

H<sub>0</sub><sup>e</sup>S99

The Annual Meeting of the Human Behavior and  
Evolution Society  
June 2–6  
Salt Lake City, Utah

June 7, 2009

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**Local hosts** Elizabeth Cashdan and Alan Rogers

**Local organizing committee** Elizabeth Cashdan, Edward Clift, Geoff Hayes, Dustin Penn, Kristina Robb and Alan Rogers

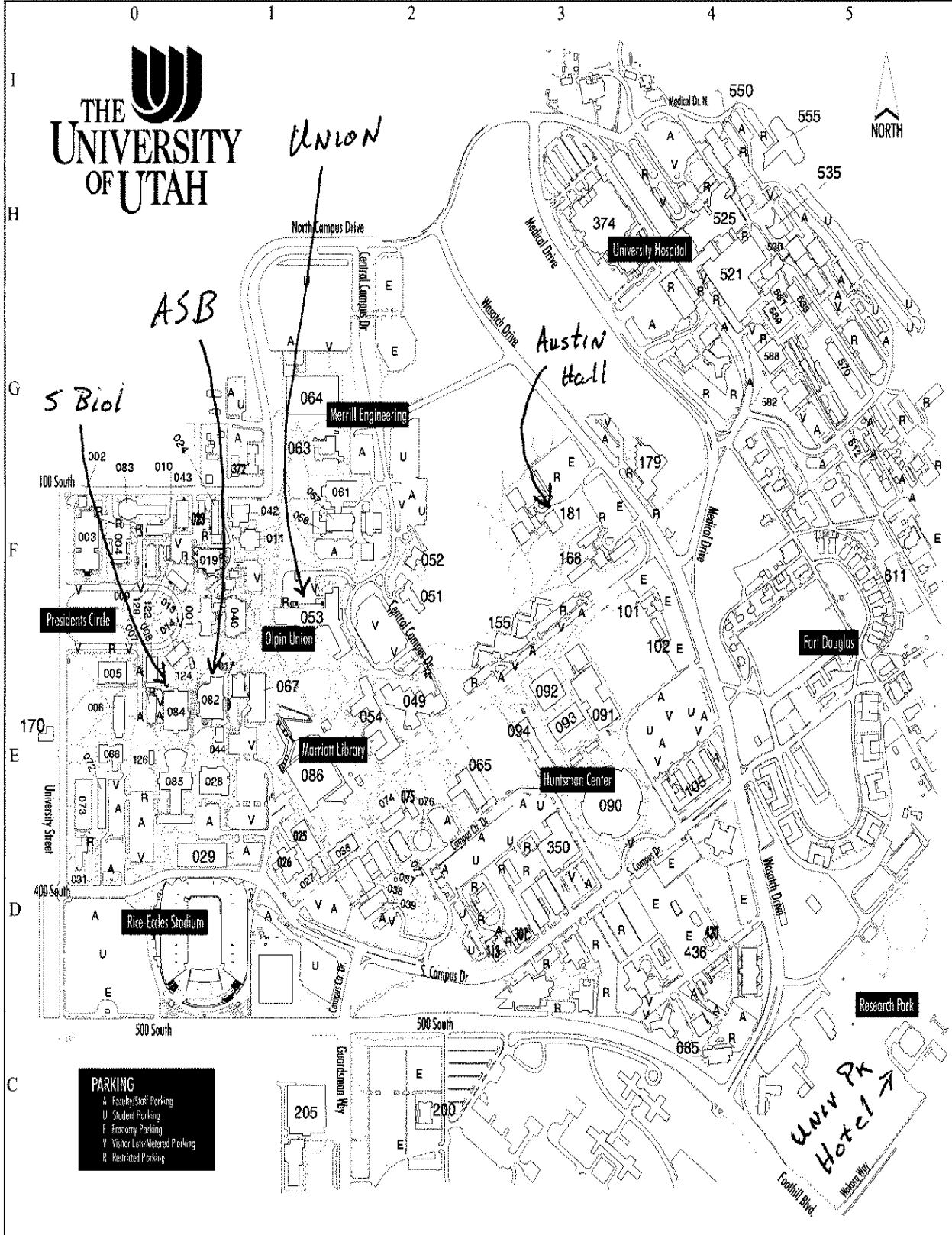
# Contents

<b>1</b>	<b>General Information</b>	<b>8</b>
1.1	Navigating in Salt Lake City . . . . .	8
1.2	Nearby restaurants . . . . .	8
1.3	University food services dining hours . . . . .	9
1.4	Bookstore coupon . . . . .	9
1.5	Parking . . . . .	9
1.6	Shuttle service . . . . .	9
1.7	Guided tour . . . . .	10
1.8	About posters . . . . .	10
1.9	Speaker preview room . . . . .	10
1.10	Bicycles . . . . .	10
<b>2</b>	<b>Program</b>	<b>11</b>
	Poster setup . . . . .	11
	Thursday morning plenary . . . . .	11
1	Thursday morning paper sessions . . . . .	12
1.1	Differential parental investment: Theory and data . . . . .	12
1.2	Cognitive specializations . . . . .	12
1.3	Symposium: Examining the validity of the waist-to-hip ratio hypothesis of human female attractiveness (organizer: McBurney DH) . . . . .	12
1.4	Symposium: Biopoetics. Part 1 (organizer: Clift EM) . . . . .	12
	Thursday afternoon plenary . . . . .	13
2	Early Thursday afternoon paper sessions . . . . .	13
2.1	Birth order . . . . .	13
2.2	Pregnancy, prenatal effects, and fertility . . . . .	13
2.3	Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 1 (organizer: Penn D) . . . . .	13
2.4	Symposium: Biopoetics. Part 2 (organizer: Clift EM) . . . . .	13
3	Late Thursday afternoon paper sessions . . . . .	14
3.1	Social reasoning . . . . .	14
3.2	Aesthetics of human form . . . . .	14
3.3	Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 2 (organizer: Penn D) . . . . .	14
3.4	Symposium: The psychology and physiology of human sperm competition (organizer: Shackelford TK) . . . . .	14
4	Thursday evening . . . . .	15
4.1	Poster session . . . . .	15
	Friday morning plenary . . . . .	15
5	Friday morning paper sessions . . . . .	15

5.1 Metatheory, philosophy of science and ethics . . . . .	15
5.2 Fertility, demography, and culture . . . . .	15
5.3 Mating tactics . . . . .	16
5.4 Emotion and motivation . . . . .	16
5.5 Special panel discussion: Risk-taking . . . . .	16
Friday afternoon plenary . . . . .	16
6 Early Friday afternoon paper sessions . . . . .	17
6.1 Psychology of risk and reciprocity . . . . .	17
6.2 Coalitions and conflicts . . . . .	17
6.3 Symposium: Alternative approaches to the evolution of cooperation. Part 1 (organizer: Smith EA)	17
6.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 1 (organizer: Penn D)	17
Poster takedown . . . . .	17
7 Late Friday afternoon paper sessions . . . . .	18
7.1 Kinship . . . . .	18
7.2 Evolution of religion and morality . . . . .	18
7.3 Symposium: Alternative approaches to the evolution of cooperation. Part 2 (organizer: Smith EA)	18
7.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 2 (organizer: Penn D)	18
Friday evening: Banquet and keynote address . . . . .	18
Saturday morning plenary . . . . .	19
8 Saturday morning paper sessions . . . . .	19
8.1 Aggression and homicide . . . . .	19
8.2 Developmental evolutionary psychology . . . . .	19
8.3 Symposium: Ontogeny of human reproductive strategies (organizer: Bailey M)	19
8.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 1 (organizer: Sellen DW) . . . . .	20
Saturday afternoon . . . . .	20
9 Early Saturday afternoon paper sessions . . . . .	20
9.1 Modelling human cooperation and coalitions . . . . .	20
9.2 Male attractiveness, anthropometrics, and mating . . . . .	20
9.3 Jealousy . . . . .	21
9.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 2 (organizer: Sellen DW) . . . . .	21
10 Late Saturday afternoon paper sessions . . . . .	21
10.1 Experimental economics . . . . .	21
10.2 Language, intentionality, and cognition . . . . .	21
10.3 Parents and children . . . . .	22
10.4 Symposium: Constraining evolutionary hypotheses of human male homosexuality (organizer: Bailey M) . . . . .	22
Saturday evening barbecue . . . . .	22
Sunday morning plenary . . . . .	22
11 Sunday morning paper sessions . . . . .	22
11.1 Evolution of human life history . . . . .	22
11.2 Male sexual coercion and control . . . . .	23
11.3 Topics in human sociality . . . . .	23
<b>3 Abstracts</b> . . . . .	<b>24</b>
Thursday morning plenary address . . . . .	24
1 Thursday morning paper sessions . . . . .	24
1.1 Differential parental investment: Theory and data . . . . .	24
1.2 Cognitive specializations . . . . .	26

1.3 Symposium: Examining the validity of the waist-to-hip ratio hypothesis of human female attractiveness . . . . .	27
1.4 Symposium: Biopoetics. Part 1 . . . . .	29
Thursday afternoon plenary address . . . . .	30
2 Early Thursday afternoon paper sessions . . . . .	31
2.1 Birth order . . . . .	31
2.2 Pregnancy, prenatal effects, and fertility . . . . .	32
2.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 1 . . . . .	33
2.4 Symposium: Biopoetics. Part 2 . . . . .	34
3 Late Thursday afternoon paper sessions . . . . .	35
3.1 Social reasoning . . . . .	35
3.2 Aesthetics of human form . . . . .	36
3.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 2 . . . . .	38
3.4 Symposium: The psychology and physiology of human sperm competition . . . . .	39
4 Thursday evening . . . . .	40
4.1 Poster session . . . . .	40
5 Friday morning paper sessions . . . . .	47
5.1 Metatheory, philosophy of science and ethics . . . . .	47
5.2 Fertility, demography, and culture . . . . .	48
5.3 Mating tactics . . . . .	50
5.4 Emotion and motivation . . . . .	51
5.5 Special panel discussion: Risk Taking . . . . .	53
Friday afternoon plenary address . . . . .	53
6 Early Friday afternoon paper sessions . . . . .	53
6.1 Psychology of risk and reciprocity . . . . .	53
6.2 Conflict and reconciliation . . . . .	54
6.3 Symposium: Alternative approaches to the evolution of cooperation. Part 1 . . . . .	55
6.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 1 . . . . .	57
7 Late Friday afternoon paper sessions . . . . .	58
7.1 Kinship . . . . .	58
7.2 Evolution of religion and morality . . . . .	59
7.3 Symposium: Alternative approaches to the evolution of cooperation. Part 2 . . . . .	60
7.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 2 . . . . .	61
Saturday morning plenary address . . . . .	62
8 Saturday morning paper sessions . . . . .	63
8.1 Aggression and homicide . . . . .	63
8.2 Developmental evolutionary psychology . . . . .	64
8.3 Symposium: Ontogeny of human reproductive strategies . . . . .	66
8.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 1 . . . . .	67
9 Early Saturday afternoon paper sessions . . . . .	69
9.1 Modelling human cooperation and coalitions . . . . .	69
9.2 Male attractiveness, anthropometrics, and mating . . . . .	70
9.3 Jealousy . . . . .	71
9.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 2 . . . . .	72
10 Late Saturday afternoon paper sessions . . . . .	73
10.1 Experimental economics . . . . .	73
10.2 Language, intentionality, and cognition . . . . .	74
10.3 Parents and children . . . . .	76
10.4 Symposium: Constraining evolutionary hypotheses of human male homosexuality . . . . .	77

Sunday morning plenary address . . . . .	78
11 Late Sunday morning paper sessions . . . . .	79
11.1 Evolution of human life history . . . . .	79
11.2 Male sexual coercion and control . . . . .	80
11.3 Topics in human sociality . . . . .	81
<b>Index</b>	<b>83</b>



# Chapter 1

## General Information

### 1.1 Navigating in Salt Lake City

Addresses in Salt Lake City are given as Cartesian coordinates with the Mormon Temple as the origin. For example, the street called “1300 East” is one block west of the University. It runs north and south, and it’s name means that it lies 13 blocks east of the temple. To get there, you walk down the street called “200 South,” which lies 2 blocks south of the temple. Many streets have names as well as numbers. For example, the street at the west edge of the University is called “University Street,” but it is also 1400 South. If you walk west from ASB or S Biology, you will run into University Street between 200S and 300S.

### 1.2 Nearby restaurants

Name	Address	Description
Market Street Broiler	1300E 260S	A bit more upscale, but still reasonable. Specializes in fish.
Einstein’s Bagels	1300E 240S	
Gepetto’s	1300E 230S	Salads, sandwiches, pasta, pizza, calzones. Outdoor patio.
WH Brumby’s	1300E 224S	An upscale deli and bakery, featuring a selection of salads, pastries, homemade soups and sandwiches.
B&D Burgers	1300E 222S	
Subway Sandwiches	1300E 221S	
Little Caesar’s Pizza	1300E 201S	
Sono Express	1318E 200S	Inexpensive Japanese food.
The Pie Pizzeria	1320E 200S	A popular student hangout.
University Pharmacy	1320E 200S	Sandwiches
Chop Suey Luey’s	1328E 200S	Inexpensive Chinese food
Big Ed’s	210S University Street	A “mom and pop” place serving omlettes for breakfast, sandwiches for lunch and dinner. Closes at 7pm on Friday, 3pm on Saturday

Further to the west, Trolley Square (602S 700E) is an upscale shopping mall carved out of a renovated trolley station. It has several restaurants with moderate prices, including: The Old Spaghetti Factory, Rodizio’s (a Brazilian “Gaucho”-style restaurant), The Pub, Tony Roma’s, and The Hard Rock Cafe. Across 700E from Trolley Square is Tucci’s (515S 700E), an Italian restaurant.



### 1.3 University food services dining hours

- Union Deli: Serving breakfast & lunch, Tuesday–Friday 7am–3:30pm
- Union Express: Thursday–Friday 7:45am–3:30pm
- Union Panorama Room: Lunch, Tuesday–Friday 11am–2pm
- Residence Halls Trading Post (Ballif Hall): Tuesday–Friday 4pm–7pm, Sunday 10am–7pm

### 1.4 Bookstore coupon

The University Bookstore is offering a 20% discount to HBES participants during the meeting. The discount coupon is included in the registration packet. The bookstore is SW of the Union, and E of ASB. It is open MWHF 8am–5:30pm, Tue 8am–7pm, and Sat 10am–3pm.

### 1.5 Parking

For very brief stays (a few hours), it is probably simplest to park at a meter or at one of the visitor pay-lots. (There is a pay-lot just E of the Union.) Otherwise, buy a daily permit at the HBES registration and information desk. Parking permits cost \$0.75 per hour or \$3.00 per day. Parking permits for residence hall guests can be purchased at the residence halls.

### 1.6 Shuttle service

The University operates a free shuttle bus service on campus and to the University Park Hotel. Shuttles are in service from 6am through 6pm weekdays. A shuttle schedule is included in your registration packet. To travel between campus and the University Park Hotel, combine the “purple” and “blue” or “red” routes.

In addition to the University shuttle service, HBES will provide shuttle service between the University Park Hotel, Austin Hall (dormitory), and the Olpin Union. The Union is a two-minute walk from the meeting rooms. The HBES shuttle will run between the hours shown below.

Hours	Purpose
WE 06:30–10:00pm	to reception
TH 07:30–08:30am	to meeting
TH 05:30–06:00pm	from meeting
TH 07:15–07:45pm	to posters
TH 09:00–09:30pm	from posters
FR 07:30–08:30am	to meeting
FR 05:30–07:00pm	from meeting/to banquet
FR 10:00–10:30pm	from banquet
SA 07:30–08:30am	to meeting
SA 05:30–07:00pm	from meeting/to barbeque
SA 09:00–09:30pm	from barbeque
SU 07:30–08:30am	to meeting
SU 12:00–12:45pm	from meeting

## 1.7 Guided tour

A 7-hour guided tour, “The Alps of Utah,” has been arranged for participants, following the conference on Monday, June 7. Departure (by motor coach) will be at 9:00 a.m., in front of the University Marriott Park Hotel. You can sign up for the tour at the information desk.

### Tour Highlights

The splendor of the rocky Mountains beckons as you leave Salt Lake to make your way up Emigration Canyon to Park City, a silver mining boomtown-turned-ski-resort. After a tour of the city, you will have time to explore the many unique shops in Park City’s Main Street historic district. Reboard your motor coach and continue on past the charming Swiss village of Midway and into the Alps of Utah. Breath-taking alpine scenery awaits you in Provo Canyon, home of Robert Redford’s Sundance Resort, where you will have lunch. On the way back, you will stop to photograph Bridal Veil Falls.

Tour includes transportation, guide, and lunch at Sundance.

**Price: \$49 per person**

## 1.8 About posters

The space available for each poster will be 4 feet high by 8 feet wide. Posters should be set up at 8am Thursday morning on the walkway between the ASB Building and the South Biology Building. The official poster session will be Thursday evening from 7:30 to 9:30. If possible, please leave your posters up until Friday afternoon. They should be taken down by 4:15PM Friday.

## 1.9 Speaker preview room

A slide projector is available in room 306, S Biology Building, for speakers to use in previewing their slides.

## 1.10 Bicycles

Bicycles can be rented through the University for \$14 plus \$15 per day. Ask at the registration/information desk.

# Chapter 2

# Program

## Overview of special events

Time	Event	Place
WE 06:00–09:00P	Registration	Union Ballroom
WE 07:00–10:00P	Welcome reception	Union Ballroom
TH 08:00–05:30P	Registration	ASB Foyer
TH 12:00–01:15P	Publication committee meeting	Union: Parlor B
TH 06:00P	Student dinner	Gepetto’s restaurant (meet outside ASB 220)
TH 06:00–08:00P	Executive Council meeting	Marriott University Park Hotel: restaurant
TH 07:30–09:30P	Poster session	Walkway between ASB and S Biology Bldgs.
FR 08:00–05:30P	Registration	ASB Foyer
FR 12:00–01:15P	Student workshop	S Biol 212
FR 07:00–10:00P	Banquet	Marriott University Park Hotel
FR 08:30P	Keynote address	Marriott University Park Hotel
SA 08:00–05:30P	Registration	ASB Foyer
SA 12:00–02:15P	Business meeting	Union: Panorama East
SA 07:00–09:00P	Barbecue and competition announcements	Union Terrace (Ballroom in case of rain)

## Poster setup

Walkway between ASB and S Biol

Note	Time	Presentation
	TH 08:00	Poster presenters should set up their posters

## Thursday morning plenary

ASB 220

Note	Time	Presentation
	TH 08:25	Welcome
	TH 08:30	Introduction
	TH 08:40	<i>Plenary address:</i> Demographic transition: Closing in on an evolutionary explanation? Borgerhoff Mulder M
	TH 09:40	Break

<sup>0</sup> Key to notes: A=paper added to symposium, NI=New Investigator Competition, PD=Post-Doctoral Competition

## 1 Thursday morning paper sessions

### 1.1 Differential parental investment: Theory and data

ASB 210

Note	Time	Presentation
	TH 10:10	Paternity confidence and fitness outcomes: Abortion, divorce, and paternal investment. Anderson KG, Kaplan H, Lancaster JB
	TH 10:30	Evaluating parental investment hypotheses with structural equation modeling techniques: A test of model invariance for genetic and stepparent families. Zvoch K
	TH 10:50	Parental investment and anticipated reproductive payoff. Keller MC, Nesse RM, Hofferth SL
	TH 11:10	The excess of female death rates in pre-war Japan. Hiraiwa-Hasegawa M, Hasegawa T
	TH 11:30	Darwin's dads: An evolutionary analysis of father absence. Beroldi G
	TH 11:50	Lunch

### 1.2 Cognitive specializations

S Biol 212

Note	Time	Presentation
	TH 10:10	Cues for risk under Darwinian priorities. Wang XT
	TH 10:30	Hemispheric mechanisms in risky choices. Galinsky AM, Wang XT
	TH 10:50	Grue, necessary connection, and domain-specificity: From poverty of the stimulus to richness of structure. Duchaine BC
NI	TH 11:10	Evolution and the utility subversion effect. Kugel AK
	TH 11:30	The hunter-gatherer theory of spatial sex differences: A naturalistic study. Silverman I, Choi J, MacKewn A, Moro J, Olshansky E, Fisher M
	TH 11:50	Lunch

### 1.3 Symposium: Examining the validity of the waist-to-hip ratio hypothesis of human female attractiveness (organizer: McBurney DH)

ASB 220

Note	Time	Presentation
	TH 10:10	Why did Tassinari and Hansen (1998) fail to replicate the relationship between WHR and female attractiveness? Bronstad PM, Singh D
	TH 10:30	Waist-hip ratio and attractiveness: New evidence and a critique of "a critical test." Streeter SA, McBurney DH
	TH 10:50	Is beauty in the domain specific, context sensitive, multi-modular adaptations of the beholder? Shiwiari use of female WHR and body weight in assessments of attractiveness. Sugiyama L
	TH 11:10	Waist-to-hip ratio representation in ancient sculptures from four cultures. Singh D, Frohlich C, Haywood M
A	TH 11:30	How Universal are Preferences for Female Waist-to-Hip Ratios? Evidence from the Hadza of Tanzania. Wetsman A, Marlowe FW
	TH 11:50	Lunch

### 1.4 Symposium: Biopoetics. Part 1 (organizer: Clift EM)

ASB 304

Note	Time	Presentation
	TH 10:10	Narrative as virtual reality. Scalise SM
	TH 10:30	The poetics of babytalk I: "macro"-poetics. Dissanayake E
	TH 10:50	The poetics of babytalk II: "Micro"-poetics. Miall DS
	TH 11:10	Art, imagination, and the adapted mind: Towards a theory of aesthetics. Tooby J, Cosmides L
A	TH 11:30	Similarities and differences in drawings by children and cross-fostered chimpanzees. Radeke MK, Waters GS, Cianelli S, Fouts RS
	TH 11:50	Lunch

**Thursday afternoon plenary**

ASB 220

Note	Time	Presentation
	TH 01:05	Introduction
	TH 01:15	<i>Plenary address:</i> Adaptation and coevolution of the sexes: Gender-specific fitness, interlocus contest evolution (ICE), and sexually antagonistic genes. Rice WR
	TH 02:15	Break

**2 Early Thursday afternoon paper sessions****2.1 Birth order**

ASB 220

Note	Time	Presentation
	TH 02:25	Parental investment and the inequality of equality. Davis JN, Hertwig R, Sulloway FJ
	TH 02:45	Does birth order covary with mating strategy? Michalski RL, Shackelford TK
	TH 03:05	Birth order and attachment style. Wehr P, Paulhus DL
PD	TH 03:25	Who's keeping in touch? Sex, birth order and contact with kin. Salmon CA
	TH 03:45	Break

**2.2 Pregnancy, prenatal effects, and fertility**

S Biol 212

Note	Time	Presentation
	TH 02:25	The 2nd to 4th digit ratio in autistic children and elite musicians. Manning JT, Baron-Cohen S, Wheelwright S, Sanders G, Slumming V
	TH 02:45	Stress reduction does not change ovarian function in infertile women. Flynn JP, Ellison PT, Freizinger M, Domar AD
	TH 03:05	Paternal involvement during pregnancy predicts the human sex ratio at birth. Norberg K
	TH 03:25	Human twinning as a reproductive strategy in pre-industrial Finland—double fitness or double trouble? Lummaa V, Haukioja E, Lemmetyinen R, Pikkola M
	TH 03:45	Break

**2.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 1 (organizer: Penn D)**

ASB 210

Note	Time	Presentation
	TH 02:25	Ecological sustainability and demographic transitions. Low BS
	TH 02:45	The effect of information and social incentives in obtaining economic support for an environmental fund-raising campaign: An evolutionary approach. Mysterud I
	TH 03:05	An evolutionary perspective on overfishing in northwest Newfoundland. Palmer CT
	TH 03:25	Why do empowered women have fewer offspring? Penn D
	TH 03:45	Break

**2.4 Symposium: Biopoetics. Part 2 (organizer: Clift EM)**

ASB 304

Note	Time	Presentation
	TH 02:25	The handicap principle, threat, and art. Aiken NE
	TH 02:45	Cold cuisine in the canadian subarctic: Shamanic revenge motifs in traditional oral narratives. Allen WE
	TH 03:05	Universals as the unit of literary analysis. Carroll J
	TH 03:25	Art and kinship. Coe K
	TH 03:45	Break

### 3 Late Thursday afternoon paper sessions

#### 3.1 Social reasoning

S Biol 212

Note	Time	Presentation
	TH 04:15	Character counts: Cheater detection is relaxed for honest individuals. Cosmides L, Tooby J, Montaldi A, Thrall N
	TH 04:35	Guilty minds: How perceived intent, incentive, and ability to cheat influence social contract reasoning. Barrett HC
	TH 04:55	Is prospective altruist-detection an evolved solution to the adaptive problem of subtle cheating in cooperative ventures? Moore C, Brown WM
	TH 05:15	Detecting free-riders in cooperative groups: A study on Wason selection task. Hiraishi K, Hasegawa T
	TH 05:35	Out

#### 3.2 Aesthetics of human form

ASB 304

Note	Time	Presentation
	TH 04:15	Anthropometric measures contributing to judgments of female facial attractiveness by four ethnic groups. Anderson NK, Park M, Johnston VS, Giddon DB
	TH 04:35	Facial attractiveness and symmetry in humans. Hume DK, Montgomerie R
	TH 04:55	Females' first impressions of males: Are they accurate and how are they used to judge attractiveness? Hunt CB, Nordahl DK, Figueredo AJ
	TH 05:15	Reconciliation between and within countries: A "rational choice" or "reasoned instinct." Brecke PA, Long WJ
	TH 05:35	Out

#### 3.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 2 (organizer: Penn D)

ASB 210

Note	Time	Presentation
	TH 04:15	Are East African pastoralists truly conservationists? Ruttan LM, Borgerhoff Mulder M
	TH 04:35	Sex differences in disregard of personal health risks and environmental degradation. Wilson M, Daly M
	TH 04:45	Visual complexity and perceived scenic preference in urban squares. Atzwanger K, Schäfer K
	TH 05:15	Aboriginal overkill and the myth of the "ecologically noble savage"—A continuous-time analysis of wildlife observations made by Lewis and Clark. Kay CE
	TH 05:35	Out

#### 3.4 Symposium: The psychology and physiology of human sperm competition (organizer: Shackelford TK)

ASB 220

Note	Time	Presentation
	TH 04:15	Preventing, correcting, and anticipating sperm competition in humans. LeBlanc GJ, Shackelford TK, Weekes VA
	TH 04:35	Human female coital orgasm is predicted by her partner's physical attractiveness. Weekes VA, Shackelford TK, LeBlanc GJ, Bleske AL, Euler HA, Hoier S
	TH 04:55	Factors affecting human ejaculate composition. Pound N, Javed MH, Ruberto C, Shaikh MA, Del Valle AP
	TH 05:15	Absence makes the heart grow fonder, but only for men: The psychological architecture of human sperm competition. Shackelford TK, LeBlanc GJ, Weekes VA, Bleske AL, Euler HA, Hoier S
	TH 05:35	Out

**4 Thursday evening**

Time	Event	Place
TH 06:00P	Student dinner	Gepetto's restaurant (meet outside ASB 220)
TH 06:00–08:00P	Executive Council meeting	Union: Parlor A

**4.1 Poster session****Walkway between ASB and S Biol**

Note	Time	Presentation
	TH 07:30	Begin poster session (see abstracts p. 40)
	TH 09:30	End

**Friday morning plenary****ASB 220**

Note	Time	Presentation
	FR 08:30	Introduction
	FR 08:40	<i>Plenary address</i> : Mate choice and genetic variation. Petrie M
	FR 09:40	Break

**5 Friday morning paper sessions****5.1 Metatheory, philosophy of science and ethics****ASB 304**

Note	Time	Presentation
	FR 10:10	Integrating evolved strategies with proximate mechanisms: Eating disorders. Holcomb HR
	FR 10:30	The nature of value: Evolutionary ethics and the naturalistic fallacy. Chisholm JS
	FR 10:50	Science: 'Religion liberated and writ large:' Comment on Wilson's consilience. Pope SJ
	FR 11:10	Darwinian theory: Please handle with care. Dyson-Hudson R
	FR 11:30	
	FR 11:50	Lunch

**5.2 Fertility, demography, and culture****ASB 210**

Note	Time	Presentation
	FR 10:10	Fertility decline in the modern world and in the original demographic transition: A sociobiological interpretation. Sanderson SK, Dubrow J
	FR 10:30	Individual variation in reproductive behavior in rural China under the one-child policy. Ting TF
NI	FR 10:50	Keeping up with the Joneses: Evolutionary demography of the contemporary United States. Jones JH
	FR 11:10	Culture areas as a product of ancient demic expansions. Jones D
	FR 11:30	Human history and race under the Darwin model. Harpending H, Eller E
	FR 11:50	Lunch

**5.3 Mating tactics**

ASB 220

Note	Time	Presentation
FR 10:10		Sexual intercourse in adolescent relationships: The impact of female choice. Cleveland HH
FR 10:30		Sex, lies, and strategic interference: The psychology of deception between the sexes. Haselton MG, Buss DB, Oubaid V, Angleitner A
FR 10:50		Human mate poaching: Who, how, and why? Schmitt DP, Cintron J
FR 11:10		Self-enhancement and competitor derogation: Sociosexuality as a predictor of tactic use and effectiveness. Bleske AL, Buss DM
FR 11:30		Violence and self-esteem. Grometstein RP
FR 11:50		Lunch

**5.4 Emotion and motivation**

S Biol 212

Note	Time	Presentation
FR 10:10		Translating the value function for gains and losses into positive and negative affect: A Darwinian approach to affective feeling states. Ketelaar T
FR 10:30		An evolutionarily based investigation of facial expression perception. Goos LM, Silverman I
FR 10:50		Love and security of attachment as two independent systems underlying intimate relationships. MacDonald KB, Kale L
FR 11:10		Female emotionality: An evolutionary perspective. LeCroy D
FR 11:30		The sexual balance of power: Blood, solidarity, status, and honor in Sonora, Mexico. Figueredo AJ, Corral-Verdugo V, Frias-Armenta M, Bachar KJ, Goldman-Pach J, McNeill PL, Castell-Ruiz IP, Valiente-Ots MC, Villavicencio-Carrillo P
FR 11:50		Lunch

**5.5 Special panel discussion: Risk-taking**

ASB 404

Note	Time	Presentation
FR 10:10		What is this thing called risk? Risk-sensitive foraging. Daly M An economic perspective. Eckel C
FR 10:30		Adaptive modulation of risk acceptance: Unpredictability of environment (Part 1). Low BS, Hill E, Sugiyama L, Henrich J, McElreath R.
FR 10:50		Adaptive modulation of risk acceptance: Status and state of the individual (Part 2). Wang XT, Thornhill R, Smith EA, Hawkes K.
FR 11:10		Selection-minded synthesis. Cashdan EA, Rogers AR, Wilson M, Daly M, Smith EA.
FR 11:30		Open discussion
FR 11:50		Lunch

**Friday afternoon plenary**

ASB 220

Note	Time	Presentation
FR 01:05		Introduction
FR 01:15		<i>Plenary address</i> : Avoiding the gender blahs. Udry JR
FR 02:15		Break



## 6 Early Friday afternoon paper sessions

### 6.1 Psychology of risk and reciprocity

S Biol 212

Note	Time	Presentation
NI	FR 02:25	The evolution of altruist detection: Can humans decode nonverbal signals of cooperative de-meanor? Brown WM
NI	FR 02:45	Giving and receiving within romantic relationships. Janicki MG
	FR 03:05	The role of self-deception and repression in cooperation in longterm relationships. Sullivan MS, McNally JJ, Surbey MK
	FR 03:25	Tracking costs and benefits in social relationships: Exchange orientation and relationship context. Addison TA
	FR 03:45	Break

### 6.2 Coalitions and conflicts

ASB 304

Note	Time	Presentation
	FR 02:25	Female coalitions and gossip. Hess N
	FR 02:45	Urban begging and ethnic nepotism in Russia: An ethological pilot study. Butovskaya M, Salter FK, Diakonov I, Smirnov A
NI	FR 03:05	The ugly duckling—a story about ducks and swans, or a metaphor of ethnicity: Why ethnies are ‘species’ to the human brain. Gil-White F
	FR 03:25	The role of humans in chimpanzee ( <i>Pan troglodytes</i> ) post-conflict negotiations. Malone NM, Vaughan LL, Fuentes A
	FR 03:45	Break

### 6.3 Symposium: Alternative approaches to the evolution of cooperation. Part 1 (organizer: Smith EA)

ASB 210

Note	Time	Presentation
	FR 02:25	Tests of alternative currencies for Ache cooperative hunting. McMillan GP
A	FR 02:45	Cooperation and food sharing among the Hadza. Marlowe FW
	FR 03:05	It’s a wonderful life: Signaling generosity among the Ache of Paraguay. Gurven M
	FR 03:25	Costly signaling and evolutionary solutions to collective action problems. Smith EA
	FR 03:45	Break

### 6.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 1 (organizer: Penn D)

ASB 220

Note	Time	Presentation
	FR 02:25	Odorant receptors that are expressed in the testis: Evidence of selection for non-olfactory functions. Branscomb A, Seger J
	FR 02:45	Behavioral and physiological effects of androstadienone in human subjects. Monti-Bloch L
	FR 03:05	Chemical signals and sexual selection: Do odor cues honestly signal health and disease? Penn D, Zala S, Potts W
	FR 03:25	The scent of men’s symmetry may honestly advertise fitness. Thornhill R, Gangestad SW
	FR 03:45	Break

## Poster takedown

Walkway between ASB and S Biol

Note	Time	Presentation
	FR 04:00	Poster presenters should take down their posters by 4:15PM

## 7 Late Friday afternoon paper sessions

### 7.1 Kinship

S Biol 212

Note	Time	Presentation
	FR 04:15	Sibling solidarity in an American polygamous community: Unpacking inclusive fitness. Jankowiak WR
	FR 04:35	Bands, tribes, chiefdoms, states? A perspective from evolutionary anthropology. Patton JQ
	FR 04:55	Selection and Australian kinship. Steadman LB
NI	FR 05:15	The psychological causes of “group-level adaptations.” Price ME
	FR 05:35	Out

### 7.2 Evolution of religion and morality

ASB 304

Note	Time	Presentation
	FR 04:15	Religion as a blueprint for the construction of a community superorganism. Wilson DS
	FR 04:35	Religion as an evolutionary byproduct. Kirkpatrick LA
	FR 04:55	So many choices, so little time. O’Neill P, Petrinovich L
	FR 05:15	How religion began: Testing the ritual healing theory. McClenon JM
	FR 05:35	Out

