

HEB 97

Sophomore Tutorial in Human Evolutionary Biology

Department of Human Evolutionary Biology

Harvard University

Spring 2024

Instructors

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Course Description

This course will serve as an introduction to key concepts and methods in human evolutionary biology. Tutorial meetings will consist of readings and discussions, with biweekly writing assignments which integrate major course themes.

Course Goals

- Understand key concepts in human evolutionary biology
- Become familiar with the methods of human evolutionary biology
- Develop your ability to critically evaluate scientific studies and arguments
- Develop your scientific communication skills

Course Readings

- Darwin, C. 1859. *On the Origin of Species: A Facsimile of the First Edition*. Harvard University Press (1964). ISBN-10: 0674637526. ISBN-13: 978-0674637528
Please purchase only the Harvard University Press edition of *On the Origin of Species (A Facsimile of the First Edition)*. It is available from the Coop, Amazon, and other booksellers. The pagination differs between editions and it's much easier to have a good class discussion if we're literally all on the same page.
All other readings are available on the course website.

Course Format

HEB sophomore tutorial is a discussion seminar. Prior to each class meeting, you will read several articles that focus on a key topic in Human Evolutionary Biology. During class, you will discuss the readings with your classmates and instructor. The goal of our class discussions is twofold: to learn about important questions and topics in HEB, and to begin to think about them as a human evolutionary biologist does. In addition to class discussion, we will view collections and exhibits of living primates and extinct hominin ancestors. Over the

course of the semester, you will complete four written assignments that are designed to further your understanding of key HEB topics, and your ability to generate and evaluate arguments in HEB.

Grading Breakdown

Discussion points 10%

Participation 15%

Writing assignment 1 (due: Feb 17): 15%

Writing assignment 2 (March 10): 15%

Writing assignment 3 (April 7): 20%

Writing assignment 4 (May 5): 25%

Further Particulars

Summary points

Prior to class during Weeks 1–11, you will submit summary points about the assigned readings. For each reading, briefly state the main points. You may summarize in any method, e.g. bullet points, pictures, diagrams, art, an original poem, etc. Over the course of the semester, you must utilize two different methods for your summaries for full credit.

Your summary point assignment should also include 2-3 discussion questions for that week's readings. Submit an electronic copy to the Canvas site 24 hours before your section meeting. These points and questions will help you participate in—and potentially lead—our discussions. Each summary points assignment will be graded 0–2 points (10%).

Participation

Tutorial meetings are intended to be highly interactive discussions of assigned readings. The success of our course depends on enthusiastic participation from everyone. Come to class **prepared to discuss the articles** critically and creatively, to ask questions, and to synthesize ideas into the larger picture of human evolution and adaptation. Periodically, you may be called upon to lead class discussion of one of the readings. When leading discussion, the goal is to get the class to talk about the article's main points, evidence, and likelihood of the conclusions (15%).

Your participation grade is based on the following criteria:

1. Section attendance and punctuality.
2. Evidence of thoughtful, reflective reading.
3. Engagement in section discussions, demonstrated by thoughtful comments, attention to other discussants, and reference to course readings.

Writing assignments

Four essays, of increasing grade weight, will be due over the course of the semester. They are designed to develop critical thinking and writing skills and to familiarize you with key topics in human evolutionary biology (75% total).

Final Grades

Final grades will be assigned as follows:

100 – 95: A	75–73: C
94 – 90: A-	73–70: C-
89 – 86: B+	69–66: D+
85 – 83: B	65–63: D
82 – 80: B-	62–60: D-
79 – 76: C+	< 60: E

Course Sectioning

Section times will be scheduled based on most popular student availability timeslots, assessed by polls during the first weeks of term.

Please check Canvas, under the People tab, to find your section assignment.

Permanent Section Switches

In order to keep the section sizes equivalent, once sections have been assigned sections switches will be permitted only if absolutely necessary and provided balanced numbers can be maintained.

Weekly Section Switches

Weekly section switches will only be permitted for documented excused absences. They must be requested in advance by emailing your instructor.

Academic Integrity

The Harvard College Honor Code

Members of the Harvard College community commit themselves to producing academic work of integrity – that is, work that adheres to the scholarly and intellectual standards of accurate attribution of sources, appropriate collection and use of data, and transparent acknowledgement of the contribution of others to their ideas, discoveries, interpretations, and conclusions. Cheating on exams or problem sets, plagiarizing or misrepresenting the ideas or language of someone else as one's own, falsifying data, or any other instance of academic dishonesty violates the standards of our community, as well as the standards of the wider world of learning and affairs.

