

Lectures on: Evolution and Psychology

Aims: *These two lectures aim to refresh students' knowledge of the theory of evolution, or to introduce them to it, and to introduce them to aspects of psychology which have been influenced by evolutionary approaches.*

Objectives: *By the end of the lectures the students should:*

- *know the general outlines of the theory of evolution and the time course of human evolution*
- *be able to answer correctly a majority of the questions on the self-assessment test included in the handout*
- *understand some of the key differences between nativist and empiricist theories in psychology*
- *be aware of the sections of the course text (Gleitman et al., 1999/2004) where evolutionary approaches are applied to perceptual, cognitive, emotional and social aspects of psychology.*

Essay Question: From **TOPIC 6** in the Seminar topics List —

“Does the theory of evolution have any relevance for psychological topics?”

Basic Reading

Gleitman et al., (2004) *Psychology* 6th edition, or Gleitman et al., (1999) *Psychology* 5th edition, or Gleitman, (1995) *Psychology* 4th edition.

<i>Page reference in Gleitman et al 2004</i>	<i>Page reference in Gleitman et al 1999</i>	<i>Page reference in Gleitman 1995</i>	<i>Textbook Heading</i>
see 416-7	406-9	380-83	“Natural Selection and Survival”
5-6	3-4	3-4	“Displays”
152-4	152-4	141-2	“Differences in what different species learn”
197-201	192-7	175-180	“Evolution and sensory equipment”
338-342	373-4	350-1	“The growth of language in the child”
353-357	390-4	367-375	“The critical period hypothesis & Language in non-humans”
416-417	405-37	379-413	“The biological roots/basis of social behaviour”
451-458	476-81	443-448	Emotions and facial expression
438-440	494	455-6	“Reciprocal altruism”/“The roots of reciprocity”
478-484	552-7	511-6	“What is the cognitive starting point?”
506-510	576-9	534-7	“The roots of attachment.”
632-634	747-50	702-5	“The sociocultural perspective”

Optional Further Reading (Alternatives)

- Dawkins, R. (1995) *River out of Eden*. Weidenfeld and Nicholson: London, Bk library class mark= 575 DAW
- Johanson, Donald C., and Edgar, Blake (2001) *From Lucy to Language*. London: Cassell paperbacks. 2 copies in Main Birkbeck Library, classmark=599.938 JOH
- Manning, A. & Dawkins, M.S. (1992) *An Introduction to Animal Behaviour*. Cambridge University Press: Cambridge. Birkbeck library Class mark=591.5 MAN
- Pinker, S. (1994) *The Language Instinct*. Penguin Books: London. Chapter 10, “Language Organs and Grammar Genes” (Birkbeck class mark=400 PIN) OR browse —
- Pinker, S. (2003) *The Blank Slate: the modern denial of human nature*. Penguin Books: London. Birkbeck library classmark 155.2 PIN (2 copies)
- Richards, G. (1987) *Human Evolution*. Routledge: London. (Bk Lib GYW, N [Ric])
- Walker, S.F. (1985) *Animal Thought*. Routledge & Kegan Paul: London. Chapter 2, “Darwinian Continuity.” (<http://tinyurl.com/y51qeh> in the School intranet)

NOTES ON TOPICS TO BE COVERED

1. The theory of evolution

The Darwinian theory of evolution by natural selection is covered on page 406-9 of Gleitman (1999) or page 416 of Gleitman et al. (2004). A key feature is that there are inherited differences between individuals. From Darwin onwards, it has usually been assumed that inherited differences will apply to instinctual behaviours as well as bodily structures.

2. What do Darwinians say about psychological topics?

Darwinians therefore typically emphasise innate or “built-in” factors as influences on psychological capacities or behaviour patterns. They emphasise “nature” instead of “nurture” and therefore tend to be “nativists” rather than “empiricists”.