### 7.3 Symposium: Alternative approaches to the evolution of cooperation. Part 2 (organizer: Smith EA)

ASB 210

Note	Time	Presentation
	FR 04:15	Assortative interactions and the evolution of cooperation: Theory and tests. Dugatkin L, Wilson DS
	FR 04:35	Costly signaling and commitment: A test of an hypothesis using historical data on the longevity of 19th century utopian communes. Sosis R
	FR 04:55	Is the capacity for subjective commitment an adaptation? Can it help to explain altruism and social complexity? Nesse R
	FR 05:15	Discussant. Boone JL
	FR 05:35	Break

### 7.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 2 (organizer: Penn D)

ASB 220

Note	Time	Presentation
	FR 04:15	Human body odor, symmetry, and attractiveness. Rikowski A, Grammer K
A	FR 04:35	Human pheromones and physical attraction: More than meets the eye. Kohl JV
A	FR 04:55	Fluctuating asymmetry and the human female orgasm. Montgomerie R, Bullock H
	FR 05:15	Do MHC-dissimilar mating preferences function to prevent infectious or genetic disease in offspring? Potts WK, Penn D, Meagher S, McClelland E
	FR 05:35	Break

## Friday evening: Banquet and keynote address

Marriott University Park Hotel

Note	Time	Presentation
	FRI 07:00	Banquet
	FRI 08:30	Keynote address: If evolutionary theory is so powerful, why do we still need history? Hrdy S

**Saturday morning plenary**

ASB 220

Note	Time	Presentation
	SA 08:30	Introduction
	SA 08:40	<i>Plenary address:</i> Female aggression: Fear, form and frequency. Campbell A
	SA 09:40	Break

**8 Saturday morning paper sessions****8.1 Aggression and homicide**

ASB 220

Note	Time	Presentation
	SA 10:10	Killer psychology: The evolution of intrasexual homicide. Buss DM, Duntley JD
	SA 10:30	Killer psychology: The evolution of mate homicide. Duntley JD, Buss D
	SA 10:50	Evolved psychology and sexual aggression: Implications for law. Jones OD
	SA 11:10	Hate crime is different: A Darwinian typology of crime. Wiebe RP, Shively M
	SA 11:30	“Warfare” possibilities in the late paleolithic. Boehm C
	SA 11:50	Lunch

**8.2 Developmental evolutionary psychology**

ASB 304

Note	Time	Presentation
	SA 10:10	Ontogeny and phylogeny—an overlooked relationship. Dickins TE, Davies MNO, Boucher J
	SA 10:30	In search of cues governing kin recognition and incest avoidance. Lieberman DL, Tooby J, Cosmides L
	SA 10:50	Early emergence of cheater detection in human development. Cummins DD
	SA 11:10	Friendship extraordinaire: Social relationships between twins reared apart and together. Segal NL, Arad, S
A	SA 11:30	Sex differences and similarities in human mate selection preferences: Stereotypes versus self-report. Boster J
	SA 11:50	Lunch

**8.3 Symposium: Ontogeny of human reproductive strategies (organizer: Bailey M) S Biol 212**

Note	Time	Presentation
	SA 10:10	Quality of early family relationships and individual differences in the timing of pubertal maturation in girls: A longitudinal test of an evolutionary model. Ellis BJ, McFadyen-Ketchum S, Dodge KA, Pettit GS, Bates JE
	SA 10:30	Growing up early or late?: An endocrinological investigation of alterations in pubertal timing under stressful conditions. Surbey MK
	SA 10:50	Environmental and genetic influences on pubertal development: Evolutionary life history traits? Rowe DC
	SA 11:10	Origins of sociosexuality: A twin study. Martin NG, Bailey JM
A	SA 11:30	Childhood psychosocial stress accelerates age at menarche: A test of Belsky, Steinberg and Draper’s model. Coall DA, Chisholm JS
	SA 11:50	Lunch

### 8.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 1 (organizer: Sellen DW)

ASB 210

Note	Time	Presentation
	SA 10:10	Subsistence shift in prehistory and the change in diet and disease stress at weaning. Armelagos GJ, Goodman AH, Smay DB
	SA 10:30	Variation in weaning age by subsistence type. Smay DB, Sellen DW
	SA 10:50	Mother's work, weaning foods and alloparenting among three- and ten-month-old Aka foragers and Ngandu farmers. Hewlett BS, Shannon D, Lamb M
	SA 11:10	Self feeding among Bofi forager young children. Fouts H
	SA 11:30	Evolutionary ecology of breastfeeding and the weaning's dilemma. McDade T
	SA 11:50	Lunch

### Saturday afternoon

Union: Panorama East

Note	Time	Presentation
	SA 12:00	Business Meeting (lunch provided for participants)
	SA 02:15	Out

## 9 Early Saturday afternoon paper sessions

### 9.1 Modelling human cooperation and coalitions

ASB 304

Note	Time	Presentation
	SA 02:25	Ownership and sharing: Exploring social foundations of communal sharing norm by evolutionary game analysis. Kameda T, Takezawa M
	SA 02:45	Coalition modelling and political evolution: Some 'population thinking' on leadership in prehistory. Keckler CNW
	SA 03:05	Evolutionary psychology and dynamical systems: Watching traits unfold in complex networks. Kenrick DT, Li N, Butner J
	SA 03:25	Food sharing patterns of an Ache reservation: Implications for kin terms, nepotism, and reciprocal altruism. Allen-Arave WK
	SA 03:45	Break

### 9.2 Male attractiveness, anthropometrics, and mating

ASB 220

Note	Time	Presentation
	SA 02:25	Menstrual cycle variation in women's preferences for male face shapes. Penton-Voak IS, Perrett D, Castles DL
	SA 02:45	Females can assess relationship style from male face shape. Castles DL, Perrett DI, Little A, Penton-Voak IS
	SA 03:05	Male waist-to-hip ratio and interpersonal perception. Stewart M, Campbell L, Manning JG, Simpson JA
	SA 03:25	Cross cultural analysis of the role of physical appearance in candidate appraisal. Schubert JN, Strungaru C, Curran MA
	SA 03:45	Break

**9.3 Jealousy****S Biol 212**

Note	Time	Presentation
	SA 02:25	Re-allocation of mating effort as a result of pregnancy. Friedman BX, Shackelford TK
	SA 02:45	Sexual jealousy in later life: An evolutionary psychological perspective. Drass E, Shackelford TK, Weekes VA, LeBlanc GJ, DeKay WT, Buss DM
	SA 03:05	Sex differences in the events that elicit jealousy. Groothof HAK, Dijkstra P, Poel GA, Laverman TTG, Schrier M, Buunk BP
	SA 03:25	Emotional reactions to infidelity. Ward D, Shackelford TK, LeBlanc GJ, Drass E
	SA 03:45	Break

**9.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 2 (organizer: Sellen DW)****ASB 210**

Note	Time	Presentation
	SA 02:25	Human weaning: Towards a synthesis of applied and evolutionary perspectives. Sellen DW
	SA 02:45	The forager olympics. Does it take 20 years to become a competent hunter-gatherer? Blurton Jones NG, Marlowe FW
	SA 03:05	Children on the reef: Slow learning or strategic foraging? Bird DW
	SA 03:25	The incompetent child, the unfinished adult: Anthropological perspectives on the juvenile. Bird R, Bird DW
	SA 03:45	Break

**10 Late Saturday afternoon paper sessions****10.1 Experimental economics****ASB 210**

Note	Time	Presentation
	SA 04:15	Trust, reciprocity and facial expressions in simple bargaining games. Eckel CC, Wilson RK
	SA 04:35	Testosterone and negotiations: An investigation into the role of biology in economic behavior. Burnham T
	SA 04:55	Cooperation in groups: Giving reciprocity a chance. Kurzban R, McCabe K, Smith V
	SA 05:15	Ownership and sharing: Experimental demonstrations of "windfall as a common property" effect. Takezawa M, Kameda T
	SA 05:35	Out

**10.2 Language, intentionality, and cognition****ASB 304**

Note	Time	Presentation
	SA 04:15	The adaptive function of infant-directed speech. Monnot M
	SA 04:35	Language evolution and language diversity. Bichakjian BH
	SA 04:55	Old brain, new media: Ascribing intentionality to interactive media. Mishra P, Zhao Y, Others
	SA 05:15	Does human memory reflect the environment of early hominids? Schooler LJ, Rhine RJ, Serio Silva JC
	SA 05:35	Out

**10.3 Parents and children**

S Biol 212

Note	Time	Presentation
	SA 04:15	Does children's work increase household production? Production, consumption and family size among subsistence agriculturalists. Kramer KL, Boone J
	SA 04:35	Do parents matter? The determinants of children's activities in the Okavango Delta, Botswana. Bock J
	SA 04:55	Adapted to famine: The evolutionary sense of anorexia. Guisinger S, Schuldberg D
	SA 05:15	Birth order, sibling investment, and fertility among Ju/'hoansi (San). Draper P, Hames R
	SA 05:35	Out

**10.4 Symposium: Constraining evolutionary hypotheses of human male homosexuality (organizer: Bailey M)**

ASB 220

Note	Time	Presentation
	SA 04:15	Empirical tests of two evolutionary hypotheses of male homosexuality. Bailey JM
	SA 04:35	Theory and research on birth order and sexual orientation. Blanchard R
	SA 04:55	Homosexuality: What causes are compatible with natural selection? Cochran GM
A	SA 05:15	Fitness of gay males: 2. Genes for homo-, bi-, and asexuality. Squires AM
	SA 05:35	Out

**Saturday evening barbecue**

Union Terrace (Ballroom in case of rain)

Note	Time	Presentation
	SA 07:00	Barbecue

**Sunday morning plenary**

ASB 220

Note	Time	Presentation
	SA 08:30	Introduction
	SA 08:40	Plenary address: Grandmothering and the evolution of <i>Homo erectus</i> . O'Connell JF
	SA 09:40	Break

**11 Sunday morning paper sessions****11.1 Evolution of human life history**

ASB 220

Note	Time	Presentation
	SU 10:10	The grandfather hypothesis. Josephson SC
	SU 10:30	Reproduction and the post-menopausal longevity. Judge DS
	SU 10:50	Life history evolution in a rural Gambian population. Mace R, Sear R
	SU 11:10	The reproductive payoffs of kin propinquity in a 19th century American frontier population. Heath KM
	SU 11:30	Greater male variability: An evolutionary explanation. Miller E
	SU 11:50	End of conference

**11.2 Male sexual coercion and control****ASB 210**

Note	Time	Presentation
	SU 10:10	Knaveish males: Rape as a deceitful strategy in human male-male competition. Mondragon-Ceballos R
	SU 10:30	Sexual coercion as a predictor of influence strategies later in life: A longitudinal analysis over a 10-year period. Malamuth NM, Impett E
	SU 10:50	Dads, cads, and patriarchs: Male reproductive strategies and the epidemiology of domestic violence. Novak SA, Rodseth LT
	SU 11:10	Evolved psychological mechanisms and perceptions of sexual harassment severity. Colarelli SM, Morlan S
	SU 11:30	
	SU 11:50	End of conference

**11.3 Topics in human sociality****ASB 304**

Note	Time	Presentation
	SU 10:10	Deceptive functions of symbolic language in human evolution. Beahrs JO
	SU 10:30	Childhood friendships and associations among Ache indians: effects of rank and kinship. Ruttenberg A, McIntyre M
	SU 10:50	Evolutionary dyads in relations: Inborn sociality and socialized individuality reconsidered. Molnar P, Nagy E
	SU 11:10	Sociobiology and evolutionary psychology in South Korea: with comparison to Japan and other Western countries. Sakura O
	SU 11:30	The tragedy of biopolitics: Aristotle's biological naturalist political theory. Peritore P
	SU 11:50	End of conference

# Chapter 3

## Abstracts

NI  
PD  
A

**Key to marginal notations:** “NI” is used to indicate New Investigator contestants, “PD” indicates Post-Doctoral contestants, and “A” indicates presentations that were added to organized symposia by the Program Committee.

### Thursday morning plenary address

*Borgerhoff Mulder M*<sup>1</sup> **Demographic transition: Closing in on an evolutionary explanation?**

The radical late 19th century shift in human reproduction, known as the demographic transition, constitutes a major challenge to evolutionary approaches to human behaviour. Why would people ever choose to limit their reproduction voluntarily when, at the peak of the Industrial Revolution, resources were so plentiful? Several hypotheses have been advanced by evolutionary social scientists: Can the transition be attributed to the standard life history tradeoff between quality and quantity of offspring? Is low fertility attributable to cultural evolutionary processes? Or is it simply a maladaptive outcome of novel environmental and social conditions? After reviewing the status of each of these hypotheses, I present empirical work that focuses explicitly on the evolved psychological mechanisms that might underlie the demographic behaviour. Finally I introduce a set of models that link fertility decline to a particular set of economic dynamics between inherited capital, fertility, and wealth accumulation.

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### 1 Thursday morning paper sessions

#### 1.1 Differential parental investment: Theory and data

*Anderson KG*<sup>2</sup>, *Kaplan H*<sup>3</sup>, *Lancaster JB*<sup>4</sup> **Paternity confidence and fitness outcomes: Abortion, divorce, and paternal investment**

Evolutionary theory predicts that males should be less likely to invest in putative genetic offspring who are unlikely to be their actual offspring. Among humans the theory has important practical implications, but has not been directly tested. In this paper we test three predictions concerning the relationship between paternity confidence and fitness outcomes. First, men will provide less direct investment to low paternity confidence offspring. Second, men will be more likely to divorce women who bear them low paternity confidence offspring; since children receive less paternal investment after divorce, divorce is an indirect means of discriminating against low paternity confidence offspring. Third, if the first two predictions are correct, women will respond to anticipated decreased paternal investment in low paternity confidence offspring by being more likely to abort pregnancies for which their partners have low paternity confidence. We tested these predictions using a sample of men living in Albuquerque, New Mexico. Men provided information on their time involvement with 390 children whose mothers they had divorced, the divorce outcomes of 1,901 relationships that produced live births, and the birth outcomes of 2,865 pregnancies that were attributed to the men. The results strongly support all three predictions, confirming that paternity confidence plays an important role in male parental and reproductive strategies.

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**Zvoch K<sup>1</sup> Evaluating parental investment hypotheses with structural equation modeling techniques: A test of model invariance for genetic and stepparent families**

Using structural equation modeling techniques to analyze data from the National Education Longitudinal Survey, a model representing select factors hypothesized to underlie variation in parental resource distribution was generated and tested on the questionnaire responses from parents of a nationally representative sample of high school seniors. Tests of model fit revealed that a model specifying both direct and indirect (through a child's academic achievement) influences of familial SES on educational investment provided the best fit to the data. Invariance tests were conducted to compare the model estimates derived from families containing two genetic parents with those obtained from stepparent families. Results indicated that measurement of the latent constructs was similar across family type, but a structural nonequivalence was found. Familial SES had a significantly stronger direct influence on educational investment in genetic parent families. Additional analyses, limitations, and a discussion of results will be presented.

**Keller MC<sup>2</sup>, Nesse RM<sup>3</sup>, Hofferth SL<sup>4</sup> Parental investment and anticipated reproductive payoff**

Natural selection should have crafted parental investment (PI) to maximize the total fitness of the parent, but it does not necessarily follow that PI will vary in proportion to likely future reproductive success of each individual child. Whether PI is associated with anticipated reproductive payoff should depend on the type and effect of the PI. The Panel Study of Income Dynamics Child Supplement data tracked 3500 respondents about their parental care habits. Time diary data was also collected. No differences in parental investment by sex as a function of status were found. Differences were found in PI as a function of parents' appraisal of "likely future success" of child. These findings are compared to other studies and to derivations arising from evolutionary theory.

**Hiraiwa-Hasegawa M<sup>5</sup>, Hasegawa T<sup>6</sup> The excess of female death rates in pre-war Japan**

The changes in sex differences in death rates in these 100 years in Japan were investigated. From the beginning of

the 20th century to around 1936, the female death rates always exceeded the male death rates from the age of 2 until around 42. Most of the female deaths during reproductive ages were related to childbirth. However, the higher death rates during infancy through adolescence among women must have different reasons, and most probably, were due to malnutrition and disease from neglect, and from child labor. The situation started to change after the Second World War: the female death rate exceeded the male death rate from the age of 12 until 20 in 1947, and only from 13 to 16 in 1952. The male death always exceeded the female death in all ages since 1955, but the excess of male deaths gradually increased through time. These findings will be discussed in relation to changes in differential parental investment patterns in pre-war and post-war Japan.

**Beroldi G<sup>7</sup> Darwin's dads: An evolutionary analysis of father absence**

This evaluation covers the evolutionary literature on father absence and the mainstream literature upon which it is based. The main contribution of evolutionary work is the possibility that the bases for the complex of psychology and behavior that is associated with being raised in a fatherless household are adaptations and not psychopathology as the mainstream perspective holds. This analysis will look at predictions from each of these perspectives. A "Father Necessity" hypothesis will be offered as the environmental cue that triggers these alternate life history strategies, thereby answering the question that the originators of this field, Draper & Harpending, asked in their 1982 & 1988 works but did not answer. Father presence is theorized as the human evolutionary norm with degrees of father presence explaining the psychology and behavior of contemporary populations. I will take an exploratory look at what kinds of hypotheses about father absence evolutionary biology and the human evolutionary disciplines might have made *de novo*. Some issues (e.g., developmental vs. concurrent contingency, brain dedication, joint fitness's effect on father involvement, how behavior genetics' models seem to account for more of the effects) will be touched upon. Finally, I will suggest some directions for future research such as using other indices of maturation than menarche, and the evolution of the coordination of the development of psychological & behavioral characters.

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## 1.2 Cognitive specializations

### *Wang XT*<sup>1</sup> **Cues for risk under Darwinian priorities**

Natural selection should have equipped humans with cognitive mechanisms which are sensitive to the cues for risks that had reflected the adaptive significance of the risks. In a series of experiments, we examined how decision makers select and use kinship, group composition, group size, and verbal cues in making their risky choices. These decision cues were manipulated in choice problems presented in a statistically identical payoff structure. We assume that primary decision cues have and are used according to their pre-determined Darwinian priorities. Instead of trying to maximize expected utility of choice outcomes, as suggested by various models of rational choice, decision makers are expected to maximize the opportunity of reaching a task-specific goal, determined primarily by evolutionarily meaningful cues (e.g., kinship, group composition). However, in evolutionarily novel contexts where no primary cues are available, decision makers have to resort to subtle meanings of secondary cues (e.g., verbal cues) for adjusting their aspiration levels. For instance, the subjects' risk preference to a sure outcome or a gamble in an ambiguous, anonymous group context was more likely to be affected by the framing (phrasing) of choice options. The empirical results will be discussed in a mean-variability-minimum requirement (MVM) framework. Within the framework, risky choice is viewed as a function of three variables: mean expected value of choice outcomes, variability in choice outcomes, and the minimum requirement (aspiration level) determined by various decision cues.

### *Galinsky AM*<sup>2</sup>, *Wang XT*<sup>3</sup> **Hemispheric mechanisms in risky choices**

Hemispheric asymmetry and modality were examined as a function of risky choice behavior in human decision making. Participants were asked to evaluate two alternative plans in terms of their estimated outcomes and then to make their choice between the two plans.

A modified dichotic listening technique was used to present the plans while an unrelated message was presented simultaneously to the opposed ear. The competition for pathways between the messages allowed selected messages to be registered hemispherically. Participants' minimum requirement (MR) for making their decision was measured. Risk preference patterns for left ear-right hemisphere (LE-RH) participants were consistent with the

prediction that they would be more sensitive to the emotional cues in choice problems. Specifically, framing effects were found for LE-RH participants; however, no significant framing effects were found for right ear-left hemisphere (RE-LH) participants. Consistent with previous findings, risk preference patterns showed a group size, social-context specific pattern. Finally, MR results supported a mean-variance model of human risky decision behavior (Wang, 1996c). MR was higher for participants under negative framing, lower when switching to positive framing, and higher under kinship conditions. This study suggests that risk-sensitive and social-context dependent mechanisms may be lateralized with the right hemisphere being specialized for the processing of emotional cues.

### *Duchaine BC*<sup>4</sup> **Grue, necessary connection, and domain-specificity: From poverty of the stimulus to richness of structure**

For any finite set of data there are an infinite number of hypotheses that are consistent with the data. Thus, projection of proper hypotheses is critical to the effective operation of any inductive process. Known as the grue problem in epistemology and the poverty of the stimulus problem in psycholinguistics, the recognition of this problem has been critical in the development of theories of word acquisition and grammar acquisition. Outside of these two areas however, the grue problem has had little impact on cognitive theories. This neglect is unfortunate, because consideration of the grue problem provides insight into developmental questions and guidance in developing research questions. In order to illustrate the value of considering the grue problem, I will discuss its potential value for theories of classical conditioning and gaze direction determination.

### *Kugel AK*<sup>5</sup> **Evolution and the utility subversion effect** NI

What contribution might our understanding of evolution make to economic policy? Recent years have seen an increasing reliance on the use of economic market forces to guide and coordinate human behavior. This is based in part on theory that suggests that, for the most part, the more efficient and freely operating the marketplace, the better. But there is an important way in which just what this system does well—that is, give us ever more precisely what we want—can be the source of future problems.

In a limited evolutionary environment, the relationship between a motivated action and its associated motivational element need not be close; the lack of alternative

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opportunities allows some distance between the motivation and the motivator. For instance, this distance is observable in the human sex drive, which motivates reproduction only indirectly. Creating a product that matches the motivational aspects directly may create a more 'desirable' product, but since other relationships are not maintained (including those associated with the real evolutionary benefits), the behavior resulting may not have the benefits that the motivational dynamic evolved to serve. In this way, this economically-driven motivator replacement can be expected to 'destructure' human behavior.

*Silverman I<sup>1</sup>, Choi J, MacKewn A, Moro J, Olshansky E, Fisher M* **The hunter-gatherer theory of spatial sex differences: A naturalistic study**

This study was based on Silverman and Eals' hunter-gatherer theory of spatial sex differences. The main hypothesis was derived from an attempt to conceptually link three-dimensional (3D) mental rotations ability, the spatial attribute showing the largest and most reliable male advantage, to direction-finding in a natural setting. Participants were led individually on a circuitous route through a wooded area during which they were stopped at prescribed places and required to set an arrow pointing toward where the route had begun. As a further measure, the participant was eventually asked to lead the researchers back to the beginning point by the most direct route. In a later session, participants completed a test battery consisting of 3D mental rotations, two non-rotational spatial tests, and a test of general intelligence. Participants also supplied salivary samples for analyses of sex hormone levels, which were correlated with all other measures. Preliminary data analyses, excluding hormonal measures, supported the hypothesis that males excelled on direction-finding in the woods. Also, as expected, direction-finding was related to 3D mental rotations ability, but not to non-rotational spatial abilities or to general intelligence.

### 1.3 Symposium: Examining the validity of the waist-to-hip ratio hypothesis of human female attractiveness

**Organizer** McBurney DH<sup>2</sup>, Singh D<sup>3</sup>

**Symposium abstract** Waist-to-hip ratio (WHR) is a reliable signal of a woman's reproductive age, fertility, and health. Men from various cultures judge women with

lower WHRs as more attractive than women with high WHRs. Recently the relationship between WHR and female attractiveness has been questioned by Tassinary and Hansen (1998). Furthermore, Yu and Shepard (1998) claim that preference for low WHR is a western media artifact. In this symposium Bronstad will present data showing that the female line drawings developed by Tassinary and Hansen confounded body weight and hip size. Bronstad shows that when perceived body weight of the figures is controlled men and women prefer figures with low (~ .7) WHR. Streeter reports preference for 0.7 WHR in female photographs that were altered to represent a wide range of WHRs and varying chest and hip sizes. Sugiyama presents data collected from men of the Shiwiar tribe that suggests attractiveness judgments are influenced by both WHR and body weight. Singh will present data showing consensus for representation of male and female WHRs in ancient sculptures from four different cultures. The different contributions to this symposium demonstrate the validity of the WHR hypothesis of human female physical attractiveness within a historical and cross-cultural context.

*Bronstad PM<sup>4</sup>, Singh D<sup>5</sup>* **Why did Tassinary and Hansen (1998) fail to replicate the relationship between WHR and female attractiveness?**

Many studies have found that men judge women with low waist-to-hip ratio (WHR) as attractive, healthy, and desirable for romantic relationships. Tassinary and Hansen (1998) recently challenged the WHR hypothesis of female physical attractiveness. They claimed that all research on WHR and attractiveness relied on the same set of confounded line drawings. They also claim that none of the research investigated whether abnormally low WHRs were judged as more or less attractive than WHRs in the normal range. They developed a new set of line drawings in which they claimed to manipulate several bodily dimensions orthogonally (waist, hip, and body weight). With these new line drawings they found that a) line drawings with masculine WHRs were ranked as more attractive than feminine WHRs and b) low WHRs are judged as more fertile. Thus, men prefer women who are more masculine and less fertile. However, they created low WHRs by expanding the size of the hip. This manipulation confounded WHR, hip size, and perceived body weight. Using their line drawings we find that within each weight category (under-, normal-, and overweight) line drawings with low WHR are judged to be up to 20 pounds heavier and up to 14 years older than figures with high WHR. The

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confound between WHR and perceived body weight accounts for Tassinary & Hansen's findings. We will show that once the confound is statistically corrected the relationship changes and WHRs of 0.7 are most preferred.

*Streeter SA*<sup>1</sup>, *McBurney DH*<sup>2</sup> **Waist-hip ratio and attractiveness: New evidence and a critique of "a critical test"**

Singh (e.g., 1993) has suggested that a low waist-hip ratio (WHR) in women is an honest signal of fertility. A series of studies by Singh and others has consistently found that men and women rate a WHR of about 0.7 most attractive. Tassinary & Hansen (1998), however, using a new set of line drawings in which they claimed (incorrectly) to have varied WHR independently of weight, found no relationship between attractiveness and WHR. We tested attractiveness of photographs of one woman that we manipulated to give a range of WHR spanning the 1st–99th percentiles of anthropometric data (0.5, 0.6, 0.7, 0.9, 1.2). In addition we varied both hip and chest size. College students judged the photos for attractiveness on a seven-point scale and also estimated the weight of each figure in pounds. For almost all combinations of hip and chest size the preferred WHR was 0.7. Medium chest size was preferred to large or small. Men found most photos more attractive than did women, and showed a greater relative preference for a 0.7 WHR. The effect of WHR was more pronounced when data were analyzed as the residuals of attractiveness regressed on weight. We will discuss reasons for Tassinary and Hansen's failure to find an effect of WHR. For example, Tassinary and Hansen's data actually show considerable evidence of preference for 0.7 WHR when plotted separately for each hip size, instead of for each waist size.

*Sugiyama L*<sup>3</sup> **Is beauty in the domain specific, context sensitive, multi-modular adaptations of the beholder? Shiwiar use of female WHR and body weight in assessments of attractiveness.**

As adaptationist hypotheses about the human psyche have gained wider attention, a number of conceptual issues have been overlooked. For instance, in recent tests of the hypothesis that men have adaptations which use female waist-to-hip ratio (WHR) in assessments of female sexual attractiveness, neither the context-sensitive nor the multi-modular nature of information processing adaptations has been adequately considered. This has led to a misinterpretation of empirical results, and the reassertion

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of explanations rooted in cultural determinism. I present (i) a task analysis of some of the problems a WHR assessment mechanism must solve, (ii) predictions based on this analysis about the expected design of adaptations that could solve these problems, and (iii) data on Shiwiar WHR, body fat, and assessments of female attractiveness showing that (iv) Shiwiar males use both WHR and body weight in assessments of female attractiveness in predicted ways. Slight changes in experimental method predictably obscure or uncover the expression of WHR preference in ways that account for recent cross-cultural "falsification" of the WHR hypothesis.

*Singh D*<sup>4</sup>, *Frohlich C*<sup>5</sup>, *Haywood M*<sup>6</sup> **Waist-to-hip ratio representation in ancient sculptures from four cultures**

The relationship between female attractiveness and low waist-to-hip ratio (WHR) has been demonstrated in men from US, England, Germany, India, Indonesia, Hong Kong, and Africa (Guine-Bissau). Recently Yu and Shepard (1998) argued that the preference for low WHR in all these cultures is caused by exposure to western media. These investigators argue that even minimal exposure to western media can alter centuries-old indigenous beauty ideals. One way to test the validity of this argument is to examine the consensus in body shape preferences in diverse societies prior to the emergence of the western media. We measured WHR in 286 sculptures from India, Egypt, Greece (Greco-Roman) and Africa. In all these cultures the mean female WHR was significantly lower than the mean male WHR despite cultural within-sex variability. We conclude that preference for female WHR can vary between cultures but the preferred WHR is always lower than the preferred male WHR. The western media may alter local beauty ideals by illuminating and exaggerating the perceived difference between male and female WHR.

*Wetsman A*<sup>7</sup>, *Marlowe F*<sup>8</sup> **How Universal are Preferences for Female Waist-to-Hip Ratios? Evidence from the Hadza of Tanzania.**

Female waist-to-hip ratio (WHR) has been proposed by evolutionary biologists to be an important component of human male mate choice since this trait is thought to provide a reliable cue to a woman's reproductive value. Based largely upon work conducted in industrialized societies, the claim has been made that preferences for low

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WHR are culturally invariant. Recent research with subjects who practice swidden agriculture, however, revealed that this trait was not preferred. A logical extension of such an inquiry is to test WHR preferences in a foraging population. This was done with the Hadza of Tanzania who were shown figures of females that varied by weight and waist-to-hip ratio. Again, low WHR was not preferred. Hadza men do not consider waist-to-hip ratio when expressing preferences for mates. Instead, they are most interested in the weight of potential partners. Coupled with the earlier work with the horticultural group, this work brings into question whether preferences for low WHR are culturally invariant.

#### 1.4 Symposium: Biopoetics. Part 1

**Organizer** Clift EM<sup>1</sup>

**Symposium abstract** Biopoetics is a rapidly growing area of interest among members of the Human Behavior and Evolution Society. It includes a number of researchers seeking to apply an evolutionary framework to the understanding of human creativity and symbolic processes. More specifically, the biopoetics perspective may be seen as adding the following ingredients to the overall mission of HBES: (a) it promotes research into the creative interplay of domain-specific modules as they are actualized in specific behavioral environments, (b) it focuses on the relatively unexplored intersections of evolutionary processes and material culture, and (c) it promises to grow rapidly in depth and breadth by reexamining from an evolutionary perspective primary data found in fields such as art history, literary theory, and communication studies. This symposium highlights current research and surveys the developing conceptual framework responsible for this distinctive approach to the study of evolution and human behavior.

##### *Scalise SM*<sup>2</sup> **Narrative as virtual reality**

Acquiring knowledge first-hand can be dangerous and costly; we may therefore expect selection to have favored a system or systems by means of which information could be acquired at second hand. Language is perhaps the most obvious means of accomplishing this task. Verbal communication takes several forms, however: conversation, precautions, threat, argument, and so on. In other words, verbal communication appears to be specialized: it is possible that each of the several forms it

takes performs a different task. One of these specialized forms is narrative. If humans are designed to learn from experience—that is, if the mind contains structures designed to process and retain useful information gleaned through first-hand experience—then a system that simulated first-hand experience might reasonably be expected to produce the same result. This is precisely what narrative does: dedicated to constructing integrated representations of the human physical, social, and mental environment, the narrative faculty serves as a virtual reality. In this paper, then, I argue that selection favored the integration of the language faculty with numerous cognitive structures used to process and retain first-hand experience (theory of mind, causal reasoning, temporal perception, locational memory)—otherwise known as narrative-as-a means of exploiting the benefits of first-hand experience while removing many of the costs.

##### *Dissanayake E*<sup>3</sup> **The poetics of babytalk I: “Macro”-poetics**

Even at birth, human infants can perceive sequences, detect contingencies, and develop expectancies. Combined with inborn receptivity to human faces and voices, these temporal abilities predispose infants to engage in complex dyadic social interactions (“babytalk”) in which the partners influence each other’s behavior. By responding with demonstrably close attunement to the temporal presentation of facial, vocal, and gestural signals, they adjust to their partner’s perceived emotional state. For this paper, and the next, a transcript of spontaneous speech to an 8-week infant was analyzed for both “macro-poetic” and “micro-poetic” features. Macro-poetics refers to large-scale formal structure (e.g., framing, closure, line length, theme and variation, parallelism), or to dynamic variation (e.g., pauses, pacing, pitch, and tonal considerations). When utilized in the temporal arts (i.e., music, dance, mime, and poetic language), such features are considered to be sources of “aesthetic” affect. The capacity in preverbal infants to respond to these signals and their temporal manipulation by another person in a context of emotional affiliation and conjoinment suggests a function of the temporal arts besides that of sexual display. That is, one can also view these arts as culturally-created extensions and elaborations of innate affective signals which engender and sustain affiliative emotion and accord between individuals, as their precursors do between mothers and infants.

##### *Miall DS*<sup>4</sup> **The poetics of babytalk II: “Micro”-poetics**

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In this paper, and the previous one, we extend studies by others of mother-infant interactions (“babytalk”) in which mothers use temporally-organized behaviors (special infant-directed vocalizations, facial expressions and gestures) to engage their preverbal infants’ attention and attempt to regulate their emotional state. We have identified in the sound stream of maternal utterances both global (macro poetic) and small-scale (micro poetic) structural and dynamic devices that create and direct emotional response. For their part, preverbal infants appear to be innately ready to prefer and respond to these features. Specifically, in the present paper, the mother’s speech exhibits a systematic use of “micro poetic” metrical stresses and other rhythmic features, as well as phonetic variations and contrasts, that facilitate the mutual regulation of affective and perceptual interaction—that is, they engage, direct, and reengage the infant’s attention, and respond to his changing behaviors. Because of their spontaneity, rapidity, and flexibility, these appear to be produced by the mother without deliberation, yet they reveal a rich structuring of the mother-infant relationship.

*Tooby J*<sup>1</sup>, *Cosmides L*<sup>2</sup> **Art, imagination, and the adapted mind: Towards a theory of aesthetics**

Puzzlingly, humans engage in many activities that appear to have no evolutionary utility, such as contemplating sunsets or immersion in fictional worlds, images, and experiences. However, in addition to the adaptive problems involved in performing fitness-enhancing activities, there are the less well-studied problems involved in building the neural adaptations and knowledge stores that proximately cause fitness-producing behavior. We suggest that many seemingly non-utilitarian aspects of human life are grounded in a set of developmental adaptations that are indispensable for the successful construction of neurocomputational adaptations to exacting standards, and for the ongoing construction of vast, richly detailed knowledge systems (e.g., evolved information contained in encapsulated formats may be unpacked and related to elements in the local environment through fictional experiences). The domain of interactions that can organize an adaptation is far broader than the domain in which it must perform functionally. Activities that organize an adaptation can be liberated from the constraints of encountering the actual task (e.g., tag and predator escape), if there is an abstract isomorphism between elements in the organizing experience and elements in the adaptive task, and if there are adaptations that detect activities embodying this isomorphism, extract the organizing information present

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in them, and decouple the irrelevant aspects from being stored as relevant

*Radeke MK*<sup>3</sup>, *Waters GS*<sup>4</sup>, *Cianelli S*, *Fouts RS*<sup>5</sup> **Similarities and differences in drawings by children and cross-fostered chimpanzees**

A

The drawing patterns of three adult cross-fostered chimpanzees and human children between the ages of 2 to 6 years old were investigated with respect to marks on pictures, marks on hand written words, marks in blank spaces and marks crossing boundaries. Subjects were given a 8.5 by 11 piece of paper, divided into 9 equal size rectangles bordered by black lines. Each rectangle contained either hand written words, a picture, or was left blank. The arrangement of hand written words, pictures and blank spaces were counterbalanced with regard to placement on the page. Ten drawing pages were given to the children and the chimpanzees in a random order. Non-toxic crayons or non-toxic colored pencils were used. Similarities were found between the children and chimpanzees with respect to boundaries, and a strong tendency for coloring in pictures. Differences included the chimpanzee’s concentration of marks over both pictures and hand written words, while children tended to concentrate their marks over pictures. Individual differences between the chimpanzees are discussed.