PLEASE NOTE: students are **prohibited** from recording any class activity including lecture, lab, office hours or *posting any class materials to any website*. Students that violate this policy will be referred to the Harvard College Administrative board.

Generative AI policy

We expect that all work students submit for this course will be their own. We specifically forbid the use of ChatGPT or any other generative artificial intelligence (AI) tools at all stages of the work process, including preliminary ones. Violations of this policy will be considered academic misconduct. We draw your attention to the fact that different classes at Harvard could implement different AI policies, and it is the student's responsibility to conform to expectations for each course.

Collaboration Policy

NOTE: The following is the default collaboration policy for this course. Policies specific to individual writing assignments will be indicated in the assignment description.

Discussion and the exchange of ideas are essential to academic work. Unless instructed otherwise, you are encouraged to consult with your classmates on the choice of paper topics and sources. However, you should ensure that any written work you submit for evaluation is the result of your own research and writing, and that it reflects your own approach to the topic. You must also adhere to standard citation practices in Human Evolutionary Biology and properly cite any books, articles, websites, lectures, etc. that have helped you with your work. If you received any help with your writing (feedback on drafts, etc.), you must also acknowledge this assistance. Representing the words, ideas, or concepts of another person without appropriate attribution is plagiarism.

Extensions and Late Work

If you require an extension on an assignment because of an emergency or Harvard-related reason (e.g., for seniors with thesis deadlines) **you must ask for the extension in advance of the deadline**; otherwise, late assignments will be downgraded by 5%/day late.

Attendance

You are expected to attend all sections. For emergency and other excused absences, you must provide documentation (e.g. doctor's note for illness; coach's note for sports travel). If at all possible, you should attend another section meeting that week (see above – "Weekly Section Switches").

Accommodations for students with disabilities

Students needing academic adjustments or accommodations because of a documented disability must present their Faculty Letter from the Accessible Education Office (AEO) and speak with the professor by the end of the second week of the term. Failure to do so may result in an inability to respond in a timely manner. All discussions will remain confidential, although faculty are invited to contact AEO to discuss appropriate implementation.

READING LIST

Week 1 (January 29– February 2): Introduction to evolution

What is Darwin's theory of natural selection? What evidence did Darwin provide to support his theory?

READING:

- Darwin, C. (1859). *On the Origin of Species*. A Facsimile of the First Edition. Cambridge, MA: Harvard University Press. Read introduction by Ernst Mayr, Chapters 1-4, and 14.

Week 2 (February 5 – February 9): Selection, adaptation, and speciation

What is an adaptation? What lines of evidence support an adaptive hypothesis for a trait? What is a species and how does speciation occur?

READING:

- Grant, P.R. (1991) Natural selection and Darwin's finches. *Scientific American*, 265, 82-87.
- Gould, S.J. & Vrba, E.S. (1982) Exaptation: a missing term in the science of form. *Paleobiology* 8, 4-15.
- Gould, S. J., & Lewontin, R. C. (1979). The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme. *Proceedings of the Royal Society of London. Series B, Biological Sciences*, 205(1161), 581–598.
<https://doi.org/10.1098/rspb.1979.0086>
- Hendry, A.P. (2009) Speciation Q&A. *Nature*, 458, 162-164.

IN CLASS EXERCISE: Reading Scientific Papers

Week 3 (February 12 – 16): Phylogenetic thinking, Introduction to primates

What is a primate? What are the major taxa within primates? What are chimpanzees like? Why are they important in understanding humans? What was the last common ancestor of humans and chimpanzees like? How do we know?

READING:

- Baum, D.A., DeWitt-Smith, S., & Donovan S.S.S. (2005). The tree-thinking challenge. *Science*, 310, 979-980. Please also do part 1 of the quiz. Part 2 is optional!
- Boyd, R., & Silk, J.B. (2014). *How Humans Evolved*. 7th ed. New York: WW Norton & Company. Excerpt from Ch. 5, Primate Diversity and Ecology. pp 109- 143.
- Haslam, M., Hernandez-Aguilar, R. A., Proffitt, T., Arroyo, A., Falótico, T., Fragaszy, D., Gumert, M., Harris, J. W., Huffman, M. A., Kalan, A. K., Malaivijitnond, S., Matsuzawa, T., McGrew, W., Ottoni, E. B., Pascual-Garrido, A., Piel, A., Pruetz, J., Schuppli, C., Stewart, F., Tan, A., Visalberghi, E., Luncz, L. V. (2017). Primate archaeology evolves. *Nature Ecology & Evolution*, 1(10), 1431-1437.
<https://doi.org/10.1038/s41559-017-0286-4>
- McGrew, W.C. (2010). In search of the last common ancestor: new findings on wild chimpanzees. *Philosophical Transactions of the Royal Society B*, 365, 3267- 3276.
- Wrangham, R., & Pilbeam, D. (2001). African apes as time machines. In B. Galdikas, N.E. Briggs, L.K. Sheeran, G.L. Shapiro, & J. Goodall, (Eds.), *All Apes Great and Small Volume 1: African Apes* (pp. 5-18). Berlin: Springer-Verlag.

