may be evolutionarily stable if these emotions are signaled and decoded accurately. It was hypothesized that altruists produce involuntary facial signals which are detectable by others. One-minute video-clips were constructed of 5 self-reported altruists and 5 self-reported non-altruists. Altruist/non-altruist pairs were videotaped while playing the game "Mastermind" jointly against the experimenter. In one condition the altruist received credit for game performance; while in the other condition the non-altruist received credit. Under blind conditions, 168 undergraduates rated the 10 video-targets' helpfulness, concern, attentiveness and expressiveness. Results suggest that individuals can detect altruists. Altruists were viewed as significantly more attentive and concerned than non-altruists when playing the game for their partner's benefit. Non-altruists were rated significantly more attentive and concerned than altruists when playing the game for their own benefit. Regardless of condition altruists were viewed as more helpful than non-altruists. Results will be discussed in light of current conceptual models explaining the evolution of altruism among non-relatives.

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### **A Developmental Study of Sexual Dimorphisms in Spatial Behavior**

A number of studies have revealed sex differences in preferred strategies for spatial mapping tasks, with males disposed to Euclidean methods (distance concepts and cardinal directions) and females to topographical techniques (landmarks and relative directions). The present study was designed mainly to assess whether these differences were a function of females' lesser Euclidean abilities or greater capacities for object location recall, both of which have been assumed to originate with division of labor in hominid evolution. The method was to trace parallels in the ontogenetic development of each of these dimorphisms, using school samples ranging in age from 7 to 18. All measures tended to show predicted sex differences at about puberty with the exception of the water level test of Euclidean reasoning, on which male scores exceeded female scores beginning about age 8.

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### **'Holistic Darwinism' and Humankind**

"Holistic Darwinism" is a candidate name for a post-neo-Darwinian evolutionary paradigm. When two functionally-linked genes are differentially selected, when two symbionts are jointly favored, or when a group of communally nesting insects reproduce in greater abundance, the unit of differential survival and reproduction is the "whole"—the combined (synergistic) effects produced by the co-operating parts. Holistic Darwinism is not a different theory; it involves a different way of viewing the dynamics of evolution. It is distinctive in that it is concerned especially with the "bioeconomics"—functional costs and benefits—of co-operative phenomena of all kinds. It does not contradict the neo-Darwinian assumption of gene self-interest but highlights the paradoxical interdependence of genes and their "vehicles". Indeed, it is argued that the "unit" of replication (genes, genomes, gene pools) is less important as a

determinant of co-operative phenomena than are the functional properties and survival consequences of co-operation, as the data on such interactions clearly suggest. Many hypotheses have been advanced to explain the evolution of complexity — an undisputed historical trend if not a “law”. Holistic Darwinism focuses on the causal role of functional synergy. There have been many “engines” of evolutionary change, but the engine is nothing without the car. Human evolution may provide an important example.

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### **Olfactory Perception and Pregnancy Sickness: A Test of the Pregnancy Sickness as Maternal Adaptation Theory**

Increased 1st trimester olfactory sensitivity is a key prediction of Profet's theory that pregnancy sickness (PS)—food/odour aversions, nausea, retching, and/or vomiting—evolved as a maternal adaptation to prevent the ingestion of embryotoxins commonly found in foods. This prospective, controlled, and longitudinal study assessed 19 pregnant and 18 non pregnant women on the following variables:

- olfactory perception
- food aversions and cravings
- food intake
- nausea, retching, and vomiting

Increased 1st trimester olfactory sensitivity was found, thus lending support to Profet's theory. The study's other findings are also generally consistent with an adaptive view of PS.

DISSANAYAKE, Ellen

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### **Could Salient Features in Mother-Infant Interactions Underlie Some Adult Affiliative Behaviors?**

That maternal vocalizations to infants contribute to their psychosocial development is well known, but it is less appreciated that the vocalizations are one element in co-created, ritualized, species-typical, closely-attuned interactions. In these, exaggerated vocal, facial, and gestural signals, which express and convey motivation and emotion, are processed and responded to in terms of their varied temporal patterning and dynamic intensity. Such reciprocal interactions allow sharing of emotional state and contribute to the “bond” between the pair, months before classical attachment occurs. As other primate mothers and infants do not engage in such interactions, it appears that they originally evolved in ancestral hominid mothers and infants. In other animals, ritualized adult affiliative behaviors frequently are derived from parental or infantile signals. In humans, salient and affecting features of mother-infant interactions may be co-opted for “cultural” rituals that build adult affiliation—e.g., sexual foreplay and the arts of music and dance—which rely upon producing and responding to subtle cues of timing and dynamic intensity. Implications of this possibility will be examined.

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### **The Ethology and Sociobiology of Suicide**

Suicide is a functionally-defined set of varying (compared to courtship/copulation) motor patterns whose frequency of expression across different demographically-defined human populations is 5-200/100,000 individuals/year. Suicide frequency across different demographically-defined populations correlates inversely with the value of an individual's contribution to their Inclusive Resource Balance (IRB), defined as the total value of a kin group's resources. The data supports that

- natural selection adaptively configured the human brain so that individuals who perceive that their IRB contributions are negative will improve their own inclusive fitness by committing suicide
- the bias for which particular motor pattern to use to commit suicide is culturally transmitted across generations.