## Thursday afternoon plenary address

*Rice WR*<sup>6</sup> **Adaptation and coevolution of the sexes: Gender-specific fitness, interlocus contest evolution (ICE), and sexually antagonistic genes**

Two phenomena are described that may strongly influence adaptation and coevolution of the sexes. The first is intersexual ICE (Interlocus Contest Evolution). ICE is a Red Queen process that is manifest at the level of interacting genes within the gene pool of the same species, rather than the traditional Red Queen that concerns interacting species within a community. Intersexual ICE encompasses antagonistic coevolution between alleles at different loci that code for phenotypes that mediate contests between the sexes in the context of reproduction. Data from the literature and from recent experiments in my laboratory motivate the hypothesis that intersexual ICE plays a central role in the evolution of reproductive isolation during the speciation process. The second phenomena influencing adaptation and coevolution of the sexes

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is sexually antagonistic genes, i.e., genes that are segregating for alleles that are advantageous to one sex during ontogeny but disadvantageous to the other sex. Because the sexes are constrained to share a common gene pool, and since most genes are not gender-limited, the common occurrence of sexually antagonistic alleles would substantially interfere with the adaptive evolution of each sex. A theoretical rationale for widespread polymorphism of sexually antagonistic genes is developed. New experiments are described that a) cloned entire haploid genomes, b) express these full sets of genes in both males and females, and then c) measured sex-specific life-time fitness. These experiments indicate that sexually antagonistic genes are common in the genome and contribute substantially to the standing variance in fitness.

## 2 Early Thursday afternoon paper sessions

### 2.1 Birth order

*Davis JN*<sup>1</sup>, *Hertwig R*<sup>2</sup>, *Sulloway FJ*<sup>3</sup> **Parental investment and the inequality of equality**

How should parents divide investment among their children? Previous research on such decisions in birds has shown that, from the parental standpoint, the ideal distribution is highly contingent on the amount of resources available. The more parents have, the more equitably they ought to distribute them among their offspring, achieving essentially equal distribution when parents have enough to successfully raise their entire brood to adulthood. If we assume that human parents typically regulate family size so that they have appropriate levels of resources to raise all of their children, then we might expect a more or less similarly equitable distribution of investment to occur in human families. The equity heuristic, a boundedly rational decision rule that takes into account the typical conditions of human decision making, namely, limited time, knowledge, and computational power, specifies that parents should attempt to subdivide resources equally among their children. We will present a counterintuitive implication of the equity heuristic: Whereas an equity motive produces a fair distribution at any given point in time, it yields a cumulative distribution of investment that is unequal. We test this analytical observation against evidence reported in studies exploring parental investment, and we

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show how it can provide an explanation of why the literature reports a diversity of birth-order effects.

*Michalski RL*<sup>4</sup>, *Shackelford TK*<sup>5</sup> **Does birth order covary with mating strategy?**

This study addresses differences between firstborns and laterborns relating to adult long-term and short-term mating strategies. Because research suggests that firstborns display a stronger sense of responsibility than do laterborns, we hypothesize that this translates into greater pursuit of a long-term mating strategy by firstborns. Laterborns, in contrast, are hypothesized to pursue a short-term mating strategy involving casual sex. Furthermore, laterborns involved in a long-term relationship are hypothesized to be more likely than firstborns to become sexually involved with people other than their long-term partner. Self-report data on birth order and on sexual strategy (pursuit of short-term versus long-term romantic relationships) was collected from several hundred male and female college students. Results clarify the relationships between birth order and sexual strategy, and suggest the value of an evolutionary psychological perspective. Discussion addresses limitations of this research and important directions for future work.

*Wehr P*<sup>6</sup>, *Paulhus DL*<sup>7</sup> **Birth order and attachment style**

Building on Sulloway's niche-theory of birth order, Salmon and Daly (1998) have investigated the special character of middle-born children. Compared with first and lastborns, middle-borns report less sentiment towards their parents but stronger sentiment towards siblings and peers. Firstborns, whose greater value lies in their parents' earliest possible reproductive return, can expect the lion's share of parental investment. Lastborns benefit for two reasons: Parents should invest all remaining resources in a lastborn child, and lastborns never need endure dilution of investment. Middle-borns, it is argued, have no advantages. We extend these arguments to differences in attachment style. The greater investment enjoyed by first and lastborns should translate into a higher likelihood of secure attachment style relative to middle-borns. Based on Salmon and Daly (1998), middle-borns should be more likely to display a secure attachment style to friends as opposed to romantic partners. A sample of 347 undergraduate students completed a questionnaire on birth order and attachment. Early results indicate that middle-borns are less likely to be securely attached to both romantic partners and friends, confirming our first hypothesis. Middle-borns were more securely attached to friends compared to

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romantic partners, but so were first and lastborns, failing to sustain our second hypothesis. Our discussion suggests attachment style develops as a complex function of family sentiment.

PD

*Salmon CA*<sup>1</sup> **Who's keeping in touch? Sex, birth order and contact with kin.**

Previous research by the author has indicated that birth order is a strong predictor of familial sentiments, with middleborns being less family-oriented than first or lastborns. In this study, the effects of sex and birth order on the actual frequency of contact of Canadian undergraduates with maternal and paternal kin were examined. Undergraduate subjects saw maternal kin more frequently than paternal kin (ten times per year as opposed to seven). In the GSS sample, maternal kin were also visited more frequently than paternal (eleven times a year as opposed to eight). While the birth order of subjects did not appear to have a significant influence on contact, the birth order of the undergraduate subjects' parents did, with the offspring of middleborn mothers having relatively little contact with maternal grandparents and the offspring of middleborn fathers having relatively little contact with paternal grandparents. However, the same pattern of birth order effects was not found in a General Social Survey sample. The implications of this are discussed with regard to sex differences in the use of kin ties, birth order and parental solicitude, and life stage specific familial contact.

## 2.2 Pregnancy, prenatal effects, and fertility

*Manning JT*<sup>2</sup>, *Baron-Cohen S*<sup>3</sup>, *Wheelwright S*<sup>4</sup>, *Sanders G*<sup>5</sup>, *Slumming V*<sup>6</sup> **The 2nd to 4th digit ratio in autistic children and elite musicians**

It has been hypothesised that prenatal exposure to high levels of testosterone may be important in the aetiology of autism and musical ability. The 2nd to 4th digit ratio (2D:4D) is sexually dimorphic (2D:4D men < 2D:4D women) and negatively correlated with testosterone and sperm numbers in men. 2D:4D ratio is determined in utero and therefore may be a correlate of prenatal testosterone concentrations. We present 2D:4D ratios from (a) autistic children and their families and (b) elite musicians. The 2D:4D of our samples is compared with population norms and with measures of the intensity of the expression of the traits (i.e. autism and musicality). The evolutionary implications of prenatal testosterone exposure are

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discussed including the possibility of viewing musicality as an honest advertisement of male fertility.

*Flynn JP*<sup>7</sup>, *Ellison PT*<sup>8</sup>, *Freizinger M*<sup>9</sup>, *Domar AD*<sup>10</sup> **Stress reduction does not change ovarian function in infertile women**

Previous studies have suggested that female reproduction can be suppressed due to psychosocial stress and that stress reduction may lead to better pregnancy outcomes. In a clinical study, Domar et al. (1998) found that infertile women who participated in a ten week Mind Body (M/B) stress reduction group conceived at higher rates than a control group of infertile women. The current study investigated the possible mechanisms through which stress and its reduction may influence the probability of conception. Ten infertile women were recruited to participate in a M/B group. Subjects collected morning saliva samples and kept daily logs of coital frequency for one menstrual cycle before and one cycle after the M/B treatment. Subjects also completed the Beck Depression Inventory before and after the M/B treatment. Saliva samples were radioimmunoassayed for progesterone, estradiol and cortisol. There were no changes in any of the hormonal indices as a result of the M/B treatment. However, scores on the Beck Depression Inventory were significantly lower after the M/B treatment, indicating that subjects' affective states improved as a result of the group. Coital frequency rates also significantly increased. These results suggest that the increased conception rates associated with psychosocial stress reduction are not due to changes in ovarian function, but may be influenced by changes in coital frequency.

*Norberg K*<sup>11</sup> **Paternal involvement during pregnancy predicts the human sex ratio at birth**

Over the last three decades, there has been a decline in the human sex ratio at birth in a number of industrialized countries. Some authors have attributed this decline to large-scale climate change or environmental exposures. However, a rise of the sex ratio among black infants in the US over the same period suggests a demographic or behavioral mechanism instead. I use US natality statistics from 1969 to 1996, the National Longitudinal Survey of Youth, and other data sets to show an association between the sex ratio at birth and the involvement of the father before or during pregnancy. For example, in the NLSY, mothers who were living with a male partner at

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the time of the child's conception had 52.4% boys; mothers who were not living with a male partner at conception had 51.4% girls. The effect holds true even when the comparison is made among children born to the same mother, and may explain most of the changes in sex ratios among black and white births in the US since 1970. The association is consistent with the hypothesis that the sex ratio of offspring may be adapted to the availability of parental resources.

*Lummaa V<sup>1</sup>, Haukioja E<sup>2</sup>, Lemmetyinen R<sup>3</sup>, Pikkola M<sup>4</sup>*  
**Human twinning as a reproductive strategy in pre-industrial Finland—double fitness or double trouble?**

Highest twinning rates for Caucasian populations have been recorded in the Finnish archipelago, while twin deliveries in adjacent inland areas have historically been rarer. Here we present evidence for divergent selection pressure on twinning between these two areas during pre-industrial era (1752-1850) and show how differences in brood size in traditionally relatively isolated populations may be maintained by natural selection. We used an extensive demographic data set collected from Finnish church books to compare the lifetime reproductive success of mothers with a probable genetic tendency for twinning with control mothers delivering only singleton offspring. Twin and singleton mothers in the archipelago did not contribute differently to the subsequent population, while in the inland twin mothers' reproductive output was significantly lower than that of control mothers. With regard to causal factors, differences in the profitability of twinning between the areas are in line with the general assumption of life history theory, according to which predictable resource levels favour evolution of reproductive strategies with large brood sizes. In the archipelago the food situation has traditionally been relatively high and constant, whereas in poor inland areas crop failures and subsequent famines have been common throughout the centuries. Relationship between environmental conditions and cost of producing different sexes, and the effect of enlarged brood size on this, will be discussed.

### 2.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 1

**Organizer** Penn D<sup>5</sup>

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**Symposium abstract** Overpopulation, environmental degradation, and the loss of biodiversity are arguably the most important problems facing our species in the next century. Since our environmental problems are often the result of human behavior, the solutions lie in social policy rather than technology. Several newly emerging social sciences, such as ecological economics, have begun to integrate ecological principles into their framework; however, they still ignore evolutionary biology. Environmental philosophy and policy is often based on misconceptions and myths about human behavior. Evolutionary biology provides important insights into environmental problems, such as Hardin's 'tragedy of the commons.' Speakers in this session will show how recent advances in evolutionary ecology and psychology provide badly needed insights into overpopulation and other environmental problems. This is the first session on the newly emerging field of Darwinian ecology, which applies evolutionary principles to address environmental problems.

*Low BS<sup>6</sup>* **Ecological sustainability and demographic transitions**

The behavioral ecology of conservation gives us pause in considering how to design ecologically sustainable practices: in the evolutionary history of our and other species, "more" has always been reproductively more profitable—more resources, more or better-invested (more consumptive) offspring. Popular environmental movements call for something evolutionarily novel: a combination of both low fertility and low consumption, something that has previously been associated with relatively low reproductive success in any species. Family planning programs typically focus on lowered fertility, and not on fertility timing or on consumption levels. As a result, demographic transitions tend to be local and reversible, and vary greatly in their speed and ecological impact. I discuss the impacts of several current patterns: age-specific fertility, human discount rates, and conflicts of reproductive interests.

*Mysterud I<sup>7</sup>* **The effect of information and social incentives in obtaining economic support for an environmental fund-raising campaign: An evolutionary approach**

In two reviews, Bobbi S. Low and Joel T. Heinen (1992, 1993) focus on a behavioral ecological approach in studying resource use, environmental problems and sustainable development. Several ways to affect people in a desired direction were discussed, among others the use of information (about the consequences of the behavior and how

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to solve the problem) and social incentives. The latter is based on reciprocity (both “direct”, sensu Trivers 1971 and “indirect”, sensu Alexander 1987) and the fact that humans are a social species. “Indirect reciprocity” means that person A cooperates with person B in a given situation such that person B receives a direct benefit at the expense of A. In reality, this act conveys in effect a long-term benefit to A in future interactions with persons C, D, etc. when they observe A’s cooperation with B. Indirect reciprocity concerns therefore the reputation a person gets through his/her social interactions which affect those in the future with other people. This paper reports results from a study that tests the effect of various combinations of information and a social incentive based on indirect reciprocity in motivating a sample of 200 students to support economically a certain fund-raising campaign by an environmental organization in Norway. Our working hypothesis was that information about an environmental problem presented with a social incentive would be more efficient than presenting the information alone.

**Palmer CT<sup>1</sup> An evolutionary perspective on overfishing in northwest Newfoundland**

Evolutionary concepts are used to explain several aspects of commercial overfishing on the west coast of Newfoundland. First, individual level selection can explain the failure of fishers to conserve resources for the long term good of the group. Second, kin selection can account for the hiring of close kin as crewmembers even when it is economically inefficient to do so. Third, reciprocal altruism is the key to understanding the competition among fishplants trying to process the declining resource. Additional ways evolutionary concepts can be used to improve existing models of human ecology are also discussed.

**Penn D<sup>2</sup> Why do empowered women have fewer offspring?**

Although global population is growing exponentially, it has stabilized in some rich, developed countries (demographic transition). This is puzzling because we expect people to have more, not fewer children when they obtain more resources. However, these recent fecundity declines are more closely associated with increases in women’s power (education, social status, and control over reproduction) than economic wealth per se. How can we explain this response? In humans and other polygynous species, there is an evolutionary conflict of interest over the optimal family size between males and females: women have more to lose than men when they bear too

many children, therefore, they may have lower optima and mechanisms to resist male pronatalistic coercion. Sexually emancipated societies are an evolutionarily novel environment that may result in women sometimes overcompensating and having no offspring. This sex-specific family size hypothesis needs to be tested since it has important implications for the debate over the importance of economic growth versus sexual equality for reducing the earth’s population growth.

## 2.4 Symposium: Biopoetics. Part 2

**Organizer** Clift EM<sup>3</sup>

**Aiken NE<sup>4</sup> The handicap principle, threat, and art**

In my book, *The Biological Origins of Art* (Praeger, 1998), I argue that natural threat stimuli are used in art to evoke emotion. I outlined the neurobiological processes that make this possible and offered speculation as to why art should evoke fear. Now the publication of *The Handicap Principle* by Amotz and Avishag Zahavi (Oxford, 1997) offers a theory of signal selection which provides explanatory power to my speculation. This paper will discuss just a couple of threat examples but the Zahavi’s theories provide ample support for other notions of art in an evolutionary context.

**Allen WE<sup>5</sup> Cold cuisine in the canadian subarctic: Shamanic revenge motifs in traditional oral narratives**

Oral narratives have been employed by traditional indigenous peoples the world over for millennia. Motifs about good and bad shamans, “medicine” battles and sorcery, and subsequent acts of revenge can be found in the narratives of almost all indigenous hunters and gatherers. Such narratives likely have their origin in our evolutionary past - i.e., they are rooted in our evolved psychology. We spent 99.9% of our evolutionary history in band and tribal-level societies that were characterized by chronic internecine violence. One of the functions of traditional oral narratives has been to symbolically convey the moral proscriptions and prescriptions that legitimize individual and group identity. The following paper presents two oral narrative collected among the Dene Athabascans in the Northwest Territories, Canada in the winter of 1994, along with a brief discussion of the significance of the shamanic revenge themes that recur in such narratives.

**Carroll J<sup>6</sup> Universals as the unit of literary analysis**

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Novelists and playwrights have almost unanimously proclaimed that fictions and dramas depict “human nature.” Sociobiologically oriented critics have thus far made use of this principle by attempting to analyze literary representations as depictions of a universal human nature. I shall describe and illustrate a way to use human universals that gives us greater access to the particularity of literary meaning. I propose that we take human universals as elementary components that can be combined in various but predictably limited ways. Literary meaning resides not only in the universal itself, but in the specific way any given universal interacts with other universals. To illustrate the method I propose, I shall focus on a single human universal, the tendency for females to “marry up” socially. As Symons explains, this tendency is the consequence of females being a limited sexual resource. I shall reference dozens of instances in which this universal serves as a central principle in the organization of plots, and I shall argue that the different ways authors present this universal gives us access to their particular and distinct forms of literary meaning. These differences of meaning reflect distinct cultural circumstances, the personality characteristics of individual authors, and the use of specifically literary formal structures, but all these differences can be formulated as variations and combinations within a finite set of universal elements.

#### *Coe K*<sup>1</sup> **Art and kinship**

Recent discoveries of mummified remains of tattooed humans have led to a resurgence of interest in permanent forms of body decoration. Tattooing is ancient (the mummies are prehistoric), widespread (found on mummies in such places as Chile, Greenland, China, and the Alps), has potentially high costs (pain and possible infection and death), and is often placed on highly visible parts of the body. Hypotheses accounting for such permanent decoration fall roughly into four categories: It (1) reflects beliefs (e.g., the decoration provides magical protection), (2) provides pain relief (i.e., primitive form of acupuncture), (3) communicates prowess and sexual attractiveness (e.g., deer tattoos on good deer hunters or the good genes of men strong enough to withstand pain and risk infection), (4) identifies particular categories of individuals (slaves as one example). I will build upon the last two explanations to argue that an important function of permanent decoration in traditional societies is the communication of common ancestry, and thus kinship.

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### **3 Late Thursday afternoon paper sessions**

#### **3.1 Social reasoning**

##### *Cosmides L*<sup>2</sup>, *Tooby J*, *Montaldi A*, *Thrall N* **Character counts: Cheater detection is relaxed for honest individuals**

Research suggests that the evolved architecture of the human mind contains an expert system designed for reasoning about social exchange, with a subroutine specialized for cheater detection. We will report the results of experiments investigating whether information about an individual’s character can activate or deactivate the cheater detection subroutine. Information indicating that an individual is honest appears to *selectively* deactivate the mechanism. That is, subjects are less likely to seek out information that would tell them whether the honest individual has cheated, but their tendency to monitor others for cheating remains high. Information indicating that an individual often cheats does not appear to increase subjects tendency to monitor that individual, at least when compared to the (already high) level of monitoring they exhibit when they have no characterological information.

##### *Barrett HC*<sup>3</sup> **Guilty minds: How perceived intent, incentive, and ability to cheat influence social contract reasoning**

Across cultures, people distinguish between intentional and unintentional failure to comply with social contracts. In terms of evolutionary psychology, this implies that there must be an intersection between the domains of “theory of mind” and “social exchange” reasoning. In fact, people must bring inferences from many domains to bear in determining whether someone has “cheated” on a social contract, as evidenced by questions such as: “Did the suspect intend to do it?” “What was his motive?” and “Was he physically able to do it?” In this study I examined the influence of these three factors on social contract reasoning using the Wason selection task, a test of cheater detection in social contract reasoning. I presented six versions of a social contract Wason task to 239 subjects, varying whether the protagonist in the accompanying story 1) intended to break the social contract rule, 2) had an incentive to break the rule, and/or 3) was physically able to break the rule. Each subject saw a combination of 1, 2 or 3 of these factors. The results showed that removing intent, incentive, and ability each decreased performance,

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additively, by about 20% from a ceiling of 65. In other words, people track others' intentions, motives, and abilities, each of which influences social contract reasoning. I discuss the implications of this study for the architecture of social contract reasoning, in particular, how inferences from multiple domains are combined in social decision-making.

**Moore C<sup>1</sup>, Brown WM<sup>2</sup> Is prospective altruist-detection an evolved solution to the adaptive problem of subtle cheating in cooperative ventures?**

Reciprocal altruism in humans may be made possible in part by the existence of information-processing mechanisms for the detection of overt cheating. However, cheating may not always be readily detectable due to the division of labour. Subtle cheating poses a serious problem for the evolution of altruism. This paper argues that subtle cheating may have exerted selective pressures on early hominids to be sensitive to information regarding the genuineness of an altruistic act. In two experiments, subjects were required to complete Wason selection tasks designed to allow for the detection of altruism. Performance on the altruist-detection tasks was compared to performance on control Wason selection tasks (Experiment 1) and to performance on control and cheater detection tasks (Experiment 2). Participants were significantly better at solving cheater-detection and altruist-detection versions compared to control versions of the problems and there was no significant difference between altruist and cheater detection. Results are discussed in relation to recent conceptual models for the evolution of altruism. Specifically, it is argued that non-kin altruism may be an evolutionarily stable strategy if altruists can detect one another and form mutually beneficial social support networks.

**Hiraishi K<sup>3</sup>, Hasegawa T<sup>4</sup> Detecting free-riders in cooperative groups: A study on Wason selection task**

It is widely accepted that "utility" affects reasoning and elicits a thematic-content-effect on the Wason Selection Task (WST). Taking a Darwinian approach this paper proposes that detection of free-riders in cooperative groups has utility for humans and elicits a thematic-content-effect. In a cooperative group where members selectively share resources with in-group members, free-riding can take two forms; the consumption of resources by out-group members, or the failure of in-group members to share resources. The detection of free-riders is essential for the maintenance of cooperative relationships, so

it was predicted that people would be efficient at detecting free-riding on the WST. Taking the perspective of the resource provider, undergraduates (Study 1) and 6th grade pupils (Study 2) completed the WST. Our prediction was supported in both experiments, as respondents in both age groups showed a thematic-content-effect and checked for the existence of out-group members taking undeserved resources. Taking the perspective of the resource recipient, both undergraduates (Study 3) and 5th and 6th pupils (Study 4) also showed a thematic-content-effect. However, there were important differences between the groups. While the undergraduates checked only for the existence of out-group members taking undeserved resources, our prediction received the strongest support from the pupils who also checked for the existence of in-group members being denied access to resources.

### 3.2 Aesthetics of human form

**Anderson NK<sup>5</sup>, Park M<sup>6</sup>, Johnston VS<sup>7</sup>, Giddon DB<sup>8</sup> Anthropometric measures contributing to judgments of female facial attractiveness by four ethnic groups**

As part of an overall study for determining the physical bases of perception of faces, four groups of judges (Chinese, Japanese, Korean, and Other) ( $N = 54$ ) were required to rate attractiveness and to classify the ethnicity of 60 gray scale, full face images of female Asians. Attractiveness ratings were based on a 5-point scale (1=very attractive, 5=very unattractive); judges were asked to classify faces as Most and Least Likely Chinese, Japanese, or Korean (Most Likely=1, Least Likely=3). A total of 49 linear, angular, and proportional measures were examined statistically to determine the specific anthropometric characteristics used in making these judgments. In agreement with prior studies (Johnston & Franklin, 1993), a specific set of measures (e.g. short lower face height, thin nose, etc.) were found to be significantly correlated ( $p < .05$ ) with the attractiveness ratings for all judge groups. Additional anthropometric measures were found to be specific for ratings of attractiveness by some of the judge groups (e.g. Chinese judges preferred low-set eyebrows). Unlike ratings of attractiveness, the judges' criteria for assessing the ethnicity of the faces were consistent within the ethnic judge groups, but varied widely across judge groups. There was some overlap however between the anthropometric measures used to determine the ethnicity of a face and those associated with attractiveness. These findings

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are discussed within the framework of natural and sexual selection.

*Hume DK*<sup>1</sup>, *Montgomerie R*<sup>2</sup> **Facial attractiveness and symmetry in humans**

We investigated the role of facial symmetry in assessments of attractiveness. Because fluctuating asymmetry (FA) is predicted to be negatively related to aspects of fitness, symmetry should be found attractive in potential mates. Grammer & Thornhill (1994) found a positive relationship between measured facial symmetry and facial attractiveness. However, Swaddle & Cuthill (1995) manipulated facial symmetry and found symmetry to negatively effect attractiveness. We tested the relationship between symmetry and attractiveness using two different methods of image presentation. First, viewers rated the attractiveness of 32 subjects, where each subject was seen only once, and each image seen represented some level of symmetry manipulation (similar to Swaddle & Cuthill). Then viewers ranked four symmetry manipulated images of the same subject in order of attractiveness. Both methods clearly showed that symmetrical faces were found to be most attractive. We suggest that variation in facial expressions among Swaddle and Cuthill's images might explain the differences between their results and ours. Facial expressions in our sample were held constant, thus removing this potential confound.

*Hunt CB*<sup>3</sup>, *Nordahl DK*<sup>4</sup>, *Figueredo AJ*<sup>5</sup> **Females' first impressions of males: Are they accurate and how are they used to judge attractiveness?**

Sexual selection research has shown that females and males prefer specific qualities in their mates. Because females assume most of the initial reproductive burden, however, their choice of mate carries more consequence than that of males. We hypothesized that females are adapted to utilize information contained in visual and vocal cues to form accurate first-impressions of males' mating strategies and personality. We predicted that females use these impressions to judge males' attractiveness based on their own mating strategy and personality. Forty-two males completed personality and mating strategy questionnaires and were videotaped for 3 minutes as they provided un-prompted information about how they would start a conversation with a female they found attractive. One hundred forty-three females completed the same questionnaires. Additionally, females viewed

videotapes of five randomly-chosen males. Females rated each male's personality and mating strategy and indicated their attractiveness. Females generally perceived males as being more emotional, less active, and less monogamous than males perceived themselves. Generally, females were less attracted to males they perceived as highly emotional, sociable, or promiscuous. Highly sociable females, however, were attracted to highly sociable males. Promiscuous females were attracted to most males, except those they rated as highly monogamous. These results suggest that females' first-impressions of males are reasonably accurate and used as a basis for attraction. Most females appear to value emotional stability in mates, perhaps as an indication of consistent providing. Positive assortative mating appears to operate on dating strategies and certain personality traits.

*Brecke PA*<sup>6</sup>, *Long WJ*<sup>7</sup> **Reconciliation between and within countries: A "rational choice" or "reasoned instinct"**

This study explores two explanations for reconciliation between and within countries. The first explanation, based on the rational choice paradigm, argues that reconciliation emerges from cost-benefit calculations by leaders of countries or leaders of major groups within countries. Depending upon the circumstances, leaders send signals to their counterparts and their own constituencies indicating their preferences and commitment to a major restructuring and improvement in relations. The second explanation, based heavily on research on social behavior in evolutionary psychology, posits that reconciliation reflects a prior, more fundamental process. Reconciliation results from an internal re-evaluation of oneself and one's counterpart combined with an awareness that actions to re-establish social harmony and structure are advantageous. The desire for reconciliation arises from a deep, emotive understanding. In those instances where there has been a long history of interaction, and each actor relies on the other for his well being, the willingness to reconcile becomes more salient.

This study reports our project to determine which explanation best fits the data. Initial findings suggest that rational choice is a superior explanation for reconciliation between countries. The paper will also report research underway to test whether that finding breaks down when we move to the within-country situation in which cooperation with the counterpart becomes more important.

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### 3.3 Symposium: Darwinian ecology: Evolutionary perspectives on environmental problems. Part 2

**Organizer** Penn D<sup>1</sup>

**Ruttan LM<sup>2</sup>, Borgerhoff Mulder M** **Are East African pastoralists truly conservationists?**

Controversy exists among anthropologists, conservation biologists and development workers as to whether the concept of the “ecologically noble savage” is a myth. Central to this debate are the problems of how to identify conservationist behavior and the issue of whether sound management practices of common property are likely to evolve. While social scientists have documented instances where restraint over the use of resources occurs, those who adopt an evolutionary perspective are challenged to identify the selective mechanisms whereby such altruistic conservation acts might be maintained in a population. Here a game theoretic approach is used to analyze the case of pastoralist grazing reserves. We demonstrate that under some conditions, conservation can be the result of narrow self-interest and there is no collective action problem. However, the range of these conditions is much broader for wealthy individuals and thus, the wealthy may also find it advantageous to coerce others into conserving. In conclusion, we propose an extension of the definition of conservation that is of greater generality for use in non-foraging populations, and incorporates the essential political element of how conflicts over resource use are resolved.

**Wilson M<sup>3</sup>, Daly M<sup>4</sup>** **Sex differences in disregard of personal health risks and environmental degradation**

We hypothesize that women and men differ, as a result of sexual selection, in their willingness to tolerate health hazards and other risks in pursuit of material and social benefits. In an experimental study utilizing a hypothetical dilemma, a financial incentive had slightly more appeal for men than for women, whereas a health hazard was a strong disincentive for women but not for men. We also hypothesized that men would be more likely to downplay environmental degradation in the pursuit of profit on the logic that men may discount the future more than women as a result of prioritizing present profits. In another hypothetical dilemma about a choice of crop to farm, men were significantly more likely than women to choose the soil-degrading but higher profit crop. A number of other expectations can be derived if we assume there is an evolved

facultative decision process modulating tradeoffs between financial and status benefits, on the one hand, and costs in personal health and long-term detrimental consequences to the environment, on the other.

**Atzwanger K<sup>5</sup>, Schäfer K<sup>6</sup>** **Visual complexity and perceived scenic preference in urban squares**

Because choice of habitat exerts a powerful influence on survival and reproductive success, the mechanisms involved have been under strong selection for millennia (Orians & Heerwagen 1992), so that those structures which have in the course of human evolution conferred high habitat quality also trigger positive responses today. Several models of scenic quality are based on an assumed relationship between visual complexity and increasing aesthetic quality, influenced by the finding that increasing ecological stability is related to environmental quality. In urban environments Herzog (1992) was able to demonstrate with rating studies that order and complexity appeared to be consistent predictors for preference. Most studies confirm a positive correlation between visual complexity and interest (e.g. Nasar 1987). The relationships between preference and complexity are less consistent. A problem of these studies is that complexity was only derived from human judgments that turned out to be influenced by content categories. We therefore directly measured the physical characteristics of the scenes (urban squares in Austria and Germany) using computer image processing (fractal dimension), and having them rated for perceived complexity, interest and preference. Our data indicate a strong positive correlation between objective complexity measurements, subjective evaluation and preference at least in urban environments. This may result from a lack of enough complexity, far from producing a downturn in preference. We conclude that this result is of high interest for urban design planners.

**Kay CE<sup>7</sup>** **Aboriginal overkill and the myth of the “ecologically noble savage”—A continuous-time analysis of wildlife observations made by Lewis and Clark**

Lewis and Clark’s journals are often cited as an example of how the West teemed with wildlife before that area was despoiled by advancing European civilization. To test this hypothesis, I performed a continuous-time analysis of wildlife observations made by Lewis and Clark on their expedition across the continent in 1804-1806. This included bison, elk, mule deer, white-tailed deer, black-tailed deer, moose, pronghorn antelope, bighorn

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sheep, grizzly bears, black bears, and gray wolves. I also recorded all occasions on which Lewis and Clark met native peoples. Those data show that Native Americans controlled the distribution and numbers of wildlife throughout the West. As predicted by the Aboriginal Overkill hypothesis, the only places Lewis and Clark reported an abundance of game were in aboriginal buffer zones between tribes at war, but even there, wildlife populations were not food-limited. Bison, grizzlies, bighorn sheep, and wolves were seldom seen except in aboriginal buffer zones. Moreover, Lewis and Clark were only able to complete their journey because of the food, horses, and above all else, knowledge that they received from native people. There was no wilderness. Finally, as noted by Lewis and Clark, the West was even more densely populated prior to the smallpox pandemic that decimated native people in 1780.

### 3.4 Symposium: The psychology and physiology of human sperm competition

**Organizer** Shackelford TK<sup>1</sup>

**Symposium abstract** Sperm competition occurs when the sperm of two or more males simultaneously occupy the reproductive tract of a female. Some empirical work has been conducted on human sperm competition. The majority of this work focuses on the physiological outcomes of sperm competition, such as sperm number per ejaculate. This symposium highlights recent work on the psychology and physiology that underlie human sperm competition. LeBlanc et al. propose that sperm competition generated several adaptive problems for males and that males have evolved mechanisms designed to solve each of these problems. Weekes et al. tested the hypothesis that female coital orgasm is an adaptation for retaining the sperm of males with high genetic quality. Using physical attractiveness as a proxy for “good genes,” the researchers find that a woman’s coital orgasm positively covaries with her partner’s physical attractiveness. Pound et al. had men provide ejaculates by masturbation while watching pornographic videos. The content of the videos had several unique effects on ejaculate parameters. Additionally, time spent sexually aroused positively covaried with the number of sperm ejaculated. Shackelford et al. assessed sperm competition risk as the time a man has spent apart from his partner since the couple’s last copulation. Men at greater risk of sperm competition report, for example, (a) that their partner is more attractive and

(b) greater interest in having sex with their partner. The four presentations report some of the first work that addresses the psychology and physiology that may underlie human sperm competition.

#### *LeBlanc GJ*<sup>2</sup>, *Shackelford TK*<sup>3</sup>, *Weekes VA*<sup>4</sup> **Preventing, correcting, and anticipating sperm competition in humans**

Sperm competition occurs when the sperm of two or more males simultaneously occupy the reproductive tract of a female. Sperm competition has been documented or inferred in a variety of animal species, including humans. Female infidelity is the primary context for sperm competition. Males face tremendous costs associated with a female partner’s infidelity. A principal cost is investing limited resources in genetically unrelated offspring. Female infidelity and sperm competition generated several sets of adaptive problems that males faced over evolutionary history. These include preventing sperm competition, correcting the problems posed by sperm competition, and anticipating sperm competition. It is proposed that males have evolved physiological and psychological mechanisms specifically designed to solve each of these problems.