3. Schools of thought influenced by the Darwinian approach.

“**Ethology**” has been defined as the scientific study of the function and evolution of patterns of animal behaviour. This area of study is associated with Niko Tinbergen (1907-1988) and Konrad Lorenz (1903-1989) who both won the Nobel prize for their work in 1973 (See Gleitman et al., 1999, p 408). They suggested that many aspect of behaviour of animal species in their natural environments could be explained by “**INNATE RELEASING MECHANISMS**”, by which genetically pre-programmed *RELEASING STIMULI* could elicit inherited *FIXED ACTION PATTERNS* of instinctive behaviour. The releasing stimuli are often very imprecise, and a **SUPERNORMAL STIMULUS** is an artificial stimulus which is more effective at releasing instinctive behaviour than any natural stimulus.

There are many examples, especially in the behaviour of new-born birds, where evidence for such mechanisms is strong. It was always more controversial to apply similar concepts to aspects of human behaviour such as emotional expression. (see “Ethology and Human Nature”, Gleitman et al., 1999 p. 437; Lorenz, 1967; Morris, 1967).

“**Sociobiology**” was a term coined by E.O. Wilson in 1975 to describe a branch of biology which focuses on the evolutionary basis of animal social behaviours. It deals more with strategies of social behaviour rather than the individual lock-and-key mechanisms studied by ethologists, but there is no firm boundary between ethology and sociobiology. As for ethology, there has been strong disagreement with the idea that principles derived from animal behaviour can be applied to the human case, in “Human Sociobiology” (see “Mating patterns in humans”, Gleitman et al., 1999 p. 424).

“**Evolutionary Psychology**”. This is a more recent term, which has come into use in the 1990’s but is not referred to explicitly in Gleitman et al. textbooks. There is some overlap with ethology and sociobiology, but the emphasis in evolutionary psychology is on the special effects of human evolution on human psychology rather than on generalizing from animals to humans. A very strong case can be made that the human species is genetically pre-programmed to use *language* and “Evolutionary psychology takes many of the lessons of human language and applies them to the rest of the psyche (Pinker, 1994; p. 410). The emphasis on language and reasoning means that the interaction between innate and cultural factors can in principle be given due weight. (Tomasello et al; 1993). The two names most often associated with evolutionary psychology are Leda Cosmides and John Tooby (e.g. Duchaine et al., 2001; Stone et al., 2002 — See Gleitman et al., 2004 p. 440 or Gleitman et al., 1999, p. 494).

4. Which areas of psychology have or been or could be influenced by evolutionary ideas?

Most areas of psychology have been influenced to some extent by evolutionary ideas at one time or another in the last 150 years. Clearly the area most influenced by evolutionary theories has been animal psychology. During the last 20 years it has been cognitive psychologists interested in perception and language who have been most likely to point to innate mechanisms governing human cognition (e.g. Fodor, 1983) whereas social psychologists have not generally appealed to innate mechanism but rather to social influences and social constructions (e.g. Harre, 1986)

One can make rough distinctions between the areas of human psychology below:

a) **Perceptual systems** (*colour vision, object perception, face recognition*)

Few would deny that “The sensory equipment of any species is an adaptation to the environment in which it lives” (see Gleitman et al., 1999, p. 192/2004; 197-201). The same goes for motor systems — walking upright, and using an opposable thumb, and consequent capacities for eye-hand co-ordination, are special human characteristics which can be related to those of our primate cousins.

b) **Cognitive systems** (*object perception, early language, grammar*)

Apart from the sensory apparatus, there is evidence that the human brain comes already equipped to interpret sensory information in standard ways — “Do humans come equipped with some built-in notion of space and objects? Some experiments with very young infants suggest that they do.” (Gleitman et al., 1999, p. 552/2004, p. 478; “What is the cognitive starting point?”).

