

Evolutionary approaches to human behavior

The “New Synthesis” and Sociobiology

Genes as the units of selection: “**Replicators**” and “**Vehicles**” (organisms)

Evolution of behavior from **the genes’ “point-of-view”**

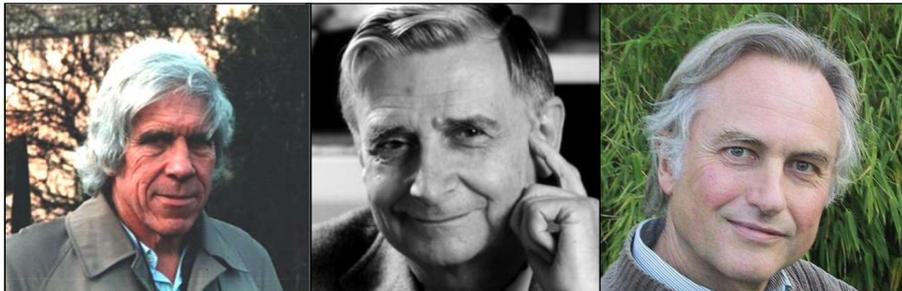
Individual **Fitness** and “**Inclusive Fitness**”

Kinship : “**Coefficient of relationship**” (S. Wright) and the “**Hamilton’s Rule**”

WD Hamilton: “*The Genetical Evolution of Social Behaviour*”(1964)

EO Wilson: “*Sociobiology*” (1975) [Wilson & Wilson 2007: Group Selection?]

R Dawkins: “*The Selfish Gene*” (1976)



Altruism and the Hamilton's Rule:

$$B \times r > C$$

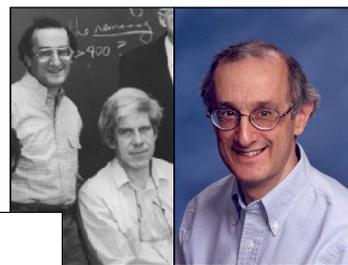
r = the genetic relatedness of the recipient to the actor
 B = additional reproductive *benefit* gained by the recipient
 C = reproductive *cost* to the actor

Direct Fitness
 (Direct descendants)
 +
 Indirect Fitness
 (relatives that survive thanks to the subject's help) $\times r$ } Inclusive Fitness

W.D. Hamilton & Robert Axelrod

Altruism and cooperation between **unrelated** individuals:

The "Prisoners' dilemma"



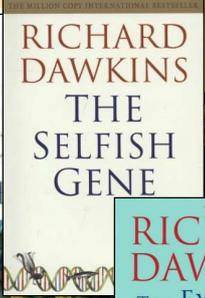
		Player B	
		<i>Cooperate</i>	<i>Defect</i>
Player A	<i>Cooperate</i>	A→3, B→3 Reward for mutual cooperation	A→0, B→5 Sucker's payoff and temptation to defect
	<i>Defect</i>	A→5, B→0 Temptation to defect and sucker's payoff	A→1, B→1 Punishment for mutual defection

Axelrod & Hamilton (1981):
The Evolution of Cooperation

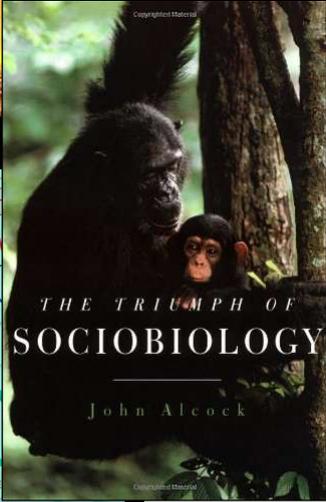
Sociobiology



E.O. Wilson (1975)



R. Dawkins (1976)



J. Alcock (2003)

Evolutionary Psychology

Cosmides, L. & Tooby, J.
(*The "Santa Barbara Church"*)

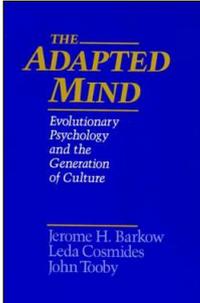
Evolution of human behavior:
("nature x nurture"...)

The "Environment of Evolutionary Adaptation" (EAA)

Modularity: the metaphor of the "Swiss army knife"

Cognitive adaptations for social exchange
 Detection of social rules' violators
 Perception of ingroup/outgroup cues (race etc)

Modularity and "Evoked Culture"

Barkow, Cosmides & Tooby (1992)

Evolutionary Psychology X
the “Standard Social Science Model” (SSSM)

Cognitive predispositions (adaptations)

X

“Tábula rasa” (“the blank slate”)

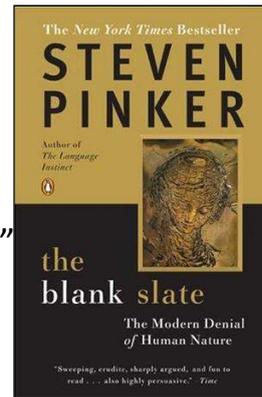
Human “Universals” X “Cultural relativism”