IN CLASS EXERCISE: Visiting HMNH's primates

DUE Feb 17 @ 11:59PM: Writing assignment 1

Week 4 (February 19 – 23): The first hominins, locomotor behavior and ecology

What is a hominin and how do we identify them? What adaptations characterize the earliest hominins? What hypotheses explain the divergence of the panin and hominin lineages?

READING

- Lieberman, D.E. (2013). *The Story of the Human Body*. New York: Pantheon Books. Ch. 2, Upstanding Apes. pp 25-47.
- Sockol, M.D., Raichlen, D.A., & Pontzer, H. (2009). Chimpanzee locomotor energetics and the origin of human bipedalism. *Proceedings of the National Academy of Sciences*, 104, 12265–12269.
- Senut, B., Pickford, M., Gommery, D., & Ségalen, L. (2018). Palaeoenvironments and the origin of hominid bipedalism. *Historical Biology*, 30(1-2), 284–296.
<https://doi.org/10.1080/08912963.2017.1286337>
- Wood, B., Doherty, D., & Boyle, E. (2020, May 29). Hominin Taxic Diversity. *Oxford Research Encyclopedia of Anthropology*.
 - *Beginning on p. 3756 of file

IN CLASS EXERCISE: What is evidence in HEB?

Week 5 (February 26–March 1): Origins of *Homo*, diet quality and energetic trade offs

How is *Homo erectus* different than australopithecines? What may have facilitated this difference? What is the role of tradeoffs in evolutionary change?

READING:

- Wrangham, R.W., & Carmody, R. (2010). Human adaptation to the control of fire. *Evolutionary Anthropology*, 19, 187-199.
- Bramble, D.M., & Lieberman, D.E. (2004). Endurance running and the evolution of *Homo*. *Nature*, 432, 345–352.
- Roach N.T., Venkadesan, M, Rainbow, M.J. & Lieberman D.E. (2013). Elastic energy storage in the shoulder and the evolution of high-speed throwing in *Homo*. *Nature* 498: 483-487.
- Aiello, L.C., & Wheeler, P. (1995). The expensive tissue hypothesis: the brain and the digestive system in human evolution. *Current Anthropology*, 36, 199-221. article commentary optional.

IN CLASS EXERCISE: Paraphrasing

Week 6 (March 4-March 8): From archaic to modern humans

What is a modern human? When and where did modern humans evolve? What can genetic data tell us about the origin of our species, and about how we are similar/different from other species of *Homo*?

READING:

- Stringer, C. (2012). Evolution: What makes a modern human. *Nature*, 485, 33-35.

- Bergström, A., Stringer, C., Hajdinjak, M., Scerri, E.M. and Skoglund, P. (2021). Origins of modern human ancestry. *Nature*, 590 (7845), 229-237.
- Reich, D. (2018) *Who We Are and How We Got Here: Ancient DNA and the New Science of the Human Past*. New York: Springer-Verlag. Ch. 2, Encounters with Neandertals. pp. 25–50.
- Harvati, K., & Reyes-Centeno, H. (2022). Evolution of Homo in the Middle and Late Pleistocene. *Journal of human evolution*, 173, 103279.

DUE March 10 @ 11:59PM – Writing Assignment 2

SPRING BREAK week of March 9-17

Week 7 (March 18 – 22): Life History

What is life history theory? How is human life history unique? What selection pressures may have shaped the way humans allocate energy across the lifespan?

READING:

- Reiches, M.W. (2012). Life History Theory. Handout written for HEB 97, Sophomore Tutorial in Human Evolutionary Biology.
- Reznick, D.A., Bryga, H., & Endler, J.A. (1990). Experimentally induced life- history evolution in a natural population. *Nature*, 346, 357-359.
- Robson, S.L., van Schaik, C.P., & Hawkes, K. (2006). The derived features of human life history. In R.L. Paine & K. Hawkes (Eds.), *The Evolution of Human Life History* (pp. 17-44). Santa Fe, NM: School of American Research Press.
- Kramer, K.L. (2010). Cooperative breeding and its significance to the demographic success of humans. *Annual Review of Anthropology*, 39, 417-436.

