

ANTHROPOLOGY 483:

EVOLUTIONARY BIOLOGY FOR ANTHROPOLOGISTS

THE UNIVERSITY OF TENNESSEE – KNOXVILLE SPRING 2023

TIME: MONDAYS AND WEDNESDAYS, 1:50 – 3:05 P.M.

LOCATION: 105 STRONG HALL

INSTRUCTOR: DR. BENJAMIN M. AUERBACH

CONTACT INFORMATION

OFFICE: 416 STRONG HALL

OFFICE HOURS: WEDNESDAYS, 11:00 A.M. – 12:00 P.M. OR BY APPOINTMENT

E-MAIL: AUERBACH@UTK.EDU

(DR. AUERBACH DOES NOT READ E-MAILS BETWEEN 7 P.M. AND 8 A.M.)

COURSE AT-A-GLANCE

- The course emphasizes literacy and conversancy in basic concepts of evolutionary theory and its applications to anthropological inquiry.
- Students will learn about current topics in anthropology, including morphological integration, species concepts, hybridity, and pattern versus process in evolution.
- Students are expected to engage in classroom discussions and develop critical evaluation skills concerning scientific studies.
- Evaluation takes the form of weekly short answer assignments and two take-home essay exams.

IMPORTANT SUBMISSION DEADLINES

Note that late submissions will not be graded.

Each Friday at 2:00 P.M. (with some exceptions): Weekly Responses [via e-mail](#)

7 March at 5:00 P.M.: Critical response to *The Eugenics Crusade* [via e-mail](#)

21 March at 5:00 P.M.: Take-home midterm exam [via e-mail](#)

11 April at 5:00 P.M.: Critical response to *Your Inner Fish* [via e-mail](#)

12 May at 5:00 P.M.: Take-home final exam [via e-mail](#)

COURSE DESCRIPTION

Evolutionary studies are fundamental to biological anthropology, and anthropological disciplines have used concepts derived from evolutionary theory to develop a variety of approaches to research questions. Research from paleoanthropology to modern human ecology relies on a thorough understanding of evolutionary theory and modeling. Thus, any person planning to pursue anthropology as a professional should possess a background in evolutionary biology.

This lecture course provides you, advanced undergraduate students, with a fundamental background in evolutionary biology, both from historical and modern theoretical perspectives. Whenever possible, examples from anthropology are used to illustrate ideas and processes. Concepts covered (see the course schedule below) include the history of evolutionary theory, systematics, variation, forces of evolution, evolution in the fossil record, species & species concepts, pattern and process, and Evo-Devo. While none of these topics will be explored exhaustively, you will learn about fundamental concepts for each subject and be provided with the tools with which to investigate them further, both independently and in more advanced graduate studies.

COURSE OBJECTIVES

By the end of this course, you will:

- develop an appreciation for the scientific inquiry that led to major developments in evolutionary biology;
- procure a thorough understanding of basic evolutionary theory, including mechanisms and the origins of biological diversity;
- appreciate the scales at which evolutionary biology operates, from the molecular level to the fossil record;
- pursue critical application of evolutionary processes to understanding of human evolution and cultural history.

COURSE STRUCTURE

Classes will meet twice each week unless noted otherwise in the Course Schedule (see below). The course is structured as an upper-division lecture. Dr. Auerbach will formally introduce major themes and subjects, but you are expected to contribute to the class by participating in discussions about those ideas. On all meeting days of the course, Dr. Auerbach will lecture on the main points of the topic(s) covered by the readings (though not necessarily on all the details of the readings). **It is in your interest to take notes.** Dr. Auerbach *will not* make lecture notes available.

Please note that Dr. Auerbach will be away at professional workshops and conferences throughout the semester. You will be expected to watch two documentaries (*Your Inner Fish* and *The Eugenics Crusade*) outside of class in lieu of lecture and write a critical response paper (see the Evaluation section below).

COURSE READINGS

All course readings will be made available via PDFs on Canvas. You should look into acquiring a copy of Futuyma & Kirkpatrick's *Evolution*, which is available through the UT Bookstore.