“Innate” cognitive biases

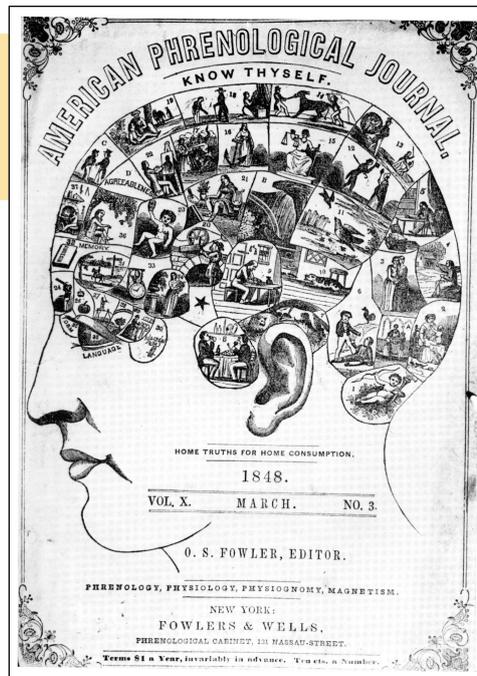
Constraints on learning

“Domain Specificity”:

“Modularity” X “generic” cognitive systems



Cognitive
modularity



Cognitive modularity

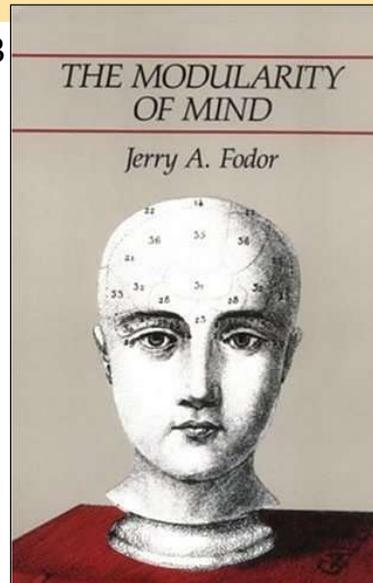
Jerry Fodor, 1983

Brain modules:

- Domain Specificity
- ENCAPSULATION*
- Mandatory operation (automaticity)
- Inaccessibility to consciousness
- Speed
- Shallow outputs
- Fixed neural localization
- & typical disruption patterns

* x "top-down"/"horizontal" control...

Fodor: *Peripheral* Modules (ex: sensory input) + non-modular cortical processing



Evolutionary Psychology: Modularity

Functional specialization and
Massive modularity

Pinker, S.: *“modules should be defined by the specific operations they perform on the information they receive, rather than by a list of necessary and sufficient features”*

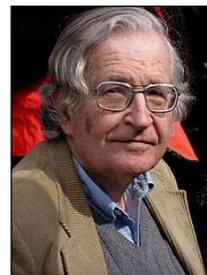
Exs: Language

- Broca's & Wernicke's areas
- FOXP2 gene

Face recognition
Motion perception



Pinker, S



Chomsky, N.

D. Sperber: “Proper” and “Actual” domains of cognitive modules

An **evolved cognitive module** is an **adaptation** to a range of phenomena that presented problems or opportunities in the ancestral environment of the species. Its function is to process a given type of stimuli or inputs. These inputs constitute the **proper domain** of the module.

All inputs meeting the input conditions of a module constitute its **actual domain**. These inputs conditions can never be perfectly adequate. Some items belonging to the proper domain of the module might fail to satisfy them – a snake can look like a piece of wood. Some items not belonging to the proper domain of a module might nevertheless satisfy its input conditions – a piece of wood can look like a snake.

There will be **false negatives** – that is, items belonging to the proper domain but not to the actual domain; and **false positives** – items belonging to the actual but not to the proper domain (Sperber & Hirshfeld 2004)

“Proper” and “Actual” domains of cognitive modules: false positives/negatives

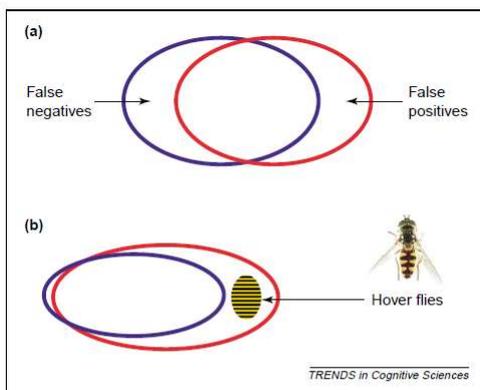


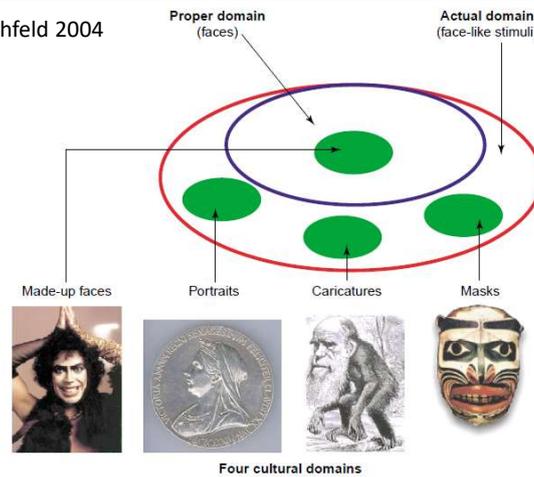
Figure 1. (a) The proper domain (blue) and the actual domain (red) of a cognitive module. In assigning items to a domain, it is likely that there will be some false negatives and some false positives. (b) The proper domain (blue) and the actual domain (red) of a wasp-detector module. An area of the actual domain (shown in black and yellow stripes) is occupied by hover flies mimicking wasps (false positives).

