

A7. HUMANS IN BIOLOGICAL PERSPECTIVE

Paper coordinator: Professor Martin Jones mkj12@cam.ac.uk

Paper aims and objectives:

This paper provides a broad introduction to biological anthropology and covers major subject areas such as primate biology and behaviour, human evolution, human health, adaptation to different environments and life history theory. Through studying this course, students will gain a strong foundation in the field of biological anthropology and an understanding of how different approaches can be used to address specific questions about human origins and diversity. The paper begins with an introduction to non-human primates, highlighting the importance of the comparative approach for understanding evolutionary processes. We then go on to discuss human evolution, diversity and adaptation, including introductory lectures on human genetics and health. The paper concludes with a module on human growth and ecology.

General Reading:

Boyd, R. & Silk, J. (2012) *How Humans Evolved*. (6th edit). W. W. Norton & Co.
Campbell C.J. et al. (ed). (2010). *Primates in Perspective*. (2nd edit). Oxford University Press.
Dawkins, R. (1989) *The Selfish Gene*. New edit. Oxford University Press.
Fleagle, J. (2013) *Primate Adaptation and Evolution*. (3rd edit). Academic Press.
Ridley, M. (2003) *Nature Via Nurture: Genes, Experience, and What Makes Us Human*. Harper Collins
Stringer, C. & Andrews, P. (2011) *The complete world of Human Evolution*. 2nd edition. Thames & Hudson
de Waal, F. (2001) *Tree of Origin. What Primate Behavior Can Tell Us about Human Social Evolution*. Harvard University Press.

Lecture Rooms:

Michaelmas term:

Mill Lane Room 4 (Tuesdays), Mill Lane Room 9 (Wednesdays) Mill Lane, Cambridge, CB3 1RX

Lecture Times:

Michaelmas, Lent and Easter Terms (Tuesday 9am, Wednesday 11am)

First Lecture Tuesday 10th October

Syllabus:

This paper is about the relationships between the biology, ecology and behaviour of our own species. The paper first places humans in a broad evolutionary framework by exploring the order Primates. During these lectures, we highlight the importance of the comparative method advocated by Charles Darwin (comparing homologous traits across a wide range of different species to draw general inferences about their evolution) for understanding evolutionary processes. The paper then explores our more recent evolutionary history in more detail. Firstly, we ask what it means to be human from a genetic point of view. Principles and evolutionary mechanisms that generate and shape genetic variation are presented, explaining how inferences from observed patterns of diversity within and among human populations are made. In the

following lectures, hominin evolutionary history is discussed in more detail, with a focus on the evolution of human diversity. Then, human adaptation is introduced more broadly, with reference to the interactions between our biology and our behaviour. Finally, growth, ecology and disease are discussed, with a focus on modern human populations.

Michaelmas

Tues 10 Oct	Introduction to course	RF
Wed 11 Oct	Primate Biology 1	JD
Tues 17 Oct	Primate Biology 2	JD
Wed 18 Oct	Primate Biology 3	JD
Tues 24 Oct	Primate Biology 4	JD
Wed 25 Oct	Primate Behaviour 1	JD
Tues 31 Oct	Primate Behaviour 2	JD
Wed 1 Nov	Primate Behaviour 3	JD
Tues 7 Nov	Primate Behaviour 4	JD
Wed 8 Nov	Human Evolution 1	RF
Tues 14 Nov	Human Evolution 2	RF
Wed 15 Nov	Human Evolution 3	RF
Tues 21 Nov	Human Evolution 4	RF
Wed 22 Nov	Human Evolution 5	RF
Tues 28 Nov	Human Evolution 6	RF
Wed 29 Nov	Human Evolution 7	RF