There is a strong consensus among psycholinguists that human infants make built-in assumptions about word use and syntax (Gleitman et al., 1999, pp. 379-380: ‘Perceptual and conceptual biases in child learners’), and that “the young child is neurologically ‘programmed’ to learn language.” (Gleitman et al., 1999; pp. 381-382/ Gleitman et al., 2004; p. 338).

c) **Emotional systems** (*smiling, other emotional expressions, anger, jealousy, love, humour*)

Facial expression of emotions change relatively little from culture to culture and Gleitman takes the sociobiological view that the built-in features of human emotional expression serve the same kind of communicative functions as *displays* in non-human animals. (1999, p. 476-81/ 2004. pp. 451-8)

d) **Social systems** (*co-operation, competitiveness, conformity, mate selection, parental care*)

Sociobiologists are inclined to explain co-operation in human groups as based on kin-selection, or on reciprocal altruism, which are both consistent with the “selfish gene” idea. Critics counter that while the capacity to have a culture may require a uniquely evolved human genetic makeup, social behaviour within a particular culture can only be understood in terms of cultural, rather than genetic, rules. (Gleitman et al., 1999, pp. 435-6/ 2004; p. 458).

A slightly more abstract idea about the evolution of human capacities is that human intelligence evolved as an adaptation to cope with the complexities of social exchange rules in any particular culture. (Cosmides, 1989; Gleitman et al., 1999; p. 494/ 2004; p. 489).

It is important to bear in mind that there is no moral obligation to follow such biologically based pre-dispositions as may exist. Gleitman et al. (1999, p.437; see also p. 426) refer to a remark made to the character played by Humphrey Bogart in the film *The African Queen* — “Nature, Mr. Allnutt, is what we were put on this earth to rise above!”.

Many, such as Donald (1993), and critics of evolutionary psychology argue that the human capacity for *invention* in a social context changes everything — even the biological role of memory, because literacy means that the brain is “externally programmable”, and that the internet and computer-based information technology constitute another new stage of cognitive and social change which is outside strictly Darwinian and genetic evolution.

Conclusion: Darwinian evolution has shaped many aspects of human cognition, starting with the capacities of our perceptual systems, and arguably including higher-order aspects of cognitive and emotional biases. But biologically based predispositions do little to diminish the profound role of cultural and historical influences on uniquely human intellectual achievement and social diversity.

Lecturer's References (Not for further reading)