- Ackermann RR, Arnold ML, Biaz MD, Cahill JA, Cortés-Ortiz L, Evans BJ, Grant BR, Grant PR, Hallgrímsson B, Humphreys RA, Jolly CJ, Malukiewicz J, Percival CJ, Ritzman TB, Roos C, Roseman CC, Schroeder L, Smith FH, Warren KA, Wayne RK, Zinner D. 2019. Hybridization in human evolution: insights from other organisms. *Evolutionary Anthropology* 28:189-209.
- Agosto ER, and Auerbach BM. 2022. Morphological integration and evolutionary potential of the primate shoulder: Variation among taxa and implications for genetic covariances with the basicranium, pelvis, and arm. *Journal of Human Evolution* 169:103221.
- Atreya S, and Ackermann RR. 2020. Colonialism and narratives of human origins in Asia and Africa. In: *Interrogating Human Origins: Decolonisation and the Deep Human Past*, edited by M Porr and JM Matthews. New York: Routledge. pp 72-95.
- Auerbach BM. 2012. Skeletal variation among early Holocene North American humans: implications for origins and diversity in the Americas. *American Journal of Physical Anthropology* 149:525-536.
- Auerbach BM, Savell KRR, and Agosto ER. 2023. Morphology, evolution, and the whole organism imperative: why evolutionary questions need multi-trait evolutionary quantitative genetics. *Yearbook of Biological Anthropology*.
- Boughner JC, and Rolian C (editors). 2016. *Developmental Approaches to Human Evolution*. New York: Wiley-Blackwell.
- Boyle EA, Li YI, and Pritchard JK. 2017. An expanded view of complex traits: from polygenic to omnigenic. *Cell* 169:1177-1186.
- Cravens H. 1988. *The Triumph of Evolution: American Scientists and the Heredity-Environment Controversy 1900-1941*. Philadelphia: The University of Pennsylvania Press.
- Delson E, and Stringer CB. 2022. The naming of *Homo bodoensis* by Roksandic and colleagues does not resolve issues surrounding Middle Pleistocene human evolution. *Evolutionary Anthropology* 31:233-236.
- Futuyma DJ, and Kirkpatrick M. 2017. *Evolution*. Fourth edition. Sunderland, MA: Sinauer Associates, Inc.
- Futuyma DJ, and Kirkpatrick M. 2023. *Evolution*. Fifth edition. Oxford: Oxford University Press.
- Hallgrímsson B, Jamniczky H, Young NM, Rolian C, Parsons TE, Boughner JC, and Marcucio RS. 2009. Deciphering the palimpsest: studying the relationship between morphological integration and phenotypic covariation. *Evolutionary Biology* 36:355-376.
- Hallgrímsson B, Mio W, Marcucio RS, and Spritz R. 2014. Let's face it—complex traits are just not that simple. *PLoS Genetics* 10:e1004724.
- Hansen, TF, and Pélabon C. 2021. Evolvability: a quantitative-genetics perspective. *Annual Review of Ecology, Evolution, and Systematics* 52:153-175.
- Hunley KL, and Cabana GS. 2016. Beyond serial founder effects: the impact of admixture and localized gene flow on patterns of regional genetic diversity. *Human Biology* 88:219-231.
- Levine P, and Bashford A. 2010. Introduction: Eugenics and the Modern World. In: *The Oxford Handbook of the History of Eugenics*, edited by A Bashford and P Levine. New York: Oxford University Press. pp 3-24.
- Lewontin R. 2000. *The Triple Helix: Gene, Organism, and Environment*. Cambridge, MA: Harvard University Press.
- Madison P. 2021. Brutish Neanderthals: history of a merciless characterization. *Evolutionary Anthropology* 30:366-374.