Lent

Tues 23 Jan	Human Genetics 1	TK
Wed 24 Jan	Human Genetics 2	TK
Tues 30 Jan	Human Genetics 3	TK
Wed 31 Jan	Human Genetics 4	TK
Tues 6 Feb	Ecology and Adaptation 1	LB
Wed 7 Feb	Ecology and Adaptation 2	LB
Tues 13 Feb	Ecology and Adaptation 3	LB
Wed 14 Feb	Ecology and Adaptation 4	LB
Tues 20 Feb	Social Lives and Social Networks 1	MD
Wed 21 Feb	Social Lives and Social Networks 2	MD
Tues 27 Feb	Nature vs Nurture 1	NMT
Wed 28 Feb	Nature vs Nurture 2	NMT
Tues 6 Mar	Nature vs Nurture 3	NMT
Wed 7 Mar	Double Burden of Malnutrition 1	NMT
Tues 13 Mar	Double Burden of Malnutrition 2	NMT
Wed 14 Mar	Double Burden of Malnutrition 3	NMT

Easter

Tues 15 May	Double Burden of Malnutrition 4	NMT
Wed 16 May	Double Burden of Malnutrition 5	NMT

RF=Prof Robert Foley; JD Dr Jake Dunn; TK Dr Toomas Kivisild; LB Dr Laura Buck; NMT Prof. Nicholas Mascie-Taylor

Michaelmas Term

Professor Robert Foley

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Outline

“Nothing in biology makes sense except in the light of evolution” is a famous quotation of the great biologist, Theodosius Dobzhansky. As humans are the product of evolution, a core theme in biological anthropology is to explore how humans have been shaped by our long term history, and by the contexts in which hominin ancestors lived. These lectures will look at the patterns and processes of human evolution, and the light they throw on the nature of our species.

Human evolutionary studies is a multi-disciplinary field, and now involves palaeontology, archaeology, genetics, anthropology and psychology and the cognitive sciences, as well as being closely integrated with evolutionary biology more generally.

These lectures have two aims – one, to provide an introductory overview to the history of the human lineage and the pattern of hominin evolution, and two, to place this into the broader theories and methods of evolutionary biology.

Lectures

1. The more we discover, the harder it gets: a brief history of the search for human origins
2. When did we become human? The timeline for human evolution
3. Evolution is ecology: energetics, ranging the evolution of bipedalism
4. The geography of human evolution: from Africa to the world
5. The evolution of behaviour: energetics, ranging the evolution of bipedalism
6. Life history and the evolution of intelligence
7. Mind, behaviour and culture – an evolutionary perspective
8. Genes, phenotypes, behaviour and dispersals – the evolution of human diversity

Reading

There are many excellent textbooks on human evolution, and the ‘story’ of human evolution – a small selection below.

Klein, R. G. (2009). *The Human Career*. Chicago: Chicago University Press.

Lewin, R., & Foley, R. A. (2003). *Principles of Human Evolution*. Oxford: Blackwells.

Boyd, R., & Silk, J. (2014). *How humans evolved*. New York: Norton.

Stringer, C., & Andrews, P. (2012). *The Complete World of Human Evolution*. London: Thames & Hudson.

Equally, there are many excellent books on evolution. The classic and authoritative one is Futuyma's, but you should also look at various books by Richard Dawkins (not just the Selfish gene!). Nettle provides an excellent introduction to evolution directed at human sciences.

Futuyma, D. (2013). *Evolution*. New York: Sinauer Associates.

Nettle, D. (2009). *Evolution and Genetics for Psychologists*. Oxford: Oxford University Press.

Dawkins, R. (1982). *The Extended Phenotype*. San Francisco: Freeman.

Some of the themes in the course can be found in a book of mine (but it is a bit out of date)

Foley, R. A. (1995). *Humans before humanity: an evolutionary perspective*. Oxford: Blackwells Publishers.

Additional reading will be given for the various topics covered in the lectures.

Supervisions

It is for supervisors to select and set topics in relation to the needs of particular groups of students. A number of potential essay topics are provided below that can be used as a guide.

- Discuss the evidence for early hominin evolution, and consider why Africa plays such a central role.
- Hominin evolution is best viewed as an adaptive radiation – discuss what is meant by this statement, and the adaptive basis for hominin radiations.
- The key evolutionary changes in the hominin lineage are behavioural – discuss the evidence for the chronology of human behavioural change.
- Discuss how genetics, archaeology and the fossil record can throw light on the evolution of modern humans and their diversity.
- How has recent research in cultural evolution, evolutionary psychology and behavioural ecology thrown light on human evolution.