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### **Explorations Of East-West Differences: The Western Canon Since Goethe and the Turning Eastward**

In 1969 we published a study demonstrating clear-cut behavioral differences between Caucasian and Chinese neonates (Freedman and Freedman, 1969). Subsequent papers went on to speculate about East-

West differences in philosophy and art with the claim that such contrasts may be attributed, in part, to differences in European and Chinese gene pools (Freedman, 1980, 1986). In the present paper E.O. Wilson's call for consilience between biology and the social sciences is extended to the humanities. The Western Canon since Goethe is explored (per Harold Bloom, 1994), with emphasis on the appearance and waning of romantic longing, and the concurrent turn to Hindu-Buddhist notions of ego-lessness (e.g., Schopenhauer, R.W. Emerson, T.S. Eliot). We ask, along with C.G. Jung, if this turn Eastward offers a realizable possibility to Western spiritual seekers or, contrariwise, are native Europeans temperamentally unsuited to the pursuit of ego-lessness?

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**Sibling and Offspring Recognition by Olfaction**

Kin recognition is important for kin altruism, assortative mating, and directing parental effort to kin and away from nonkin. Humans can sometimes identify the odors of kin, either by social contact or by phenotypic matching: generalizing from own or kin's odors to those of others. Mothers and newborns, and full siblings, can identify each other by odor. Kin altruism is sensitive to degree of consanguinity; Segal (1988) found that identical twins cooperated more than fraternal twins. In this proposed study 25 pairs each of full-, half-, and step-siblings will be tested for ability to recognize siblings by odor. One sibling will wear a shirt for three nights, and the other will then try to distinguish it from a shirt worn by a same-age unrelated control. Parents who agree to participate will attempt the same discrimination. Each child will complete the Sibling Relationship Questionnaire, which measures emotional closeness. We hypothesize that children and parents will correctly match and prefer odors of siblings/offspring in direct proportion to biological kinship, and that odor identification will correlate with emotional closeness of siblings.

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#### **Behavioral Genomics Will Mediate Ultimate and Proximate Causations**

Behavioral genetics describe differences amongst conspecifics (members of a same species) and depend upon inter-individual differences within the species. Inherited behavioral patterns represent molecular hypotheses for which gene variants determine or influence behavior. Contemporary research entails work not only on the human genome, but contrast comparisons with other genomes including, for instance, bacteria, nematodes, fruitflies, fish, mice, and dogs. Future explorations of this kind will likely uncover highly conserved molecular consistencies of the genome that influence behavior. We can safely predict that DNA instructions forming and then influencing brain will include patterns of interaction with conspecifics (no doubt often contingent on developmental variables). For an example approach, the molecular biology literature shows that certain parts of the genome that possess great conservatism are indexed by cytosine-guanine (CG) islands. From the way that DNA repair enzymes work, the nucleotide base C tends to mutate to thymine (T). Only highly valuable sequences crucial to organism survival from ancient ancestors to present still persist as they originally were. Since vertebrates diverged from invertebrates 400 million years ago, only about one of every four CG sequences have survived into present species. Some of these are doubtless "housekeeping" genes that mediate crucial processes for keeping the cells functional (such as ubiquitin that functions to rid cells of waste). Others probably perform important intercellular functions such as segmentation. While most conserved genes with CG sequences may be tissue-nonspecific, some may influence behavior patterns. But whether this tag of conservatism bears out or not as behaviorally relevant, parallel markers are needed to decipher behavioral basic plans from those more species-specific.

KEYWORDS: behavioral genetics, genome, basic plan, DNA, CG islands

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**An Evolutionarily Based Study of Facial Expression Recognition**

A series of photos depicting anger, disgust, fear and sadness were tachistoscopically presented to male and female university students at two intervals during the day, when testosterone levels were expected to be high and low. An original questionnaire designed to measure monogamous vs. polygamous mating strategies was also administered to male subjects and information about menstrual cycle phase was taken from female subjects as an indicator of estrogen levels. Findings, in part, were that anger and sadness were more frequently correctly identified overall by female than male subjects. However, both sexes were better at identifying anger posed by males rather than females, and sadness and fear posed by females rather than males. Males tended to better recognize female emotions, in general, when they were in the high testosterone phase of the diurnal cycle. These and other analyses are discussed from

perspective of sex specific adaptive mechanisms.

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### **Evolutionary Aesthetics: Landscape Preferences in Children and Young Adults**

Humans lived the most time of their evolutionary past in the savannas of tropical Africa. Therefore our aesthetic answers to landscape should be influenced by environmental key features we also find in the savanna. Although we might have such a predisposition humans have settled in almost any possible landscape of earth. We thus assume that in the course of human life-cycle we acquire in an "imprinting-like process" preferences for valuable habitats. In order to test this hypothesis pre and post puberty children were tested for their preferences with computer generated landscapes. Visual orientation, point of view, lighting, time of day and season were kept constant and the height of mountains and the number of trees were varied systematically in a 3x3 design. Subjects rated how much they would like to "live in" or "visit" the virtual landscapes. The subjects came from Vienna and all had experience with "Savannah-types" (south-east of Vienna) and forest-mountain types (Vienna Woods) of landscapes. As predicted pre puberty children liked Savannah-type landscapes most, and post puberty children shifted their preferences to forest-mountain types of landscapes.

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### **Human Ethology: The next generation**

The last years have brought a revival of Konrad Lorenz's ideas, especially in the field of cognitive psychology. The idea that the brain has acquired rules for processing information and decision-making was clearly posed by him in his book "The backside of the mirror". Although the concept of the "innate-teacher" and related concepts never have reached wide empirical scientific attention, many modern publications are using this concept. Moreover many ideas and scientific hypotheses which are propagated at the moment exceed Lorenz's view of genetic determination in human thinking by far. This shows that Lorenzian ideas are as modern as fifty years ago, although many students are not aware of it. What is still missing is a fusion of cognitive processes and the actual "real world" performance of human behavior. This is a difficult link to establish. In some of his early publications and later in his letters to students he noticed a gap between the description of bird and fish behavior and that of mammal or human behavior. The difference in his view was "variability" and this variability was related to the description of the form of behavior. Taking this idea and modern recording equipment, this and the task which future generations of scientists in this field have to tackle.