- Malik AH, Ziermann JM, and Diogo R. 2018. An untold story in biology: the historical continuity of evolutionary ideas of Muslim scholars from the 8th century to Darwin's time, *Journal of Biological Education*, 52: 3-17.
- Marks J. 2012. Why be against Darwin? Creationism, racism, and the roots of anthropology. *Yearbook of Physical Anthropology* 55:95-104.
- Marks J. 2020. Naming the sacred ancestors: taxonomic reification and Pleistocene genomic narratives. In: *Interrogating Human Origins: Decolonisation and the Deep Human Past*, edited by M Porr and JM Matthews. New York: Routledge. pp 295-309.
- Roksandic M, Radović P, Wu X, and Bae CJ. 2022. *Homo bodoensis* and why it matters. *Evolutionary Anthropology* 31:240-244.
- Ruff CB. 1994. Morphological adaptation to climate in modern and fossil hominids. *Yearbook of Physical Anthropology* 37:65-107.
- Savell KRR, Auerbach BM, and Roseman CC. 2016. Constraint, natural selection, and the evolution of human body form. *Proceedings of the National Academy of Sciences USA* 113:9492-9497.
- Shanker K, Vijayakumar SP, and Ganeshaiiah KN. 2017. Unpacking the species conundrum: philosophy, practice and a way forward. *Journal of Genetics* 96:413-430.
- Spiro JP. 2009. *Defending the Master Race: Conservation, Eugenics, and the Legacy of Madison Grant*. Burlington: The University of Vermont Press.
- Turner TR, Wagner JK, and Cabana GS. 2018. Ethics in Biological Anthropology. *American Journal of Physical Anthropology* 165: 939-951.
- Weiss KM, and Buchanan AV. 2004. *Genetics and the Logic of Evolution*. New York: Wiley-Liss.
- Young, M., Richard, D., Grabowski, M., Auerbach, B. M., de Bakker, B. S., Hagoort, J., Muthuirulan, P., Kharkar, V., Kurki, H. K., Betti, L., Birkenstock, L., Lewton, K. L., & Capellini, T. D. (2022). The developmental impacts of natural selection on human pelvic morphology. *Science Advances* 8: abq4884.

ATTENDANCE POLICY

You are expected to attend all lectures barring legitimate professional, athletic, religious, legal or medical reasons. If lectures must be missed, Dr. Auerbach should be contacted at minimum 24 hours before class meets. **Students who have more than three unexcused absences from class will be docked one letter grade for the final course grade.**

COURSE WEB SITE

All course materials, including supplemental readings, will be available online from the course Canvas site (online.utk.edu). **Please do not submit any assignments or exams to Dr. Auerbach via Canvas. All assignments should be turned into Dr. Auerbach via e-mail.**

STUDENTS WITH SPECIAL NEEDS

If you require accommodation because of special needs in learning, please contact the Office of Disability Services at 2227 Dunford Hall (974-6087). Please also contact Dr. Auerbach immediately via e-mail after you register with the Office of Disability Services. Arrangements will be made to adjust the course to fit your needs.

EVALUATION

You should expect to engage topics with critical thinking, in addition to developing a fundamental understanding of key evolutionary concepts. You are expected to synthesize information presented in readings and in class to develop well-supported arguments about the primary ideas introduced throughout the course. Evaluation of your performance will rest on participation in class, weekly response assignments, two critical essays, and the completion of two take-home exams. So long as you keep up with readings and take notes in class, you should find the material both rewarding and able to be mastered.

See the first page of the syllabus for the directions and deadlines for submitting assignments and examinations to Dr. Auerbach.

PARTICIPATION AND WEEKLY RESPONSES (30%)

You should come to class fully prepared. This means that all the readings provided must be read **before** coming to class, so that you benefit from lectures to gain a deeper understanding of the material covered. Your participation—asking questions and contributing information in class—is encouraged throughout the course. Your participation will require you to be able to develop informed arguments based on the information you have read.

Short answer responses to assigned questions are due at the end of each week. Dr. Auerbach will give prompts for each week. **You should answer the question independently, but you are allowed to discuss the concepts with other students in the course. However, do not write your responses collaboratively.** These responses reflect what you are learning in the course and will help Dr. Auerbach address areas of misunderstanding or knowledge gaps throughout the semester.

There are a few Fridays in which you **do not** need to submit a weekly response: **27 January, 10 March, 31 March, and 21 April.**

RESPONSE PAPERS (10% EACH)

In early March, you are required to critically watch the PBS documentary *The Eugenics Crusade* (2 hours), and in early April, watch Neil Shubin's *Your Inner Fish* three-part documentary (3 hours) outside of class. These are assigned in lieu of class meetings on the 27th of March and 19th of April. *The Eugenics Crusade* covers much of the material that is also provided in the readings for 27 February, concerning the methods by which evolutionary theory was perverted toward structural racism and legal policy in favor of negative eugenic beliefs. Dr. Shubin's series covers many basic principles of modern evolutionary thought we will discuss in the weeks leading up to it, including how developmental models and genotype-phenotype mapping have allowed a more complete understanding of organismal morphology. After watching each series, you should write

a brief (**up to four page**) argumentative response paper in response to one of a choice of prompts provided by Dr. Auerbach.