Lent Term

What makes us Human? Introduction to Human Genetics

4 lectures

Dr Toomas Kivisild (tk331@cam.ac.uk)

Humans share many phenotypic and genetic traits with other primates and have retained largely the ancestral primate synteny in their chromosomes with only minor modifications. But we also differ from closest primate relatives in many phenotypic traits and millions of single nucleotide changes. These changes defining human uniqueness can be partitioned into two lists: a shorter list of strictly human specific and a longer list of changes that are shared by other extinct hominins. The distinction of these two lists of changes is not always clear because of incomplete fossil record and the lack of genetic data from most of the extinct hominins.

Readings:

O'Bleness M, Searles VB, Varki A, Gagneux P, Sikela JM. (2012) Evolution of genetic and genomic features unique to the human lineage. *Nat Rev Genet.* 13(12):853-66. doi: 10.1038/nrg3336. Review.

Jobling, M.A., Hollox, E., Hurles, M.E., Kivisild, T., Tyler-Smith, C. (2013) *Human Evolutionary Genetics*: 2nd edition. Garland Science. Chapters 7-8.

Relethford, J.H. *The Human Species*, McGraw-Hill, 2012, Ch7-12

Ecology and Adaptation

Laura Buck

Homo sapiens is a global species. Our dispersal into almost all ecological niches on the planet has required singular levels of adaptation for what was once a solely African primate. We will focus on types of environmental stressor, how these effect the human body and how they can be mediated. Over the course of the four lectures we will cover genetic, physical, behavioural and cultural adaptations, before considering whether humans are still evolving today.

Readings

- Balter, M. 2005. Are Humans Still Evolving? *Science*, 309: 234-237.
- Stock, J. T. 2008. Are Humans Still Evolving? *EMO Reports*, 9: S51-54.
- Laland et al., 2000. Niche construction, biological evolution and cultural change. *Behavioural and Brain Sciences*, 23: 131-175.
- Fumagalli et al., 2015. Greenlandic Inuit show genetic signatures of diet and climate adaptation. *Science* 349: 1343-1347.
- Scheinfeldt et al., 2012. Genetic adaptation to high altitude in the Ethiopian highlands. *Genome Biology* 13:R1.
- Holliday 1997. Body proportions in Late Pleistocene Europe and modern human origins. *Journal of Human Evolution* 32: 423-448.

Lent and Easter Term 2018**The Double Burden of Malnutrition**

Professor C G Nicholas (Nick) Mascie-Taylor
Professor of Human Population Biology and Health

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Selected Reading List for Double Burden of Malnutrition

1. The Lancet Series on Maternal and Child Nutrition published: June 6, 2013
2. Shrimpton, Roger; Rokx, Claudia. 2012. *The double burden of malnutrition : a review of global evidence*. Health, Nutrition and Population (HNP) discussion paper. Washington DC ; World Bank. <http://documents.worldbank.org/curated/en/2012/11/18004669/double-burden-malnutrition-review-global-evidence>
3. WHO. The double burden of malnutrition. Policy brief. Geneva: World Health Organization; 2017.
4. Double burden or double counting of child malnutrition? The methodological and theoretical implications of stuntingoverweight in low and middle income countries Katie Bates, Arjan Gjonça, Tiziana Leone ([http:// dx. doi. org/ 10. 1136/ jech- 2017- 209008](http://dx.doi.org/10.1136/jech-2017-209008)). Published online May 31, 2017 J Epidemiol Community Health 2017 71: 779-785

Supervision Topics

1. What is the double burden of malnutrition? How can it be resolved?
2. What are the main determinants of childhood undernutrition in developing countries? What interventions can be used to address the problem?

Assessment:

This paper is assessed by a three-hour written examination. All topics are covered in a single undivided paper, and candidates must answer three questions from a choice of ten.

Supplementary Teaching:

Students are expected to have supervisions arranged by their Director of Studies. Four supervisions per term are usual, and three to four essays are typically expected.