- Alemseged, Z., Spoor, F., Kimbel, W. H., Bobe, R., Geraads, D., Reed, D., et al. (2006). A juvenile early hominin skeleton from Dikika, Ethiopia. *Nature*, 443(7109), 296-301.
- Archer, J. (2001) Evolving theories of behaviour. *The Psychologist*, 14(8), 414-418 (available free at <http://tinyurl.com/y6qs9e>).
- Bradshaw, J.L. (1997) *Human Evolution: A Neuropsychological Perspective*. Hove: Psychology Press.
- Buss, D.M. (1991) Evolutionary personality psychology. *Annual Review of Psychology*, Vol.42, Pp.459-491
- Cosmides, L. (1989) The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition*, 31, 187-276.
- Csibra, G. (2003). Teleological and referential understanding of action in infancy. *Philosophical Transactions of the Royal Society, London B*, 358, 447-458.
- Darwin, C. (1872/1965) *The Expression of the Emotions in Man and Animals*. Chicago University Press.
- Diamond, J. (1992) *The Rise and Fall of the Third Chimpanzee*. Random House Vintage Edition: London
- Donald, M. (1993) Précis of *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition*. *Behavioural and Brain Sciences*, 16:737-791.
- Duchaine, B., Cosmides, L., & Tooby, J. (2001). Evolutionary psychology and the brain. *Current Opinion in Neurobiology*, 11(2), 225-230. (online in ScienceDirect)
- Eible-Eibesfeldt, I. (1970) *Ethology: the Biology of Behavior*. London, Holt, Rinehart and Winston.
- Enard, W., Przeworski, M., Fisher, S. E., Lai, C. S. L., Wiebe, V., Kitano, T., Monaco, A. P., & Paabo, S. (2002). Molecular evolution of FOXP2, a gene involved in speech and language. *Nature*, 418(6900), 869-872.
- Fodor, J.A. (1983). *The Modularity of Mind*. MIT Press: London.
- Green, R. E., Krause, J., Ptak, S. E., Briggs, A. W., Ronan, M. T., Simons, J. F., et al. (2006). Analysis of one million base pairs of Neanderthal DNA. *Nature*, 444(7117), 330-336.
- Harré, R. (ed) (1986) *The Social Construction of Emotion*. Oxford: Blackwell.
- Iverson, J. M. and Goldin-Meadow, S. (1998) Why people gesture when they speak. *Nature*, 396, p 228.
- Jones, D. (1999). Evolutionary psychology. *Annual Review of Anthropology*, 28, 553-575.
- Jones, S. (1994) *The Language of the Genes*. Harper Collins Flamingo Edition: London
- Kenrick, D. T., Li, N. P., & Butner, J. (2003). Dynamical evolutionary psychology: Individual decision rules and emergent social norms. *Psychological Review*, 110(1), 3-28.
- Lai, C.S.L., Fisher, S.E., Hurst, J.A., & Vargha-Khadem, F. (2001). A forkhead-domain gene is mutated in a severe speech and language disorder. *Nature*, 413: 519-523.
- Liegeois, F., Baldeweg, T., Connelly, A., Gadian, D. G., Mishkin, M., & Vargha-Khadem, F. (2003). Language fMRI abnormalities associated with FOXP2 gene mutation. *Nature Neuroscience*, 6(11), 1230-1237.
- Lorenz, K. (1967) *On Agression*. Methuen: London.
- Lorenz, K.Z. (1952) *King Solomon's Ring*. London: Methuen.
- Meaburn, E., Dale, P. S., Craig, I. W., & Plomin, R. (2002). Language-impaired children: No sign of the FOXP2 mutation. *Neuroreport*, 13(8), 1075-1077.
- Morris, D. (1967) *The Naked Ape: a zoologist's study of the human animal*. London: Cape.
- Parfitt, S. A., et al. (2005). The earliest record of human activity in northern Europe. 438(7070), 1008-1012
- Peleg, G., Katzir, G., Peleg, O., Kamara, M., Brodsky, L., Hel-Or, H., et al. (2006). Hereditary family signature of facial expression. *PNAS*, 103(43), 15921-15926.
- Pinker, S (1997/8) *How the Mind Works*. Norton, New York.
- Ponting, C., & Jackson, A. P. (2005). Evolution of primary microcephaly genes and the enlargement of primate brains. *Current Opinion in Genetics & Development*, 15(3), 241-248.
- Reichert, H., & Simeone, A. (2001). Developmental genetics evidence for a monophyletic origin of the bilaterian brain. *Philosophical Transactions of the Royal Society of London Series B-*, 356(1414), 1533-1544.
- Segal, L (2001) Main agendas and hidden agendas. *The Psychologist*, 14(8), 422-423 (available free at <http://tinyurl.com/y6qs9e>).
- Shu, W. G., et al.. (2005). Altered ultrasonic vocalization in mice with a disruption in the Foxp2 gene. *Proceedings of the National Academy of Sciences of the United States of America*, 102(27), 9643-9648.
- Stone, V. E., Cosmides, L., Tooby, J., Kroll, N., & Knight, R. T. (2002). Selective impairment of reasoning about social exchange in a patient with bilateral limbic system damage. *PNAS*, 99(17), 11531-11536.
- Sun, T., & Walsh, C. A. (2006). Molecular approaches to brain asymmetry and handedness. *Nature Reviews Neuroscience*, 7(8), 655-662.
- Tinbergen, N. (1951) *The Study of Instinct*. Oxford University Press: London. BK library class mark= 591.512 TIN
- Wilson, E.O. (1975) *Sociobiology*. Harvard University Press: Cambridge, Mass.