#### *Weekes VA*<sup>5</sup>, *Shackelford TK*<sup>6</sup>, *LeBlanc GJ*<sup>7</sup>, *Bleske AL*<sup>8</sup>, *Euler HA*<sup>9</sup>, *Hoier S*<sup>10</sup> **Human female coital orgasm is predicted by her partner’s physical attractiveness**

Human female orgasm may be an adaptation, having evolved to solve problems that threatened survival or reproduction. Work guided by Sperm Competition Theory suggests that female coital orgasm functions to suck up sperm and that the timing of female orgasm relative to male ejaculation affects the number of sperm retained in the reproductive tract. It also has been hypothesized that female coital orgasm functions to preferentially retain the sperm of males higher in genetic quality. 388 women involved in committed, heterosexual relationships and residing in the United States or Germany completed a survey about their sexual behavior. The present research tested the hypothesis that women’s coital orgasm covaries with ratings of their partners’ physical attractiveness, a heritable indicator of male genetic quality. Results support the hypothesis, even when controlling for women’s relationship satisfaction, the woman’s age, her partner’s

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age, and relationship duration. Discussion integrates current findings with previous work, and highlights the active role of female sexuality, in general, and female coital orgasm, in particular.

*Pound N<sup>1</sup>, Javed MH, Ruberto C, Shaikh MA, Del Valle AP* **Factors affecting human ejaculate composition**

An early prediction of sperm competition theory was that males should inseminate more sperm when the risk of double mating, and hence sperm competition, is high. R. R. Baker & M. A. Bellis (1989) reported that the number of sperm in human ejaculates varies in accordance with this theory and in recent years evidence has accumulated to suggest that males of many other species are also capable of adaptive regulation of ejaculate composition. However, little attention has been paid to the psychological and physiological mechanisms that may underlie adaptive regulation of sperm delivery in human males. In the present study, volunteers produced semen samples by masturbation while watching pornographic videos. The content of the pornographic videos had important effects on certain ejaculate parameters once other sources of variability had been taken into account. Sperm motility was greater for samples collected in the morning while across subjects sperm concentration and motility, but not ejaculate volume, were positively correlated with the time taken to produce the sample. If time taken to produce the sample is closely related to the time spent in a state of sexual arousal then the latter variable is a strong predictor of the total number of sperm ejaculated. These results will be discussed in the context of a general theory of facultative adjustment of ejaculate composition and copulatory behaviour.

*Shackelford TK<sup>2</sup>, LeBlanc GJ<sup>3</sup>, Weekes VA<sup>4</sup>, Bleske AL<sup>5</sup>, Euler HA<sup>6</sup>, Hoier S<sup>7</sup>* **Absence makes the heart grow fonder, but only for men: The psychological architecture of human sperm competition**

Sperm competition occurs when the sperm of two or more males simultaneously occupy the reproductive tract of a female and compete to fertilize an egg. RR Baker and MA Bellis (1995) found that men who spend less time together with their partner since the couple's last copulation (an index of greater risk of sperm competition) inseminate more sperm at the next copulation, independent of the total time since last copulation. There may be psychological mechanisms linked to these physiological adjustments. Data

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were collected in the United States and in Germany from 388 women and 304 men in committed, sexual relationships. As predicted, men who spent less (relative to more) time together with their partner since last copulation report (a) that their partner is more attractive, (b) that other men find their partner more attractive, (c) greater interest in having sex with their partner, and (d) that their partner is more sexually interested in them. None of these effects are found for women, and all the effects are independent of total time since last copulation and the participant's relationship satisfaction. Discussion addresses 2 failed predictions, sample and design limitations of the study, and directions for future work.

## 4 Thursday evening

### 4.1 Poster session

*Brase GL<sup>8</sup>* **Beyond the Selection Task: The Effects of Different Presentation Formats on Reasoning about Social Contracts**

Recent research on domain-specific theories of human reasoning has revolved primarily around the Wason selection task as an evaluation tool. Although the selection task does fulfill this purpose admirably, it is important to determine if, in fact, a reasoning theory is generalizable across a broader range of reasoning formats. Cosmides and Tooby's social contract theory of reasoning is evaluated in the contexts of two alternative reasoning formats: syllogism completion tasks and the partial information paradigm. A series of experiments explores the effects on reasoning about social contracts when cast in these different formats, when presented as situations dealing with individuals versus categories of individuals, and when a contextual story is provided or not provided. The results indicate that reasoning about social contracts does generalize across different presentation formats. Several new potential issues are made more prominent by the use of alternative formats, including the implications of using generalized currencies (e.g., money) in social exchanges.

*Bullock HL<sup>9</sup>, Montgomerie RD<sup>10</sup>* **Relationship predictors of human female orgasm**

Human female orgasm is not necessary for conception and may be an adaptation that has other reproductive functions. One possibility is that female orgasm is an adaptation for influencing sperm competition. In support of the

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sperm competition hypothesis, Thornhill, Gangestad and Comer (1995) found that female orgasm rate was correlated with Fluctuating Asymmetry (FA) of the partner, but not with characteristics of the relationship. As part of a larger study replicating Thornhill et al. (1995), we examined the correlation between the relationship characteristics measured by Thornhill et al. (1995), plus 3 additional characteristics, and female orgasm rate. Data from a pilot study ( $n = 14$  couples), in which subjects answered questions about financial status, health, sexual behaviours and relationship behaviours and attitudes, showed correlations between female orgasm rate and some relationship characteristics. Here we use a much larger data set ( $n > 80$  couples) to determine which relationship characteristics were related to female orgasm rate. We compare our results to Thornhill et al. (1995) and address the question of whether there is convincing evidence that female orgasm is an adaptation, or whether the weight of the evidence suggests a non-adaptationist explanation.

*Campbell L<sup>1</sup>, Simpson JA<sup>2</sup>, Kashy, DA<sup>3</sup>, Fletcher GJO<sup>4</sup>*  
**Ideals and Flexibility in Close Relationships**

Two studies tested how the ideal standards people have for romantic partners and their degree of ideal flexibility interact in predicting relationship quality. In Study 1, people in dating relationships rated themselves and their ideal partners on three dimensions: warmth/trustworthiness (WT), vitality/attractiveness (VA), and status/resources (SR). They then reported their ideal flexibility, and how closely their partner matched their standards. People who rated themselves higher on each dimension had higher ideal standards and reported less flexibility. Women reported higher ideal standards and decreased flexibility for the WT and SR dimensions than men. Men and women, though, did not differ on their ratings on the VA dimension. Relationship quality was higher the more partners matched individuals' ideal standards, and this effect was moderated by the flexibility of ideals on two dimensions (WT and SR). Study 2 obtained the same ratings from both members of dating couples. The same pattern of gender differences emerged as in Study 1. Smaller discrepancies between ideal standards and partner perceptions also predicted greater relationship quality for both couple members. Flexibility moderated the relation between ideal standards and relationship quality. The results are discussed in terms of the evolutionary significance of ideal standards and the flexibility of standards for ascertaining self-perceived mate value

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*Cornwell R<sup>5</sup>, Palmer CT<sup>6</sup>*  
**Professors as predatory animals: Overcoming the evolved psychological mechanisms behind student resistance to evolutionary psychology**

We propose that resistance to novel concepts such as evolutionary psychology is influenced by evolved psychological mechanisms governing emotions, including fear responses initiated by status related threats. Research by Le Doux and others suggests that such incoming stimuli is initially processed for emotional content, and only secondarily as rational thought. Therefore any threat perceived at the initial process may trigger psychological mechanisms that disturb or block rational processing. Research by Epstein has also indicated that different methods of instruction may trigger or avoid these defensive mechanisms. This hypothesis is tested by comparing student reaction to different methods of presenting excerpts from Robert Wright's "The Moral Animal".

*Cox G<sup>7</sup>*  
**Action potentials in Slavic culture: Neuro-cultural impact of long-term strategies of males-only genocide and conquest rape in East European prehistory**

Materials from a variety of disciplines are examined to explore the oft-mentioned, seldom-examined truism about Slavic passivity. The sketchy historical record, legendary accounts, and archaeological findings agree that males-only genocide and conquest rape were frequent occurrences in Eastern European prehistory. This is a feature of the interaction between nomadic herders and sedentary horticulturalists, two economic strategies that comprise a complementary dyad of evolutionary niches. Slavic kinship terminology suggests that as proto-Common-Slavic differentiated from Indo-European, young males were virtually absent as plenipotent figures in the community, and that Slavic kinship passed through classificatory and avuncular stages. For the historical period, literary, sociological, and historical materials are examined as evidence for modern correlates of this paradigm. It is suggested that environmentally activated "incipient systems" describe such paradigms better than the concept of genetic hard-wiring. Finally, the possibility is considered that the paradigm is of central importance in the current difficulties, particularly since change is typically effectuated in Slavic culture through subversion of hypertrophic power systems rather than through direct action.

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*Dab-Ecuyer I<sup>1</sup>, Robert M<sup>2</sup>* **Natal dispersal and visuo-spatial cognition: No relationship in humans**

As sex-specific navigational activity may be a critical factor in the emergence of sex differences in visuo-spatial skills, it is important to consider the influence of dispersal (distance from birth site to first breeding or potential breeding site) as a possible selective pressure of this cognitive process. If this is the case, it could be expected that the sex displaying the greater dispersal in a given species would also display a visuo-spatial advantage. In mammals, males generally show the greater natal dispersal, whereas the reverse pattern was found in North American humans. Pan-culturally however, men performed better than women in visuo-spatial skills calling for dynamic components. The present study assessed dispersal for 25- to 45- year old men and women among a sample of 300 Montrealers. Visuo-spatial proficiency was estimated by dynamic tasks such as mental rotation, and horizontality, as well as by the static task of object-location memory. Sex differences favoring men were observed in the dynamic tasks, and a female advantage was found in the static one. However, dispersal did not correlate with visuo-spatial performance for any sex. Finally, analysis performed on other navigational behaviors revealed positive relations between home range size and dynamic visuo-spatial skills, but for men only. The results stress the relevance of examining the evolutionary bases of visuo-spatial processing with respect to sex- and navigational-related pressures.

*DeKay WT<sup>3</sup>, Shackelford TK<sup>4</sup>, Drass E, LeBlanc GJ, Weekes VA* **Intergenerational jealousy: Parental reactions to the imagined infidelities of children-in-law**

Paternity uncertainty has been an important adaptive problem and sexual jealousy seems to be one psychological adaptation in men designed to deal with the problem. Men, more than women, are bothered by thoughts of their partners' sexual (as opposed to emotional) infidelity, whereas women are more bothered by thoughts of emotional infidelity. Paternity uncertainty is a special case of a more general problem, called relational uncertainty, where uncertainty in relatedness arises whenever cuckoldry can sever the line of decent between two individuals. It follows that perhaps other kin members have adaptations analogous to sexual jealousy causing them to experience upset or distress in circumstances where cuckoldry could sever relatedness between themselves and another individual in whom they invest. Grandparents, for

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example, should be especially bothered by thoughts of sexual infidelity by their daughters-in-law, and should be especially bothered by thoughts of emotional infidelity by their sons-in-law. We administered a series of forced-choice items to a sample of older adults ( $N = 207$ ) asking them to imagine sexual and emotional infidelity by their children-in-law and to indicate which is most upsetting. Results were mixed, indicating that women tend to be more upset by thoughts of sexual infidelity by their daughters-in-law, but men tend to be more upset by thoughts of sexual infidelity by their sons-in-law.

*Dijkstra P<sup>5</sup>, Buunk AP<sup>6</sup>, Singh D<sup>7</sup>* **Jealousy as a function of a rival's body build: Do men and women differ?**

The present studies investigated the importance of a rival's waist-to-hip ratio (WHR), one of the most important determinants of bodily attractiveness, in the evocation of jealousy. Study 1 and 2 presented participants with pictures of same-sex individuals varying in the size of their WHR. Results showed that for both men and women a rival's WHR evoked feelings of jealousy. However, because Study 1 and 2 manipulated WHR by varying the size of the waist, Study 1 unintentionally also manipulated a rival's degree of body taper. Therefore, in order to investigate the independent contribution of a rival's WHR and upper trunk proportions, Study 3 manipulated both a rival's WHR and shoulder-to-hip ratio (SHR) and assessed feelings of jealousy in a sample of college students. Study 3's results revealed a gender difference: whereas a rival's WHR evoked more jealousy in women than in men, a rival's SHR evoked more jealousy in men than in women. To examine the generalizability of these results, Study 4 repeated Study 3 in a sample of married individuals over thirty. Surprisingly, results showed that whereas a rival's WHR still evoked more jealousy in women than in men, no gender difference was found for a rival's SHR. A possible explanation is that for men over thirty SHR contributes less to their value as a mate than for college-aged men.

*Fiddick L<sup>8</sup>* **Fear and loathing in deontic reasoning**

Contrary to standard analyses of deontic reasoning, which suggest that deontic reasoning is a unitary phenomenon, an evolutionary perspective suggests that deontic reasoning is the product of a collection of discrete cognitive adaptations. Among the mechanisms that evolutionary psychologists have proposed are cognitive adaptations for social exchange and cognitive adaptations for hazard

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avoidance. Building on previous cognitive and neurological research demonstrating the dissociability of reasoning about social exchange and reasoning about precautions against hazards, I present new evidence that these domains of reasoning are associated with different emotions: social exchange with anger and precautions with fear.

**Goldberg R<sup>1</sup> Selection Advantages of Judaism's Requirement of Monthly Conjugal Separation (Niddah)**

According to Jewish law, husbands are forbidden sexual intimacy with their wives for approximately twelve days every month corresponding to just before, during and after menstruation. As a result, from the Judaic perspective, sexual relations are not "squandered" during the time of monthly female infertility. Complimenting the niddah restriction are Talmudic requirements that the husband "satisfy" his wife sexually during the permitted time of each month, including the days when she is most likely to be ovulating. This paper will suggest that these marital requirements constitute a group-specific reproductive strategy which has the effect of increasing both the total number of Jewish offspring and the parental investment in their existing offspring.

**Hagen EH<sup>2</sup>, Craig NM<sup>3</sup>, Hames RB<sup>4</sup>, Lauer MT<sup>5</sup>, Price ME<sup>6</sup> Parental investment and child health in a Yanomamo village**

The 1998 El Niño significantly reduced garden productivity in the Upper Orinoco region in Venezuela. Consequently, parents were forced to carefully allocate food to their children. Nutrition data collected from village children combined with genealogical data allowed us to determine which children suffered most, and whether the patterns of food distribution accorded with predictions from parental investment theory.

For boys, three social variables accounted for over 70% of the variance in subcutaneous fat: number of siblings, age of the mother's youngest child, and whether the mother was the senior or junior co-wife, or was married monogamously. These results accord well with parental investment theory. Parents experiencing food stress faced a tradeoff between quantity and quality, and between investing in younger vs. older offspring. In addition, boys with access to more paternal investment (i.e., no step-mother) were better nourished. These variables did not account for any of the variance in female nutrition. Girls'

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nutrition was associated with the size of their patrilineage and the number of non-relatives in the village, suggesting that lineage politics may have played a role.

An apparent lack of relationship between orphan status and nutrition is also interesting, given that orphans suffered high rates of skin flea infections. The large number of orphans being cared for by only two grandparents suggests that grooming time may have been the resource in short supply.

**Janicki MG<sup>7</sup>, Renaud ML<sup>8</sup> The importance of type of reciprocity and framing in perceptions of social exchange.**

Are people in close relationships concerned about being reciprocated? Evolutionary psychologists suggest people should be, but some social psychologists argue getting repaid is not that important (e.g. Clark & Mills, 1979). These two perspectives may be reconciled by evidence that there is more than one types of direct reciprocity, and that people respond differently to each type. What we call "Type I reciprocity" is repaying someone back for something given or done for you (e.g. a friend looked after cat, and you gave her chocolates). "Type II reciprocity" is helping or doing something for someone, after something was done for you (e.g. you return the favour by looking after your friend's dog). We hypothesized that not receiving Type II reciprocity would be more upsetting than not receiving Type I. 160 undergraduates read a two-part scenario featuring two instances of helping between friends (each part featured one type of reciprocity), and then answered questions about the importance of reciprocating, cost of giving, value of the help, and upset at not being reciprocated. Each part also included a between-subjects frame manipulation, in which the importance of being reciprocated was framed as a loss or a gain. An additional manipulation was whether the first instance of helping was repaid or not. The predicted differences in responses to the two types of reciprocity were found. The evidence suggests that framing and previous payback also have an influence.

**Jensvold ML<sup>9</sup>, Fouts RS<sup>10</sup>, Hood JA<sup>11</sup>, Fouts DH<sup>12</sup>, Waters GS<sup>13</sup> The development of phrases in a signing chimpanzee**

Young chimpanzees cross-fostered by humans acquired the signs of American Sign Language and used them to communicate with humans and each other. The cross-fosterlings combined the signs into phrases; the devel-

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opment of their phrases paralleled that of human children. As a young adult Washoe, the first of the cross-fosterlings, adopted 10 month old Loulis. For five years humans did not sign in his presence. He acquired his signs from Washoe and other chimpanzees. Loulis' first sign appeared 8 days after he was introduced to Washoe. When Loulis was 71 months old he had acquired 51 signs. Like the cross-fostered chimpanzees Loulis combined his signs into phrases. Loulis' phrase development for his first five years are described. The number, variety, and length of his phrases increased. The phrase development patterns paralleled that of the cross-fostered chimpanzees. Linguists often describe language as an all-or-none phenomena. Yet human children, cross-fostered chimpanzees, and Loulis acquired language gradually in an orderly pattern. If language is all-or-none, then at what point does a developing individual have language? Darwinianism holds that biological functions vary in degree rather than kind. The evidence from this and other studies of language development show that language, like other behaviors develops as a gradual process rather than as an all-or-none phenomena.

*Jocic V<sup>1</sup>, Wilson M<sup>2</sup>* **When good boyfriends go bad: Sensitivity to cues of sexual conflict**

If men's tendencies toward sexual proprietariness are ubiquitous correlates of the use of violence against female partners then one might expect people to be sensitive to cues that indicate a proclivity for aggressive, possessive and controlling behaviour on the part of the male. The experiment entailed a  $2 \times 2 \times 2$  between-subjects design where key portions of a photo-story about "Brad and Julie" were altered to convey male aggression or female polyandry; sex of subjects was the third independent variable. Subjects' estimates of the likelihood of Brad acting in an aggressive and controlling manner were dependent on the presence of the experimentally manipulated cues of female polyandry and of male proclivity toward aggression.

*King J<sup>3</sup>, O'Connor LE<sup>4</sup>, Berry JW<sup>5</sup>, Weiss A<sup>6</sup>, Lim S<sup>7</sup>* **Personality, Subjective Well-being and Psychopathology in Chimpanzees**

In prior empirical studies we demonstrated that adjectival personality items and subjective well being could be reliably assessed in Chimpanzees. Chimpanzee personality structure included five factors resembling the five factors

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in Homo Sapiens personality, in addition to a broad dominance related factor. The present study was designed to investigate the relationships among personality, subjective well-being, and psychopathology in a Chimpanzee population. Chimpanzees were rated on a 43-item personality measure, on a 4-item measure of subjective well-being, and a 20-item measure of psychopathology, adapted for this population from the Overall and Gorham Brief Psychiatric Rating Scale. In addition, several items related to self-conscious emotions were included. Subjects were 43 chimpanzees living in 6 zoos, participants in the ChimpanZoo project of the Jane Goodall Institute. Each subject was rated on the three instruments, by raters familiar with the Chimpanzees. After determination of interrater reliability, mean scores on each measure were calculated for each Chimpanzee, and correlations as well as multivariate statistics among the measures were calculated. In addition, critical behavioral incidents of the Chimpanzees were reported by the raters familiar with each zoo population in an effort to illustrate the quantitative personality, subjective well being, and psychopathology data with informal behavioral observation data.

*Kohl JV<sup>8</sup>* **Mammalian Olfactory-Genetic-Neuronal-Hormonal-Behavioral Reciprocity and Human Sexuality**

The early prenatal migration of gonadotropin releasing hormone (GnRH) neurosecretory neurons into the brain enables mammalian olfactory pathways to exhibit sexually dimorphic specificity to social-environmental chemical stimuli (e.g., pheromones). Mammalian pheromones induce change in GnRH pulsatility. Hypothalamic GnRH pulsatility directs the concurrent maturation of the neuroendocrine, central nervous, and reproductive systems. Pheromonally induced alterations in GnRH pulsatility allow for a life-long causal linkage between pheromones, olfaction, gene activation, neurotransmission, autonomic responses, luteinizing hormone/follicle stimulating hormone ratios, steroidogenesis, synaptogenesis, synaptolysis, apoptosis, and hormonally induced behavioral changes. Human pheromones induce changes in pituitary and gonadal hormone secretion, apparently by influencing GnRH pulsatility. Accordingly, human pheromones appear to link the genetic "nature" and the social-environmental "nurture" of human reproductive sexual behaviors and of other behaviors via a conditioned stimulus-response cycle common to many species.

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**Korchmaros JD<sup>1</sup> Older Adults' Altruistic Tendencies: Tests of Hypotheses Derived from Evolutionary Theory and the Inclusive Fitness Model**

Most studies designed from an evolutionary perspective to examine the mechanisms that guide altruistic behavior have involved testing students. To increase generalizability, a study was conducted that involved testing older adults (ages 60 to 75). This study tested hypotheses derived from evolutionary theory and the inclusive fitness model by presenting older adults with hypothetical dilemmas and instructing them to report on their willingness to act altruistically toward others of varying age and degree of biological relatedness to the prospective altruists. It was found that older adults were more likely to aid close kin than distant kin, more likely to aid their spouses than almost all others, and more likely to aid in life-or-death situations than in non-life-or-death situations. Furthermore, in life-or-death situations, older adults were more likely to aid those high in reproductive value (i.e., those individuals younger than 45 years of age) than those of low reproductive value (i.e., those 45 years of age or older); whereas in non-life-or-death situations, older adults were more likely to aid the very old and the very young (i.e., those high in socially prescribed neediness) than those of intermediate ages (i.e., those low in socially prescribed neediness). These results provide strong support for the evolutionary explanation of altruistic behavior.

**Kukulski P<sup>2</sup> Search for sex differences in American Catholic beliefs**

Catholics in the USA were surveyed through a web form and analyzed for sex differences. Religious beliefs continue because they align with biological cognitive tendencies of the individual. There have been numerous experiments demonstrating sex differences in cognitive abilities. Therefore sex differences in religious beliefs are expected. Catholic beliefs are usually treated as one fairly consistent set. The Catholic set as a whole could theoretically continue through two overlapping subsets. This survey searches for the existence of subsets by sex. Included were items dealing with Pascal Boyer's four premises—a supernatural god, a non-physical component which continues, certain people have the right essence to understand god's messages, and rituals can effect this world; items on mating strategies—status and fidelity; and questions from my HBES 98 poster which were subsequently found to show significant sex differences in the Judeo-Christian subgroup. Participants were recruited through

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opt-in targeted e-mail with an effort to increase participation. Results will be presented with differences examined against Catholic teachings and evolutionary theory. Since any discovered sex differences result from the partitioning of a specific belief system in contact with a more universal biological base, these differences are not predicted to show the same pattern for additional religions, though there may be comparable rationale for their origins.

**LeCroy D<sup>3</sup> Darwin in the clinic: An evolutionary perspective on psychodynamics found in a single case study**

It is here reasoned that psychodynamic mechanisms as posited by various theorists since Freud are candidates for evolved information processing mechanisms. Going beyond the assumption that psychodynamic constructs, like the defense mechanisms, serve an internal emotional housekeeping function, and are adaptive only in enhancing social and other coping strategies through a general decrease in anxiety, it is suggested that these mechanisms represent specific solutions to recurrent problems encountered during our ancestral past. In the context of the evolutionary principle of parent-offspring conflict and with reference to recent ideas pertaining to the evolution of self-deception, certain psychodynamic constructs are described as they appeared to occur in a single, female psychotherapy patient. Analysis of this case will explore the enduring idealization and solicitous attitude along with repression of fear and resentment with which children often organize their experience of abusive or neglectful parents. It is speculated that these represent psychodynamic mechanisms that constitute offspring strategies for avoidance of infanticide elicited by signals of maternal ambivalence. It is further suggested that during our ancestral past they may have resulted in a degree of "helper at the nest" enhancement of maternal and sibling fitness in place of direct reproduction for adults who suffered suboptimal parenting.

**McBride DK<sup>4</sup> Ecological surveillance as necessary mechanism for selecting reproductive strategies**

Reproductive strategies are selected presumably based upon some combination of genetically and environmentally mediated sources of control. Such strategies vary considerably among humans, ranging from sexual orientation (homosexual-heterosexual) to particular variables within an orientation (bias for morphological symmetry, male preference for 0.7 waist/hip ratio in female mates, etc.). McBride and others have argued that generalized

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male aggressiveness is a fundamental component of reproductive strategy, consistent with the literature on non-humans, but moreover that aggressiveness is modulated by ecological variability—in modern man, this can be measured as economic variability. Similarly, Crawford has argued that anorexia nervosa is a fundamental reproductive strategy whose net effect is to reduce or eliminate the probability of pregnancy. This effect is also thought to be modulated by ecological phenomena. This paper reviews these and similar interpretations of reproductive strategies, and provides a theoretical representation of the necessary ecological surveillance by which successful RSs must be selected. Supportive of this notion, evidence of current surveillance habits among humans, and speculation about neural functioning centered upon the limbic system are provided.

*McDowell R*<sup>1</sup>, *Goodrich D*<sup>2</sup>, *Fuentes A*<sup>3</sup> **Assessing conflict negotiation: A preliminary comparison of chimpanzee's and human children's post-conflict behavior**

It has been hypothesized that primates utilize affiliative interactions following a conflict in order to repair social bonds. Few studies, however, have directly compared the post-conflict interactions of different primate species. One possible reason for this is that the post-conflict interactions of primates have been examined using several differing methodologies. One method that has been used effectively with chimpanzees and numerous other non-human primate species is the use of a matched control procedure. Experimenters in the current study collected data on a sample population of human children. These data were then compared with a longitudinal post-conflict study on a population of captive chimpanzees which employed the same matched control procedure. Experimenters compared proportions of reconciliation, consolation, and redirection along with the amount of attracted vs. dispersed behaviors of conflict pairs. The results showed a difference in the conciliatory tendencies of chimpanzees and human children. Utilizing the same methodology for non-human and human primates offers exciting possibilities of comparisons which may uncover the similarities and differences in adaptive evolutionary strategies pertaining to the repair of social bonds in highly social primate species.

*Mealey L*<sup>4</sup> **Anorexia: A result of female competition?**

Several theorists have tried to model anorexia on Wasser & Barash's (1983) "reproductive suppression model"

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(RSM). According to the RSM, individual females adaptively suppress their reproductive functioning under conditions of social or physiological stress. Mild anorexia may, therefore, be viewed as an adaptive response to modern conditions; more severe anorexia may be viewed as an adaptation gone awry. Previous models have not, however, examined the richness of Wasser & Barash's original presentation: in that, they documented manipulative reproductive suppression of subordinate females by dominants. I propose that the modern "epidemic" of anorexia is explained neither by adaptive self-suppression nor by environmental mismatch (an adaptation gone awry); I propose that "epidemic" levels of anorexia seen in modern Western society are a direct consequence of intrasexual competition, the scope of which has been enhanced by the power and reach of modern communications media.

*Mills ME*<sup>5</sup> **Sex Difference or Gender Difference? A Proposal for New, Evolution-Based Definitions**

The usage of the terms "sex" or "gender" difference is problematic in that these terms reflect an outdated nature vs. nurture dichotomy derived from the Standard Social Science Model (SSSM). The history, and current status, of the usage of these terms is reviewed. Using Buss' et al. (1998) adaptation, exaptation, functionless by-product, and random noise classification system, a new nosology is proposed to classify sexually dimorphic behavior, and new, more useful definitions of "sex" and "gender" terminology are proposed that are more compatible with the Integrated Model.

*Renaud ML*<sup>6</sup> **Modeling travel related decisions in an ancestral population: The effects of variability in speed, vigilance and attitude on fitness.**

Travel safety research has traditionally been heavy on application and light on theory. A strong theoretical foundation would be invaluable in evaluating past studies and directing future research. A preliminary model of traveling behaviour was constructed to demonstrate the potential benefits of using evolutionary theory as the theoretical foundation. The model incorporates three factors considered to be significant in most traffic accidents: speed, vigilance and attitude. The variability of each factor is limited to three discrete levels (e.g. below average, average and above average speed). The fitness costs and benefits of variability in each of these factors was modeled for ancestral populations in which the assumed purpose of daily travel was mostly for food acquisition and the mode of

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travel was by foot. The relative fitness effect of the levels of each factor was quantified for four travel related consequences (i.e. food acquisition ability, injury risk, mortality risk, and mating potential as perceived by others). The model reveals travel decisions that would have increased or decreased fitness for each gender. It is argued that fitness enhancing combinations would have resulted in adaptations favouring certain behavioural decision over others. As these same adaptations direct modern travel decisions, current travel research should focus on how these fitness-enhancing decisions would be manifest in the contemporary travel environment.

### *Shellberg T*<sup>1</sup> **Selfish genes, obsolete machines, and senescence**

The Medawar-Williams pleiotropic theory of senescence has long dominated evolutionary thinking about why organisms deteriorate and therefore die. I believe, though, that it cannot possibly be correct, and in my HBES 96 talk “Did Senescence Slip Through Williams’ Net” I identified several serious problems and questionable assumptions with this theory. Among them: it’s clearly rooted in archaic individual (not gene)-selectionist thinking, with its essential premise that senescence could not have been directly, positively selected for. No wonder it completely fails to explain the neat predictable patterns of life spans and the enormous variations. No wonder there is still no solid evidence that senescence effects are coattail riders of pleiotropic genes which cause good effects in youth. In this paper I will review those criticisms and will argue that we will never understand senescence until we assume that genes for senescence were directly, positively selected for *because* they cause senescence. Also, I will propose a specific hypothesis as to why these genes were selected for.

### *Sherman J*<sup>2</sup> **Selling adaptation to business managers—a report on applications**

The author, an HBES member and PhD candidate presents management training ideas, materials and techniques grounded in evolutionary psychology, epistemology and theory, and describes the market for them, based on the first year of operations of Adaptive Strategies, ([www.adaptivestrategies.net](http://www.adaptivestrategies.net)) his consulting and training firm. Useful to students thinking about careers outside academia.

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### *Swan TB*<sup>3</sup>, *Benack S*<sup>4</sup> **Determinants of Relationship Satisfaction: Partner Characteristics and Social Comparisons**

A great deal of evolutionary behavior research has been devoted to identifying specific factors in mate selection and mate retention, especially those which show gender differences. What is needed is a more precise understanding of the cognitive mechanisms, the implicit computational processes, for how such expectations and subjective determinations of satisfaction are established and calibrated. In the research we are currently conducting, we directly assess the relative assessment of relationship satisfaction by directly comparing appraisals of young men and women for 1) what they believe they attained in their relationships, 2) what they believe their partners did, 2) what men and women can typically expect to attain, 3) what same-sexed peers attain, and, 4) what one can ideally hope to attain. In addition, to assist in teasing apart the influence of social comparison expectations, we take into account individual differences in the strategy of self-monitoring.

## **5 Friday morning paper sessions**

### **5.1 Metatheory, philosophy of science and ethics**

#### *Holcomb HR*<sup>5</sup> **Integrating evolved strategies with proximate mechanisms: Eating disorders**

An important reason why many claims to have found evolved strategies are not convincing is that a gap remains between evolved strategies and proximate mechanisms. For instance, to test between rival evolutionary explanations of bulimia and anorexia in terms of delayed reproduction or female-female manipulation, we need first to formulate hypotheses that integrate evolved strategies with proximate mechanisms, and then combine evidence from ‘special design’ and ‘mating success’. I identify some obstacles to integration, with special emphasis on overcoming the nonevolutionary theses that eating disorders are not “about food” but symbolize a different underlying stressful condition and that bulimics are anorectics who fail to deny their hunger. I discuss several proximate mechanisms, and argue that merely reinterpreting them in terms of evolved strategies is necessary but insufficient to decide among competing evolutionary hypotheses that

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span biological, psychological, social, and cultural factors of human behavior.

**Chisholm JS<sup>1</sup> The nature of value: Evolutionary ethics and the naturalistic fallacy**

One of the first reactions against Herbert Spencer's doctrine of Social Darwinism was GE Moore's (1903) naturalistic fallacy. Following David Hume (1740), Moore maintained that it is wrong to argue from what is to what ought to be i.e., from the facts of nature to human values. Perhaps because it has served so nobly in the war against Social Darwinism this argument has become received wisdom amongst virtually all philosophers and biologists. Close to 100 years later, however, there is a growing consensus that the naturalistic fallacy is itself partly fallacious and is blocking the development of such new areas of inquiry as evolutionary medicine, evolutionary public health, evolutionary ethics, and evolutionary humanism. The purpose of this paper is to review recent critiques of the naturalistic fallacy in philosophy and evolutionary biology and to sketch an outline of an evolutionary theory of value.

**Pope SJ<sup>2</sup> Science: 'Religion liberated and writ large:' comment on Wilson's consilience**

Consilience aims to provide a comprehensive framework for relating all the various disciplines of knowledge under the banner of natural science. Religion served valuable group-bonding functions in primitive societies but ought to be replaced by science. The problem behind our interminable moral conflicts is that ethics has been too closely identified with religion. This interpretation identifies "religion" with fundamentalism. Evolutionary theism is simply not on his map. Wilson continues to offer the secular equivalent of a comprehensive systematic theology and not just an explanatory scientific analysis of human conduct. Three kinds of distortion can be mentioned. First, the desire to unify all knowledge rides on the very dubious assumption that there is only one kind of truth. Second, many epigenetic rules seem only vaguely related to genetics and seem much more the product of culture than biology. Third, this theory of religious phenomena amounts to a set of assertions concocted on the basis of evolutionary hunches rather than conclusions proceeding from carefully constructed arguments. It is important to educate the public mind about the credibility, beauty and breadth of evolutionary theory, but there must be a better way of achieving these goods than by promoting universal

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scientific materialism and the replacement of religion by science.

**Dyson-Hudson R<sup>3</sup> Darwinian theory: Please handle with care**

The damage done by the misuse of Darwinian theory to validate racism still resonates in the social sciences: many academics in powerful positions refuse even to consider that the evolutionary history of our species may influence present-day human behaviors. A current danger is that a similar misuse of Darwinian theory in the consideration of relationships between the sexes, simplistically interpreted as demonstrating that "boys will be boys because evolution made us that way," will alienate an even larger percentage of the population. The fallacy is that the predictable differences in genetically influenced predispositions among different groups, which natural selection has almost certainly fashioned throughout the evolutionary history of the species, can tell us what people will do, even what people have a right to do. In this talk I propose to:

- Explore the misuses of Darwinian theory that underlies sexist (and racist) conclusions in sociobiology in the context of the evolutionary history of the human species; and
- List the requirements for an evolutionary argument laid out by an avid anti-selectionist—requirements we should strive to satisfy, even though this is not possible this stage.