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### **An Ethological Interpretation of Line Fighting**

A line fight is a pitched battle in which two groups of combatants face each other in roughly parallel lines. Although an essential tactic in the capture of military objectives, line fighting occurred in many simpler societies with no such purpose. Free of compulsion from superiors, individual warriors found satisfaction in such confrontations. The wide distribution and emotional basis for this pattern suggest an ethological hypothesis: Male humans have evolved to feel pleasurable excitement in formalized group confrontations in which the risk of death is relatively low. In the last few thousand years, as warfare has become increasingly dangerous, the pattern has often been expressed in aggressive team sports. Two reasonable speculations for the ultimate cause of the pattern are stable territoriality and competitive mating display.

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### **Human Pheromones and The Neuroendocrinology of Behavior**

This review details the mammalian neuroendocrine sequence that allows human pheromones to influence human behavior. The prenatal migration of gonadotropin releasing hormone (GnRH) neurosecretory neurons establishes neural substrates. These substrates enable human olfactory pathways to exhibit sexually dimorphic specificity to social-environmental chemical stimuli, and also allow for transduction of these chemical signals or pheromones. Human pheromones thereby appear to activate genes in GnRH neurons and to influence GnRH pulsatility and gonadotropin secretion, as evidenced by changes in pituitary and gonadal hormone secretion. GnRH pulsatility directs the concurrent maturation of the neuroendocrine, central nervous, and reproductive systems. Pheromonally induced alterations in GnRH

pulsatility allow for a causal linkage between human pheromones, olfaction, neurotransmission, autonomic responses, luteinizing hormone/follicle stimulating hormone ratios, steroidogenesis, synaptogenesis, synaptolysis, apoptosis, and hormonally induced behavioral changes. Mammalian, including human, pheromones appear to elicit behavioral change via their effect on a five-step pathway: gene-cell-tissue-organ-organ system.

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### **Card Sharks and Poker Faces: Development and Evolution of Deception**

An experimental research program designed to investigate developmental progressions in children's ability to enact and decipher intentionally deceptive communications in various game-playing situations is described. In the first paradigm, children's spontaneous deceptive hiding strategies reveal a stepwise progression from simple to more complex strategies with increasing age, the latter involving a recursive awareness of intentionality. In the second paradigm, children are invited to play a card game in which the experimenter poses a nonverbal signal (smiling) that is systematically associated with the truthfulness (or falseness) of cues provided to the child. The detection of such contingencies appears to be a more advanced problem and is not frequently solved until age 7, despite the fact that infants as young as two months are capable of detecting contingencies in their environment. These developmental data provide a basis for speculating on evolutionary progressions in deceptive communications.

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### **Does Mitochondrial DNA Proximate the Ultimate Motherhood?**

Women excel men widely, in motherly-feminine behavior, in language processing, and in right-side dominance. These characteristics were selected to support the intensive human motherhood. Femininity is the external signaling of motherhood. Language is the way to better understand the helpless infant. Right dominance is a by-product of the strong left, speaking, hemisphere in the brain. Here I speculate, that the proximate mechanisms that evolved to carry out this ultimate motherhood, are Mitochondrial genes, selected over many generations in mothers only, to influence the production of steroid hormones, that take place in the gonads, adrenals, placenta and brain. Steroidogenesis shapes a motherly behavior conducted by brain centers, like the hypothalamus for sex differential traits, or the speech areas of Broca and Vernicke for language praxis. Estrogens are a central growth factor in the brain. Higher levels of estrogens in women over men shape and operate their higher levels of motherhood. A pilot study measuring sex differences and covariance among several extreme groups in femininity, language, and side dominance, as well as steroid levels in blood, offers support for these ideas.

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### **Developmental Instability of The Digits and Predictors of Spermatogenesis, Testosterone, LH and Fecundity in Men and Women**

Developmental instability may be measured by fluctuating asymmetry (FA, deviations from perfect bilateral symmetry) or by deviations from the developmental plan of a structure such as the hand. The differentiation of the digits and the gonads is controlled by Hox genes. This means that developmental instability of the former may be related to the function of the later. It is shown that FA of the digits predicts ejaculate size in men and the ratio between the length of the 2nd and 4th digit (2D; 4D) is associated with ejaculate size and testosterone levels in men and LH levels in women and men. Data are presented which indicate that

- the 2D:4D ratio is determined in utero
- low 2D:4D in men and high 2D:4D in women are associated with high fecundity
- female 2D:4D minus male 2D:4D is a strong predictor of the fecundity of a partnership

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### **Implications of the Evolution of Laughter for Language Acquisition**

The universality of human laughter and its stereotypical structure indicates its underlying strong genetic and neurophysiological bases. Laughter has been regarded as a social vocalization or as a pattern of emotional expression in previous research, but no one has investigated its significance for language acquisition. Although humans share more linguistic competence with nonhuman primates than previously assumed, what distinguishes the acoustics of human speech from nonhuman primate production. While the ability to produce laugh-like vocalizations is shared by humans and apes, acoustic features of the

sounds differ between them. The emergence of human laughter is related to the development of the ability to utter sounds with segmental features. My longitudinal observations of 8 infants between 3 and 11 months in interaction with their mothers indicate the behavioral pattern of laughter is modified during development, and that it plays an important role in the development of babbling, the precursor of human speech.