TAKE-HOME EXAMINATIONS (25% EACH)

Two short answer and essay exams will be administered during the semester, which you will complete outside of class. In these, you will need to be able to identify key concepts and individuals in evolutionary theory. The exams will only cover the information for that section, though be aware that many concepts (e.g., forces of evolution) will be emphasized throughout the course. Each exam will also have one or two brief essay questions, which will ask you to synthesize the ideas that you have encountered through lectures and reading. Synthesizing knowledge will be given priority on all exam questions. Grading guidelines are found at the end of this syllabus in the Appendix.

As these are take-home exams, you are expected to be able to look up and draw on sources to fully respond to questions. **UNLIKE WEEKLY RESPONSES, THESE ARE NOT COLLABORATIVE.** You must complete the exams independently; if you collaborate with other students, or if you plagiarize your responses, you will receive a score of zero on the exam.

**FINAL GRADES ARE NOT NEGOTIABLE.
NO EXTRA CREDIT IS AVAILABLE.**

University Policies

Academic Integrity:

An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. “As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

Plagiarism:

Students are also responsible for any act of plagiarism. Plagiarism is using the intellectual property or product of someone else without giving proper credit. The undocumented use of someone else’s words or ideas in any medium of communication (unless such information is recognized as common knowledge) is a serious offense, subject to disciplinary action that may include failure in a course and/or dismissal from the University. Specific examples of plagiarism are:

1. Copying without proper documentation (quotation marks and a citation) written or spoken words, phrases, or sentences from any source;
2. Summarizing without proper documentation (usually a citation) ideas from another source (unless such information is recognized as common knowledge);

3. Borrowing facts, statistics, graphs, pictorial representations, or phrases without acknowledging the source (unless such information is recognized as common knowledge);
4. Collaborating on a graded assignment without the instructor's approval;
5. Submitting work, either in whole or in part, created by a professional service and used without attribution (e.g., paper, speech, bibliography, or photograph).

University Civility Statement:

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected.

Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus:

<http://civility.utk.edu>.

ATTENDANCE, SUBMISSION AND MAKE UP POLICY

Short of legitimate athletic, religious, legal or medical reasons, you will not be eligible to take examinations at any time other than those that are officially designated. Exams and assignments **must** be submitted at the deadline time. Late submissions (without prior permissions for extensions from Dr. Auerbach) will be assigned a grade of zero.

TIPS FOR GETTING THE MOST OUT OF THE COURSE

As a crucial part of this course is keeping up with the reading before class meetings, you need to give ample time to reflect on the perspectives presented in the textbook and papers you read. You are *strongly* encouraged to read broadly, looking into additional sources to help you better develop an understanding of the topics covered. An excellent place to start is always in the references cited within the assigned readings. Dr. Auerbach is also available to point you toward additional resources as specific questions arise.

COURSE SCHEDULE: Evolutionary Biology for Anthropologists (ANTH 483) – SPRING 2023

DATE	TOPIC	READINGS
23 January	Introduction to the course Critical arguments and how to study evolutionary biology	Madison 2021
PART ONE: FUNDAMENTALS OF EVOLUTION		
25 January	Getting started: Concepts and analytic approaches	Weiss and Buchanan – Chapter 2
30 January	A brief history of evolution	Futuyma and Kirkpatrick (<i>on Canvas</i>) – Chapter 1 Malik et al. 2018
1 February	The place of anthropology in the history of evolution	Cravens 1988 – Chapters 1 & 3
6 February	Raw materials: mutation and variation	Futuyma and Kirkpatrick – Chapter 4
8 February	How genes relate to phenotypes	Weiss and Buchanan – Chapters 4 & 5
13 February	Natural selection	Futuyma and Kirkpatrick – Chapter 3
15 February	Genetical theory of evolution	Futuyma and Kirkpatrick – Chapter 5
20 February	Genetic drift	Futuyma and Kirkpatrick – Chapter 7
22 February	Quantitative traits and how they evolve	Futuyma and Kirkpatrick (<i>on Canvas</i>) – Chapter 7
27 February	Perverting evolution through eugenics	Levine and Bashford 2010 Marks 2012 <i>Optional (but useful!):</i> Spiro 2009 – Chapters 5 & 6
1 March	Evolution in space	Futuyma and Kirkpatrick – Chapter 8
6 March	How to be fit, and why is there sex?	Futuyma and Kirkpatrick – Chapters 10 & 11