Sperber & Hirshfeld 2004



“Proper” and “Actual” domains of cognitive modules: implications for culture

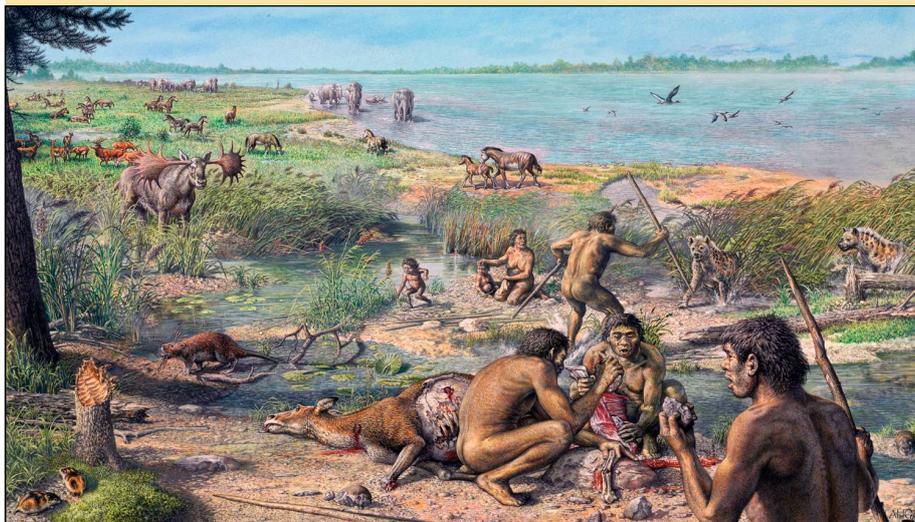
Sperber & Hirshfeld 2004



Is art an adaptation or a by-product of modules' actual domains (see next lecture)?

Evolutionary Psychology

The “Environment of Evolutionary Adaptiveness” (EEA)



~ Pleistocene (~2.6 Mya [early *Homo*] to 11.7 kya)

Human Ethology & Evolutionary Psychology

Human trans-cultural “Universals” as adaptations

- Perception: universals x Cultural biases (ex: colors)
- Language
- Basic emotions & Facial expressions of emotion
- “Us X Them”: Social bonding mechanisms
- Kinship structures and Sexual taboos
- Rites of passage
- Mythologies and Religion, immortality beliefs and Mortuary rites
- Moral reasoning (Haidt)

Darwin and Human Ethology

Evolutionary continuity
the expression of emotions

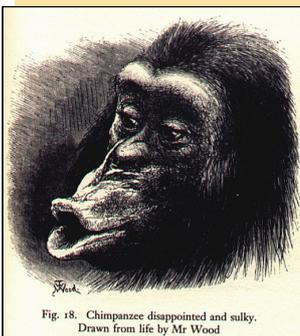
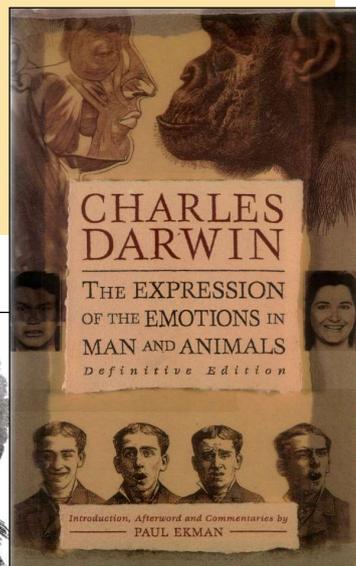


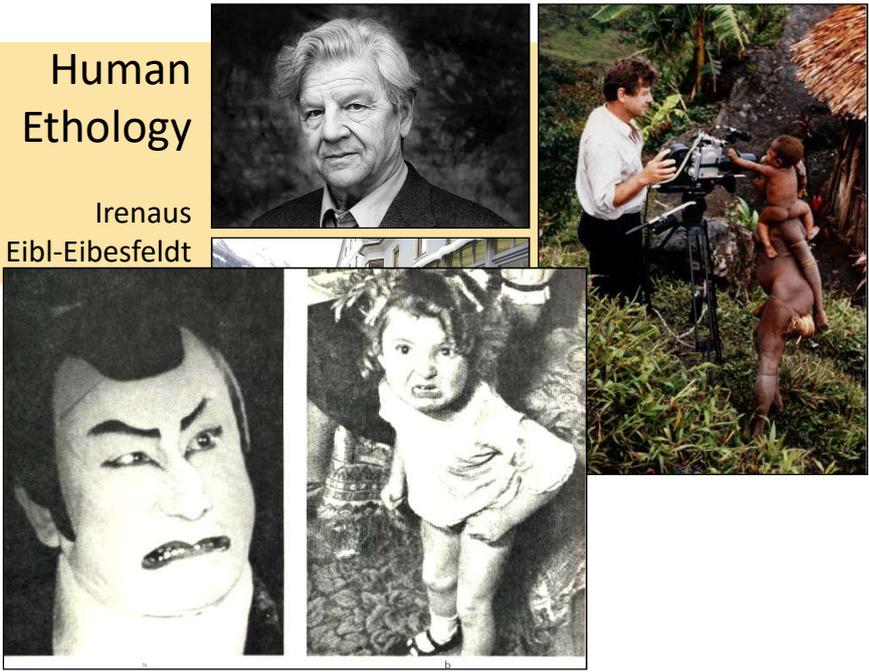
Fig. 18. Chimpanzee disappointed and sulky.
Drawn from life by Mr Wood