Since we are dealing with human behavior and our "scientific" conclusions may be misused to define and circumscribe people's roles and opportunities, we have an obligation to understand what Darwinian theory really says, and to be careful and responsible in how we use this powerful theory

## 5.2 Fertility, demography, and culture

**Sanderson SK<sup>4</sup>, Dubrow J<sup>5</sup> Fertility decline in the modern world and in the original demographic transition: A sociobiological interpretation**

One of the leading interpretations of fertility decline in the modern world and in the original demographic transition relates it to the changing economic value of children. Under preindustrial conditions, children normally have considerable economic value for their parents and

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fertility is high as a result. But as industrialization and overall modernization occur, the economic value of children shifts from positive to negative. As children become economic liabilities rather than assets, fertility declines accordingly. This interpretation has been challenged by those who claim that the flow of wealth in preindustrial societies is always from parent to child rather than from child to parent. An alternative interpretation is that humans have been selected to promote their reproductive success by aiming for a family with two surviving children. Fertility rates are adjusted to the rate of infant and child survival, and will be high when survival rates are low and low when survival rates are high. We tested this idea through multiple regression analyses that examined the relative impact of infant mortality rates and other dimensions of modernization on fertility. Our findings showed conclusively that parents are overwhelmingly adjusting their fertility rates to the level of infant mortality. This was the case throughout the world between 1960 and 1990, as well as for the currently developed societies between 1880 and 1940. The so-called economic value of children seems to play little role in a couple's choice to have few or many children.

*Ting TF*<sup>1</sup> **Individual variation in reproductive behavior in rural China under the one-child policy**

Studies of demographic and fertility related behavior in China have been largely focused on the nation as a whole. Although there have been some analyses regarding the variation among sub-regions (i.e., at the county and provincial levels), none has addressed individual variation within a particular group. I employ the evolutionary biology approach to study how resource disparities influence individuals in different groups and how ensuing fertility patterns respond. In other words, I examine the socio-economic and ecological correlates of individual birth and fertility histories for rural Chinese during mid 1980s, when China had the one-child policy.

*Jones JH*<sup>2</sup> **Keeping up with the Joneses: Evolutionary demography of the contemporary United States**

A positive relationship between lifetime reproductive success (LRS) and wealth or social status has been found repeatedly in ethnographic and historical studies of stratified societies. This finding has been less easily obtained in contemporary industrial societies, leading some to despair that evolutionary explanations for human reproductive behavior cease to have any power in contemporary so-

cieties. However, LRS is a proxy measure of fitness that is inappropriate for nonequilibrium populations. Here I develop a life cycle model of the life histories of people in the contemporary United States. Parameter values for the model come from the Current Population Survey (CPS) from the US Census Bureau, National Center for Health Statistics Mortality Follow-Up Survey, and several other sources. Using this model, I estimate fitness for different life histories, explore the fitness consequences of various life cycle trade-offs, and formulate functional hypotheses for the observed fertility transition that accompanied the industrial revolution in the West.

*Jones D*<sup>3</sup> **Culture areas as a product of ancient demic expansions**

The archeologist Colin Renfrew, among others, argues that we are witnessing an "emerging synthesis" in our understanding of human prehistory, in which genetic, linguistic and archeological findings are coming together to paint a consistent picture of ancient large-scale population spreads. I show that when the world is divided into major culture areas based on variation in kinship systems, these correspond closely—but not perfectly—to genetic and linguistic clusters identified by other researchers. I argue that it is possible to reconstruct (1) an ancient set of culture areas corresponding to major genetic subdivisions of the human race and associated with ancient demic expansions and (2) a smaller overlying set of culture areas of more recent origin that do not map onto genetic subdivisions, and result from changes in political economy independent of large-scale demic expansions. I also review latitudinal variation in kinship systems. This talk should interest people who are interested in the parallel and non-parallel descent of genes, language and culture, or in reconstructions of prehistoric human social behavior.

*Harpending H*<sup>4</sup>, *Eller E*<sup>5</sup> **Human history and race under the Darwin model**

Molecular genetics has promised to reconstruct human history, our origins and dispersals, for decades. In the last five years volumes of high quality data have appeared. They show that the promises were false. These data share a boring pattern in which: neighbors are similar to each other and similarity decreases smoothly with distance. But there is no apparent relationship between genetics and language on large scales, and neutral genetic markers do a poor job of predicting physical appearance.

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If we explore the Darwin hypothesis that visible human differences reflect sexual selection rather than response to the environment, then it is easy to reconcile the various data about human diversity. While neutral markers blend, physical appearance and language should follow common-type advantage dynamics. Such traits would preserve deep history erased by gene flow in the neutral genome. Just as Basque language is a trace of an older population in Europe, physical appearance may tell us more than genes tell us about ancient populations and their movements. Similarity in appearance between Bushmen and East Asians, Ainu and Australians, Pygmies and other groups around the Pacific all may be traces of ancient shared ancestry, retained by sexual selection while the neutral genome has been replaced by gene flow.

Under this model ancient large differences have been erased by high levels of local gene flow everywhere since the end of the Pleistocene. This model reconciles molecular evidence of race differences that precede the expansion of modern humans with contemporary low levels of neutral gene difference among continents.

### 5.3 Mating tactics

#### *Cleveland HH*<sup>1</sup> **Sexual intercourse in adolescent relationships: The impact of female choice**

For adolescents choosing to date is one thing, choosing to have sex may be quite another. Using data from nearly 1,000 couple dyads drawn from the National Longitudinal Study of Adolescent Health, this study examines the associations among individual characteristics of male and female adolescents and the occurrence of sexual intercourse in adolescent relationships. Characteristics of adolescents associated with early transition to non-virginity, identified from the Public Health literature (e.g., family structure, attraction to sex, school attachment), were used to predict sexual intercourse within adolescent couples. Logistic regressions found that risk factors contributed similarly to the occurrence of sex within adolescent relationships for both male and female adolescents. Adding difference scores—computed by subtracting the value of the female's score from the male's score on each risk factor—to the regression models, however, revealed that when couples were discordant for risk of sex female traits determined the occurrence of sex. Findings will be discussed in terms of female choice and the struggle for control of sexual behaviors in relationships.

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#### *Haselton MG*<sup>2</sup>, *Buss DB*<sup>3</sup>, *Oubaid V*<sup>4</sup>, *Angleitner A*<sup>5</sup> **Sex, lies, and strategic interference: The psychology of deception between the sexes**

The desires of one sex can lead to deceptive exploitation by the other sex, producing a co-evolutionary arms race between the sexes. Three studies explored the psychological mechanisms that may have arisen from this arms race by testing predictions derived from Strategic Interference Theory (Buss, 1989). Study 1 ( $N = 217$ ) tested predictions about emotional reactions of American men and women to specific forms of intersexual deception. The forms of deception included resource deception, status deception, deception about external commitments, deception about depth of pre-copulatory feelings, and deception about the likelihood of sexual intercourse. Study 2 ( $N = 200$ ) replicated the predicted sex differences in a study of German men and women. Study 3 ( $N = 279$ ) explored inferences men and women make about same-sex and opposite-sex emotional reactions to intersexual deception. Study 3 also tested predictions from Strategic Interference Theory about within-sex differences in reactions to deception. All three studies support the hypothesis that the emotional reactions of the sexes are tailored to sex-linked forms of strategic interference. Discussion focuses on further predictions of Strategic Interference Theory, new avenues for research on cross-sex perceptions of upset due to deception, the importance of sex differences in developing a comprehensive theory of emotions, and the co-evolutionary arms race between the sexes.

#### *Schmitt DP*<sup>6</sup>, *Cintron J*<sup>7</sup> **Human mate poaching: Who, how, and why?**

In a series of 3 studies, we examined the phenomenon of human mate poaching—obtaining a mate who is already in a relationship. First, we explored the personality and sexuality of those who poach, and those who tend to get poached. Second, we compared the perceived effectiveness of poaching tactics to the effectiveness of general romantic attraction tactics. Third, we determined whether certain poaching tactics actually were more effective than others as predicted by Sexual Strategies Theory. Discussion focussed on the observed differences between short-term and long-term forms of mate poaching.

#### *Bleske AL*<sup>8</sup>, *Buss DM* **Self-enhancement and competitor derogation: Sociosexuality as a predictor of tactic use and effectiveness**

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Past research suggests that men and women judge certain tactics of mate attraction as more effective in the pursuit of a short-term mate, and other tactics as more effective in the pursuit of a long-term mate (Buss & Schmitt, 1996). We proposed that sociosexuality is related to men's and women's perceptions of tactic effectiveness and reported frequency of use. In Study 1 ( $N = 168$ ), we asked college men and women to judge the effectiveness of 130 self-enhancement tactics and 83 competitor-derogation tactics. In Study 2 ( $N = 168$ ), we asked a different sample of college men and women to report how often they engaged in each self-enhancement tactic and competitor-derogation tactic. Key findings include: (1) compared to restricted men, unrestricted men reported more frequent use of acting dominant and popular to enhance themselves, and more frequent use of physical domination to derogate their rivals; (2) compared to restricted women, unrestricted women reported more frequently derogating their rivals as having a boyfriend or as unwilling to put out; (3) compared to restricted men and women, unrestricted men and women judged the tactics of acting seductive, accepting a sexual offer, and asking for sex as more effective in attracting a member of the opposite sex. Discussion focuses on the importance of understanding mate attraction as a function of both sex and individual differences within sex in sexual strategy.

#### *Grometstein RP*<sup>1</sup> **Violence and self-esteem**

In the traditional social sciences view, poor self-esteem can lead to violent behavior, and efforts at violence prevention often attempt to raise self-esteem. However, a recent model by Roy Baumeister and colleagues proposes a connection between unjustified, or threatened, high self-esteem and violence. Using data and theories from anthropology, primatology, social psychology, criminal justice, and evolutionary psychology, the presentation will investigate the plausibility of the high and low self-esteem models by considering how they fit into Darwinian interpretations of both within- and between-group conflict.

## **5.4 Emotion and motivation**

### *Ketelaar T*<sup>2</sup> **Translating the value function for gains and losses into positive and negative affect: A Darwinian approach to affective feeling states**

An organism that is built to infer the future state of its environment from its affective or emotional reaction to

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events in its current environment may have an adaptive advantage over other organisms that must directly experience consequences in order to learn the contingencies between current and future environments (e.g., that a snake bite right now can cause death later). In three experiments, participants were exposed to differing amounts of gains and losses in a valued resource and the magnitude of their subsequent affective reactions (to these gains and losses) were recorded. Of interest was the prediction that changes in perceived value (gains and losses) would be directly reflected in systematic changes in positive and negative affective feeling states. The basic logic of these experiments was that if "affect" represents the prospective "value" of one's current situation, then positive and negative affective reactions to gains and losses should correspond to several well-established descriptive properties of Prospect Theory, the leading judgment and decision-making model of value representation (Kahneman & Tversky, 1979). Results revealed that participants affective reactions to gains and losses did in fact map directly onto the two central descriptive properties of Prospect Theory ("losses loom larger than gains," and "the carriers of value were change in value"). These findings are discussed in terms of their implications for understanding the role of emotion in models of resource valuation in human social bargaining situations and in animal foraging contexts.

### *Goos LM*<sup>3</sup>, *Silverman I*<sup>4</sup> **An evolutionarily based investigation of facial expression perception.**

Numerous studies have indicated that facial expressions have a biological basis and a long phylogenetic history. Furthermore, research has suggested that angry facial expressions are perceived and attended to differently than other facial expressions. The present study was designed to investigate sex differences in perceiving and being perceived across four negative facial expressions: Anger, disgust, fear and sadness. In order to model the split second decision making requirements of the real world, photos of facial expressions were presented to male and female university students tachistoscopically, with 30 millisecond stimulus durations. To support an interpretation of a biological basis to the perception of anger, two possible correlates of individual differences in the detection of anger, derived from evolutionary theory, were explored: The relationship between testosterone level and anger perception; and the relationship between mating strategy and anger perception. Female participants correctly identified anger and sadness more often than male participants.

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However, both sexes correctly identified anger displayed by males more often than anger displayed by females. It is argued that the findings of the present study are indicative of real differences in the perception of male anger, independent of biased response tendencies or variations in poser expressiveness, and represent evidence of a perceptual preparedness for the detection of anger.

**MacDonald KB<sup>1</sup>, Kale L<sup>2</sup> Love and security of attachment as two independent systems underlying intimate relationships**

There are several reasons to distinguish security of attachment from warmth (love) as separate evolved systems (K. MacDonald, "Warmth as a developmental construct: An Evolutionary Analysis" *Child Development* 63, 753-773, 1992). Warmth is conceptualized as a sex-differentiated reward system underlying pair bonding and high-investment parenting and as a personality system within the Five Factor Model. Differences in security of attachment are seen as resulting from different internal working models of relationships, as hypothesized by Bowlby. This paper provides evidence for two separate systems having the predicted relationships. The Experiences in Close Relationships Inventory (ECRI), an instrument designed to measure adult attachment styles, was administered to 239 undergraduates. Factor analysis replicated two dimensions of the ECRI: Avoidance (conceptually linked to lack of warmth) and Anxiety (conceptually linked to security in close relationships). Subjects also filled out the LOV scale of the Interpersonal Adjective Scale Big Five Revised (IASB5R) in order to explore expected negative correlations between warmth as measured in standard personality tests and the Avoidance factor of the ECRI. As predicted, women scored lower on ECRI Avoidance and higher on the IASBR5 LOV scales, while there were no sex differences on ECRI Anxiety. As predicted, LOVE was negatively correlated with Avoidance but not with Anxiety.

**LeCroy D<sup>3</sup> Female emotionality: An evolutionary perspective**

Typical male and female differences in behavior during intensely emotional couple counseling have led to this speculation that sex differences in behavior during human male-female conflict are due to differences in evolved tactics. Men tend toward displays of anger or to withdrawal probably as a way of dampening escalation of personal distress and hyperarousal that could lead to violence. Women tend toward emotional displays like cry-

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ing, whining, begging, twisting wet tissues, etc. These are particularly evident when women detect signs of waning emotional commitment in their partners. It is here suggested that human female distress-displays mimic that of juveniles and may represent a co-evolution between neotenus stimuli and high male parent investment. During our ancestral past, mimicry of juveniles may have sufficiently averted aggression and increased transfer of resources from males to females to support specific selection. This neoteny may also, in parallel with male-male competition, explain the degree of sexual dimorphism in size, small size being also imitative of youth, not accountable by our only mildly polyandrous species. It is not suggested that emotional displays by women reflect regression or general immaturity, but rather the emergence of a situation dependent evolved strategy. Extremely self-sufficient women may be less prone to this, but my observation that men without personal resources who are dependent upon women indicating loss of interest do not display juvenile-like emotional behavior suggests it isn't solely an outcome of differential control of resources. These hypotheses are based on informal observations and could lead to testable predictions.

**Figueredo AJ<sup>4</sup>, Corral-Verdugo V<sup>5</sup>, Frias-Armenta M<sup>6</sup>, Bachar KJ<sup>7</sup>, Goldman-Pach J<sup>8</sup>, McNeill PL<sup>9</sup>, Castell-Ruiz IP<sup>10</sup>, Valiente-Ots MC<sup>11</sup>, Villavicencio-Carrillo P<sup>12</sup> The sexual balance of power: Blood, solidarity, status, and honor in Sonora, Mexico**

Two independent samples of 128 women and 106 men were interviewed in a study site in Hermosillo, Sonora, Mexico between 1996 and 1998. Respondents were screened for having been involved in committed sexual relationships during the past year, but not with each other. Interview questions pertained to their family structure, family support, and family conflict, including their possible experience of domestic violence. Females reported on their victimization by spousal aggression and males on their perpetration. Family structure parameters constructed from these data included the following: (1) the local density of their female kin (weighted by r.g), (2) the local density of their male kin (weighted by r.g), (3) the social support provided by the local kin (both emotional and instrumental), (4) the socioeconomic status of close kin (where  $r.g = 0.50$ ), and (5) their personal "code of honor" (the "revenge" factor). Cumulative interactions between family structure parameters of both local

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male and local female kin were computed for both male and female respondents. It was expected that the risk of spousal violence should be proportional to the relative social leverage afforded to each woman and each man, respectively, by the hypothesized interactions. Multisample structural equation models showed that the same cumulative interactions of local density of male kin simultaneously protected women from spousal abuse but empowered men to perpetrate it. Thus, the risk of spousal violence was partially determined by the “sexual balance of power” between the cumulative interactions of corresponding family structure parameters of potential victims and potential perpetrators.

## 5.5 Special panel discussion: Risk Taking

**Organizer** Wilson M<sup>1</sup>

## Friday afternoon plenary address

### *Udry JR*<sup>2</sup> **Gender and relationship formation: Avoiding the gender blahs**

Romantic relationships are a defining feature of adolescence. This research explores the formation of romantic heterosexual relationships in adolescence, and examines the role of gender composition in the formation, content and duration of relationships. The study uses a unique design feature of the National Study of Adolescent Health (Add Health) to link the data of two members of each romantic pair who are both in the survey. Gender is defined as the masculinity/femininity of each partner. I show that gender is a predictor of who nominates whom, whether the romantic choice is reciprocated, whether they have sex, how long it takes the couple to get around to sex, and how long the relationship survives. Couples in the middle of the range of gender distribution for their respective sexes have a low probability of reciprocating romantic choices, of having sex; they take a long time getting around to sex, and their romantic relationships do not last very long. It seems like middle-middle gender couples do not produce a hot enough spark to ignite romance.

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## 6 Early Friday afternoon paper sessions

### 6.1 Psychology of risk and reciprocity

#### *Brown WM*<sup>3</sup> **The evolution of altruist detection: Can humans decode nonverbal signals of cooperative demeanor?** NI

How can altruism exist when there are selective pressures against its evolution? One route is if altruists detect one another using reliable nonverbal signals. 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 concerned and attentive than non-altruists when playing the game for their partner’s benefit. Non-altruists were rated significantly more concerned and attentive than altruists when playing the game for their own benefit. Regardless of condition, altruists were viewed as more helpful than non-altruists. Perhaps a seemingly disadvantageous character like altruism can be evolutionarily stable when partner preferences are based upon reliable signals of altruism.

#### *Janicki MG*<sup>4</sup> **Giving and receiving within romantic relationships** NI

Social exchanges within romantic relationships should feature special characteristics associated with the courtship and mating function of the relationship. As resources are a limiting factor on their reproductive success, females should favor mates who can provide resources. Consequently, demonstrating investment in their potential mates should be an important courtship strategy for males. A study was designed to test the general hypothesis that men give more to women than vice versa in the early stages of a relationship (before marriage or cohabitation). 55 undergraduates, each single and in a romantic relationship for at least 1 year, were asked to recall and evaluate both items they had given to and received from their significant other. The participants evaluated: the cost and value of items, their own level of upset or their perceived upset of their significant other if

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reciprocation did not occur, and the balance of exchange within the relationship (who had given more). Several predictions were supported. As an interesting contrast, these findings will be compared to those from a study of exchanges within same sex friends.

*Sullivan MS*<sup>1</sup>, *McNally JJ*<sup>2</sup>, *Surbey MK*<sup>3</sup> **The role of self-deception and repression in cooperation in longterm relationships**

A mind divided into conscious and unconscious domains may have played a crucial role in the evolution of human cooperation. Psychological mechanisms rendering information unconscious, such as repression and self-deception, would have been selected if they facilitated the initiation and maintenance of reciprocal altruism through the repression of one's own selfish motives or those of another. We tested this theoretical proposition by examining the role of self-deception and repression in responses to hypothetical opportunities to cooperate or defect based on the Prisoner's Dilemma Game paradigm. We found that players intentions to cooperate were heightened when playing against a relative (sibling) or spouse compared with a non-relative or neighbour. Moreover, level of intended cooperation was greatest when the pay-offs involved the maintenance of harmonious family relations, or benefited children. In general, participants scoring highly on measures of self-deception and repression reported greater intentions to cooperate than those with low scores. Self-deception and repression scores appeared to mediate the effects of varying the characteristics of the other player or the pay-offs, but to a different degree, suggesting that repression is a form of self-deception. The possibility that levels of self-deception may be altered by the social environment or by being in a romantic relationship was raised as a possible direction for future research.

*Addison TA*<sup>4</sup> **Tracking costs and benefits in social relationships: Exchange orientation and relationship context.**

Exchange orientation is an important area of research in the social psychological literature but it is not adequately informed by evolutionary theory. According to evolutionary models, tracking of costs and benefits should occur in varying degrees in all social relationships but degree of genetic relatedness should influence such tracking. More specifically, people are expected to be less concerned about reciprocal exchange in close kin relationships than in non-kin relationships. The first goal

of the present study was to examine the impact of relationship context on exchange orientation. Subjects completed Sprecher's (1998) exchange orientation (EO) scale in relation to one of four different relationship contexts. These included sibling, cousin, close friend and acquaintance relationships. As expected, EO scores differed according to relationship context. The second goal of this study was to determine whether EO was related to the amount of help given in hypothetical scenarios. Similar to previous studies (Burnstein, et al. 1994) the amount of help given varied according to the relationship between the subject and the potential beneficiary. In addition, EO scores were correlated with the amount of help given only for acquaintance relationships. Those subjects who were more likely to keep track of costs in an acquaintance relationship gave less help. These findings provide further support for relationship-specific psychological processes.

## 6.2 Conflict and reconciliation

*Hess N*<sup>5</sup> **Female coalitions and gossip**

Female exogamy was a recurrent feature of human social life in the EEA. Because an exogamously-married woman entered a group in which she had to compete with others for the resources of her husband's lineage, residence in a new group presented an adaptive problem to new wives. Female exogamy also presented an adaptive problem to women who were already established in their groups, because the presence of a new, nubile female was likely to attract the attention of male group members. I propose that female coalitions functioned, in part, to help new female group members and established female group members compete at an individual level for access to male investment. One form of competition may have been gossip. Coalition membership may have better allowed women to compete through gossip simply because there is truth in numbers. Coalition membership may have also allowed for defensive tactics against gossip, through the coordination of alibis. In this paper, I propose several predictions about female coalitions. These predictions are based on the assumptions that (1) a main goal of female coalitions was the ability to extract proportionately more resources from male group members than other women, and (2) one way this was done was through gossip. These predictions were supported by a survey I conducted on female friendship.

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*Butovskaya M*<sup>1</sup>, *Salter FK*<sup>2</sup>, *Diakonov I*<sup>3</sup>, *Smirnov A*<sup>4</sup> **Urban begging and ethnic nepotism in Russia: An ethological pilot study**

Ethnic nepotism theory predicts that even in times of communal peace altruism is more pronounced within ethnic groups than between them. Beggars were observed in Moscow suburban and metro trains using focal individual sampling of 180 subjects 128 ethnic-Russians, 25 Gypsies, 25 Moldavians, and 2 others. Givers were mainly ethnic Russians (> 90%). There were between-group differences in sex- and age-distribution. While Russian beggars were mostly mature or elderly persons, 84% of Gypsy beggars were children among whom girls prevailed, contrary to the Russian sample. Multivariate analysis suggest that begging strategies can be subdivided into three groups: active, personified and appeasing-undirected. Russian strategies were most variable. Gypsy children offered music and singing as releasers of reciprocity, their behaviour being appeasing-undirected. Begging success was rated low, average or high depending on frequency of monetary gifts. The most successful beggars were not aggressive, but friendly-personified or appeasing, often using religious rituals. Russians, children, and elderly used aggressive strategies more often than young adults ( $R_s = -0.169$ ,  $p < 0.011$ ). Ethnic-nepotism is indicated by the fact that Gypsies applied more powerful releasers, including the use of reciprocity and children, without marked success. Greater tolerance was shown to adult Russian beggars, despite more demanding behavior, whereas the few non-Russian adults were highly submissive or friendly.

NI

*Gil-White F*<sup>5</sup> **The ugly duckling—a story about ducks and swans, or a metaphor of ethnicity: Why ethnies are ‘species’ to the human brain**

If the brain is domain specific about most things, should social groups be the exception? EP must examine whether any specialized modules process particular kinds of social groups. But except for some recent work on ‘race’, EP has proposed little more than that the work of Henri Tajfel, with the minimum group paradigm, suggests an evolved ‘groupishness’ to favor one’s own. Tajfel’s experiments relied on very abstract groups and therefore reveal a patently domain-general phenomenon. I argue that ethnic groups in particular (and a few other related social categories) are processed by the ‘living kinds’ module that initially evolved to process species and genus level

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categories. I present cognitive data from Mongolia of ethnic-group processing that supports the hypothesis that ethnies are processed naively as species, with its associated essentialism. The evolutionary argument is that with the arrival of culture and local norm-conformism, endogamous norm-bounded groups appeared in the ancestral environment and primed the ‘living kinds’ module. Why? Because (1) category-based endogamy, (2) descent-based membership, and (3) lots of intercorrelated ‘hidden’ properties (here: group-based interactional norms) are the diagnostic features of species. The module was exapted to process ethnies and then retained because the inferential inductions it promotes are adaptive in an environment where those with different norms need simultaneously to avoid and predict each other.

*Malone NM*<sup>6</sup>, *Vaughan LL*<sup>7</sup>, *Fuentes A*<sup>8</sup> **The role of humans in chimpanzee (*Pan troglodytes*) post-conflict negotiations**

This study examines data from an intensive long-term study of post-conflict interactions in a small population of captive chimpanzees *Pan troglodytes*. Previous research has shown that routine exposure to caregivers and researchers can elevate levels of group agonism. The present study explores both positive and negative aspects of human interaction in all phases of conflict and post-conflict negotiations. Peaceful post-conflict interactions with humans can provide consolation and reassurance to a conflict participant. Seeking affiliative interactions with humans, a viable option for some captive non-human primates, may function to reduce stress and anxiety. These interactions are labeled “attracted pairs” if they occur earlier in the post-conflict than in the matched control. Preliminary results suggest a relevant role for chimpanzee-human interactions during the post-conflict period. Future studies may provide further insight into mutually-beneficial husbandry strategies.

### 6.3 Symposium: Alternative approaches to the evolution of cooperation. Part 1

**Organizer** Smith EA<sup>9</sup>

**Symposium abstract** The view that reciprocity is fundamental to cooperative social relationships has long been popular in anthropology, evolutionary psychology, and behavioral ecology. Models of conditional reciprocity

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have been used to explain apparently altruistic or generous acts such as the sharing of food, cooperative labor arrangements, or the provisioning of public goods. While the reciprocity paradigm is theoretically rich, evidence from human and non-human societies has raised doubts about its ability to explain many instances of generosity, cooperation, and collective action. This symposium brings together several alternative approaches to explaining the evolution, psychology, and adaptive function of cooperation. These alternatives include costly signaling, reputation formation, subjective commitment, and group selection via assortative interaction.

*McMillan GP*<sup>1</sup> **Tests of alternative currencies for Ache cooperative hunting**

Group foraging may be an example of cooperation, depending on the composition of the payoff matrix describing the social interaction. Although a great deal of effort has been placed on describing possible solutions to the cooperator's dilemma, comparatively little emphasis has been placed on determining whether or not any particular instance of social behavior is an example of a collective action problem. During a forest trek, Ache men in Eastern Paraguay spend most of their days in search and pursuit of game. Some prey, such as the Capuchin monkey and the Agouti paca, are pursued by groups of men, while others, such as the nine-banded armadillo, are pursued alone. Depending on the currency which hunters are attempting to maximize, ranging from food to prestige, Ache group hunting may or may not involve a collective action problem. This paper analyzes data on Ache group foraging using alternative currencies, to determine how Ache group foraging may have evolved, and whether group foraging might present a collective action problem. It is hypothesized that Ache men hunt in groups to maximize either total meat for the residential band, or prestige, measured in an individual hunter's success in producing meat. It is further hypothesized that these benefits are produced at a cost of either time or energy expended while foraging. If these currencies induce conflicting interests in the preferred pursuit group size for monkeys, pacas, and armadillos, then group foraging is a cooperative dilemma for Ache hunters, and requires further explanation to account for its presence in Ache hunting behavior.

*Marlowe FW*<sup>2</sup> **Cooperation and food sharing among the Hadza**

The evolution of cooperation is facilitated when individu-

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als live in small, kin-based groups where individuals regularly interact, can easily keep track of others' interactions, and where future interactions are highly likely—all features that characterize humans in hunting and gathering societies. However, when we observe cooperation, such as widespread food sharing, how can we be sure what motivates it? To the extent reciprocity was important over a long period of human evolution, we might expect norms of fairness to be fairly universal. To test this proposition, I played the ultimatum and dictator games with the Hadza, an egalitarian hunting and gathering society in Tanzania. In these games, which elicit a players reaction to the challenge of sharing, the Hadza made less generous offers than people in state societies. Hadza offers were also lower the smaller the camp. Hypotheses for sharing are evaluated in light of these results, as well as data on Hadza foraging.

*Gurven M*<sup>3</sup> **It's a wonderful life: Signaling generosity among the Ache of Paraguay**

Intensive food sharing among foragers and horticulturists is commonly explained as a means of reducing the risk of daily shortfalls, insuring adequate daily consumption for all group members who actively pool resources. Consistently high food producers who give more than they receive, however, gain the least risk-reduction benefit from this daily pooling since they are the least likely to go without food on any given day. Why then do some high producers consistently share food and why do some average producers share proportionally more food than others? I propose that although these individuals may not receive the same amounts they give (i.e. a strict Tit-for-Tat), one explanation for their generosity is that they receive additional food during hard times. These include brief episodes of sickness, disease, injury, or accidents, fairly common events in traditional societies which can prevent individuals from producing food, and thereby have non-trivial long-term effects on morbidity and fecundity, and ultimately on lifetime reproductive success. Data collected among the Ache, a group of South American forager-horticulturists, indicate that those who shared and produced more than average (signaling cooperative intent and/or ability to produce) were rewarded with more food from more people when injured or sick than those who shared and produced below average. These results, framed within the context of trade-offs between short-term and long-term fitness, may provide insight into motivations behind costly expenditures for establishing and reinforcing status and reputation.

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**Smith EA<sup>1</sup> Costly signaling and evolutionary solutions to collective action problems**

Beginning with Trivers' (1971) analysis of reciprocal altruism, conditional reciprocity has overwhelmingly dominated evolutionary explanations of cooperative behavior between non-kin. However, this dominance is increasingly challenged on both theoretical and empirical grounds. One alternative to reciprocity theory that seems to hold promise for understanding some forms of cooperative behavior is the costly signaling paradigm developed by Zahavi and Grafen. Costly signaling theory (CST) proposes that expensive behavioral or morphological signals are designed to convey honest information benefiting both signalers and the recipients of these signals. I explore how CST can account for a variety of prominent and widespread features of generosity and collective action—indeed, the very features that pose problems for reciprocity models such as tit-for-tat. I review various examples of cooperative behavior that appear to meet the predictions of CST; in particular, I focus on cases that present collective action problems difficult to solve within the standard conditional-reciprocity framework. I conclude with some suggestions as to broader implications of this research, and the costly signaling paradigm in general, for understanding widespread features of human social behavior.

**6.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 1**

**Organizer** Penn D<sup>2</sup>

**Symposium abstract** In recent years, evidence has been emerging that humans, like other mammals, use chemical signals or “pheromones” to choose their mates. Speakers at this session will present results from recent studies on both the mechanisms and adaptive functions of chemical communication and mate choice. Monti-Bloch will present evidence that a particular male pheromone triggers various physiological changes in women when it is applied to the vomeronasal organ. Branscomb will present work on the evolution of olfactory receptor genes, which are expressed in both the nose and on sperm. Two speakers, Rikowski and Thornhill, will present evidence that women prefer the odor of symmetrical to asymmetrical men, as a mechanism to increase the genetic quality of their offspring. Potts will review recent evidence

that humans and mice select their mates using odors influenced by the highly polymorphic MHC genes to avoid inbreeding and to diversify the immune systems of their progeny. I will present recent work that indicates house mice use chemical signals to obtain mates that are resistant to infectious diseases. These talks show how studies on behavior can integrate proximate mechanisms and evolutionary functions.

**Branscomb A<sup>3</sup>, Seger J<sup>4</sup> Odorant receptors that are expressed in the testis: Evidence of selection for non-olfactory functions**

Approximately one out of every hundred mammalian genes is an olfactory receptor (OR). The extensive genomic real-estate that is devoted to ORs hints at extra-olfactory functions. We compare the evolution of ORs that are expressed in the testis, with that of canonical ORs. Odorant receptors that are expressed in the testis evolve at a markedly slower rate, and show other behaviors which suggest that they are under more stringent selection than ordinary ORs. Odorant receptors are therefore likely to perform important but unknown functions in non-nasal tissues.

**Monti-Bloch L<sup>5</sup> Behavioral and physiological effects of androstadienone in human subjects**

Androstadienone is an androstene occurring in male human skin secretions and it stimulates chemosensory receptors in the female human vomeronasal organ (VNO) (L Monti-Bloch and BI Grosser, 1991). We studied the effect of androstadienone in 40 women. A single discrete vapor pulse of androstadienone was delivered to the right VNO of 20 subjects using a multifunctional miniprobe that prevented contamination of the olfactory receptors, trigeminal chemosensory receptors, and the respiratory system. 20 control subjects received a vapor pulse of propylene glycol to their VNO. All subjects were administered a psychometric test before and 30 minutes after VNO stimulation. Respiratory frequency, cardiac frequency, parasympathetic tone, electrodermal activity, body temperature, and electroencephalograms were also measured during the experiment. Androstadienone significantly reduced negative affect, while increasing relaxation. There was also significant reduction of respiratory frequency, cardiac frequency, skin conductance, and increased parasympathetic tone, body temperature, and alpha brain-waves. In the control group there were no significant psychological or autonomic nervous system changes. We conclude

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that local androstadienone stimulation of the female human VNO reduced nervousness, tension and other negative feelings, while increasing parasympathetic nervous system tone. Thus, androstadienone can be considered a human pheromone acting through chemoreceptors in the VNO.

*Penn D*<sup>1</sup>, *Zala S*, *Potts WK* **Chemical signals and sexual selection: Do odor cues honestly signal health and disease?**

Do people use chemical cues to avoid mating with unhealthy individuals, as suggested by R.A. Fisher (1915)? Physicians have long been able to diagnose a variety of diseases using a patient's odor, although this ability is not well studied. Recent experimental studies with house mice (*Mus musculus*) in our lab and others have found that females can assess a male's infection status from his odor: females are attracted to the odors of males and they prefer a male's scent when he is uninfected than when he is infected. Yet, rather than being aversive, the odor of an infected male simply loses its attractiveness, which suggests that attractive odorants are missing from an infected male's scent. I will present the results from an experiment that we are currently conducting with house mice to determine how infection alters a male's odor, and how the odor of infected males influences the sexual receptivity of females. This research may have implications for the adaptive function of chemical communication in humans and other animals.