Aims and Objectives

- *Aims: These two lectures aim to refresh students' knowledge of the theory of evolution, or to introduce them to it, and to introduce them to aspects of psychology which have been influenced by evolutionary approaches.*
- *Objectives: By the end of the lectures the students should:*
- *know the general outlines of the theory of evolution and the time course of human evolution*

Objectives continued

- *be able to answer correctly a majority of the questions on the self-assessment test included in the handout*
- *understand some of the key differences between nativist and empiricist theories in psychology*
- *be aware of the sections of the course text (Gleitman, 1999) where evolutionary approaches are applied to perceptual, cognitive, emotional and social aspects of psychology.*

Format of lectures

- The question addressed is a general one: what is the relevance of evolution for psychological topics?
- There will be a very brief coverage of a large number of areas
- The answer to be given is in terms of the 'nature/nurture' issue.

Topic and essay question

- Does the theory of evolution have any relevance for psychological topics?
- Gleitman's textbook mentions evolution, or "biological bases" in several places.
- So to that extent it is relevant, although —

Culture vs Evolution

Gleitman et al. (1999, page 436) agree that it is arguable that human social behaviour is "so thoroughly infused by culture" that comparisons with the Darwinian influences on animal behaviour are fruitless.

"..there is no question that human social behaviour is flexible and subject to social learning in way that other species' behaviour is not." Gleitman et al. (2004, page 458)

The Theory of Evolution

- Resources are not unlimited
- Some individuals will flourish more than others and produce more offspring
- There are inherited differences between individuals, with some random changes
- Natural selection occurs if a population changes over generations because of this (see e.g. Dawkins, 1995)

What Darwinians say about Psychological topics

- Darwinians emphasise innate or “built-in” factors in psychology
- They emphasise nature rather than nurture and are “nativists” rather than “empiricists”
- They are often interested in development during an individual’s life-span

Darwinian Schools of Thought (p 2 of handout)

- **Ethology:** scientific study of innate factors in animal behaviour (N. Tinbergen and K. Lorenz, Nobel Prize, 1973)
- **Sociobiology:** as above, but emphasis on social behaviour (E.O. Wilson, 1975)
- **Evolutionary Psychology:** emphasis on the effects of human evolution on human psychology (Tooby and Cosmides, 1992)

Areas of psychology influenced

- Animal psychology has been most influenced (ethology & sociobiology)
- Psychologists interested in human language and perception now point to innate mechanisms (Pinker, 1994)
- Social psychologists appeal to cultural influences and are generally against innate factors (Harre, 1986)

Review of innate influence in areas of human psychology (p3 on handout)

- **Perceptual systems:** vision; colour vision. Also motor systems, and eye-hand co-ordination
- **Cognitive systems:** built-in concepts of time, space and physical reality; the bioprogram for 1st language learning
- **Emotionality:** facial expressions as displays
- **Social systems:** bioprograms for social interaction? (Tomasello *et al*, 1993)

Social systems: extra comments (p3)

- human intelligence may have evolved because of its importance in social interaction, especially to cope with social exchange rules (Gleitman, 1999 p. 494)
- natural inclinations are not necessarily desirable: cultural systems may have often developed to supplant them (Hobbes, 1651; Gleitman, 1999, p. 405 & p. 437)

Conclusion (p. 4 of handout)

- Darwinian evolution has shaped many aspects of human cognition
- starting with the capacities of our perceptual systems
- and arguably including higher-order aspects of cognitive and emotional biases
- But biologically based predispositions do little to diminish
- the profound role of cultural and historical influences on uniquely human intellectual achievement and social diversity