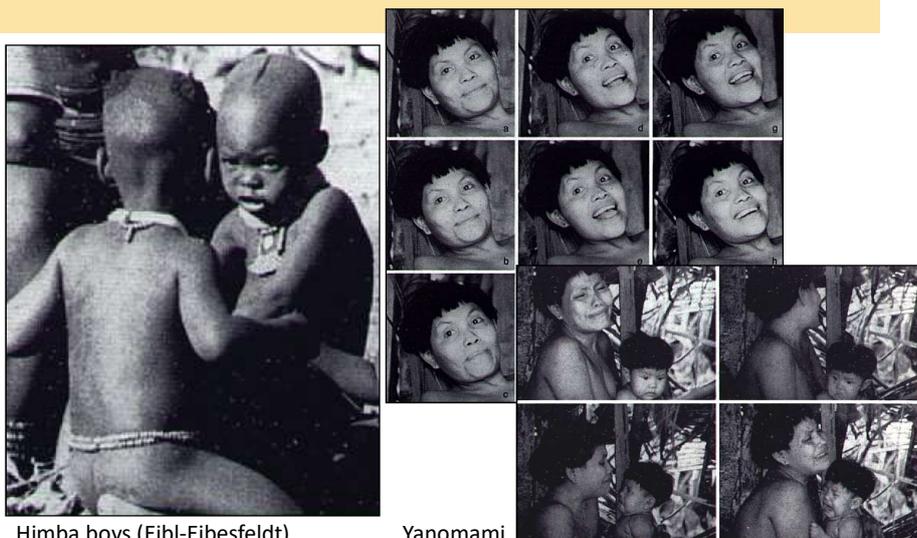
C. Darwin: *The Expression of the Emotions in Man and Animals* (1872)

Human Ethology

Irenaus Eibl-Eibesfeldt



Facial expression and Nonverbal communication



Himba boys (Eibl-Eibesfeldt)

Yanomami

Nonverbal communication: microexpressions



Hass / Eibl-Eibesfeldt

“Eyebrow flash” (contact)

a - French; b/c - Yanomami; d - !Kung (Kalahari); e - Huli (Papua-New Guinea); f - Balinese



Yanomami

European

“Tongue-flicking”
(in flirting)

“Basic” universal emotions?

Caroll Izard

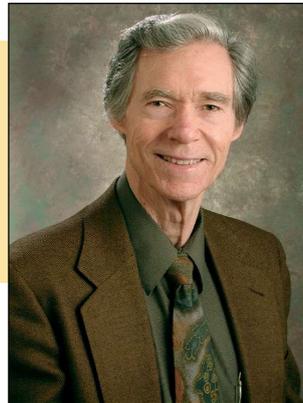
Izard CE (1971). *The face of emotion*. New York: Appleton-Century-Crofts.

X

“Cultural Relativism”

Ex: Margareth Mead

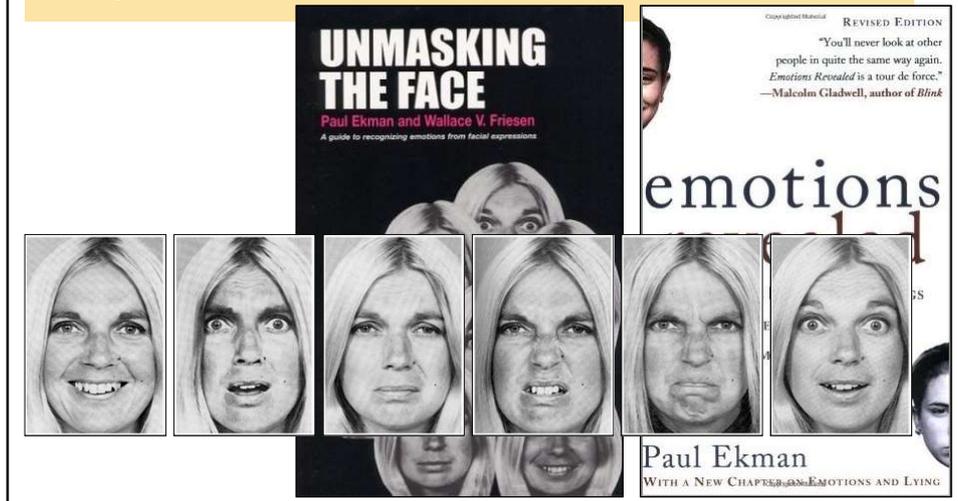
Mead, M. (1975). Review of Darwin and facial expression. *Journal of Communication* 25, 209-213.



1. Happiness
2. Surprise
3. Sadness
4. Anger
5. Disgust
6. Contempt
7. Fear

Izard & Malatesta 1987

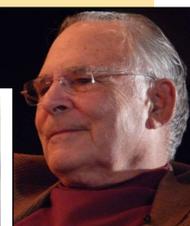
Paul Ekman & Wallace Friesen: “Universals” and cultural differences in the expression of emotions



“Basic” universal emotions?

Paul Ekman:
Transcultural
studies

Ekman P & Friesen W.V
(1971). Constants across
cultures in the face and
emotion. *J. of Personality
and Social Psychology*, 17,
124-129.



Happiness
Anger
Disgust
Sadness

OK

Fear +
Surprise...

NOT OK...