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**Cognitive Neuroscience, Emotion, and Leadership**

Over the last decade, as advances in cognitive neuroscience have transformed our understanding of the human brain, it has become evident that emotional responses play a central role in learning and memory. This research greatly deepens our understanding of the proximate mechanisms underlying the nonverbal cues signaling emotion or social status, which have long been studied by ethologists concerned with nonhuman primates and human social interactions. At the same time, in political science and social psychology, experimental studies of the way viewers respond to televised images of leaders have confirmed the central role of emotion as a mediating factor in attitude change. By integrating these three lines of research, I propose a new model of emotion and cognition that helps explain many phenomena in contemporary politics. The resulting understanding of leader-follower relations not only points to serious dangers associated with politics in the television age, but suggests practical reforms in our electoral process.

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**An Evolutionary Psychological Explanation Of Colic**

Colic is defined medically as a self-limiting disorder, characterized by intermittent unexplained excessive crying, which lasts for three or more hours per day for at least four days per week in an otherwise thriving infant. Neither the substrative mechanisms nor the cause of colic are known, although the incidence is between 15 - 20% of the population. Median paroxysms are 2 3/4 hr per day. There are three theories that address the etiology of colic. A social interactional model is based on supposed failure of the infant to communicate with parents. A neural model posits immature components of the central nervous system. The third is a gut motility theory, which suggests three etiologies: one based on increased levels of gut (hormone) motilin; one based on lactose intolerance; and one based on protein intolerance. Empirical success of these explanations does not appear to be differentiable, and there is no universally effective treatment, based on these theories or otherwise. This study offers a fourth tentative explanation, one which is consistent with the emerging principles of co-evolutionary psychology. Much as Profet has held that pregnancy sickness is an adaptation (as a deterrent to ingestion of teratogens) rather than a disorder, colic is hypothesized here to be an adaptation which imposes significant emotional pressure on parental patience. Parents who are unfit for the rigors starkly reduce their (current or future) contribution to the gene pool. Socio-biological data are consistent with this view.

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**The Cooperative (Contagious) Nature of Yawning: An Evolutionary Explanation**

Yawning among humans is a cooperative behavior, but we do not know why. In fact there is no consensus on why we yawn at all. That this pervasive behavior is adaptive should be accepted since it is found among (presumably) nearly all members of the species, and it (presumably) ascended through selection pressures. The latter point implies that the benefits of yawning greatly exceed the costs of building it as a survivable character. The psychopharmacological literature contains many references to medical stimulation of yawning and suppression of yawning, and a significant lot is known about the neural substrates of this conditionable reflex. There are several hypotheses about the origin and utility of yawning, though few confront issues of cost and benefit. The explanations vary from (some very confused) perspectives associated with oxygenation to those of prevention of infections of the tonsils. Interesting and provocative as these entirely serious explanations and studies are, more curious is the field observation and experimental confirmation that yawning is socially contagious, and that as a released behavior, it serves real social purposes among several species, most notably humans. This paper reviews the phenomenology of yawning and offers an olfactory sampling-based, evolutionarily psychological explanation of its status as an adaptation for individual and group survival. The explanation is integral to a more general theory of cooperative behavior.

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### **The Role of Fluctuating Asymmetry on Judgments of Physical Attractiveness: A Monozygotic Co-Twin Comparison**

A Plethora of recent studies across a variety of taxa have confirmed a prediction evolutionary and developmental biology that body symmetry is a major correlate of attractiveness and mate choice. Inferences about the presumed causal nature of the role played by symmetry are however, hampered by the fact that symmetry is generally correlated with other features related to mate choice. Furthermore, only one type of deviation from bilateral symmetry, fluctuating asymmetry, which is a consequence of environmental insult during development, is posited to have an effect on attractiveness. This study is the first to directly assess the role of FA in relation to human attractiveness: by comparing monozygotic co-twins, we controlled for natural correlates of symmetry and isolated FA from other forms of asymmetry. Results demonstrate that the more symmetric twin of a pair was consistently rated as more attractive, and that the magnitude of the difference between twins in perceived attractiveness was directly related to the magnitude of perceived difference in symmetry.

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### **"If I Look At Your Face I Have to Die!" A Common Denominator of Early Childhood Autism**

It is a curious problem of the early childhood autism that there are so many different noxes (brain damage, infectious diseases, genetic and psychodynamic factors) while the symptoms impress as a monotonous syndrome of disturbances in behavior and mind. I succeeded in finding a common denominator for typical symptoms (excluding only severe brain damage), compatible with other theories: The fear of the frontal view of the human face. Evolution provided babies with a frontal mother scheme eliciting basic trust. Mistrust will only develop with the eight-months fear and only after the mother is personally known. But autistic children experience from birth on the frontal view as a menacing stare telling them not to exist, and sometimes, with parents without a baby scheme, they are right. In the conflict between flight and survival, the children behave as if not-existing, finding only some security in sameness. A child avoiding to look at mother's face and listen to her voice will not learn the connection of mimic and affect, not experience imitation and identification and thus cannot develop theories of mind. Also other symptoms can be explained by this basic assumption.

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### **Infrastructural Properties of Vocal Communication in Ontogeny and Evolution**

The study of infant vocalizations in the past two decades has outlined stages of development. The stage model makes it clear that infants progress systematically towards a capacity for speech starting in the first month of life. Further, failure in timely emergence of stages is a signal of hearing or speech disorders. The key to recognition of significant stages is infrastructural modeling of properties of complex vocal communication systems. The infrastructural model specifies aspects of vocal capacity that must be built, step by step, in order for rich communication to be possible. Having once formulated an infrastructural model, developmental stages that would otherwise be unnoticed are easily recognized. In addition, having once formulated an infrastructural model, we are in a position to make more reliable evolutionary projections and interspecies comparisons, because the model specifies necessary building blocks for a rich communicative system, whether in development or in evolution.