*Thornhill R*<sup>2</sup>, *Gangestad SW*<sup>3</sup> **The scent of men's symmetry may honestly advertise fitness**

Three studies by the authors of university men have all shown that the body scent of men who have greater body bilateral symmetry is rated as more attractive by normally ovulating (non-pill-using) women during the period of highest fertility based on day within the menstrual cycle. Women in low-fertility phases of the cycle and women using hormone-based contraceptives do not show this pattern. The attractiveness of men's scent of symmetry is independent of men's hygienic behavior and fragrance use. The scent of male symmetry appears to be an honest signal of developmental stability but not one based on current testosterone or cortisol levels. Analysis is underway to determine if the scent of men's symmetry covaries with their MHC-related body scent. The relationships, if any, between women's symmetry, age, cycle-related fertility and

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MHC and their scent attractiveness to men are also being examined.

## 7 Late Friday afternoon paper sessions

### 7.1 Kinship

*Jankowiak WR*<sup>4</sup> **Sibling solidarity in an American polygamous community: Unpacking inclusive fitness**

A contemporary American polygamous community presents an opportunity to explore the factors behind the formation of sibling solidarity and rivalry. The community is unique in its promotion of an ethos of "we are all brothers and sisters" which is actively advanced in church sermons, school pledges, and in weekly Sunday school meetings. In every way the community strives to discourage drawing distinctions based on genetic difference present in the polygamous family. In this paper, I will address if: 1) there is more solidarity between full siblings compared to half and step siblings; 2) children raised in a polygamous family are cognizant of genetic differences between themselves and their full and half siblings; and 3) birth mothers have different political strategies compared to fathers. This setting constitutes an excellent arena in which to examine the suitability of the inclusive fitness hypothesis to account for the types of sibling solidarity found in the community. The data presented in this paper is from an ongoing five year research project in the largest and oldest polygamous community in North America.

*Patton JQ*<sup>5</sup> **Bands, tribes, chiefdoms, states? A perspective from evolutionary anthropology**

Anthropologists typically refer to different human groups as bands, tribes, chiefdoms, or states. At one end of the spectrum kinship is seen as the primary source of group solidarity, while at the other end formal laws and sanctions for the management of social exchange are seen as the warp and weft that form the fabric of society. In this paper I argue that evolutionary anthropology is better served by classifying and/or comparing human groups in terms of the degree to which patterns of cooperation can be explained by kin selection and conversely the degree to which social cohesion is a product of cooperation between non-kin. I present a methodology for measuring patterns of cooperation within groups and constructing a matrix of

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social cohesion to establish a correlation coefficient derived by comparing this matrix to a matrix of values of Hamilton's  $r$ . Correlation coefficients from different social groups can form a basis for comparison and can be used to establish a typology of groups based on evolutionary theories of altruism. It is argued that establishing the degree to which patterns of cooperation within a group can not be explained by kin selection is a necessary first step in a convincing argument for invoking other theories of cooperation such as reciprocal altruism or group selection. Data collected from a tribal society in the Ecuadorian Amazon are used to illustrate this approach.

#### *Steadman LB*<sup>1</sup> **Selection and Australian kinship**

Using principles of Darwinian selection, a solution is proposed for the greatest enigma in the study of kinship: the Australian kinship systems. For tens of thousands of years of human evolutionary history, reproduction has been profoundly influenced by culture, especially complex kinship systems that influence both marriage patterns and altruism.

Among Australian Aborigines, cooperation between individual kinsmen is the basis of their societies. But such cooperation is continuously threatened by violent competition between male kin for wives. Various marriage prohibitions and marriage contracts between kin that will not be satisfied for 30 or more years have greatly influenced their kinship systems and represent the attempt to contain this violence. Current models of evolutionary psychology, which ignore traditions, are unable to account for these kinship behaviors. What is required is a Darwinian model of selection that incorporates the role of traditions. This paper provides such a model.

#### *Price ME*<sup>2</sup> **The psychological causes of "group-level adaptations"**

Although the concept of the group-advantageous feature ("group-level adaptation") has lost popularity among evolutionary biologists/psychologists with the decline of group-level adaptationism, it remains a useful tool for analyses of human sociocultural phenomena. Because people compete in groups (coalitions), and because some groups have features that are more advantageous than others, group-advantageous features do in fact exist, and many historians, economists, and other social scientists have no problem talking about them. If evolutionary psychology is to be integrated with these other fields, evolutionary psychological explanations for group-advantageous features are essential. In this essay I argue

that group-advantageous features are generated by psychological adaptations that evolved to increase individuals' chances of membership in relatively powerful groups in ancestral environments. I explain why membership in dominant groups would have been fitness-enhancing in ancestral environments, I give several examples of group features that exist because they are group-advantageous, and I show how these features can be seen as products of specific psychological adaptations.

## **7.2 Evolution of religion and morality**

### *Wilson DS*<sup>3</sup> **Religion as a blueprint for the construction of a community superorganism**

Religious people often describe their communities as like a single organism. Evolutionary biologists rejected this metaphor along with group selection in the 1960's, but modern multilevel selection theory suggests that the concept of human groups as superorganisms should be taken more seriously. One advantage of the metaphor is that it encourages to look for an elaborate "social physiology" of human groups, an intricate coordination of the parts that enables the whole to function as an adaptive unit. I will attempt to interpret religious belief systems from the group-level adaptive standpoint, using Calvinism as a case study.

### *Kirkpatrick LA*<sup>4</sup> **Religion as an evolutionary byproduct**

The idea that religion is somehow deeply rooted in human nature—humans as "homo religiosus"—has long been entertained by scholars and cocktail-partygoers alike. Such speculation almost invariably begins with the explicit or implicit assumption that religiousness, or some psychological mechanism designed specifically to produce it, is an *adaptation* constructed by natural selection as a solution to one or more specific adaptive problems (e.g., promoting group cohesion, reducing anxiety, etc.). I discuss several reasons for questioning this assumption, and argue instead that the diverse range of beliefs, behavior, and experience that we collectively refer to as religion emerge as evolutionary *byproducts* of numerous, domain-specific psychological mechanisms that evolved to solve other (mundane) adaptive problems. Drawing upon work from a variety of sources, I discuss the psychological bases for religion as a function of a variety of such mechanisms, including mechanisms for reasoning about the natural world (e.g., naive physics, naive biology, psychological essentialism), about other people's minds (e.g., naive

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psychology, theory-of-mind modules), and about specific kinds of interpersonal relationships (e.g., attachment, kinship, social exchange, coalitions and alliances, and intra-sexual competition).

*O'Neill P*<sup>1</sup>, *Petrinovich L*<sup>2</sup> **So many choices, so little time**

Our research has identified several dimensions that influence the resolution of hypothetical life and death moral dilemmas. We argue that the resolution of these dilemmas reflects an evolved human nature. If so, their resolution must not depend upon the testing method. A series of hypothetical life and death dilemmas was presented in either a standard survey format, or as a reaction time task. The reaction time task varies from the standard survey format in two ways. It is a speeded task and people must choose between two individuals, or two sets of individuals. We predicted that mean reaction times for the important dimensions (Kin, social monsters, etc) would be negatively correlated with mean approval rating, and that choice frequency would be positively correlated with mean approval rating. Both relationships were obtained. Reaction time tasks provide an additional method to probe the structure of moral intuitions. They are an improvement for three reasons: a participant is forced to make a choice, that choice must be made as quickly as possible, and non-verbal stimuli (including animated sequences) can be presented. The results obtained using this more realistic method support the conclusion that the pattern of responses reflect an evolved human nature, and are not a byproduct of testing method.

*McClenon JM*<sup>3</sup> **How religion began: Testing the ritual healing theory**

The ritual healing theory specifies that therapeutic rituals practiced by ancient *Homo sapiens* selected for genotypes associated with hypnotizability. Hypnotizability genotypes are hypothesized to be related to passage of information within the brain allowing both suggested and spontaneous anomalous experiences (for example: apparitions, out-of-body experiences, spiritual healing). Such episodes contributed to rudimentary religious beliefs regarding spirits, souls, life after death, and magical abilities. The present study investigates the link between hypnotizability and experiences leading to religious beliefs. Subjects were administered the Harvard Group Test for Hypnotic Suggestivity, Psychic Experience Scale, Boundary Questionnaire, and Tellegen Absorption Scale. As predicted, hypnotizability and psychic experience scores

were significantly correlated ( $r = .315, p = .04$ ). Boundary scores were significantly correlated with psychic experience ( $r = .419, p = .001$ ) and hypnotizability ( $r = .503, p = .001$ ). Multiple regression analysis indicates that Boundary Scores explain much of the correlation between hypnotizability and psychic experience. Hypnotizability and propensity for psychic experience appear to be products of "thin" cognitive boundaries.

**7.3 Symposium: Alternative approaches to the evolution of cooperation. Part 2**

**Organizer** Smith EA<sup>4</sup>

*Dugatkin L*<sup>5</sup>, *Wilson DS*<sup>6</sup> **Assortative interactions and the evolution of cooperation: Theory and tests**

Although relatively unexplored from a theoretical perspective, assortative interactions provide a potentially powerful mechanism favoring the evolution of cooperation and altruism. We present a series of models in which cooperation is a continuously varying trait and individuals are free to choose among associates, based on information that is acquired through experience, observation or cultural transmission. Assortative interactions can generate highly nonrandom variation between groups, favoring the evolution of cooperation among unrelated individuals. Cooperation can evolve even when initial phenotypic variation is not heritable (a form of genetic assimilation). While the minimal cognitive prerequisites of our model are likely met in many species, cooperation via assortative interactions may be especially important in the most cognitively sophisticated species—humans. We present results of an experiment testing the predictions of our model in a well-studied animal system—predator inspection behavior in guppies (*Poecilia reticulata*).

*Sosis R*<sup>7</sup> **Costly signaling and commitment: A test of an hypothesis using historical data on the longevity of 19th century utopian communes**

Several economists and anthropologists have recently argued that religious beliefs are a way of communicating commitment and loyalty to other group members. Adherence to a set of religious beliefs often entails a host of ritual obligations that require significant time, energy, and financial costs; costs which are unlikely to be paid by non-believers. Rituals are thus costly signals of commitment that can promote intra-group cooperation by increasing trust and diminishing the free-rider problems that

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plague most cooperative pursuits. The histories of utopian communities provide an interesting database to test this idea, since the economic success and thus survival of these communities were dependent upon solving the collective action problem posed by cooperative labor. If religious beliefs foster commitment and loyalty among individuals who share those beliefs, communes which were formed out of religious conviction should have greater economic success and longevity than communes which were motivated by secular ideologies such as socialism. This hypothesis was tested using an historical database on the longevity of two hundred 19th century utopian communes. Results suggest that religious communes were more successful at promoting long-term intra-group cooperation than secular communes.

**Nesse RM<sup>1</sup> Is the capacity for subjective commitment an adaptation? Can it help to explain altruism and social complexity?**

Human behavior is based, to a considerable extent, on beliefs about how others will act. Many such beliefs are based on an individual's self-interest. Other beliefs are, however, based on an individual's stated commitment to a course of future action that would not be in his or her self-interest. The ability to induce such beliefs in others, and the ability to hold and act on such beliefs, may give a selective advantage in at least two ways. First, an individual who can convince others that he or she will engage in spiteful attacks in certain future circumstances, will likely be left alone. Second, an individual who can convince others that he or she will be generous at some future time when this would not be in his or her best interests can create relationships based on emotional commitment instead of reciprocity. This increases risks of exploitation, but gives access to crucial resources at times when they are most needed. "Basic trust," the belief that people can act altruistically out of emotional commitment, creates a social reality in which it can, to some degree, become true. This may be why most people carefully avoid giving the appearance of calculated exchange with their close friends, and why so many people are repelled by evolutionary explanations of close relationships as reciprocal exchanges. Many human social organizations, especially religions, seem well designed to foster social strategies based on subjective commitment. The inherent paradoxes in commitment strategies give rise to inordinate and wonderful social complexity.

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*Boone JL<sup>2</sup> Discussant*

**7.4 Symposium: Scents and sensibilities: Chemical signals and mate choice. Part 2**

**Organizer** Penn D<sup>3</sup>

*Rikowski A<sup>4</sup>, Grammer K<sup>5</sup> Human body odor, symmetry, and attractiveness*

Several studies have found bodily and facial symmetry as well as attractiveness to be human mate choice criteria. These characteristics are presumed to indicate developmental stability, a quality that enables an organism to cope with perturbations during development. We hypothesized that human body odor likewise transmits information about an individual's developmental stability and thereby functions as additional, redundant olfactory signal relevant to mate choice. Therefore, we compared ratings of body odor, attractiveness, and measurements of facial and bodily asymmetry of 16 male and 19 female subjects. Subjects wore a T-shirt for three consecutive nights under controlled conditions. Opposite-sex raters judged the odor of the T-shirts and another group evaluated portraits of the subjects for attractiveness. We measured seven bilateral traits of the subject's body to assess bodily asymmetry. Facial asymmetry was examined by measurements of facial landmarks on portrait photographs. The results showed a significant positive correlation between facial attractiveness and sexiness of body odor for female subjects. We found positive relations between body odor and attractiveness and negative ones between smell and bodily asymmetry for males only if female odor raters were in the most fertile phase of their menstrual cycle. The outcomes are discussed in light of different male and female reproductive strategies.

*Kohl JV<sup>6</sup> Human pheromones and physical attraction: More than meets the eye*

Visual aspects of human physical attraction, (e.g., hair color; amount and location of terminal hair; breast development; assessment of age, height, and weight) have no readily apparent counterpart in other mammals. These aspects of physical attraction correlate with genetic and/or steroidogenic variability. Genetic and steroidogenic variability correlate well with mammalian pheromone production and distribution.

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Mammalian pheromones act on a prenatally predisposed neuroendocrine sequence that has been linked to behavior. This sexually dimorphic neuroendocrine sequence allows pheromones to elicit functional changes in pituitary and gonadal hormone secretion. During development, these changes direct the concurrent maturation of the neuroendocrine system, the central nervous system, and the reproductive system. These systems coordinate properly timed reproductive sexual behavior.

Human pheromones alter pituitary and gonadal hormone secretion. Comparing the effects of visual and olfactory input on hormonal correlates of physical attraction provides evidence that there is more to human physical attraction than meets the eye. This integrative literature review suggests that a pheromonally driven stimulus-response cycle, which is common to many species, conditions human physical attraction to visual stimuli.

*Montgomerie RD<sup>1</sup>, Bullock H<sup>2</sup>* **Fluctuating asymmetry and the human female orgasm**

In a landmark paper, TGC (Thornhill, Gangestad & Comer 1995 *Anim Behav* 50:1601-1615) reported that orgasm frequency in a population of female university students was significantly and negatively related to the degree of fluctuating asymmetry in their partner and not to any other of > 15 partner traits they measured. We repeated their study protocol with more than 80 university student couples, using a double-blind measurement procedure and adding some details so that we could explore the interesting relationship found by TGC in more depth. We found no hint of a relation between any aspect of partner FA and orgasm rate in females, despite the fact that orgasm rate in our sample varied from 0–100% and interindividual variation in FA was considerable. Unlike TGC, we also assessed FA of facial features as these traits are readily assessed by sexual partners, but again no relation to orgasm rate was found. Both length of relationship and a subjective measure of the depth of feeling for their male partner were significantly and positively correlated with female orgasm rate, though the cause-effect nature of these relations is not yet clear. We discuss possible reasons for the differences between our findings and those of TGC and we offer a plausible explanation for the results of our own study, consistent with previous hypotheses suggesting that human female orgasm is an adaptation.

*Potts WK<sup>3</sup>, Penn D<sup>4</sup>, Meagher S<sup>5</sup>, McClelland E<sup>6</sup>* **Do MHC-dissimilar mating preferences function to prevent infectious or genetic disease in offspring?**

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Genes of the major histocompatibility complex (MHC) play a critical role in immune recognition. These extremely polymorphic genes also control odors in an allele-specific fashion and evidence from humans and mice indicate that MHC-dissimilar individuals are preferred as mates. Such mating preferences could serve one or more of the following three functions. First, pathogens can rapidly evolve mechanisms to escape MHC-dependent immune recognition. Thus, MHC-dissimilar mating preferences would provide an inter-generational moving target, foiling recent pathogen adaptation to parental genotypes (red queen). Second, MHC heterozygotes can recognize pathogens in more ways than homozygotes, so heterozygotes might have an advantage in resisting infectious disease. This would favor the evolution of MHC-dissimilar mating preferences because they produce MHC heterozygous progeny. Finally, MHC dissimilar mating could function to avoid inbreeding. We will present recent experimental tests of the latter two hypotheses. Although MHC heterozygotes do not have a general advantage against infections by single pathogens, we show for the first time that they do have an advantage when coinfecting by two pathogens that have reciprocal virulence profiles in the two homozygotes. The heterozygotes appear to express the resistance profiles of each homozygote. We also provide the first experimental measurements of long-term fitness consequences of inbreeding for vertebrates. These results indicate that inbreeding depression is much more deleterious than generally thought. These data indicate that both inbreeding avoidance and enhanced disease resistance of progeny are likely to have been important in the evolution MHC-based mating preferences.

## Saturday morning plenary address

*Campbell A<sup>7</sup>* **Female aggression: Fear, form and frequency**

Rates of male and female involvement in aggression correlate very highly over nations, regions, time and age; they show similar developmental predictors and are broadly responsive to the same situational triggers. Nonetheless, ninety per cent of violent crime is committed by men. Traditionally the question of sex differences in aggression has been framed as a problem of explaining males' higher level of involvement. In this talk, I explore the insights that might be gained by restating the question in terms of women's avoidance of aggression. This entails a closer

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consideration of the costs as well as the rewards of aggression. In evolutionary terms, the continued presence of the mother has had a greater impact upon offspring survival than the continued presence of the father. This may explain why women (who, I believe, have as much to gain from intra-sexual competition as men) tend to desist from direct aggression that poses a threat to their lives. Fear of injury is proposed as the adapted psychological mechanism that drives the sex difference in aggression. It may also account for women's avoidance of other high risk activities.

## 8 Saturday morning paper sessions

### 8.1 Aggression and homicide

#### *Buss DM*<sup>1</sup>, *Duntley JD*<sup>2</sup> **Killer psychology: The evolution of intrasexual homicide**

Paleontological, ethnographic, comparative, and cross-cultural evidence all converge on the possibility that homicide has been a recurrent and powerful selective force over human evolutionary history. According to Evolved Homicide Module Theory (Buss & Duntley, 1998; Duntley & Buss, 1998), humans have evolved several distinct psychological mechanisms designed to produce killings in certain contexts where the fitness benefits outweighed the costs. This paper elaborates on one component of the theory—the psychology of intrasexual homicide, which includes direct same-sex rivalry, kin and resource protection, and warfare. We contend that selection has fashioned several same-sex homicide modules, each with distinct information processing features, designed to produce deaths in rivalrous contexts. These competitor killings, in turn, led to the co-evolution of anti-homicide modules, fashioned to respond to cues of homicidal intent and other contextual signals of impending death. Several empirical studies were designed to test predictions from this theory. These include assessments of contexts in which homicidal thoughts occur ( $N = 1,000$ ), experimental scenarios designed to assess the probability of killing in specific contexts ( $N = 300$ ), and studies assessing the co-evolution of intrasexual anti-homicide modules ( $N = 275$ ). We conclude that selection has forged an intrasexual killer psychology. Discussion focuses on the inadequacy of previous theories of homicide and the need to squarely confront the likelihood that designed conspecific deaths are ineluctable features of human nature.

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#### *Duntley JD*<sup>3</sup>, *Buss D*<sup>4</sup> **Killer psychology: The evolution of mate homicide**

In 1996, over 1800 confirmed spousal homicides occurred in the United States. Although some scientists accept the possibility of evolved infanticide modules, some remain skeptical of the feasibility of evolved mate killing modules, despite the fact that mate killings are roughly three times more common than infanticides. According to Evolved Homicide Module Theory (Buss & Duntley, 1998; Duntley & Buss, 1998), humans have evolved mate-killing mechanisms designed to staunch the fitness losses associated with mate infidelity, mate defection, and other forms of strategic interference from one's mate. We contend that evolved mate-killing modules led to the co-evolution of corresponding anti-homicide modules, fashioned to respond to reliable cues of a mate's homicidal intent and other contextual indicators of danger of death. Several empirical studies tested predictions from this theory, including studies about contexts in which thoughts of mate killing occur ( $N = 1,000$ ), experimental scenarios designed to assess the probability of killing one's mate in specific contexts ( $N = 275$ ), and studies assessing the co-evolution of mate-specific anti-homicide modules ( $N = 250$ ). Results support predictions based on the theory of evolved mate-killing modules. Discussion contrasts the "slip-up" or "epiphenomenon" theory of mate killing with Evolved Homicide Module Theory.

#### *Jones OD*<sup>5</sup> **Evolved psychology and sexual aggression: Implications for law**

Law is fundamentally about regulating human behavior. Yet the legal system lacks any sound theoretical foundation in why humans behave as they do, particularly in arenas involving emotions, norms, and seemingly un-economic behavior. This frequently hampers the design, and decreases the efficiency, of legal efforts intended to reduce the incidence of behavior judged to be unacceptable. It seems almost inevitable that an evolutionary perspective can afford lawmakers greater understanding of, and leverage against, some of the behaviors they are charged with changing.

To illustrate, this talk will report on a forthcoming article that explores possible legal implications of integrating life science and social science perspectives on the multiple causes of sexual aggression. Specifically, it will discuss ways in which knowledge of the effects of evolutionary processes on contingent human behavioral predispositions may help the legal system to better understand—without

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justifying or excusing—psychological mechanisms that contribute to patterns of rape. Because increased knowledge of causal influences may afford law increased effectiveness in deterring rape, biobehavioral theories could improve analysis of several current legal issues, from the meaning of “violence motivated by gender” in the Violence Against Women Act, to debates over the constitutionality of chemical castration.

*Wiebe RP*<sup>1</sup>, *Shively M*<sup>2</sup> **Hate crime is different: A Darwinian typology of crime**

Despite their differences, Darwinian and mainstream “general” theories of crime both attempt to account for what Ellis has termed “universally-condemned criminal behaviors”: acts of force or fraud against ingroup members committed without political purpose. The offender is seen as a person with low self-control, little empathy, and a tendency toward immediate gratification of desires. These characteristics are inconsistent with success in conventional society. However, this model may not apply to hate crimes, which are often (but not always) committed by persons of standing in their communities against persons representing a group by whom they feel threatened. Further, hate crimes involve behaviors that contrast with typical street crimes: most particularly, the victim’s suffering, incidental to the common criminal, is of paramount importance to the hate criminal. In short, hate crimes resemble intergroup conflict—ancestral warfare—and may therefore be distinct from crimes manifesting “cheater” or “mating effort” strategies, or low self-control or a deficient moral sense. The authors’ current research explores whether separate psychological mechanisms primarily underlie common crimes and hate crimes. We are especially interested in gang members, in whom each of these mechanisms, as well as the obedience to authority and hierarchy hypothesized to correlate with corporate and organizational crimes, are expected to operate.

*Boehm C*<sup>3</sup> **“Warfare” possibilities in the late paleolithic**

Extant foragers are assessed with respect to social boundary defense, perimeter defense, and propensities for lethal retaliation, and the overall pattern is projected back on to a Late Paleolithic environmental scene that is coming into focus as being extremely variable. Both cooling cycles, with needs for rapid readjustment of subsistence strategy or relocation, and warming cycles with possibilities of aridity, could have triggered not only scarcity but dislocation. Protracted warm periods producing rich environments today denied to hunter-gatherers could have

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resulted in population growth and crowding. Periodically, such factors would have stimulated inter-group conflict. At the same time, the egalitarian syndrome of anatomically modern humans was making possible the selective-retention of altruistic genes, including genes that prepare humans for patriotic warfare. It is hypothesized that the emergence of intensive warfare in the Neolithic and possible in the Mesolithic was a result of all of these factors.

## 8.2 Developmental evolutionary psychology

*Dickins TE*<sup>4</sup>, *Davies MNO*<sup>5</sup>, *Boucher J*<sup>6</sup> **Ontogeny and phylogeny—an overlooked relationship**

Evolutionary psychology is increasingly concerned with telling selective stories of modular cognitive architecture (Cosmides and Tooby, 1992; Pinker, 1998). The functional domains of these modules represent critical Pleistocene problems for our ancestors, and their internal mechanisms and output represent optimal solutions. However, the origin of this architecture is always explained with reference to adult problems and adult end-state. This appears to disregard the ontogenetic profiles of modern humans. Such a position is not necessarily a problem to a radical nativist (on the face of it) but if the position of increasing modularization through ontogeny is taken (Karmiloff-Smith, 1992) an evolutionary story primarily has to account for the selection of developmental constraints on more general systems of learning. This paper not only highlights this lack within contemporary theory but also suggests that the actual form of a modular architecture will be somewhat different from that originally envisaged by evolutionary theorists.

*Lieberman DL*<sup>7</sup>, *Tooby J*<sup>8</sup>, *Cosmides L*<sup>9</sup> **In search of cues governing kin recognition and incest avoidance**

The avoidance of sexual relations with closely related individuals was an important and recurrent selection pressure throughout our evolutionary history. The increased probability of expressed deleterious recessives and the decreased resistance to pathogens selected for cognitive mechanisms involved in the recognition of close kin and the inhibition of sexual relations between them during adulthood. Although a critical time period of the first three or four years during early childhood has been suggested for the development of a sexual aversion between

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siblings, the nature of the cues governing this process have yet to be examined. In order to explore the kinds of information computationally relevant for cognitive mechanisms dedicated to identifying and avoiding sexual relations with a sibling, we administered a questionnaire to undergraduate subjects. Subjects were asked a series of questions regarding various childhood behaviors they engaged in as well as their age range during the time they resided with each sibling. Using a number of different instruments, subjects rated how disgusting they perceived various sexual acts with different family members. The data from this questionnaire will be discussed along with previous findings from a prior questionnaire.

#### *Cummins DD*<sup>1</sup> **Early emergence of cheater detection in human development**

Evolutionary psychologists have recently argued that cheater detection constitutes a cognitive adaptation to the social environment. Here, data are presented showing that cheater detection emerges earlier in human development than do other reasoning strategies of equivalent complexity. Two-year-olds were presented with social and non-social versions of a reasoning task that required them to detect violations. The social version required them to detect instances of cheating (e.g., “Big Bird says if Mary plays with blocks, she must wear a helmet. Find the picture that shows Mary doing something wrong”). The non-social version required them to detect falsehoods (i.e., Big Bird says “if Mary plays with blocks, she always wears a helmet. Find the picture that shows Big Bird was wrong.”) The correct selections in both tasks were identical (e.g., Mary playing with blocks without a helmet), yet two-year-olds performed significantly better on the cheater detection version of the task.

#### *Segal NL*<sup>2</sup>, *Arad, S*<sup>3</sup> **Friendship extraordinaire: Social relationships between twins reared apart and together**

“They are more important to each other than I am to either of them.” (Fraternal male with identical co-triplets). The psychological literature includes studies showing greater cooperation and affiliation between identical twins than fraternal twins. These findings support the view that increased affiliation and altruism should vary with the genetic relatedness of family members. Studies of monozygotic (MZA) reared apart twins include many case histories demonstrating a nearly immediate rapport and close relationship between reunited co-twins. MZA twins’ social relationships have not, however, been systematically

assessed nor been compared with those of DZ reared apart twins (DZA). Early findings from a Twin Relationship Survey, administered to 68 MZ and 58 DZ individual twins and triplets from the Minnesota Study of Twins Reared Apart, will be presented. Participants ranged in age from 16–70 years (mean age = 44.6 years,  $SD = 13.8$ ). MZA twins’ ratings of initial and current social closeness and familiarity exceeded those of DZA twins at the highest choice levels (feeling “closer than best friends” and “more familiar than best friends”). Correlations between twins’ perceptions of their physical resemblance and social relatedness were positive and statistically significant ( $0.33 \leq r \leq 0.46$ ,  $p < .01$ ). Correlations between social relatedness measures and age at separation, time from separation to first contact and contact time prior to assessment were non-significant.

#### *Boster J*<sup>4</sup> **Sex differences and similarities in human mate selection preferences: Stereotypes versus self-report**

David Buss and his collaborators have documented and offered an evolutionary explanation for sex differences in human mate selection. They have not paid the same degree of attention to the strong similarities between what men and women say they want in a mate. This paper presents the results of a pair of replications of Buss’s methods showing, as do Buss’s results, that men and women agree about many aspects about what is attractive in a mate. Character traits like dependability, stability and mutual attraction are most important to both sexes, accidents of birth or child rearing like political beliefs, religion, and ethnicity are least important to both sexes. The sex differences are relatively small—looks and housekeeping skills are slightly more important in men’s self-report, while ambition and wealth are slightly more important in women’s self-report. The irony is that not only do men and women agree on what they want in a mate, they also agree that men and women want different things. Both men and women agree that women are choosier, most characteristics of a mate are thought to be more important to the stereotypical woman than the stereotypical man. The only exceptions are that looks, housekeeping skills, and political beliefs are judged to be more important to men. This paper addresses the puzzle of why men and women agree about what they want in a mate and also agree that men and women want different things.

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### 8.3 Symposium: Ontogeny of human reproductive strategies

**Organizer** Bailey M<sup>1</sup>

**Symposium abstract** Recently, evolutionary psychologists have focused attention on within-sex variations in reproductive life histories. Two general theories have been offered. Environmental contingency theory specifies that based on signals in their early family environment, children (unconsciously) modify their subsequent reproductive strategies. Belsky et al. (1991) offered a version of this theory to account for the association between early family stress (especially father absence) and early menarche in females. Their theory also hypothesized a link between early stress, early menarche, and an unrestricted sociosexual orientation.

The second general theory is that strategic variation is underlain by genetic differences. This theory is motivated partly by evolutionary theory and research (e.g., Gangestad and Simpson, 1990), and partly by the general observation that associations between the early family "environment" and subsequent behavior have often been mediated genetically.

Our symposium includes two papers from each perspective. Two of the talks replicate, extend, and qualify findings about the association between early environment and pubertal onset. The other two talks examine genetic and environmental determinants of aspects of reproductive live histories: menarche and sociosexuality. Genes account for a substantial proportion of variance in these traits.

*Ellis BJ*<sup>2</sup>, *McFadyen-Ketchum S*, *Dodge KA*, *Pettit GS*, *Bates JE* **Quality of early family relationships and individual differences in the timing of pubertal maturation in girls: A longitudinal test of an evolutionary model**

In an 8-year prospective study of 173 girls and their families, we tested predictions from Belsky, Steinberg, and Draper's (1991) evolutionary model of individual differences in pubertal timing. This model suggests that contextual stressors in early childhood foster more negative and coercive (or less positive and harmonious) family relationships, which in turn provoke earlier reproductive development in adolescence. Consistent with the model, fathers' presence in the home, more time spent by the father in childcare, greater supportiveness in the parental dyad, more father-daughter affection, and more mother-daughter affection, as assessed in the summer

prior to kindergarten, each predicted later pubertal timing by daughters in 7th grade. The positive/harmonious dimension of family relationships, rather than the negative/coercive dimension, accounted for these relations with pubertal timing. In total, the quality of fathers' investment in the family emerged as the most important feature of the proximal family environment relative to daughters' pubertal timing. A more specific father-effects model may provide a better account of these data than does the more general family ecology model proposed by Belsky et al.

*Surbey MK*<sup>3</sup> **Growing up early or late? An endocrinological investigation of alterations in pubertal timing under stressful conditions.**

Pubertal timing is an important life history trait that varies across species and between and within the sexes. The onset of puberty marks the beginning of the reproductive life and serves as a trigger for behavioural change. Pubertal timing is not random and appears to be either delayed or accelerated under particular conditions. Because human generations overlap events surrounding the onset of puberty offer a unique glimpse into human adaptation in terms of the developmentally shifting strategies of both parents and offspring. This paper considers the extent to which alterations in the timing of human puberty reflect evolved offspring strategies. In particular, changes in pubertal timing may reflect conditional offspring strategies that are 1) sex-specific and 2) triggered by particular environmental factors, such as stress. Because a female mammal's minimum parental investment is greater than a male's, and the costs of reproducing under inappropriate conditions significantly higher, female reproductive physiology may exhibit a heightened sensitivity to environmental perturbations. In addition, females may possess mechanisms enabling them to better compensate for periods of slow growth and stress compared with males. Results of the Family Experiences Longitudinal Study of Children's Development are assessed for evidence of these potential strategies. Analysis of the first wave of cross-sectional data ( $N = 207$ ) suggests that girls' reproductive development and endocrine profiles are more highly associated with environmental and psychological stress than are boys'. These findings provide some evidence for adaptive sex differences in responsiveness to environmental stress that appear to be mediated by proximate endocrine mechanisms.

*Rowe DC*<sup>4</sup> **Environmental and genetic influences**

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**on pubertal development: Evolutionary life history traits?**

Precocious pubertal development has been observed among girls in single parent families and among girls exposed to family conflict. One explanation for their precocious puberty is that it is evolutionarily adaptive (called here the “life history theory” view). Another explanation is that mothers simply pass on genes for precocious puberty. Thus, family environmental circumstances are not causally determinative of rates of pubertal development. The evidence for these two views was evaluated using the genetically-informative sibling pairs from the National Longitudinal Study of Adolescent Health. Both menarcheal age and pubertal timing were heritable ( $h^2 = .44$  and  $.40$ , respectively), with negligible shared environmental variation. However, in White girls, greater parental warmth delayed puberty, as did living in two parent families. A test of genetic influences underlying the correlation of warmth and pubertal timing was negative, however. Although some of these findings were inconsistent with the evolutionary life history theory, they did not disprove it decisively.

*Martin NG*<sup>1</sup>, *Bailey JM*<sup>2</sup> **Origins of sociosexuality: A twin study**

Empirical research on the ontogeny of sexual strategies has focused primarily on the age of onset of puberty, but relevant theory has also focused on sociosexuality. Specifically, Belsky et al. (1991) hypothesized that adult sociosexual orientation may be sensitive to early family environment. In contrast, Gangestad and Simpson (1990) have hypothesized that female sociosexuality reflects genetic variation maintained by frequency dependent selection. Male sociosexuality, by this model, may reflect variation in genetic quality that directly affects male opportunity. We studied the correlates and genetic and environmental determinants of Sociosexuality using a large, representative volunteer twin sample, the Australian Twin Registry. Consistent with past research, men obtained substantially higher Sociosexuality scores than women. Other demographic and personality variables were at best modestly associated with Sociosexuality, and these associations were similar for both sexes. Similar genetic and environmental factors appeared to influence male and female Sociosexuality, with familial resemblance primarily due to additive genetic rather than shared environmental factors. Environmental influences were also important and appeared primarily to make twins different from each

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other.