Week 8 (March 25 – 29): Social structure and relationships

What is human social structure like? How did we get to be this way? How is cooperation important in humans' social systems, mating systems, and life history?

READING:

- Muller, M.N. & Pilbeam, D. R. (2017). The evolution of the human mating system. In *Chimpanzees and Human Evolution*. Eds M. M. Muller, R.W Wrangham, D. R. Pilbeam. pp 383-426.
- Hill K et al. (2011). Co-residence patterns in hunter-gatherer societies show unique human social structure. *Science*, 331, 1286-1289.

- O'Connell, J., Hawkes, K., & Blurton Jones, N. (1999). Grandmothering and the evolution of *Homo erectus*. *Journal of Human Evolution*, 36(5), 461-485.
<https://doi.org/10.1006/jhev.1998.0285>
- Tomasello, M., Melis, A.P., Tennie, C., Wyman, E. and Herrmann, E. (2012). Two key steps in the evolution of human cooperation: The interdependence hypothesis. *Current anthropology*, 53(6), 673-692.

Week 9 (April 1-5): Cognition

What is unique about the human mind? What selection pressures may have shaped these traits?

READING:

- Hermann, E., Call, J. Victoria Hernández-Lloreda, M., Hare, B., & Tomasello, M. (2007). Humans have evolved specialized skills of social cognition: The cultural Intelligence hypothesis. *Science* 317, 1360 – 1366.
- DeLoache, J. S. (2004). Becoming symbol-minded. *Trends in Cognitive Sciences*, 8(2). 66-70
- Horner, V. & Whiten, A. (2005). Causal knowledge and imitation/emulation switching in chimpanzees (*Pan troglodytes*) and children (*Homo sapiens*). *Animal Cognition* 8: 164–181.
- McAuliffe, K., Blake, P.R., Steinbeis, N., & Warneken, F. (2017). The developmental foundations of human fairness. *Nature Human Behavior* 1, 0042: 1-9.
- Wiessner, P. W. (2014) Embers of society: Firelight talk among the Ju/'hoansi Bushmen. *Proceedings of the National Academy of Sciences* 111(39) 14027-35.

DUE April 7 @ 11:59PM – Writing Assignment 3

Week 10 (April 8 – 12): Culture

What role does culture play in human evolution? How did human culture evolve? What is special about it? Do other animals have culture?

READING:

- Tomasello, M. and Moll, H. (2010). The Gap is Social: Human Shared Intentionality and Culture. In: Kappeler, P. M. and Silk, J. eds. *Mind the Gap*. Springer Berlin Heidelberg, 331-349.
- Boyd, R, Richerson P.J. & Heinrich, J. (2011) The cultural niche: Why social learning is essential for human adaptation. *Proceedings of the National Academy of Sciences* 108, S2: 10918- 10925.

- d'Errico, F. and Stringer, C. B. 2011. Evolution, revolution or saltation scenario for the emergence of modern cultures? *Philosophical Transactions of the Royal Society B-Biological Sciences*, 366(1567). 1060-1069.
- Whiten, A., 2021. The burgeoning reach of animal culture. *Science*, 372(6537)

Week 11 (Apr 15 – 19): Modern Human Variation

How do living humans vary genetically and phenotypically? How do genes and culture influence human variation? How does our current understanding of human genetics influence ideas about human variation?

READING:

- Segurel, L., & Bon, C. (2017). On the evolution of lactase persistence in humans. *Annual Review of Genomics and Human Genetics*, 18(1), 297-319.
- Laland, K. N., Odling-Smee, J., & Myles, S. (2010). How culture shaped the human genome: bringing genetics and the human sciences together. *Nature Reviews Genetics*, 11(2), 137-148.
- Ilardo, M. A., Moltke, I., Korneliussen, T. S., Cheng, J., Stern, A. J., Racimo, F., de Barros Damgaard, P., Sikora, M., Seguin-Orlando, A., Rasmussen, S., van den Munckhof, I. C. L., ter Horst, R., Joosten, L. A. B., Netea, M. G., Salingkat, S., Nielsen, R., & Willerslev, E. (2018). Physiological and Genetic Adaptations to Diving in Sea Nomads. *Cell*, 173(3), 569-580.e15. <https://doi.org/10.1016/j.cell.2018.03.054>
- Jablonski, N. G., & Chaplin, G. (2002). Skin deep. *Scientific American*, 287(4), 74-81. <https://doi.org/10.1038/scientificamerican1002-74>

DUE May 5 @ 11:59PM – Writing Assignment 4