New Guinea

Evolutionary Psychology: Gender and sexuality

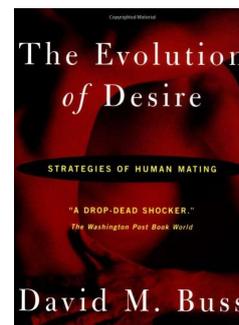
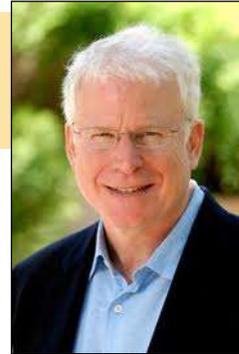
David Buss:

Mate choice
Gender differences
in reproductive strategies
Short x long-term strategies
Jealousy and gender

Buss, D.M. (1995). *The Evolution Of Desire: Strategies Of Human Mating*.

Buss, D. M. (2005). *The handbook of evolutionary psychology*

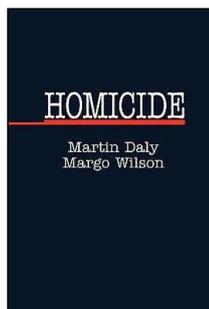
Kenrick, D. et al (1995). *Age preferences and mate choice among homosexuals and heterosexuals*.



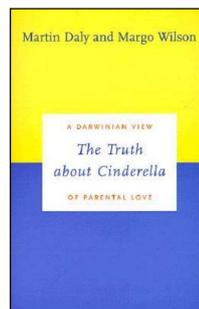
Evolutionary Psychology: Violence and gender

Daly, M. & Wilson, M.

The evolution of aggression:
Evolutionary origins of male aggression
Parental love and child abuse



Homicide (1988)



The truth about Cinderella: A Darwinian view of parental love (1998)

Cognitive adaptations for social exchange

PREDISPOSITIONS of the human infant for social interaction:

Faces/ voice discrimination (“motherese”)/ human movements

Early “dialog” Interaction (Papousek & Papousek).

Newborn: “imitation” of facial expressions (Meltzoff & Moore)



FIGURE 2.38. The model and its imitation in a 2- to 3-week old infant. From A.N. Meltzoff and M.K. Moore (1977).

(BUT see criticisms...)

Detection of social rules' violators

Cosmides & Tooby (1992): the “Wason Task”

Behind a VOWEL there is ALWAYS an EVEN number (?)

~75%
WRONG

~75%
CORRECT

MINORS should NOT DRINK ALCOHOL. Is the NORM being followed?

Evolutionary Psychology

Modularity: specialized (x “general purpose”) cognitive mechanisms

Historicity: EEA

Adaptive specificity

Environmental novelty: post-Paleolithic environmental changes

1. Valid adaptive (Darwinian) explanations of behavior must refer to **genetically evolved psychological mechanisms linked to specific features of the EEA**.
2. “Culture,” “learning,” “rational choice,” and “fitness maximizing” are **insufficiently modular** (without further specification) to be realistic cognitive or behavioral mechanisms.
3. Contemporary human behavior often involves responses to **evolutionarily novel conditions** using modular cognitive mechanisms adapted to the EEA, and hence **some of these responses may be maladaptive**.
4. Measuring fitness outcomes (or correlates) of contemporary behavioral patterns is irrelevant and misleading.

Research topics: Mating behavior, violence (male), conflicts over parental investment

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

Evolutionary Psychology and culture

(Cosmides & Tooby 1989)

Culture is the ongoing product of the evolved psyches of individual humans living in groups. Progress in our understanding of culture as a phenomenon depends on progress in uncovering the nature of the evolved mechanisms that comprise the human psyche.

The human psyche appears to consist of a large number of mechanisms, many or most of which are special purpose and domain-specific. **The output of these mechanisms taken together constitutes the “private culture” of each individual, and the interactions of these private cultures lead to the cross-individual patterns of similarity that have led anthropologists to think typologically of social groups as having “a” culture.**

The construction of a scientific theory of culture requires as its building blocks specific models of these psychological mechanisms, and so **evolutionary anthropology depends on the forging of an evolutionary psychology.** The most productive application of evolutionary biology is, therefore, in **the study of the psychological mechanisms that generate and shape culture**, rather than in the attempt to impose on cultural change too close a parallel to population genetics and organic evolution.

Evolutionary Psychology and culture

(Cosmides & Tooby 1989)

1. Evolution could not have produced a psyche that functioned as the passive receptacle of information transmitted from the social group, because (among other reasons) many members of the social group have antagonistic interests.
2. The individual is primary: Patterns of shared behavior and interindividual influence (i.e., “culture”), while they clearly exist, themselves require explanation in individual-level and evolutionary terms. **Group level cultural and social phenomena, while they have some emergent properties, are the consequence of the operation of evolved psychological (and morphological) mechanisms functioning in individuals who evolved to live in groups.** The group and properties of the group are themselves evolved consequences, rather than prior phenomena that require no explanation.
3. In contrast to “the sociological method,” specific characterization of the mechanisms underlying culture cannot be ignored or neglected. **Culture and cultural dynamics cannot be understood apart from the evolved psychological mechanisms that create, shape, and maintain culture.**

Evolutionary Psychology and culture

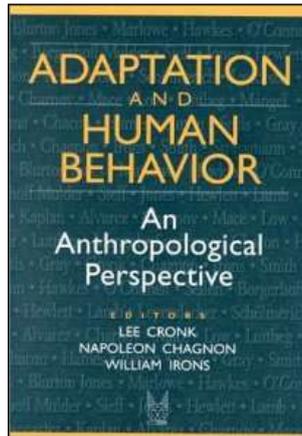
(Cosmides & Tooby 1989)