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### **Ontogenetic Priming for Social Hierarchical Functioning**

In social primates dominance status is linked with personal survival and reproductive success. Low ranking individuals must employ special behavioral strategies to offset the fitness-compromising effects of their hierarchical status. A childhood of low nurturance and chronic conflict with parents may predispose individuals to behavioral phenotypes more adaptive to low-status functioning (e.g., impulsivity; early sexual activity). Participants (undergraduates; n = 151) completed the Parental Nurturance Scale, the Index of Family Relations, (a measure of severity of family problems), Eysenck's Impulsiveness scale, California Personality Inventory (CPI) scales for Socialization, Responsibility, and Self-Control, and questions on lifestyle and sexual activity. Paternal nurturance correlated positively with the three CPI scales for women and with Socialization for men. The Index of Family Relations negatively correlated with the three CPI scales. Impulsivity was correlated negatively with parental nurturance and

positively with family problems. Level of sexual activity and age of first intercourse were correlated with nurturance and family problems in both sexes but with notable differences. Findings are discussed in light of gender differences in reproductive strategies.

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### **The Sexual Dimensions of Power**

A Q-Method protocol run among a sample of elite and non-elite males and females in New Zealand found that the sexes converge in attitudes as they become more elite, but maintain strongly bipolar attitudes when non-dominant and thereby subject to continual status conflict and insecurity regarding reproductive success. Elite males and females converge in attitudes toward cultural/religious and affectual normativity, and a mild feminism, showing a concern for social control of status conflict. Non-dominant females show more sexual realism, concern for resource security, and less normative/religious/cultural direction of their behavior than elites. Non-dominant males reject affect and normativity, and support opportunistic sexuality. They recognize intra-male competition for rank, but feel continually threatened by female choice (sexual lability, crypsis). This attitudinal survey strongly confirms differential parental investment theory, but also shows a convergence of interests between the sexes as they rise in social status.

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### **Attachment, Autism and Holding in Mind**

Autistic children, especially when stressed, have difficulty in taking the viewpoint of others into account when taking action. This is not the same as saying they are "mindblind" but rather that their use of their (probably underdeveloped) mindreading ability in social action and learning is constrained. A child's mind reading ability requires our innate ability to imitate, but is refined and developed in early "intersubjective" interactions, especially with attachment figures who give the child the experience of being "held in mind" through sensitive reaction to the child's state and meeting of the child's needs. If they can be fitted into any attachment relationship category, autistic children fit into the disoriented/disorganized category of insecure attachment. In general "disoriented" children seem often to find themselves unpredictably out of their caregiver's mind, through the caregiver being suddenly distracted. It is likely that autistic children have a similar experience but one to which their own attentional difficulty, rather than caregiver's distraction, strongly contributes.

Therapy is in three stages.

1. Addressing any physiological causes of the child's attentional and other difficulties.
2. Creating more secure attachment between child and parents.
3. Helping the child develop skills. The improvement course is described.

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### **Human Body Odour, Symmetry, and Attractiveness**

In this study we tried to find out if human body odour does signal mate qualities like other cues in mate choice. To test this hypothesis we used ratings of physical attractiveness and measures of fluctuation asymmetry as indicators for developmental stability, and compared it with the evaluated quality of body odour. We found that the more attractive the face of a woman, the more attractive her body odour. Positive relations between body odour, attractiveness and symmetry for males were found only, if female raters had been in their most fertile phase of menstrual cycle. These results show that human body odour has a signaling potential for mate choice, but a different significance for both sexes.

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### **Sex Differences in Children's Investment in Peers**

Past research has not examined sex differences in preferences for peer relationships. This is surprising because across a variety of studies with non-human primates under both laboratory and naturalistic conditions, after infancy males have been found to spend more time with peers than females who spend more time in mixed-age groups. It was hypothesized in this study that human males would prefer interaction with peers more than would females. The hypothesis was tested in two ways. In the first study, four- and six-year-old children's enjoyment of peer interaction was observed in 26 groups of same-sex peers. Girls were rated as enjoying their interactions significantly less than boys. In the second

study, six- and nine-year-old children were interviewed about individuals with whom they spend time in their homes and neighborhoods and about the individuals who participate in their favorite activities. The proportion of individuals named by children who were same-sex peers was significantly lower for girls than boys both in children's neighborhoods and in children's favorite activities. Results strongly support the hypothesis that females and males have evolved differential preferences for interaction with peers. From an evolutionary perspective, females' greater role than males in raising offspring would be supported more by relatives as opposed to peers. In contrast, males' greater involvement in group protection and in hunting would be most supported through the formation of bonds with large numbers of able-bodied peers.

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### **Puerperal Blues and Depression—Evolutionary and Crosscultural Research on the Postpartum Period**

In "Western" cultures prevalences for maternity blues and postpartum depression range between 40-85%, respectively 10-15%. Medical textbooks hold the dramatic endocrinological changes after birth responsible for these disturbances. From an evolutionary perspective, however, one should not expect that mothers, by physiological necessity, are handicapped in this important bonding period. Women who gave birth in three different clinics in the Munich area (n=600) and women of the Trobriand Islands, Papua New Guinea (n=46) took part in a katamnestic study. The puerperal period is, for a number of reasons, a vulnerable phase requiring adjustment, particularly in the new mother. Traditional cultures in Melanesia and Indonesia apparently 'handle' pregnancy, birth and puerperium in such way that no or only mild postpartum dysphoria occurs. In contrast, our "Western" way of dealing with this phase of reproduction produces the culture bound syndromes of maternity blues and depression. Factors believed to be responsible for this derailment will be discussed.