Nature versus Nurture in Different Areas of Human Psychology

	INNATE (Nativists) <i>Predetermined, biologically predisposed, constraints on learning.</i>	ACQUIRED (Empiricists) <i>Individually learned, culturally transmitted, social absorption or formal training</i>
COGNITIVE PROCESSES: <i>Perception</i> <i>Language</i> <i>Reasoning</i>	Plato Chomsky (1959, 1986) Fodor (1983) Lightfoot (1989) Evolutionary Psychology (Pinker and Bloom, 1990; Cosmides, 1989)	Aristotle Empiricist philosophers Behaviourists Connectionists, e.g. Rumelhart and McClelland (1986) Tomasello <i>et al</i> , (1993)
SOCIAL PROCESSES: <i>Emotions</i> <i>Basic Motives</i> <i>Social Structures</i>	Freud, Jung Structural anthropologists (e.g. Levi-Strauss) Sociobiologists Ethologists Evolutionary Psychology	Empiricist philosophers Social anthropologists Some psycho-analysts Social psychologists Social constructionists The “Standard Social Science Model”.

This is a brief multiple-choice *self-assessment* for the lectures given on January 11 2007. Completing it is optional and you should not hand it in for marking.

For each question there is only one correct answer.

You should be able to find the right answers somewhere in the previous pages of this handout.

1) A key feature of Darwinian evolutionary theory is that —

- there are inherited differences between individuals
- all individuals are shaped by their culture
- parents transmit what they have learned to their children
- new species emerge spontaneously

2) Theorists who emphasise innate or “built-in” factors as influences on psychological abilities or capacities are known as —

- naturalists
- experimentalists
- empiricists
- nativists

3) Theorists who emphasise individual learning and cultural influence are known as —

- naturalists
- experimentalists
- empiricists
- nativists

4) “Ethology” has been defined as the scientific study of the function and evolution of patterns of animal behaviour and is associated with —

- E.O. Wilson
- Tooby and Cosmides
- Tinbergen and Lorenz
- Harold Wilson

5) “Sociobiology” is a term coined in 1975 to describe a branch of biology which focuses on the evolutionary basis of animal social behaviours and is associated with —

- E.O. Wilson
- Tooby and Cosmides
- Tinbergen and Lorenz
- Harold Wilson

6) “Evolutionary Psychology” is a more recent term which has come into use in the 1990’s where the emphasis is on the special effects of human evolution on human psychology. It is associated with —

- E.O. Wilson
- Tooby and Cosmides
- Tinbergen and Lorenz
- Harold Wilson

7) Psychologists such as Fodor (1983) and Pinker (1998) have tended to emphasise innate mechanisms governing —

- animal social behaviour
- animal cognition
- human social behaviour
- human cognition

8) In the textbook by Gleitman (1999) it is possible to find references to the influence of evolutionary factors on —

- perception
- cognition
- emotion
- social behaviour
- all of the above

9) Species which are now extinct but which are regarded as members of the human family tree are collectively referred to as —

- primates
- hominids
- sociobiologists
- anthropoids

10) There is fossil evidence that human ancestors have been walking upright for —

- about 100,000 years
- more than 1 million years
- more than 2 million years
- more than 4 million years

11) There is fossil evidence that human ancestors have been using stone tools for —

- about 100,000 years
- more than 1 million years
- more than 2 million years
- more than 4 million years

12) There is fossil evidence that human ancestors have been using fire for —

- about 100,000 years
- more than 1 million years
- more than 2 million years
- more than 4 million years

13) There is fossil evidence that human ancestors have been burying the dead for —

- about 100,000 years
- more than 1 million years
- more than 2 million years
- more than 4 million years

14) The idea that human natural inclinations are not necessarily desirable, and that cultural systems are necessary to supplant them is often attributed to —

- Pinker (1997)
- Darwin (1872)
- Dawkins (1976)
- Hobbes (1651)

15) The most notable example of a human ability which is now widely believed to demonstrate genetic pre-determination of human abilities is —

- language acquisition in infants
- majority influence
- skilled reading
- problem solving