NEGLECTING EVOLUTIONARY PSYCHOLOGY IN FAVOR OF TRADITIONAL ANTHROPOLOGICAL APPROACHES TO CULTURE RESULTS IN **OVERDRAWN PARALLELS BETWEEN POPULATION GENETICS AND CULTURAL DYNAMICS**

THE **EVOLVED CONSTRAINTS ON CULTURE** ARE THE **DESIGN FEATURES OF HUMAN INNATE PSYCHOLOGICAL MECHANISMS**

“**EVOKED CULTURE**” : behavioral patterns triggered by environmental conditions

Human Behavioral Ecology (a.k.a Evolutionary Anthropology)



Cronk, Chagnon & Irons (2000)



L. Cronk



N. Chagnon



M. Bergerhoff Mulder



E. A. Smith



W. Irons

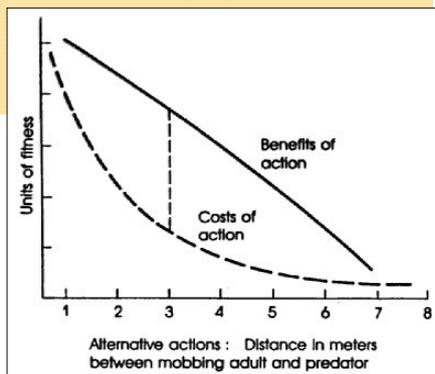


K. Hill

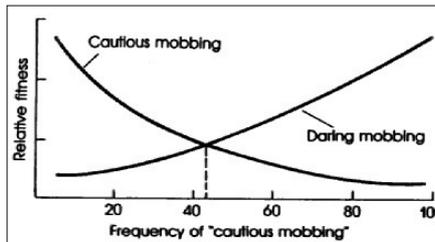
Behavioral Ecology Optimal Foraging theory

Maximization:
BENEFITS > COSTS
Ex: "mobbing"

Optimization Theory



Game theory



Human Behavioral Ecology (a.k.a. Evolutionary Anthropology)

Ecological selectionism: “What are the ecological forces that select for behavior X?”

Piecemeal approach to complex phenomenon, general analytical models & testable hypotheses.

Conditional strategies or “decision rules”: behavioral variation as adaptive responses to environmental variation.

The “**Phenotypic gambit**”: a “black box” approach to the actual [psychological etc] mechanisms involved.

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

The “Phenotypic Gambit”

HBE: focus on **explaining behavioral variation as adaptive responses to environmental variation**; this adaptive variation (facultative behavior, phenotypic response) is governed by evolved mechanisms that instantiate the relevant conditional strategy or decision rule.

A “black-box” approach to the actual mechanisms involved: the **phenotypic gambit**: taking a **calculated risk to ignore the (generally unknown) details of inheritance (genetic or cultural), cognitive mechanisms, and phylogenetic history that may pertain to a given decision rule and behavioral domain** in hopes that these don’t matter to the end result.

The **genetic, phylogenetic, and cognitive constraints on phenotypic adaptation are minimal**, and hence as a first approximation can be ignored in constructing models and generating or testing hypotheses.

EX.: Social Exchange

EP: **Mechanisms** underlying social exchange (experimental) X

HBE: Quantifying the behavioral occurrence, socioecological context, and **fitness-correlated payoffs** from food exchange in extant hunter-gatherer and horticultural populations.

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

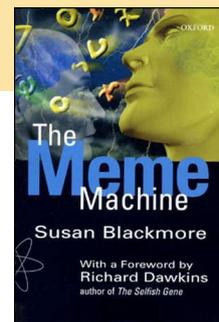
Human Behavioral Ecology (a.k.a. Evolutionary Anthropology)

1. Behavioral diversity is largely a result of diversity in the contemporary socioecological environment (rather than in contemporary variation in genes or cultural inheritance, or in past environments).
2. Adaptive relationships between behavior and environment may arise from many different mechanisms; hence HBE is generally agnostic about mechanisms (including the question of cognitive modularity).
3. Since humans are capable of rapid adaptive shifts in phenotype, they are likely to be well-adapted to most features of contemporary environments, and to exhibit relatively little adaptive lag.

Research: subsistence and resource exchange (foraging societies), parental investment (birth spacing, gender differences in parenting), reproductive strategies (e.g., polygyny vs. monogamy vs. polyandry)

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

[Darwinian] cultural evolution



Cultural evolution as a Darwinian process?

Memetics

“Memes” as cultural replicants / brains as “vehicles”

R. Dawkins (*The Selfish Gene*, 1976)

Viruses of the Mind, 1991

D. Dennett (*Consciousness explained*, 1991)

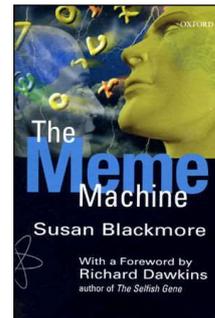
R. Brodie: *Virus of the Mind: The New Science of the Meme*, 1996

A. Lynch: *Thought Contagion: How Belief Spreads Through Society*, 1996

S. Blackmore: *The Meme Machine*, 1999

Journal of Memetics (1997-2005)

<http://cfpm.org/jom-emit/>



Memetics

Definition problems: what is a “meme”?

The Gene/Meme analogy:

Memes as ideas – (“jumping from brain to brain”)

OR

Memes as Ideas + Behavioral/cultural expressions

Cloak (1975) “i-culture” (information in brains)

X “m-culture” (external expressions)

Genotypes X phenotypes...?