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### **Male/Female Differences in Leadership Appraisal**

Theoretical concern for sex differences in voters' appraisals of political leaders began in the United States with observations of a gender gap in attitudes toward Ronald Reagan in the early 1980s. As a starting point in the investigation of the evolutionary foundations of sex differences in leader appraisal, we examine male/female differences in the evaluation of the physical appearances of candidates for leadership. Our dependent variable involves assessment of the viability (or electability) of candidates for national office. Drawing upon the literature on facial dominance and attractiveness, we posit a model in which candidate viability is a function of attractiveness, dominance, healthiness and maturity. We analyze sex differences in the appraisal of male and female candidates for political leadership, testing alternative structural models of the effects of appearance dimensions upon candidate viability. Data for male candidates are drawn from four trials of a cross-cultural design in which 96 American student and adult professional subjects and 16 adult Southeast Asian subjects in Jakarta rated still images and video clips of 16 candidates for president in the first round of the 1996 Romanian national election. Data for female candidates were drawn from C-Span broadcasts of speeches on the floor of the U.S. House of Representatives in which 19 Democratic congresswomen serially offered the same resolution in virtually identical language. Still images and video clips were rated by 165 undergraduates from midwestern and northeastern universities in the United States.

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### **Teaching How to Answer 'Why' Questions About Behavior**

Darwin's greatest contribution was not, perhaps, the discovery of evolution, but the realization of natural selection which radically changed the nature of scientific epistemology. Darwin showed us how to ultimately answer "why" questions about biological phenomena. Before 1859 there was no scientific way to get past proximate who, what, where, when and how answers. Biology, and behavioral science students though, (and often their instructors) are often unaware of the broad explanatory power of evolutionary answers and how they differ from proximate answers to "why" questions, and moreover, often continue to give teleological answers all semester unless this distinction is thoroughly discussed early on. Using such questions such as "Why do males show the Coolidge Effect?", I have developed an effective approach to teaching the distinction between proximate and ultimate evolutionary answers which actively involves the students and discourages teleological answers.

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**A Multimedia Approach to Addressing Mindblindness**

The materials on display for this poster presentation were inspired by a British manual for teaching mindreading to children with autism. The videotape and picture cards were used in an intervention study with three young school-aged children diagnosed with Pervasive Developmental Disorder (PDD), a condition associated with autism. A multimedia approach was adopted to investigate the extent to which scores on false belief tasks could be improved. The videotape included three sections. The first offered four levels for teaching theory of mind principles associated with Emotion. The second section provided five levels of Belief understanding. The third part offered an opportunity for the students to see both categories of Emotion and Belief combined in a contextualized dramatic rendition of Little Red Riding Hood. In contrast to the British mindreading lessons, actors rather than cartoons were featured, and the videotape and colour picture cards were used to help the students associate the mindreading activities with people. This was viewed as a necessary preliminary step in stimulating an awareness of the existence of mental states in others.

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### **Ethology In Etymology, Proverbs and Popular Phrases**

Human ethology, evolutionary psychology, human sociobiology and related approaches to better understand links between biology and culture have demonstrated how various human perceptions, emotions, intentions and behaviours can be explained in evolutionary terms. This paper addresses the question in which way proverbs, popular phrases, metaphors and the like build on ethologically meaningful concepts and how etymology can be utilized to uncover ethological foundations of the human mind. German, English, Romanian and other European as well as non-European languages are examined in this way. Topics are, among others, prosocial and agnostic behaviour, group cohesion, norm enforcement, territoriality, social hierarchy and parent-child interactions. Often ethologically meaningful linguistic expressions contain elements of archaic language which back the assumption that these expressions root in preliterate times. Words and phrases, thus, facilitate glances into the history of human thought.

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### **An Evolutionary Look at Dual Diagnosis**

Schizophrenia is the worst illness known to man. The sufferer is robbed of his mind. With deinstitutionalization, many schizophrenic patients have been abandoned to lives of neglect, poverty, and homelessness. Many are plagued by intractable substance abuse which has led to a new diagnostic category, dual diagnosis. This paper casts an evolutionary lens on this twin tragedy in search of new treatment approaches.

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### **The Scent of Symmetry**

Two studies examined whether women's olfactory preferences for men's scent would tend to favor the scent of more symmetrical men, most notably during the women's fertile period. College women (N = 58, N = 75) sniffed and rated the attractiveness of the scent of t-shirts worn over a period of two nights by different men (N = 41, N = 75). Results for both studies indicated that normally cycling (non-pill-using) women near the peak fertility of their cycle tended to prefer the scent of shirts worn by symmetrical men. Normally ovulating women at low fertility within their cycle and women using a contraceptive pill showed no significant preference for either symmetrical or asymmetrical men's scent. Separate analyses revealed that, within the set of normally cycling women, individual women's preference for symmetry correlated positively with their probability of conception, given the actuarial value associated with the day of the cycle they reported at the time they smelled the shirts. Potential sexual selection processes and proximate mechanisms accounting for these findings are discussed.

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### **When Males Become The Choosy Sex: Supply and Demand Factors in Female Partner Choice as Revealed from Historical Parish Registers**

Parish registers, when compiled to individual and family histories, reveal detailed insights into the behavioral and reproductive strategies of rural populations of premodern Europe. During the 18th and 19th centuries within the Krummhörn population (Ostfriesland, Germany), for example, it can be shown that in complete agreement with the Darwinian theory of sexual selection, men developed partner preferences in favor of young women while women developed partner preferences in favor of men from the local wealth elite. This led to a marriage market on which female youth was traded for male wealth. The marriage market, however, is not only determined by demand factors (mating preferences) but should—if obeying economic principles—also be influenced by supply factors.