*Coall DA*<sup>3</sup>, *Chisholm JS*<sup>4</sup> **Childhood psychosocial stress accelerates age at menarche: A test of Belsky, Steinberg and Draper’s model.**

Belsky, Steinberg and Draper’s (1991) model and extensions provided by recent life history models (Chisholm, 1999) suggest childhood psychosocial stress accelerates sexual maturity and is therefore a potential determinant of the optimal trade-off between current reproduction and future reproduction. Two mechanisms by which resources may be allocated to reproduction in a manner consistent with the predicted trade-off between current and future reproduction are attachment style (Bowlby, 1969) and time preference (Chisholm, 1999). Recent investigations have provided evidence in support of both mechanisms, however it has not been possible to establish whether they function separately or as components of the same phenotypic mechanism. The results from a cross-sectional self-report analysis of 277 Australian university staff and students provide support for the predicted relationship between early stress and accelerated menarche, however no support was found for the predicted mechanisms. The association between increased childhood stress and early menarche persisted once the variance accounted for by mother’s age at menarche was removed. However, partial correlations showed the relationship between early stress and accelerated menarche was not mediated by a short time preference or negative attachment style.

**8.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 1**

**Organizer** Sellen DW<sup>5</sup>

**Symposium abstract** After last year’s meeting marking a decade of HBES activity, the President Margo Wilson commented on the apparent reduction in studies of food issues in human evolutionary anthropology. This symposium aims to showcase new thinking about the complex but crucial role of nutrition in human fitness maximizing strategies. Contributors will try to move beyond the classical studies of human foraging behavior, and draw together perspectives from evolutionary ecology, public health, nutrition science and cultural anthropology to outline new theories to explain the evolution and cross-cultural variation in dietary practices. Papers will

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A

relate adult diets and activity patterns to aspects of infant and young child feeding or explore the potential evolutionary importance of the construction of social identity through food practices.

*Armelagos GJ<sup>1</sup>, Goodman AH<sup>2</sup>, Smay DB<sup>3</sup>* **Subsistence shift in prehistory and the change in diet and disease stress at weaning.**

The shift to primary food production provides an economic incentive for earlier weaning and the foods availability for this transition. We examine this process in two archeological populations: Dickson Mounds (Illinois) and Sudanese Nubia. Dental evidence (linear enamel hypoplasia) from Dickson Mounds suggests an earlier onset of weaning with the intensification of agriculture. The period of weaning is associated with an increase in nutritional deficiencies (iron deficiency anemia as indicated by porotic hyperostosis) and infectious lesion (as measured by periosteal reaction). There is a synergistic relationship with the dietary lesions and infection. The pattern of pathology is also associated with an increase in mortality. In the Sudanese Nubian population, we have histological evidence that women in the peak reproductive period experience premature bone loss related to lactation stress. Children in the same population show evidence of patterns inhibited bone development. The shift to agriculture had increased biological cost borne differentially by women and children.

*Smay DB<sup>4</sup>, Sellen DW<sup>5</sup>* **Variation in weaning age by subsistence type.**

A number of cross-cultural studies have demonstrated broad quantitative associations between subsistence practice and demographic parameters for pre-industrial populations. Understanding the mechanisms underlying these patterns can inform our models of pre-historic human demography, subsistence shifts, allocation to parenting and mating effort and the evolutionary implications of trade-offs between diet and disease. However, few studies have assessed whether the observed differences in fertility and mortality rates derive from differences in energy balance of mothers, differences in availability of weaning foods or differences in maternal time allocation to the competing demands of subsistence work and young child care. In this paper, we test predictions about the mechanisms underlying variation in birth spacing with dependence on various forms of subsistence using the available data on

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age at weaning, variously defined, in natural fertility populations.

*Hewlett BS<sup>6</sup>, Shannon D, Lamb M<sup>7</sup>* **Mother's work, weaning foods and alloparenting among three- and ten-month-old Aka foragers and Ngandu farmers.**

The paper will discuss intracultural and intercultural (forager-farmer) variability in: frequency and duration of infant nursing, use of weaning foods, nonmaternal breastfeeding, nonmaternal feeding, nonmaternal caregiving and mother's work. The data are based upon focal observations of 20 3-4 month-olds and 20 9-10 month-olds among Aka foragers and a comparable number of Ngandu farmers in central Africa.

*Fouts H<sup>8</sup>* **Self feeding among Bofi forager young children**

This paper examines the development of child initiated feeding among 18 to 48 month old Bofi foragers of the Central African Republic. Child focal observations were conducted on 12 children and each child was observed for 9 hours including all daylight hours. The paper demonstrates the importance of self initiated feeding and describes a general weaning process in a context where weaning foods are not prepared. Relationships between feeding patterns and life history variables are also considered.

*McDade T<sup>9</sup>* **Evolutionary ecology of breastfeeding and the weanling's dilemma**

By about 6 months of age, a dilemma emerges for the breastfeeding infant in that breastmilk alone cannot meet the infant's nutritional requirements for growth, but nutritional supplementation raises risks of illness and malnutrition. No formulaic solution can be prescribed for this dilemma, but analysis of the evolutionary ecology of breastfeeding highlights the infant-, maternal-, and context-specific factors that determine the optimal timing of supplementation, with consequences for infant growth and well-being.

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## 9 Early Saturday afternoon paper sessions

### 9.1 Modelling human cooperation and coalitions

#### *Kameda T*<sup>1</sup>, *Takezawa M* **Ownership and sharing: Exploring social foundations of communal sharing norm by evolutionary game analysis**

How does a reciprocal communal sharing system come into existence in a sustainable form in human societies? The anthropological literature has provided two explanations for the origin of communal sharing under uncertainty: risk reduction by social sharing (Kaplan & Hill, 1985) and tolerated theft (Blurton Jones, 1984, 1987; Winterhalder, 1986, 1996). In this paper, we aim to develop a third explanation focusing on the emergence of a communal sharing norm. A communal sharing norm here refers to a social norm designating uncertain resources as common properties. A series of computer simulations based on an evolutionary game framework suggests that such a communal sharing norm is indeed evolvable if we assume rational actors. A particularly important finding is that the problem of second-order free-riding, which is an essential threat to the maintenance of social norms in general, is solvable under uncertainty. We discuss heuristic values derived from this model that can be used to explore the social psychology of sharing.

#### *Keckler CNW*<sup>2</sup> **Coalition modelling and political evolution: Some ‘population thinking’ on leadership in pre-history**

This paper focuses on the development of a more adequate characterization of the political structure of EEA social groups using basic game theory. The goal is to transcend the still dominant typological thinking in political anthropology (“egalitarian, chief”) with appropriate continuous variables. As Boone and Smith have noted, this is often a preliminary to bringing evolutionary ecology to bear on questions of social change. Using Shapley-Shubik coalition models with competitive weights as ‘votes,’ population characteristics and ecological variables will lead to predictions about the size of the dominant coalition, its stability, and how well personal power can be translated into control in particular settings. My primary application is to use “the size of the dominant coalition” as a dependent variable in an analysis of political evolution. In particular my concern is to account in the same terms for

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(1) the change from a social primate-type dominance system to that characterizing some leaderless foragers, and (2) the emergence of superficially primate-like leadership in chiefdoms. One result is a challenge to models supposing the forager system to involve a “revolt” of the weak against the strong. In truth, the traditional dichotomy of either one person or all group members supposedly possessing control is profoundly misleading. The coalition model is intended as a corrective capable of generating testable quantitative hypotheses, some of which are presented.

#### *Kenrick DT*<sup>3</sup>, *Li N*<sup>4</sup>, *Butner J*<sup>5</sup> **Evolutionary psychology and dynamical systems: Watching traits unfold in complex networks**

A truism of evolutionary psychology is that traits in organisms interact with environments, yet we rarely consider the complex implications of that assumption. Imagine 36 huts in a 6x6 matrix, where individuals act aggressively or peacefully depending on immediate neighbors recent decisions. Even assuming everyone uses the same decision rule (follow majority), predicting how a random array would change from day to day is beyond human information processing limits. Modern computer technology allows us to overcome cognitive limitations and watch such group level interactions unfold visually. Interestingly, random group interactions often self-organize maintaining pockets of hostility and peacefulness. We report a series of 3 simulations involving evolutionarily relevant individual differences. The first examines the aforementioned aggressiveness decisions. The second uses student generated data on sex differences in mating strategies to consider how people respond to members of the opposite sex within overlapping networks. The final series considers the theoretical implications of allowing migration, and of varying sex ratios. Such model-testing is now readily accessible and serves an important bridging function between theory and empiricism. We discuss broader connections between evolutionary psychology and dynamical systems theory, both of which aspire to a broad interdisciplinary paradigm, yet largely ignore one another.

#### *Allen-Arave WK*<sup>6</sup> **Food sharing patterns of an Ache reservation: Implications for kin terms, nepotism, and reciprocal altruism**

This talk addresses the argument that evolutionary theories for human behavior do not hold since most societies’ kinship classifications do not correspond directly to

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genealogical relatedness. I present arguments based on Ache food sharing data that counter this critique of evolutionary theories. An important outcome of this analysis is the finding that while nepotistic biases in food sharing exist; kin selection may not be the driving force behind these transfers. Instead, reciprocal altruism appears to be driving food sharing apart from parental provisioning of dependent offspring. This draws our attention to the qualities of close kin that make them attractive reciprocal exchange partners. These qualities lead Ache households, on average, to bias their food sharing toward closer genealogical relatives regardless of social classifications. However, we should not be surprised to find cases in the ethnographic record where social interactions favored by pathways other than kin-selected altruism do not strictly follow lines of genealogical relatedness.

## 9.2 Male attractiveness, anthropometrics, and mating

### *Penton-Voak IS*<sup>1</sup>, *Perrett DI*, *Castles DL* **Menstrual cycle variation in women's preferences for male face shapes**

Masculine male facial features may honestly signal immuno-competence. In contrast to some other studies, our "feminised" computer-generated composite faces receive higher attractiveness ratings than "masculinised" faces, probably as a result of positive personality attributions. Heritable benefits to immunity can only be realized if conception follows copulation, so women may be more attentive to phenotypic markers indicating immuno-competence during the follicular phase of the menstrual cycle when conception is most likely. This paper provides further evidence that female preferences for male facial characteristics vary cyclically with probability of conception across the menstrual cycle. Within-subjects experiments (in Japan and in the UK) demonstrated that the preferences of non-pill using women shifted away from 'feminine' male face shapes towards face shapes associated with higher levels of androgens during the follicular phase of the menstrual cycle. Such shifts only occurred when subjects were judging faces in terms of "physical attractiveness" or "for a short-term sexual relationship". Preferences for suitable face shapes for "a long-term relationship" remained unchanged across the menstrual cycle. Trends were found indicating that women with a partner showed a greater cyclic shift than those without. Potentially, extra-pair copulations arising from cyclic preferences may lead to 'good genes' benefits in offspring,

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whilst maintaining the advantages of ostensive monandry.

### *Castles DL*<sup>2</sup>, *Perrett DI*<sup>3</sup>, *Little A*<sup>4</sup>, *Penton-Voak IS*<sup>5</sup> **Females can assess relationship style from male face shape**

"Feminised" computer generated composite male faces are considered more attractive than "masculinised" faces. Feminised faces also receive relatively positive personality attributions including "warm", "co-operative" and "good parent". This paper presents further evidence that feminised faces are associated with an orientation towards long term relationships. During a live television broadcast, viewers of BBC's Tomorrow's World programme were simultaneously presented with a 50% masculinised and a 50% feminised version of the same composite male face. While the faces were on screen a lonely heart advert was read out by a male actor. Half the country heard an advert written by a male seeking a short term relationship, the other half an advert written by a male seeking a long term relationship. In each case female viewers were invited to participate in a forced choice telephone response poll on which male had written the advert. 18,130 responses were logged. A majority of respondents to both the short term (56%) and long term (66%) conditions thought that the feminised male was the more likely author. However, the shift towards the feminised male in the long term condition indicates that relatively feminine facial features are associated with an orientation towards long term relationships. These results indicate that females are capable of assessing the personality and relationship style of males from the shape of their faces.

### *Stewart M*<sup>6</sup>, *Campbell L*<sup>7</sup>, *Manning JG*<sup>8</sup>, *Simpson JA*<sup>9</sup> **Male waist-to-hip ratio and interpersonal perception**

This study assessed how males perceived the behaviors of each other in a group interaction. Recent research has shown that more symmetrical males compete more directly with other males in a competitive situation (Simpson, Gangestad, Christensen, & Leck, 1999). Little is currently known about how such men behave and are perceived in a leaderless group context. The waist-to-hip ratio (WHR), or the distribution of fat deposits in the body (Singh, 1995), was used as a measure of viability. In the

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present study, 40 four-person groups of males engaged in a leaderless group discussion. Each group performed the same task. In twenty-two of the groups, an attractive woman was present as an “observer,” but was not present in the other groups. Following the group discussion, participants rated each other, and themselves, on a number of attributes. Using the Social Relations Model to analyze the data, we found, as predicted, that when the woman was present, men with relatively high WHRs were rated by other group members as being more leader-like and less agreeable. Men with relatively high WHRs also perceived themselves as more leader-like when the woman was present. This pattern of results was not found when the woman was not present. Men with attributes that signify greater health, then, are more likely to be perceived by others as more dominant and leader-like when interacting in the presence of a woman.

*Schubert JN*<sup>1</sup>, *Strungaru C*<sup>2</sup>, *Curran MA*<sup>3</sup> **Cross cultural analysis of the role of physical appearance in candidate appraisal**

In our previous research we have advanced a “good genes” model of the role of physical appearance in assessments of the electoral viability of candidates for political leadership offices. We have found very high levels of intersubject agreement in rating viability among 16 male and 19 female politicians in a series of experiments in which American subjects were presented with still images and video clips. This paper tests the cross cultural generalizability of our experimental results. If physical features are important in candidate appraisal because they advertise good genes, then they should do so universally and not have culturally dependent effects. Our experiment consists of showing video tapes with stimulus material to groups of subjects. Subject groups were exposed to either the 16 male or 19 female candidates. The 16 males were all candidates for president in the 1996 Romanian national elections and visual material was taken from a televised debate. The 19 females were members of the U.S. House of Representatives and materials were drawn from speeches at a podium on the floor of the House. For the male candidates, our comparative design involved conducting the experiment in Jakarta, Indonesia with a sample of adult professional subjects attending a professional conference. For the female candidates, the experiment has been replicated in the Trobriand Islands with a sample of high school students and with undergraduate students in Romania.

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### 9.3 Jealousy

*Friedman BX*<sup>4</sup>, *Shackelford TK*<sup>5</sup> **Re-allocation of mating effort as a result of pregnancy**

Previous research has shown that men prefer to mate with women who exhibit cues to high fertility. Once a woman becomes pregnant, however, she typically becomes temporarily infertile for at least nine months, and possibly for up to three years due to lactational amenorrhea. Because ancestral men could increase their reproductive success by copulating with fertile women, we hypothesize that husbands and wives will re-allocate their mating effort as a consequence of wife’s pregnancy. Relative to pre-pregnancy levels, we predict that during pregnancy: (1) husbands will reduce their level of mate guarding; (2) husbands’ desire for extra-pair copulations will increase; (3) pregnant wives will increase their level of mate guarding; and (4) both wives and husbands will increase their level of “safe-guarding” (behavior designed to guard the safety and well-being of one’s mate). The complete rationale behind these and additional predictions will be outlined and previous research supporting these predictions will be presented. Specific suggestions for future research into sexuality during pregnancy will be discussed.

*Drass E*<sup>6</sup>, *Shackelford TK*<sup>7</sup>, *Weekes VA*<sup>8</sup>, *LeBlanc GJ*<sup>9</sup>, *DeKay WT*<sup>10</sup>, *Buss DM*<sup>11</sup> **Sexual jealousy in later life: An evolutionary psychological perspective**

Previous research with young adults documents that men are more upset by a partner’s sexual infidelity, whereas women are more upset by a partner’s emotional infidelity. No previous work has investigated jealousy in response to a partner’s infidelity in an older sample. We obtained data from 62 men (mean age 66.6 years) and 124 women (mean age 67.3 years). Participants responded to questions regarding jealousy, infidelity and interpersonal relationships. One aim of this study was to identify whether an older sample reacts to a partner’s emotional infidelity and sexual infidelity differently than younger samples and, in particular, whether the sex differences documented in younger samples are replicable in older samples. Two competing hypotheses about sex differences in jealousy among older persons were tested, both heuristically guided by an evolutionary psychological perspective: (1) Like younger men, older men will report greater

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jealousy in response to a partner's sexual infidelity than in response to her emotional infidelity; (2) Unlike younger men, older men will report greater jealousy in response to a partner's emotional infidelity than in response to her sexual infidelity. Results support the first hypothesis; the sex differences in upset to type of infidelity found in younger samples were replicated in this older sample. Discussion provides evolutionarily informed speculation regarding these results.

*Groothof HAK<sup>1</sup>, Dijkstra P, Poel GA, Laverman TTG, Schrier M, Buunk BP* **Sex differences in the events that elicit jealousy**

When individuals are asked which event would upset them more—a partner's emotional infidelity or a partner's sexual infidelity—among heterosexuals more men than women select a partner's sexual infidelity as the most distressing event whereas more women than men select a partner's emotional infidelity as the most upsetting event. Evolutionary psychologists have attributed this gender difference to the different sexual strategies men and women possess. Other researchers, however, have argued that not innate differences but socialized cognitions concerning the implications of infidelity are responsible for the gender difference in jealousy (the so-called 'double-shot' hypothesis). For homosexuals, in contrast with heterosexuals, the two perspectives come up with different predictions with regard to the type of infidelity that the sexes would find most upsetting. The present study aimed to test the validity of the two perspectives by asking 237 Dutch homosexuals what type of infidelity they would find most upsetting and to what extent they thought one type of infidelity implied the other one. Support was found for the predictions generated by the 'double-shot' hypothesis.

*Ward D<sup>2</sup>, Shackelford TK<sup>3</sup>, LeBlanc GJ<sup>4</sup>, Drass E<sup>5</sup>* **Emotional reactions to infidelity**

This research sought to identify emotional reactions to a partner's sexual infidelity and emotional infidelity. In Study 1, 54 participants nominated emotional reactions to a partner's sexual infidelity and emotional infidelity. In Study 2, 655 participants rated each emotion for how likely it was to occur following sexual infidelity and emotional infidelity. Factor analysis revealed 15 factors of emotions, including Hostile/Vengeful, Depressed, and Sexually Aroused. Repeated measures analyses of variance with participant sex as the between-subjects factor

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and infidelity type as the within-subjects factor were conducted on the 15 factors. A main effect for sex obtained for 9 factors. For example, men scored higher on Homicidal/Suicidal, whereas women scored higher on Undesirable/Insecure. A main effect for infidelity type obtained for 12 factors. For example, participants endorsed Nauseated/Repulsed as more likely to follow sexual infidelity and Undesirable/Insecure as more likely to follow emotional infidelity. Discussion integrates results with previous work on jealousy and infidelity.

## 9.4 Symposium: The food of love, the love of food: New directions in the study of food and fitness. Part 2

**Organizer** Sellen DW<sup>6</sup>

*Sellen DW<sup>7</sup>* **Human weaning: Towards a synthesis of applied and evolutionary perspectives.**

It is argued that much potential exists for a synthesis of public health and evolutionary ecological approaches to the study of young child health and nutrition. Those concerned with improving child survival, nutrition and health lack coherent models of human parenting which can be applied in the full range of contemporary social and economic settings where resources for children are limiting. Those concerned with the evolution of mating, parenting and juvenile behavior find it difficult to test specific hypotheses of the evolved mechanisms linking behavior and fitness using only demographic measures of reproductive success. Public health practitioners should find evolutionary theory useful in developing interventions, and anthropologists should find the battery of public health measures now available helpful in the design and actualistic testing of behavioral models of child care. The weaning period may be a particularly fruitful area for such interdisciplinary study.

*Blurton Jones NG<sup>8</sup>, Marlowe FW<sup>9</sup>* **The forager olympics. Does it take 20 years to become a competent hunter-gatherer?**

People, especially people living as hunters and gatherers, have a much longer juvenile period than their closest relatives, the other hominoidea. We define juvenile period as the time from weaning to first reproduction. What might have been the selective pressures that led to its elongation? Over the years anthropologists have presented a variety of answers, ranging from the almost teleological "we

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are born undeveloped and mature slowly and remain dependent a long time so we can learn better,” to the more reasoned—“advantages to later reproduction from continued growth (and learning) must outweigh the disadvantage of lost time.” Several versions of these ideas assume that our hunting and gathering way of life not only requires much to be learned, but that much time must be spent on learning it. But is there any evidence? We conducted experiments to test whether Hadza foragers who had lost several years of practice and experience were less effective at testable foraging skills. The results were surprising. There are alternative explanations for the length of the human juvenile period. The contest between theories about the juvenile period may one day teach us a lot about the evolution of human learning and the scheduling of development.

*Bird DW*<sup>1</sup> **Children on the reef: Slow learning or strategic foraging?**

Many students of human subsistence behavior attribute differences between the foraging practices of children and adults to an unprecedented period of juvenile dependence and social learning in apprenticeship for the complexities of adulthood. But if such differences can alternatively be explained as a product of different ways to forage efficiently given different constraints, this may suggest that the distinct pattern of human juvenility evolved for reasons other than to permit additional learning. In this paper I illustrate differences in the prey choice and processing strategies of Meriam (a Melanesian people of the Torres Strait, Australia) children and adults while reef flat collecting. I then present data designed to test the hypothesis that age-linked differences in foraging result from variability in the immediate trade-offs faced by children in their separate attempts to maximize the rate at which they can deliver food to a central place. In conclusion, I relate these results to recent theoretical developments for understanding the evolution of human life histories.

*Bird R*<sup>2</sup>, *Bird DW*<sup>3</sup> **The incompetent child, the unfinished adult: Anthropological perspectives on the juvenile**

Children constitute one-half to one-third of all individuals in human society, yet we consistently ignore them or, at best, impose adult-centric interpretations on their behavior and biology. In cultural anthropology, children are overlooked in ethnographies, dismissed as incompetent, their behavior is subsumed under the all-purpose generalization of “play,” their lives spent in the quest to be little

adults, learning and practicing adult behaviors. In biological anthropology, human children are helpless, costly, constraining, require the cooperative effort of mated male and female pair to raise, and the whole function of childhood is to learn about the incredibly complex adult world. The human juvenile period is always described as a terribly long time during which offspring are dependent upon parental provisioning and care, compared to other primates where juveniles are independent foragers, capable of surviving on their own, requiring no intensive parental investment. But it seems unlikely that natural selection could maintain such a costly period of life history without designing efficient strategies of survival unique to the juvenile phase. Why can't natural selection design children to be good at being children? I will argue that children not only invent language, they invent culture in synergy and in competition with other children, they have a healthy skepticism for information imparted by parents, they have alternative strategies, diets, and goals, and their worlds are just as complex and fraught with danger and competition as our own. By taking the more juvenocentric viewpoint, that children are tiny humans born into adult-sized worlds and forced to compete for resources with each other and with adults, we may gain great insights into the origins and evolution of human behavior.

## 10 Late Saturday afternoon paper sessions

### 10.1 Experimental economics

*Eckel CC*<sup>4</sup>, *Wilson RK*<sup>5</sup> **Trust, reciprocity and facial expressions in simple bargaining games**

The Nash equilibrium predictions of standard game theory often fail in experimental tests. While innumerable refinements to Nash equilibrium have been suggested, they too fail in empirical tests. What seems apparent is that humans rely on a rich mixture of contextual cues and signals to determine how to strategize about their own choices and those of their counterparts. Our research concentrates on a simple social signal—the human face. In particular we examine the emotional cues registered by the face and investigate the meaning of those cues mean for “mind reading.” We explore the impact of facial cues in experiments using abstract schematic line drawings. We focus on games in which actors have strong incentives to engage in trust and reciprocate that trust. Our findings suggest

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that intentions to trust and reciprocate can be signaled by facial expressions.

**Burnham T<sup>1</sup> Testosterone and negotiations: An investigation into the role of biology in economic behavior**

26 male subjects participated in a \$40 ultimatum game. Offers were constrained to either \$5 (stingy) or \$25 (generous); all pairs were paid. Subjects testosterone levels were measured throughout the experiment via saliva samples. Subjects who rejected stingy offers had significantly higher testosterone levels than subjects who accepted stingy offers ( $p = .001$ ). Five of the seven highest testosterone subjects rejected the stingy offer vs. only one of the remaining nineteen subjects. Subjects who made generous offers had higher levels of testosterone than subjects who made stingy offers ( $p = 0.134$ ).

**Kurzban R<sup>2</sup>, McCabe K, Smith V Cooperation in groups: Giving reciprocity a chance**

Most public goods experiments designed to test models of cooperation in groups are weighted against finding evidence of reciprocal play. If, as we suspect, players in public goods games are trying to use a strategy of cooperating to the extent that they believe the least cooperative member of the group is cooperating, this might go undetected because uncertainty about others' contributions constrains players' ability to use this reciprocal strategy. Using a real time version of the voluntary contribution mechanism allowed us to gauge how players use information about others' contributions in making their own decisions. We employed a two by two between subjects experimental design in which groups of five subjects played ten ninety-second rounds of a linear public goods game. In half the groups, players were provided with the amount of the lowest current contribution in their group while the other half received the amount of the highest current contribution. In addition, players in half of these groups were permitted to change their contributions either up or down while in the other half players could only increase their contributions to the public good. We predicted that groups in the lowest information and increase only condition (but not others) would be able to generate and sustain high levels of cooperation. This prediction was confirmed for some but not all groups in this condition. However, strong evidence for the use of reciprocal cooperation was observed across all conditions.

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**Takezawa M<sup>3</sup>, Kameda T<sup>4</sup> Ownership and sharing: Experimental demonstrations of "windfall as a common property" effect**

High uncertainty associated with food acquisition is regarded to be a core property of the environment in which humans have evolved. Reducing such an uncertainty thus should have been one of the key problems to solve in human evolution. Kaplan & Hill (1985) argue that a social-sharing system has been developed to solve such a problem in communal societies. An evolutionary game analysis by Kameda & Takezawa (1999) suggests that a communal sharing strategy is adaptive at the individual level, when uncertainty in resource acquisition is high. These results may suggest that humans are equipped with psychological mechanisms that differentiate a sense of ownership as a function of uncertainty associated with resource acquisition. For example, even in modern society, which has developed various buffers to reduce uncertainty, we seem to be inclined to share windfall money such as those obtained by gambling with others. Although this phenomenon may simply reflect a robust ideology of "labor theory of value" (money earned without effort has little value), the alternative "evolutionary" explanation is attractive. We conducted a series of experiments to manipulate the uncertainty level associated with resource acquisition, while controlling the degree of efforts invested. Results supported our hypothesis: Uncertain resources are more likely to be shared than certain resources regardless of actual efforts invested. Replications using American subjects are currently in progress.

## 10.2 Language, intentionality, and cognition

**Monnot M<sup>5</sup> The adaptive function of infant-directed speech**

One method of testing hypotheses about the adaptive function of cognitively-modulated traits is to determine whether the trait correlates with biological processes such as growth and development. The adaptive function of the vocal modifications known as infant-directed speech or motherese was assessed by filming 52 mothers and their 3-month old infants during dyadic interaction in the home. Psychological and socio-demographic testing as well as analyses of the film transcripts resulted in 68 variables. These were used to assess the correlation between infant growth velocity and quality of motherese speech ( $R^2 = .52, p > .0001$ ). Prosodic variations such as

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higher overall tone, wider tone range, slower tempo, simpler phrases, much repetition, and exaggerated vowels characterize this form of speech used when addressing infants, sick and elderly adults, and pets. The automatic and unconscious variation of vocal aspects is similar to that of affective prosody, which reveals whether the speaker is angry, sad, happy, etc. Even very young infants apparently can impute meaning to the vocalizations of their caretakers, and grow more rapidly when they perceive empathetic attentiveness. The connection between speech qualities and cognition/intentionality on the part of the speaker is addressed.

### *Bichakjian BH*<sup>1</sup> **Language evolution and language diversity**

While it is often claimed that languages are the ad hoc fleshed-out forms of a static grammar coded in our genes, the empirical data clearly suggest that grammatical strategies and sound systems are sets of linguistic features that have pursued a developmental course, much like biological features or technological implements. The objective observer who carefully scans the histories of languages cannot fail to notice that linguistic features have evolved along definite developmental lines. These developments are under normal circumstances unidirectional, and that direction is toward greater functionality and smaller neuromuscular cost.

Critics of language evolution often think to have a counterargument by pointing out that ancestral features of some languages are still used today in other vernaculars. That is true, but such a situation also exists in biology without undermining the theory of evolution.

This paper will argue that there is indeed diversity, but that diversity, in language just as in biology, is an integral part of evolution, and evolution in turn, just as in biology, is indispensable to the proper understanding of language.

### *Mishra P*<sup>2</sup>, *Zhao Y*<sup>3</sup>, *Others* **Old brain, new media: Ascribing intentionality to interactive media**

One of the most fundamental cognitive modules predicted by Evolutionary Psychology is the Theory of Mind Module. The ToMM allows humans to infer social agency and a full range of mental states by receiving input from two components: The Intentionality Detector—that interprets motion stimuli in terms of primitive volitional mental states of goal and desire; and the Eye Direction Detector that interprets the presence and direction of eye like stimuli and thus infers perceptual mental states. We argue

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that recent research in human computer interaction suggests the existence of a third input component that infers intentionality on the basis of symbolic interaction. Evidence for this module comes from research on HCI that suggests that people perceive interactive media as being intentional social actors (Reeves & Nass 1996). People are polite to computers, attribute gender and personalities to them, and can feel betrayed and angered by them. This response is instinctual and does not go away with expertise. Children show it and so do computer experts. It is triggered easily though people are rarely aware of it happening. Neither the ID or the EDD can explain this phenomena since the stimuli that generate this perception of agency are neither generated by motion nor by the presence of eye like images. In this presentation we will offer a review of the existing research; some findings from our own research; and an evolutionary psychology based theoretical explanation.

### *Schooler LJ*<sup>4</sup>, *Rhine RJ*<sup>5</sup>, *Serio Silva JC* **Does human memory reflect the environment of early hominids?**

The rational analysis of memory (Anderson, 1990) proposes that human memory has evolved to cope optimally with the informational demands that the environment places on people. We have shown that human memory performance reflects patterns with which environmental stimuli (e.g., words) occur and reoccur (Anderson, & Schooler, 1991; Schooler & Anderson, 1997). Because the human cognitive system did not evolve in our modern environment one (e.g., Shettleworth, 1998) may wonder about informational demands that were placed on early hominids during critical periods in evolution. Milton (1981) has argued that the informational demands of ranging through the environment was critical to the evolution of learning and memory in people. Unfortunately, it is impossible to study these environments directly. However, one can study the informational demands placed on animals whose current ecological niches share something in common with those of early hominids. The ways in which primates move through forests and savannas represent good starting points for understanding some of the informational demands that shaped early hominid evolution. We have analyzed existing data on the ranging patterns of howler monkeys through forests, and baboons through savanna. It appears that the visitation patterns of howlers and baboons match up with the statistics of the modern environments. It looks like there are universal patterns in the informational demands placed on humans and other primates.

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### 10.3 Parents and children

#### *Kramer KL<sup>1</sup>, Boone J<sup>2</sup>* **Does children's work increase household production? Production, consumption and family size among subsistence agriculturalists**

The prevailing view to explain the increase in family size following the transition from hunting and gathering to agriculture is that farmers tend to have more children in order to increase the size of the household work force and the economic status of the family. This paper examines the economic behavior of children, and specifically the relationship between production and consumption among a group of modern Maya subsistence agriculturalists. We use this relationship to address the question, does having more children increase household production? To examine this question, reproductive history and time allocation data were collected in a remote modern Maya village in the Puuc region of the Yucatan Peninsula, Mexico. We start by asking are mothers and fathers able to support these large Maya families of seven to eight children? If not, to what extent do children help out? Results show that, regardless of family size, parents work effort alone does not meet a family's labor needs. On the other hand, children become net producers in their teens and maintain a positive production balance for a number of years before leaving home—suggesting that children's help is an important source to meet household labor demands that parents alone can not. Results support other studies that find that agriculturalist children have significant economic value. However, importantly, they also strongly suggest that children's helping behavior is being directed to underwrite the costs of a larger family, rather than necessarily increasing the total net production or wealth of the household per se.

#### *Bock J<sup>3</sup>* **Do parents matter? The determinants of children's activities in the Okavango Delta, Botswana**

Children's time allocation to productive and non-productive activities varies widely across and within societies. Productive tasks entail work of immediate benefit, while an important component of non-productive activities is the acquisition of skills necessary to perform productive tasks in the future. I begin with a simple model which examines the relationship of ecological parameters to parents return on investment in the embodied capital of offspring through childhood and adolescence. The ratio of children's time allocated to productivity versus skill acquisition is based on the age- and sex-specific strength and skill necessary to perform productive tasks in a local

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ecology. In foraging economies where resources require high levels of ability to extract and process we expect children's time allocation to be weighted heavily towards skill acquisition. In farming economies where resources require low levels of ability to extract and process children's time allocation should be weighted towards productivity. I expand the model to include the opportunity costs to parents of the allocation of a child's time in terms of the value of parents and siblings time. The model is tested using data collected in a community of forager, farmers, and herders in the Okavango Delta of Botswana. Major determinants of children's time allocation are the income return of children's labor to parents in different subsistence economies and the opportunity costs to potential substitute laborers.

#### *Guisinger S<sup>4</sup>, Schulberg D<sup>5</sup>* **Adapted to famine: The evolutionary sense of anorexia**

People with anorexia nervosa eat little, believe they are fat, and exercise excessively although they are dangerously thin. Anorexia has been attributed to control battles or fears of sexual maturity. Yet individuals who fast for religion or politics, as well as pigs bred for leanness, have developed anorexic symptoms. This paper argues that anorexia may have evolved as adaptation to famine conditions.

Famine and migration mark human history. The anorectic's odd symptoms make evolutionary sense if self-delusion and energy allowed them to mobilize efforts to escape depleted environments at higher rates than those who accurately and hopelessly assessed their emaciated condition and were driven by hunger on futile food searches.

We propose a dynamical systems model to explain how certain individuals succumb. The only necessary condition is that at least 15% of body weight is lost. Combinations of conditions or traits contribute to extreme weight loss, including cultural pressures to be thin and an ascetic, perfectionistic personality, a political cause, a family where the only means of protest is fasting, or a desire to appear asexual. The development of anorexia, like other sudden state changes, is an example of catastrophic change. The paper argues that anorexia develops when specific factors lead to a catastrophic descent into the attractor region of eating-disordered adaptations.