Other Darwinian approaches to cultural evolution

The Meme-Genie is a “Neodarwinian” metaphor...

All it takes for a process to be “Darwinian” is

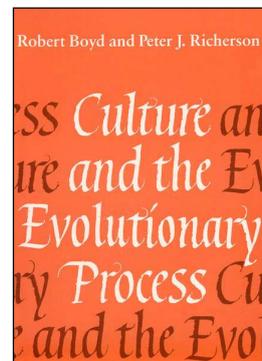
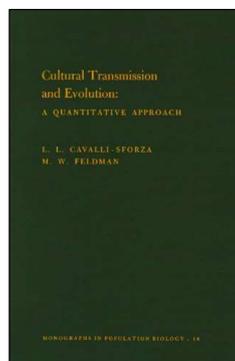
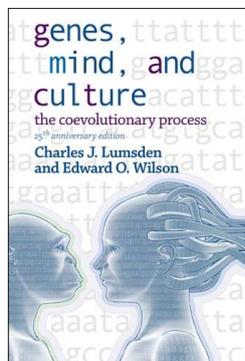
- (Inheritable) Variation and
- Selection (differential fitness)

[Lecture 7: cultural microevolution in the lab]

[Lecture 10: gene-culture coevolution]

Dual Inheritance

Gene-Culture Coevolution



Dual Inheritance Theory (preview)

Cultural inheritance: socially [nongenetically] acquired information

Cultural information: affected by multiple forces (natural selection, decision making, transmitter influence)

Mathematical modeling (~ evolutionary population genetics)

Codetermination of human behavior: genetic, cultural and [nonsocial] ecological forces.

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

Dual Inheritance Theory (preview)

1. Since culture exhibits the three characteristics required for evolution by natural selection (**variation, heritability, fitness effects**), **cultural evolution can be analyzed using [neo-]Darwinian methods.**

2. Since **cultural inheritance differs from genetic inheritance** in key ways (e.g., non-parental transmission, multiple transmission events over a lifetime), **the evolutionary dynamics of culture will also differ in important but analytically understandable ways.**

3. **Genetically nonadaptive cultural evolution is possible**, and it is more likely when the differences just referred to are most marked (e.g., modern bureaucratic societies and other hierarchical social/enculturation structures).

Research: mathematical modeling of various possible patterns of cultural evolution or of gene-culture coevolution

Smith EA (2000) *Three Styles in the Evolutionary Analysis of Human Behavior*

Niche Construction and Gene-Culture Coevolution

(Lumsden & Wilson 1981, Cavalli-Sforza & Feldman 1981, Boyd & Richerson 1985)