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### **Children's Reactions to Status Differentials**

Much research in psychology has been devoted to identifying and explaining gender differences in social interactions. A repeated finding is that males and females differ in their acceptance of status differentials among peers. Specifically, although males are concerned with issues of dominance and engage in behaviors that serve to create status differentials, females avoid status and aspire to cooperate and maintain intimacy by avoiding conflict. Although prior studies have inferred this sex difference, the research has not yet directly tested this hypothesis. The majority of research has been based either on verbal behavior, on cross-sex groups, or on hypothetical situations. The purpose of this study was to directly examine children's same-sex peer relations and the effects of status differentials in a more natural context. This was achieved by introducing a situation in which status differentials must necessarily exist. Twenty all-male and all-female tetrads from two grade levels (kindergarten and grade four) were asked to choose a leader. Each group was given a 6 minute time-limit and the negotiation process was videotaped. The results of this study showed no sex differences in the mean length of time it took to choose a leader (M males = 137 seconds; M females = 110 seconds), the mean percentage of time the children spent smiling (M males = 22%; M females = 26%), and the mean percentage of time spent negotiating (M males = 62%; M females = 66%). From an evolutionary perspective these results indicate that status, even without the acquisition of resources, is equally important for both males and females.

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### **Possible Functions of Puberty Rites**

Puberty rites, a period of intense instruction or testing followed by induction into adult society, are widespread in traditional societies and so may reflect evolved behavioral propensities and confer adaptive advantages. Indeed, many common features of puberty rites, such as sex segregation, intermale competition, parent-offspring distancing, and the onset of sexual behavior, have parallels in the naturalistically observed behavioral tendencies of adolescent simians and humans. The functions of puberty rites thus may reflect basic needs of adolescents. That is, puberty rites may conspire with the evolved bodily and behavioral changes of puberty to prepare the individual for adulthood. Specifically, puberty rites may function to provide intense instruction in adult sex roles, regulate and publicize the attainment of reproductive status, and enhance the initiate's mate value. The common theme of sexuality in puberty rites in many cultures and their coincidence with the onset of fertility meshes with the general function of adolescence as managing the transition from nonreproductive to reproductive life stages (Charlesworth, 1988).

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### **Behavioral Sex Differences In Happily Married Couples**

Research on married couples suggests that unhappy husbands withdraw from interactions with wives, to reduce physiological stress (Gottman and Levenson, 1988). Such withdrawal produces exaggerated sex differences in nonverbal communication. This research examined the nonverbal behaviors on 40 happily married couples who were videotaped discussing commitment in marriage. Although these couples

showed no significant sex differences in marital satisfaction (as measured by the MARQ of Russel and Wells) or in verbal statements regarding commitment, robust sex differences in the following nonverbal behavior emerged: smiling, laughing, and proportion of time looking at spouse (all  $p < .01$ ). Although husbands and wives looked at each other the same average number of times during discussions, wives looked significantly longer, as if listening attentively to husbands. Husbands used shorter glances at wives, suggesting more of a monitoring function. Wife's looking at husband was the single best predictor of husband's smiling, as 62% of all husband's smiles occurred within 3 seconds of the wife's looking at him. Results suggest that behavioral sex differences persist in happily married couples, and that visual gaze may be one behavioral mechanism which wives use to "soothe" husbands in happy marriages.

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### **Girls and Women in The Company of Boys and Men (film)**

This film discusses sex differences in human males and females across the lifespan, from an evolutionary and functional point of view. Documentary footage of children's playground behavior is shown, from Chicago, Illinois and Second Mesa, Arizona. Boy-girl interactions are discussed in terms of dominance and submission. Footage of married couples from Detroit, Michigan includes men and women of various ages, discussing commitment in marriage. Behavioral synchronies and asynchronies are discussed in terms of their functioning to promote stability and satisfaction in long-term relationships between males and females.

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## Abstracts - Posters

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### **Xenophobia and Mental Illness**

Introduction: Despite numerous educational campaigns during the last decades, the attitude of the public towards the mentally ill has scarcely changed. People with mental diseases have often been rejected or even been excluded from social life across all cultures. Biological psychiatry has widely undervalued the problem of (re-) integration of the mentally ill, as well as the role of biologically determined social behavior, e.g. xenophobia. Method: The literature has been reviewed, focusing on how people define and recognize mental illness, and with emphasis on their underlying attitudes. Results: Deviant body language and psychomotor disturbances coin the public image of the mentally ill. The unpredictability of their behavior induces fear and rejection, leading to social exclusion. Discussion: Mentally ill people display behavioral patterns that are usually not group conform, causing fear of and rejection by their social environment. This reaction may be interpreted as 'xenophobia'. Conclusion: The biological roots of xenophobia should be taken into account to improve the social acceptance of mentally ill people.

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### **Sexual Selection and the Evolution of Language**

This paper presents an argument for a contribution of sexual selection, specifically female choice, to the rapidity of human language evolution. Like artificial selection, sexual selection can result in rapid change in a specified trait. Female animals have been shown to assess males and choose to mate on the basis of a number of factors likely to contribute to the propagation of their own DNA. Present day women worldwide rank intelligence second out of thirteen desirable mate characteristics. Language ability might have been used by females to index general intelligence, as well as to indicate potential for successful strategizing in social relations and in hunts, thus providing resources in a number of ways. Vocabulary is highly correlated with general intelligence. While sexual selection pressures in a strictly monogamous species are not as powerful as in polygamous ones, anatomical and anthropological evidence suggests that humans have never been strictly monogamous. Language can have at least two functions in the mating game: First, as a tool of seduction, as Pinker suggests, and, secondly, as a behavior demonstrating "quality." If adulterous as well as unmated females have historically chosen disproportionately more articulate males, female choice could have been a contributor to the rapid evolution of human language.