#### *Draper P<sup>6</sup>, Hames R<sup>7</sup>* **Birth order, sibling investment, and fertility among Ju/'hoansi (San)**

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In this paper we report on a study of the relationship between birth order and number of siblings and reproduction among the Ju/'hoansi (also known as Basarwa, San or !Kung) of Botswana. Our study is unconventional in comparison to typical research of the social and psychological correlates of birth order in modern society. Generally, in modern societies there appears to be a first born advantage, particularly as measured by such indicators as educational achievement, income, occupational prestige, eminence and I. Q. (Altus, 1966; Bayer, 1967; Taubman, 1986; Majoribanks, 1988; Majoribanks, 1989; Zajonc, 1980; Zajonc, 1980). We were cognizant of the profoundly different contexts of child rearing that can be found in a non-western, technologically simple society and reasoned that sibling order might have little or reduced influence on individuals. Nevertheless, we predicted that first born Ju/'hoansi will do *better* than their later born sibs because of the frequently reported developmental benefits of being early born. Specifically, we predicted first borns would have higher fertility than would later born children. Instead, we found a significant positive correlations between birth order and number of older siblings and fertility. In addition, there are significant correlations between number of siblings and currently living siblings and reproductive success and survivorship for men but not for women. We conclude with some speculations on why birth order and sibling set size influence an individual's fertility and survivorship of children and why variation in these factors is significant for men but not for women.

#### 10.4 Symposium: Constraining evolutionary hypotheses of human male homosexuality

**Organizer** Bailey M<sup>1</sup>

**Symposium abstract** Human homosexuality is an evolutionary paradox. Homosexual people would seem to be at a substantial reproductive disadvantage, yet they exist in nontrivial numbers. These facts have motivated intense evolutionary speculation. Unfortunately, speculation has often been constrained neither by knowledge of sexual orientation nor by careful attention to relevant evolutionary considerations. The aims of this symposium are to review some of the best established facts about human male homosexuality, to evaluate some existing evolutionary hypotheses in light of relevant research, and to suggest future directions for researchers interested in both evolution and etiology of sexual orientation.

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The following facts about human male homosexuality have been well established. Male homosexuality is neither a recent nor a local (western) phenomenon. The prevalence of male homosexuality in the west is at least 1% and may be as high as 4%. Although a bisexual orientation may exist among males, it is rarer than a homosexual orientation. Homosexuality is often, but not invariably, associated with sex atypicality in other characteristics, such as childhood gender role behavior and adult occupational interests. Some other sexually dimorphic aspects of mating psychology (e.g., interest in casual sex) are not associated with sexual orientation, however. Patterns of familial resemblance are consistent with a modest to moderate genetic contribution. Gay men have a later birth order, due to an excess of older brothers.

Some existing evolutionary hypotheses, such as kin selection and heterozygote advantage (and its more general formulation), are reviewed and rejected. Two alternative hypotheses, maternal immune response and pathogens (as yet unidentified), are offered.

#### *Bailey JM*<sup>2</sup> **Empirical tests of two evolutionary hypotheses of male homosexuality**

I evaluate two evolutionary hypotheses about human male homosexuality. Kin selection specifies that although gay men do not reproduce at high rates, they assist their kin, allowing them to rear extra offspring. By this hypothesis, gay men should invest more in their relatives and should be more nurturant compared with heterosexual men. Neither hypothesis was supported in our data. Heterozygote advantage (and its polygenic generalization) specifies that although homosexuality causes markedly diminished reproductive success, more common intermediate phenotypes (heterozygotes, or those individuals with an intermediate number of trait-relevant genes) are more successful than those with no trait-relevant genes. However, there is no evidence that heterosexual relatives of homosexual probands are different from other heterosexuals. Even in monozygotic twin pairs discordant for homosexuality, the heterosexual twin shows no evidence of a feminized behavior pattern suggested by most heterozygote advantage theories.

#### *Blanchard R*<sup>3</sup> **Theory and research on birth order and sexual orientation**

Birth order is the only environmental variable that has ever been shown to correlate reliably with sexual orientation. Homosexual men have a higher mean birth or-

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der (i.e., more older siblings) than do comparable heterosexuals. This has been demonstrated in subjects examined recently and in subjects examined decades ago; in groups collected in England, Holland, Canada, and the USA; in psychiatric patients and in nonpatient volunteers; in subjects examined in adulthood and subjects examined in childhood; in men who wish they were women and in men contented with their male role and anatomy; and in men sexually attracted to adults as well as men attracted to children. It has further been shown that the probability a man will be homosexual increases only in proportion to his number of older brothers; older sisters neither increase nor decrease the probability of homosexuality in later-born males. This phenomenon has therefore been termed the fraternal birth order effect. Quantitative analyses indicate that about one homosexual man in seven owes his sexual orientation to this effect. In contrast to homosexual males, homosexual females show no consistent tendency to be born late (or early) in their sibships. It thus appears that the relation between birth order and sexual orientation pertains only to males. Females do not influence their siblings' sexual orientation, and their siblings do not influence theirs. It has been hypothesized that the fraternal birth order effect reflects the progressive immunization of some mothers to Y-linked minor histocompatibility antigens (H-Y antigens) by each succeeding male fetus, and the concomitantly increasing effects of H-Y antibodies on the sexual differentiation of the brain in each succeeding male fetus.

**Cochran GM<sup>1</sup> Homosexuality: What causes are compatible with natural selection?**

At first glance homosexuality in humans appears to be an evolutionary anomaly, and more detailed analysis only strengthens that initial impression. Kin-selection models require very large investments, which are unobserved and probably infeasible. Mutational pressure is far too weak to explain a common syndrome that has such a negative effect on fitness. The explanation may lie in a genetic conflict. Such conflicts can cause relatively common fitness-reducing syndromes that persist indefinitely, since natural selection plays on both teams. Although other kinds of genetic conflicts exist, such as segregation distortion, the most important kind is that between parasite and host. It may be that in some manner, human homosexuality is caused by a microorganism. If so, the evolutionary anomaly vanishes.

**Squires AM<sup>2</sup> Fitness of gay males: 2. Genes for homo-**

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**bi-, and asexuality**

At Davis, I nominated the Upper Pleistocene gay male an alternate male reproductive strategist, carrying (1) genes interdicting sexual arousal by female qualities and, as well, other genes linked therewith: (2) genes for arousal by male qualities, (3) genes conferring feminine attributes, and (4) genes endowing artistic skills and inclinations. I now propose genes for Robin Fox's "Westermarck effect" (interdicting sexual arousal by opposite-sex familiars of childhood). For the (1) genes above, I propose neotenic genes extending the Westermarck effect into maturity (i.e., causing genetic machinery to fail that, ordinarily, "turns off" the effect before or in early adolescence). If linked genes (1) through (4) travel together in meiosis (and if environment "cooperates"), a probable outcome of development is the "standard" gay male. When (1) and (2) separate in meiosis, there are two possibilities. (i) In a male carrying (2) and not (1), bisexual behavior and self-identity are likely to emerge. (ii) A male carrying (1) and not (2) is apt to become asexual. Phallometric data (measuring male arousal by sexual imagery) and Kinsey Institute survey data (1978 and 1994) support my genetic scheme. Furthermore, the data bespeak a significant incidence of asexuality in men of today.

**Sunday morning plenary address**

**O'Connell JF<sup>3</sup> Grandmothering and the evolution of *Homo erectus***

Despite recent, compelling challenge, the evolution of *Homo erectus* is still commonly attributed to big game hunting and/or scavenging and family provisioning by men. Here I use a version of the "grandmother" hypothesis to develop an alternative scenario, that climate-driven adjustments in female foraging and food sharing practices, possibly involving tubers, favored significant changes in ancestral life history, morphology, and ecology leading to the appearance, spread, and persistence of *H. erectus*. Available paleoclimatic, environmental, fossil, and archaeological data are consistent with this proposition; avenues for further critical research are readily identified. This argument has important implications for widely-held ideas about the recent evolution of long human lifespans, the prevalence of male philopatry among ancestral hominids, and the catalytic role of big game hunting and scavenging in early human evolution.

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## 11 Late Sunday morning paper sessions

### 11.1 Evolution of human life history

#### *Josephson SC*<sup>1</sup> **The grandfather hypothesis**

The “grandmother hypothesis” suggests that women enhance their reproductive success by provisioning their grandchildren. This increases the fertility of their daughters and may explain the origins of several human traits such as menopause, high fertility, and long lifespan. Contrary to this hypothesis, a sample of reproductive histories from 19th century Utah shows that whether mothers were alive or dead when their daughters married had only a small effect on their daughter’s reproductive success. Fathers, on the other hand, had a profound influence on the reproductive success of both sons and daughters. Men did not maximize the fertility of their wives but they did increase the fertility of their children. Grandfathering allows men to become polygynous, enhances the long-term reproductive success of women, and may be behind key elements of human evolution.

#### *Judge DS*<sup>2</sup> **Reproduction and the post-menopausal longevity**

The relationship between fertility and longevity has been of interest since the seminal works of Medawar, Williams, and Hamilton. In this paper I extend the work of Le Bourg et al. and analyze patterns of fertility and post-reproductive survival of ever-married women in Quebec during the 17th century, focusing on the 4077 women who lived beyond 50 years of age. Childlessness was rare (5%) and, women averaged 9.2 children. The average post-menopausal (defined as 50 years) lifespan was 70.9 years. Using multiple regression, the data indicated that post-menopausal years associated positively with being native born ( $p = .005$ ), having a long reproductive lifespan (years between first and last birth;  $p = .034$ ), having fewer sons ( $p = .047$ ), and a trend to being born early in the historical period ( $p = .052$ ). Neither numbers of children nor mean interbirth interval had a significant effect on post-menopausal longevity. Parous women generally lived longer than the non-parous by 6.5 years ( $t = 4.6$ ,  $p < .001$ ), of which 2.3 years were post-reproductive advantage ( $t = 3.028$ ,  $p < .001$ ) and occurred during the 6th decade. The 670 women who survived beyond 80 years differed in two reproductive parameters from other post-menopausal women. These “oldest-old” had 0.2 more

daughters during their reproductive lives than did post-menopausal women dying by age 80. I am indebted to the Montreal Historical Demography project for access to the data base.

#### *Mace R*<sup>3</sup>, *Sear R*<sup>4</sup> **Life history evolution in a rural Gambian population**

We will use a long-term historical demographic dataset from The Gambia to investigate the influence of kin on the survival of children. These Gambian data, that were collected as part of medical research project between 1949 and 1975, represent some of the most detailed demographic data from a traditional African population that exist. We find that a surviving maternal grandmother is a significant determinant of the survival of a grandchild, and is the only significant kin other than the child’s mother. These findings will be discussed with relevance to theories for the evolution of menopause and to human social evolution.

#### *Heath KM*<sup>5</sup> **The reproductive payoffs of kin propinquity in a 19th century American frontier population**

This study analyzes the effect of kin on fertility and child survivorship in a historic American polygynous society. The study population was living communally where resources were sparse and evenly distributed. Therefore, wealth can be held constant allowing one to isolate the effects of kin on individual reproductive fitness. In this population, I demonstrate that men gain greater reproductive benefits from kin presence than do women. Consistent with these results, I argue that when the probability of men gaining extra matings is greater than the childhood mortality rate then individuals should invest more in their male relatives.

#### *Miller E*<sup>6</sup> **Greater male variability: An evolutionary explanation**

On a number of psychological measures, including IQ and human abilities in mathematics and other fields, male variability appears greater than female variability. It is also known that male reproductive success is more variable than female reproductive success, because of the large female investment in pregnancy, lactation, and child rearing. In a fluctuating environment, a genotype that produces various phenotypes can out-reproduce a genotype that always produces the same phenotypes. The reason is that in many environments a human with the best phenotype out-reproduces one with a phenotype less well suited

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to that environment. Frequently the highest ranking male enjoys a disproportionate reproductive success. Having a phenotype suitable for the environment is a major advantage is obtaining this high rank. In contrast, because females have a maximum limit (due to limited capacity for childbearing) to how much reproductive benefit they can receive from a good environment, the benefits to males from variability are greater than for females.

This effect has many practical implications. It explains why at the extremes of low ability there appear to be many more men than women, such as among those with stutters, autistics, hyperactives, and children in classes for the retarded. On the positive side it helps explain why among the very gifted there are more males than females. An example is the 13 to 1 male advantage among the very mathematically precocious children.

## 11.2 Male sexual coercion and control

### *Mondragon-Ceballos R*<sup>1</sup> **Knaveish males: Rape as a deceitful strategy in human male-male competition**

The following work presents rape as a deceitful strategy in a Prisoner's Dilemma type game. I propose two male strategies: chivalrous, where both males willingly engage in the tour de force that will end in female choice; and knaveish, where one male eludes competition and forces violently the female to copulation. As the outcome of the game is partly determined by a (somewhat) passive observer—the female—winning is not entirely in the hands of contenders, adding an inevitable amount of uncertainty to the struggle. In an iterated Prisoner's Dilemma, the chivalrous strategy yields the greater payoffs, as the defeated male preserves his chances of future struggles for reproductive opportunities. The knaveish strategy being feasible when a male has so poor traits that he will accept exile or even death for as much as a single reproductive chance. On the other hand, the knaveish strategy yields the greatest payoffs in a non-iterated Prisoner's Dilemma, where males seldom interact and do not cohabit with females. Unlike other Game Theory models of behavior, the present one does not views the above mentioned strategies as independent traits, but rather as cognitive strategies that can easily dwell within the same brain. Cultural scenarios at which resource holding power and unattainable media aesthetic stereotypes are praised beyond reason as desirable reproductive traits, and individuality is lost in cities chaos, provide the best habitat for the knaveish strategy to bloom.

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### *Malamuth NM*<sup>2</sup>, *Impett E* **Sexual coercion as a predictor of influence strategies later in life: A longitudinal analysis over a 10-year period**

This study is part of a program of research designed to develop and empirically test an evolutionary-based model of the characteristics of men who use sexually coercive tactics. We hypothesized that men who use sexually coercive tactics in early adulthood would be generally more likely to use various "bullying" and related tactics in intimate relationships later in life. An initial assessment of sexual aggression was taken in early adulthood. Ten years later we measured the use of various tactics in intimate relationships, using both men's reports and those of their wives or girlfriends. Influence tactics were assessed both by scales developed by Buss et al (1987) to assess "tactics of manipulation" and by Howard et al. (1986) to measure "power tactics." As predicted, sexual aggression in early adulthood was predictive of greater use later in life of such tactics as bullying, coercion, and debasement but not in the use of tactics such as bargaining and/or reasoning. Sexual aggression was also found to predict the later use of charm as a tactic of influence. The implications of the data are discussed in the context of a "divergent interests" model of sexual coercers.

### *Novak SA*<sup>3</sup>, *Rodseth LT*<sup>4</sup> **Dads, cads, and patriarchs: Male reproductive strategies and the epidemiology of domestic violence**

Human male reproductive strategies are often classified as either "Dad" or "Cad," depending on the trade-off over the life course between paternal effort and mating effort. Human societies, in turn, are classified by Draper and Harpending (1988) as either "father-present" or "father-absent," with Dad strategies prevailing in father-present societies and Cad strategies in father-absent societies. We argue that this dichotomous classification is inadequate for understanding levels of domestic violence, which are generally high in father-absent societies but extremely variable in father-present societies. In particular, we suggest that the father-present category collapses two distinct male strategies—the "Dad" pattern and what we call a "Patriarch" pattern. Dad strategies involve intimate care giving as a major form of paternal investment while patriarch strategies involve mainly material investment in wife and offspring and much less intimate care giving. An important corollary is that Dad strategies are often compatible with female bonding, in Wrangham's (1980) sense, while Patriarch strategies militate against such bonding.

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As a result, levels of domestic violence against women are negatively correlated with Dad strategies but positively correlated, for quite different reasons, with Patriarch and Cad strategies. Future research will require an ecological model of the distribution of all three strategies in human populations.

*Colarelli SM*<sup>1</sup>, *Morlan S*<sup>2</sup> **Evolved psychological mechanisms and perceptions of sexual harassment severity**

We studied the effects of age, gender, status, and power on perceptions of the severity of behaviors associated with sexual harassment in the workplace. Because of disparities in age-related resources related to intrasexual competition, we expected that the age difference between the male harasser and female target and the age of a person perceiving a sexually-toned interaction would influence the perception of harassment severity. In addition, research on female mate preferences and choice lead us to expect that male status (when independent of power over a woman) would be inversely related to perceptions of sexual harassment severity, while power over a woman would be positively related to perceptions of sexual harassment severity. In a series of two studies, we presented research participants with scenarios of a male engaging in sexually harassing behavior towards a female co-worker. In Study 1, we manipulated the female's age and the severity of harassment behavior; in Study 2, we manipulated male status and power. The results indicated that severity of harassment behavior and male power had the strongest effects on perceptions of harassment severity.

### 11.3 Topics in human sociality

*Behrs JO*<sup>3</sup> **Deceptive functions of symbolic language in human evolution**

Symbolic language is often viewed as the prime achievement of human evolution, the fount of consciousness, and hence, the essence of "basic humanness." Human languages differ from other animals' communications not in being more accurate, but in their (1) ambiguity, (2) lack of universality, and (3) vulnerability to obfuscation and deceit. They enhance communication within in-groups, while similarly blocking it from between groups; that is, they resemble secret codes. Information always is unavoidably being emphasized, excluded, and given "spin." It is as impossible for humans not to deceive as for them

not to communicate, and their communication always carries implications for relational dynamics, affiliation and status. Once symbolic language has evolved, it is useful to consider subsequent cultural evolution as a continuing arms race between deceit and truth seeking in tension – manifest in such seemingly diverse products as influence communications, religion, the arts, logic, science and mathematics. More attention needs to be given to the ubiquitous but often covert deceitful functions of symbolic language. Doing so supports the Machiavellian hypothesis of human evolution, and the related ideas that both shared self-deception and the presence of enemies contribute fundamentally to human sociality and the nature of human experience.

*Ruttenberg A*<sup>4</sup>, *McIntyre M*<sup>5</sup> **Childhood friendships and associations among Ache indians: Effects of rank and kinship**

The social behavior of individuals in gregarious species is expected to be governed by motives that ultimately contribute to reproductive success. Affiliative associations among related individuals may reflect the evolutionary benefits gained through kin selection. Similarly, preferences by individuals to associate with others of high rank may reflect "status striving" or "status maintenance" in groups where high rank is correlated with better fitness (Cheney and Seyfarth 1990). When rank and kinship are highly correlated, we can expect assortative patterns of interaction: high-rankers associate with others of high rank while low-rankers divide their time between unrelated high-rankers and related low-rankers. Cheney and Seyfarth (1990) have summarized a large body of primate literature showing that rank and kinship indeed affect the pattern of social interactions in predictable ways. In several species, individuals of high ranking families spend more time together, groom more often, and reconcile more often after fights occur than do individuals of low ranking families.

In this study, the social behavior of over 50 children in a colony of hunter-gatherer/agriculturalists was observed. Relative ranks were based on parental household food production. This study seeks to determine if rank and kinship impact the pattern of human childhood interactions in ways similar to other species.

*Molnar P*<sup>6</sup>, *Nagy E* **Evolutionary dyads in relations: Inborn sociality and socialized individuality reconsidered**

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During the two decades passed since Meltzoff and Moore (1977) first reporting their finding on neonate imitation of grimaces, Fields and her associates (1983) documented imitation of basic emotions, and shortly after that the term evolutionary dyad was coined by Dugdale to stress the importance of the interaction of newborns and their mothers in fulfilling these potentialities. Using heart rate monitoring during neonate imitation we did find either no change or slight HR increases, taken as evidences of the human imprinting nature of the Meltzoff-Moore phenomenon. At the same series of experiments, we were able to reveal a new capacity of the newborns, namely their willingness to initiate interactions (we name this phenomenon "provocation"). The importance of the above described mutual exchange of facial informations in establishing bonding-attachment-empathy functions, as well as the evolutionary dyad concept's potential relevance in debates on group selection will be discussed.

**Sakura O<sup>1</sup> Sociobiology and evolutionary psychology in South Korea: With comparison to Japan and other Western countries**

Darwinian evolutionary theory was imported to Korea late 19th century, but introduction of sociobiology was not smooth. Actually all of "classical" ethology, sociobiology, anti-sociobiology and evolutionary psychology, are introduced to Korea just during ten years, almost simultaneously: the situation is like scrambled eggs or melange. This might be caused by colonial occupation by Japan (1910–1945) and the following Korean War (1950–1953). But recent growth of behavioral ecology in this country is rapid and productive. Some newer perspectives may be produced from such mangle-mangle. For example a taxonomist managed and directed the translation of EO Wilson's *Sociobiology* into Korean, and he, Dr. Lee, has carried out unique program of combination of conservation biology and sociobiology. I also compare characteristics in the process of reception of sociobiology in South Korea with those observed in the USA, Germany, and Japan. Korea and Japan share many of general cultural traditions, e.g., Confucianism and Buddhism, but the reception processes are totally different. This suggests that political and historical events, not contexts, are important factors for the reception of science theories.

**Peritore P<sup>2</sup> The tragedy of biopolitics: Aristotle's biological naturalist political theory**

Aristotle's biological naturalism, although pre-evolutionary, produces a model of politics easily

incorporated into an evolutionary framework, and full of critical insights. Political organization grows out of the organization of primary production for reproductive success (despotic management of slaves, serfs); extends to patriarchal management of familial dependents, (extended kin, sib, co-tribals, and clients); extends further to relations of reciprocal altruism among citizen elites (with both positive and negative reciprocities); and stops at the boundaries of the city state (defined as a partnership of families and clans), beyond which few duties are owed and raiding, slaving, and war are allowable. This model is familiar from anthropological researches on reciprocal-segmentary societies (foragers).

Political systems (monarchy-tyranny, aristocracy-oligarchy, polity-democracy) share the defects of limited and concentric evolutionary morality, and contain internal dynamics of conflict and breakdown. Alpha males rarely possess the political virtues necessary to manage conflicting roles and rules of allocation.

Evolutionary politics, on this account, is inherently conflictual, contradictory, limited in its altruism, and productive of internal conflict, and external xenophobia and war. Biological naturalism is politically pessimistic, but the anthropological and historical record gives few grounds for optimism.

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# Index

Italic page numbers refer to the program, roman page numbers to abstracts.

Addison TA, *17*, 54  
Aiken NE, *13*, 34  
Allen WE, *13*, 34  
Allen-Arave WK, *20*, 69  
Anderson KG, *12*, 24  
Anderson NK, *14*, 36  
Angleitner A, *16*, 50  
Arad, S, *19*, 65  
Armelagos GJ, *20*, 68  
Atzwanger K, *14*, 38

Bachar KJ, *16*, 52  
Bailey JM, *19*, *22*, 67, 77  
Bailey M, 66, 77  
Baron-Cohen S, *13*, 32  
Barrett HC, *14*, 35  
Bates JE, *19*, 66  
Beahrs JO, *23*, 81  
Benack S, 47  
Beroldi G, *12*, 25  
Berry JW, 44  
Bichakjian BH, *21*, 75  
Bird DW, *21*, 73  
Bird R, *21*, 73  
Blanchard R, *22*, 77  
Bleske AL, *14*, *16*, 39, 40, 50  
Blurton Jones NG, *21*, 72  
Bock J, *22*, 76  
Boehm C, *19*, 64  
Boone J, *22*, 76  
Boone JL, *18*, 61  
Borgerhoff Mulder M, *11*, *14*, 24, 38  
Boster J, *19*, 65  
Boucher J, *19*, 64  
Branscomb A, *17*, 57  
Brase GL, 40  
Brecke PA, *14*, 37  
Bronstad PM, *12*, 27  
Brown WM, *14*, 36, *see NI*  
Bullock H, *18*, 62  
Bullock HL, 40  
Burnham T, *21*, 74  
Buss D, *19*, 63  
Buss DB, *16*, 50  
Buss DM, *16*, *19*, *21*, 50, 63, 71  
Butner J, *20*, 69

Butovskaya M, *17*, 55  
Buunk AP, 42  
Buunk BP, *21*, 72  
  
Campbell A, *19*, 62  
Campbell L, *20*, 41, 70  
Carroll J, *13*, 34  
Cashdan EA, *16*  
Castell-Ruiz IP, *16*, 52  
Castles DL, *20*, 70  
Chisholm JS, *15*, *19*, 48, 67  
Choi J, *12*, 27  
Cianelli S, *12*, 30  
Cintron J, *16*, 50  
Cleveland HH, 50  
Clift EM, 29, 34  
Coall DA, *19*, 67  
Cochran GM, *22*, 78  
Coe K, *13*, 35  
Colarelli SM, *23*, 81  
Cornwell R, 41  
Corral-Verdugo V, *16*, 52  
Cosmides L, *12*, *14*, *19*, 30, 35, 64  
Cox G, 41  
Craig NM, 43  
Cummins DD, *19*, 65  
Curran MA, *20*, 71  
  
Dab-Ecuyer I, 42  
Daly M, *14*, *16*, 38  
Davies MNO, *19*, 64  
Davis JN, *13*, 31  
DeKay WT, *21*, 42, 71  
Del Valle AP, *14*, 40  
Diakonov I, *17*, 55  
Dickins TE, *19*, 64  
Dijkstra P, *21*, 42, 72  
Dissanayake E, *12*, 29  
Dodge KA, *19*, 66  
Domar AD, *13*, 32  
Draper P, *22*, 76  
Drass E, *21*, 42, 71, 72  
Dubrow J, *15*, 48  
Duchaine BC, *12*, 26  
Dugatkin L, *18*, 60  
Duntley JD, *19*, 63  
Dyson-Hudson R, *15*, 48  
  
Eckel C, *16*  
Eckel CC, *21*, 73  
Eller E, *15*, 49

Ellis BJ, *19, 66*  
 Ellison PT, *13, 32*  
 Euler HA, *14, 39, 40*  
  
 Fiddick L, *42*  
 Figueredo AJ, *14, 16, 37, 52*  
 Fisher M, *12, 27*  
 Fletcher GJO, *41*  
 Flynn JP, *13, 32*  
 Fouts DH, *43*  
 Fouts H, *20, 68*  
 Fouts RS, *12, 30, 43*  
 Freizinger M, *13, 32*  
 Frias-Armenta M, *16, 52*  
 Friedman BX, *21, 71*  
 Frohlich C, *12, 28*  
 Fuentes A, *17, 46, 55*  
  
 Galinsky AM, *12, 26*  
 Gangestad SW, *17, 58*  
 Giddon DB, *14, 36*  
 Gil-White F, *see NI*  
 Goldberg R, *43*  
 Goldman-Pach J, *16, 52*  
 Goodman AH, *20, 68*  
 Goodrich D, *46*  
 Goos LM, *16, 51*  
 Grammer K, *18, 61*  
 Grometstein RP, *16*  
 Groothof HAK, *21, 72*  
 Guisinger S, *22, 76*  
 Gurven M, *17, 56*  
  
 Hagen EH, *43*  
 Hames R, *22, 76*  
 Hames RB, *43*  
 Harpending H, *15, 49*  
 Hasegawa T, *12, 14, 25, 36*  
 Haselton MG, *16, 50*  
 Haukioja E, *13, 33*  
 Hawkes K, *16*  
 Haywood M, *12, 28*  
 Heath KM, *22, 79*  
 Henrich J, *16*  
 Hertwig R, *13, 31*  
 Hess N, *17, 54*  
 Hewlett BS, *20, 68*  
 Hill E, *16*  
 Hiraishi K, *14, 36*  
 Hiraiwa-Hasegawa M, *12, 25*  
 Hofferth SL, *12, 25*  
  
 Hoier S, *14, 39, 40*  
 Holcomb HR, *15, 47*  
 Hood JA, *43*  
 Hrdy S, *18*  
 Hume DK, *14*  
 Hunt CB, *14, 37*  
  
 Impett E, *23, 80*  
  
 Janicki MG, *43, see NI*  
 Jankowiak WR, *18, 58*  
 Javed MH, *14, 40*  
 Jensvold ML, *43*  
 Jovic V, *44*  
 Johnston VS, *14, 36*  
 Jones D, *15, 49*  
 Jones JH, *see NI*  
 Jones OD, *19, 63*  
 Josephson SC, *22, 79*  
 Judge DS, *22, 79*  
  
 Kale L, *16, 52*  
 Kameda T, *20, 21, 69, 74*  
 Kaplan H, *12, 24*  
 Kashy DA, *41*  
 Kay CE, *14, 38*  
 Keckler CNW, *20, 69*  
 Keller MC, *12, 25*  
 Kenrick DT, *20, 69*  
 Ketelaar T, *16, 51*  
 King J, *44*  
 Kirkpatrick LA, *18, 59*  
 Kohl JV, *18, 44, 61*  
 Korchmaros JD, *45*  
 Kramer KL, *22, 76*  
 Kugel AK, *see NI*  
 Kukulski P, *45*  
 Kurzban R, *21, 74*  
  
 Lamb M, *20, 68*  
 Lancaster JB, *12, 24*  
 Lauer MT, *43*  
 Laverman TTG, *21, 72*  
 LeBlanc GJ, *14, 21, 39, 40, 42, 71, 72*  
 LeCroy D, *16, 45, 52*  
 Lemmetyinen R, *13, 33*  
 Li N, *20, 69*  
 Lieberman DL, *19, 64*  
 Lim S, *44*  
 Little A, *20, 70*  
 Long WJ, *14, 37*  
 Low BS, *13, 16, 33*

Lummaa V, 13, 33  
 MacDonald KB, 16, 52  
 Mace R, 22, 79  
 MacKewn A, 12, 27  
 Malamuth NM, 23, 80  
 Malone NM, 17, 55  
 Manning JG, 20, 70  
 Manning JT, 13, 32  
 Marlowe F, 28  
 Marlowe FW, 12, 17, 21, 56, 72  
 Martin NG, 19, 67  
 McBride DK, 45  
 McBurney DH, 12, 27, 28  
 McCabe K, 21, 74  
 McClelland E, 18, 62  
 McClenon JM, 18, 60  
 McDade T, 20, 68  
 McDowell R, 46  
 McElreath R, 16  
 McFadyen-Ketchum S, 19, 66  
 McIntyre M, 23, 81  
 McMillan GP, 17, 56  
 McNally JJ, 17, 54  
 McNeill PL, 16, 52  
 Meagher S, 18, 62  
 Mealey L, 46  
 Miall DS, 12, 29  
 Michalski RL, 13, 31  
 Miller E, 22, 79  
 Mills ME, 46  
 Mishra P, 21, 75  
 Molnar P, 23, 81  
 Mondragon-Ceballos R, 23, 80  
 Monnot M, 21, 74  
 Montaldi A, 14, 35  
 Montgomerie R, 14, 18, 37  
 Montgomerie RD, 40, 62  
 Monti-Bloch L, 17, 57  
 Moore C, 14, 36  
 Morlan S, 23, 81  
 Moro J, 12, 27  
 Mysterud I, 13, 33  
 Nagy E, 23, 81  
 Nesse R, 18  
 Nesse RM, 12, 25, 61  
**NI:** New Investigator Competition  
     Brown WM, 17, 53  
     Gil-White F, 17, 55  
     Janicki MG, 17, 53  
     Jones JH, 15, 49  
     Kugel AK, 12, 26  
     Price ME, 18, 59  
 Norberg K, 13, 32  
 Nordahl DK, 14, 37  
 Novak SA, 23, 80  
 O'Connell JF, 22, 78  
 O'Connor LE, 44  
 O'Neill P, 18, 60  
 Olshansky E, 12, 27  
 Oubaid V, 16, 50  
 Palmer CT, 13, 34  
 Park M, 14, 36  
 Parlmer CT, 41  
 Patton JQ, 18, 58  
 Paulhus DL, 13, 31  
**PD:** Post-doctoral Competition  
     Salmon CA, 13, 32  
 Penn D, 13, 17, 18, 33, 34, 38, 57, 58, 61, 62  
 Penton-Voak IS, 20, 70  
 Peritore P, 23, 82  
 Perrett D, 20  
 Perrett DI, 20, 70  
 Petrie M, 15  
 Petrinovich L, 18, 60  
 Pettit GS, 19, 66  
 Pikkola M, 13, 33  
 Poel GA, 21, 72  
 Pope SJ, 15, 48  
 Potts W, 17  
 Potts WK, 18, 58, 62  
 Pound N, 14, 40  
 Price ME, 43, *see NI*  
 Radeke MK, 12, 30  
 Renaud ML, 43, 46  
 Rhine RJ, 21, 75  
 Rice WR, 13, 30  
 Rikowski A, 18, 61  
 Robert M, 42  
 Rodseth LT, 23, 80  
 Rogers AR, 16  
 Rowe DC, 19, 66  
 Ruberto C, 14, 40  
 Ruttan LM, 14, 38  
 Rутtenberg A, 23, 81  
 Sakura O, 23, 82  
 Salmon CA, *see PD*  
 Salter FK, 17, 55

Sanders G, 13, 32  
 Sanderson SK, 15, 48  
 Schmitt DP, 16, 50  
 Schooler LJ, 21, 75  
 Schrier M, 21, 72  
 Schubert JN, 20, 71  
 Schulberg D, 22, 76  
 Schäfer K, 14, 38  
 Sear R, 22, 79  
 Segal NL, 19, 65  
 Seger J, 17, 57  
 Sellen DW, 20, 21, 67, 68, 72  
 Serio Silva JC, 21, 75  
 Shackelford TK, 13, 14, 21, 31, 39, 40, 42, 71, 72  
 Shaikh MA, 14, 40  
 Shannon D, 20, 68  
 Shellberg T, 47  
 Sherman J, 47  
 Shively M, 19, 64  
 Silverman I, 12, 16, 27, 51  
 Simpson JA, 20, 41, 70  
 Singh D, 12, 27, 28, 42  
 Slumming V, 13, 32  
 Smay DB, 20, 68  
 Smirnov A, 17, 55  
 Smith EA, 16, 17, 55, 57, 60  
 Smith V, 21, 74  
 Sosis R, 18, 60  
 Squires AM, 22, 78  
 Steadman LB, 18, 59  
 Stewart M, 20, 70  
 Streeter SA, 12, 28  
 Strungaru C, 20, 71  
 Sugiyama L, 16  
 Sullivan MS, 17, 54  
 Sulloway FJ, 13, 31  
 Surbey MK, 17, 19, 54, 66  
 Swan TB, 47  
  
 Takezawa M, 20, 21, 69, 74  
 Thornhill R, 16, 17, 58  
 Thrall N, 14, 35  
 Ting TF, 15, 49  
 Tooby J, 12, 14, 19, 30, 35, 64  
  
 Udry JR, 16, 53  
  
 Valiente-Ots MC, 16, 52  
 Vaughan LL, 17, 55  
 Villavicencio-Carrillo P, 16, 52  
  
 Wang XT, 12, 16, 26  
  
 Ward D, 21, 72  
 Waters GS, 12, 30, 43  
 Weekes VA, 14, 21, 39, 40, 42, 71  
 Wehr P, 13, 31  
 Weiss A, 44  
 Wetsman A, 12, 28  
 Wheelwright S, 13, 32  
 Wiebe RP, 19, 64  
 Wilson DS, 18, 59, 60  
 Wilson M, 14, 16, 38, 44, 53  
 Wilson RK, 21, 73  
  
 Zala S, 17, 58  
 Zhao Y, 21, 75  
 Zvoch K, 12, 25

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