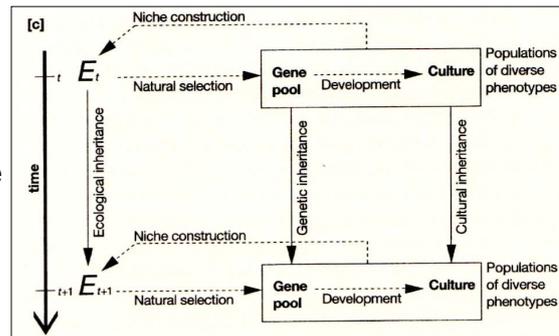
Genetic inheritance

+

Ecological inheritance

+

Cultural inheritance



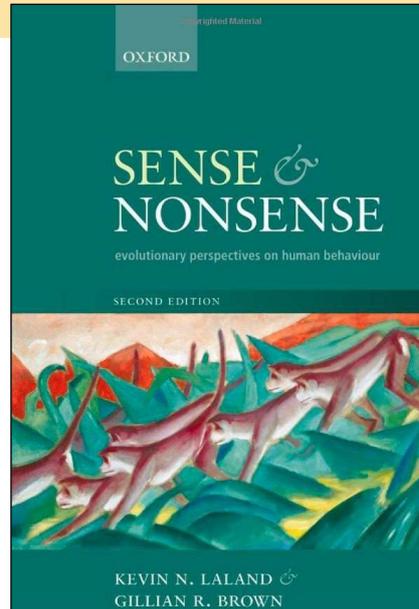
Odling-Smee, Laland & Feldman 2003

Comparing approaches

Conflicts & complementarities

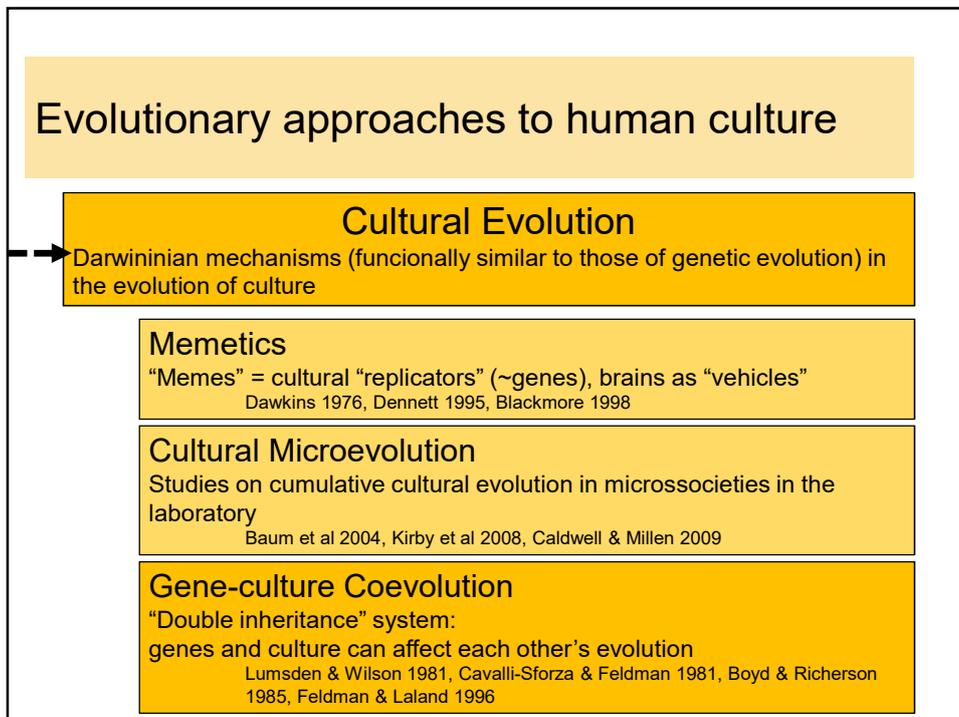
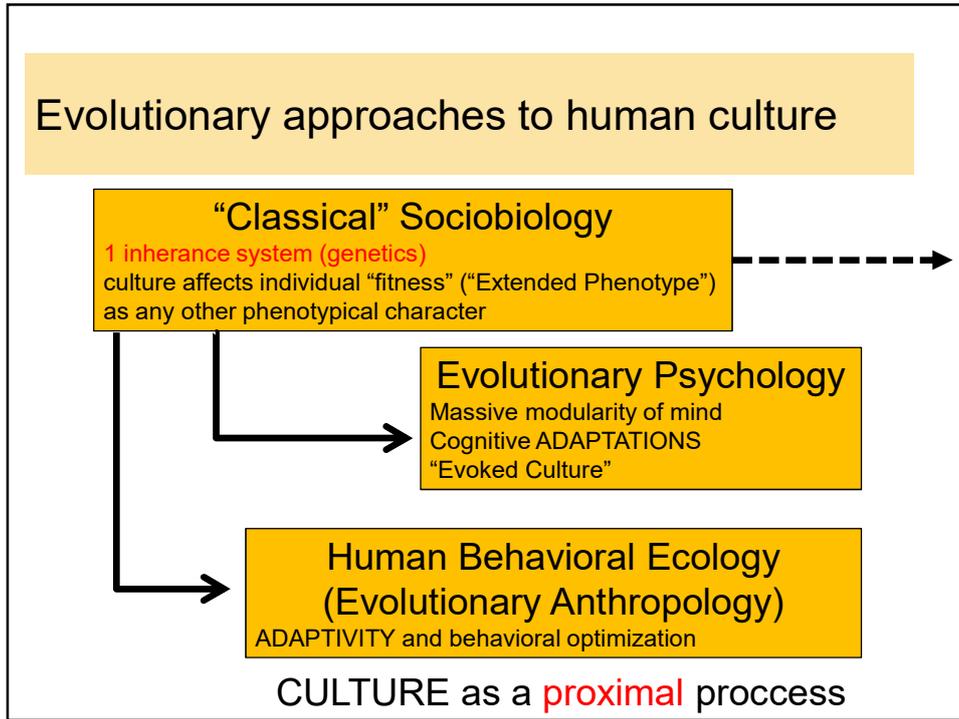
- **Different “explanation objects”**
(~ origin disciplines)
- **Different methodologies** of data collection and hypotheses testing
(idem...)
- **Different scales of evolutionary time** (EP > DIT > HBE)
- **Different “constraints”**
EP: genetic / psychological
HBE: ecological
DIT: learning (independent trial-and-error X social learning)
- Cultural evolution?

Comparing approaches



Laland & Brown 2011

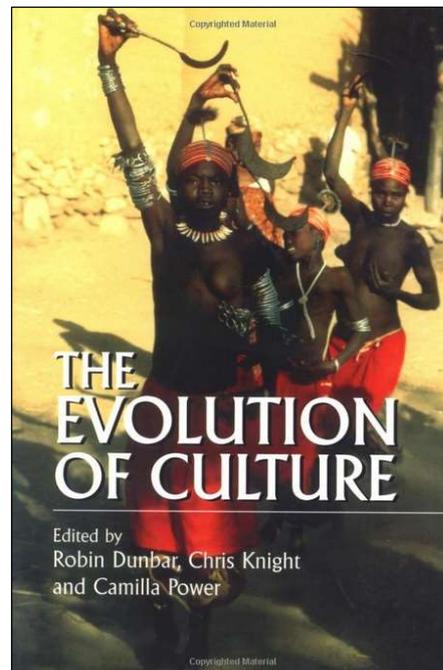
Culture in the perspective of
evolutionary approaches to psychology
(summary)



Adaptation X “Adaptiveness”

		Is the behaviour adaptive? <i>Adaptive behaviour is functional behaviour that increments reproductive success</i>	
		Yes	No
Is the behaviour an adaptation? <i>An adaptation is a character favoured by natural selection for its effectiveness in a particular role</i>	Yes	Current adaptation A current adaptation is an adaptation that has remained adaptive because of continuity in the selective environment	Past adaptation A past adaptation is an adaptation that is no longer adaptive because of a change in the selective environment
	No	Exaptation An exaptation is a character that now enhances fitness but was not built by natural selection for its current role	Dysfunctional by product A dysfunctional by-product is a character that neither enhances fitness nor was built by natural selection

Laland & Brown 2002



Next:
Is culture an adaptation?