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### **Invulnerables and Aspergers Anchor Interpersonal Continua**

Autistic individuals with Asperger's Syndrome have severe deficits in social-emotional functioning but may be otherwise of normal or even superior intelligence. Researchers studying psychological resiliency have found individuals they dubbed "invulnerables," who transcend horrific childhoods to become emotionally healthy adults. Both autism and invulnerability have confounded behavioral scientists who frequently use words such as "enigma" in discussing these two phenomena. This paper presents evidence that mainstream psychology has failed to make sense of autism and invulnerability, because the standard social science model has failed to understand how highly evolved are our instincts for social and self-development. Autism researchers Simon Baron-Cohen and his colleagues have identified a number of evolved psychological abilities or modules which they call Theory of Mind (ToMM), Shared Attention Module (SAM) and Intentionality Detector (ID) that help individuals navigate the social world. This paper presents evidence that these social abilities may be conceptualized as varying along continua, with the so-called invulnerables and autistics representing opposite poles on skill dimensions of social empathy, perception and interest.

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### **Patterns of Social Exchange Among Significant Others**

Social exchange—the trading of goods, services and other types of help—has played an important role throughout our evolutionary history. Social exchanges in romantic relationships should feature special characteristics associated with the courtship and mating function of the relationship. As reproduction is very costly for females, and resources are a limiting factor on their reproductive success, females should be more choosy in selecting mates than males, and should favour mates who can provide resources. Consequently, demonstrating investment in their mates should be an important courtship strategy for males. It was predicted that men would give more to their significant others, than vice versa, especially in the early stages of a romantic relationship. In this study, 56 undergraduates, who had been in a romantic relationship for at least one year, were asked to recall and evaluate items they had given to or received from their significant other. Although the average cost and value of items exchanged did not differ between the sexes, most men and women estimated that the boyfriend had given more in the history of the relationship than had the girlfriend. As in previous studies (Janicki, 1998), participants tended to perceive items given somewhat differently than items received. The type of items exchanged was also analyzed and is discussed.

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### **The Utility Subversion Effect**

The utility subversion effect is about the interaction between evolution-produced behavioral structure in humans and the new goods and services created by a utility-maximizing free market economy. Evolution creates a peculiar kind of adaptedness, which depends on certain relationships in the ancestral environment. This kind of adaptedness should be as true for humans as for other species. However, the existence of technological progress allows the creation of goods and services that no longer obey these relationships. These new goods and services are more desired by consumers than what they replace, yet many contribute less well to inclusive fitness even in a modern environment. The outcome is that modern economic environments tend to 'destructure' human behavior, and an efficient economy with strong market-driven technology growth can do so at an accelerating pace. Because many elements of inclusive fitness align with modern socially-constructed senses of 'good', such 'utility diversion' can be considered a problem. The public policy implications of this suggest that relying on market utility maximization to create overall public good may be more problematic than usually assumed.

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### **An Evolutionary Perspective On Pain: The Physiological Response as Proximal**

This paper outlines the ultimate nature of the pain response as that of a signaling mechanism intimately related to fitness and a product of the evolutionary environment. Cultural discrepancies and rituals, the physical consequences of evolution on the human body and anxiety are discussed and analyzed from this perspective. An attempt is made to integrate evolutionary, physiological, and psychological perspectives on pain, and to discuss specific instances where an evolutionary perspective can increase our

understanding of the pain response.

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### **Functional Significance of Swaddling as Traditional Infant-care Practiced by Native South Americans**

A traditional custom of infant caretaking, swaddling, was investigated with the Aymara in Bolivia. Results of the observation did not support the notion that swaddling was a form of infant neglect on the part of caretakers. When swaddled, infants were likely to wean earlier than when non-swaddled. Consequently, ovulation of swaddling mothers tended to resume earlier than non-swaddling mothers. Number of offspring swaddling mothers reproduced was significantly greater than non-swaddling mothers.

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### **Availability Bias for Words Representing Human Threat: Further Evidence for Domain Specificity of Cognition**

Evolutionary psychologists have postulated that people have evolved cognitive biases for processing threat-related stimuli. So far, studies have documented attentional biases, reasoning biases, and memory biases for threatening material. The present study was designed to test for a number of possible cognitive biases for "threatening" words. Students were presented with one implicit and two explicit memory tasks. We found no evidence for an implicit memory bias or an explicit recognition bias, but there was support for an explicit recall bias, as well as a response bias for threat words. The results provide support for the idea that people have evolved multiple cognitive biases for threatening material. We are now pursuing further studies of threat biases in language use.

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### **The Effects Of Fluctuating Asymmetry on Attractiveness and Attention**

Many researchers have tried to identify the specific qualities that affect attractiveness. Fluctuating asymmetry (FA), a pattern of random deviations from perfect bilateral symmetry, may be one of these qualities. FA may reveal information about a person's health and developmental stability. Consistent with sexual selection theory, individuals may preferentially choose mates with low FA, so that their offspring can inherit this developmental stability. Research has shown that FA is positively correlated with physical and mental health. Studies comparing facial FA and attractiveness, however, have produced mixed results. Of five studies investigating this relationship, only the one by Grammer and Thornhill showed significant results. All of these studies, though, had a number of methodological problems with the types of stimuli and the type of attractiveness rating used. The stimuli used in the past were black and white photographs manipulated in such a way that did not control for many extraneous variables that could have accounted for the results instead of FA. Also, these studies used a subjective rating as the sole measure of attractiveness. This study investigated the relationship between FA and attractiveness, and attempted to improve on the design of past studies. Colour photographs were used as opposed to black and white and symmetry differences were created through computer manipulation of three specific facial traits. As well two different types of measures of attractiveness were used instead of just a rating scale. The results of this study support the conclusions reached by most of the studies in this area: facial FA is not related to attractiveness. The absence of an effect on any of the measures may suggest that more improvements are required in this design before the true relationship between FA and attractiveness is found. Some improvements have been discussed concerning the stimulus materials, questionnaire and the social context of investigation. It remains a possibility, however, that the results of this study represented the true relationship between facial FA and attractiveness.