DATE	TOPIC	READINGS
7 March	<i>The Eugenics Crusade</i> Critical Response due by 5:00 P.M. via e-mail	
8 March	Origins of diversity: gene evolution	Futuyma and Kirkpatrick – Chapter 14
8 March	Midterm Take-Home Examination posted before class	
13-17 March	SPRING BREAK	
20 March	Defining boundaries: genes, organisms, and environments	Lewontin – Chapters 1 & 2
21 March	Midterm Take-Home Examination due by 5:00 P.M. via e-mail	
22 March	The triple helix	Lewontin – Chapters 3 & 4
27 March	NO CLASS (<i>Dr. Auerbach at Anatomy Connected Conference</i>)	
29 March	Species and species concepts	Futuyma and Kirkpatrick – Chapter 9
3 April	Phylogenetics	Futuyma and Kirkpatrick – Chapter 16
PART TWO: APPLYING EVOLUTIONARY THEORY TO ANTHROPOLOGICAL QUESTIONS		
5 April	Evolutionary development (Evo-Devo) in anthropology	Boughner & Rolian 2016 – Chapters 1 & 13
10 April	Evolutionary quantitative genetics	Auerbach et al. 2023 Hansen and Pélabon 2021
12 April	Patterns in evolution: climate and human variation	Ruff 1994 Auerbach 2012
17 April	Evolutionary quantitative genetics in the cranium and limbs	Savell et al. 2016 Agosto and Auerbach 2022
11 April	<i>Your Inner Fish</i> Critical Response due by 5:00 P.M. via e-mail	

19 April	NO CLASS (<i>Dr. Auerbach at AABA Conference</i>)	
24 April	Toward a more complete understanding of the origins of variance	Hallgrímsson et al. 2009 Hallgrímsson et al. 2014
26 April	Omnigenic model and importance of regulatory genes	Boyle et al. 2017 Young et al. 2022
1 May	The hybrid origins of hominids	Ackermann et al. 2019 Hunley and Cabana 2016
3 May	Unpacking the problem of defining species	Shanker et al. 2017 Delson and Stringer 2022 Roksandic et al. 2022
4 May	Final Take-Home Examination posted	
8 May	What we don't know: DNA, definitions, and ethics	Turner et al. 2018 Marks 2020 Athreya and Ackermann 2020
12 May	Final Take-Home Examination due by 5:00 P.M. via e-mail	

APPENDIX: GRADING GUIDELINES FOR EXAMS

ANTH 483: Evolutionary Biology for Anthropologists Spring Term 2023

There are two take-home examinations administered in Evolutionary Biology for Anthropologists. Each of these consists of questions that collectively test knowledge covered during one of the three sections of the course. You should type your answers to questions on individual pages, and exam answers should be submitted to Dr. Auerbach via e-mail per Dr. Auerbach's instructions. Exams will be worth a total of 50 points.

All questions will either be short answer or short essay.

- Short answer questions will either ask for terms or brief explanations of concepts. Short essay questions will ask you to present a brief summary, argument or position about a topic covered in readings or in lecture. Short answer questions will be awarded points based on correct identifications (1 point per identification).
- Each essay question may earn up to ten points. Points are awarded for the latter using the following criteria:

Criterion	Description	Points awarded
Key concepts	The answer correctly includes key concepts addressed in readings and in lectures, and uses these to best support the thesis statement. For example, a question asking for the student to identify the forces of evolution would award full points if the student cited natural selection, mutation, random genetic drift, and gene flow.	4
Logic	The answer provides a logical structure, wherein a thesis statement that argues the position of the writer is set out, and subsequent statements provide evidence and support for that thesis statement.	2
Completeness of answer	The answer demonstrates the student has a complete understanding of the basic concepts asked. For example, a question asking about the actions of evolutionary processes on variation would address how each process increased or decreased variation, as well as what variation means in relation to these different processes (e.g., selection generally decreases phenotypic variation, while mutation will increase novel genetic and possibly phenotypic variation).	2
Accurate sourcing	The answer provides correct citations and attributions for important concepts. For example, a student citing the development of natural selection will cite both Charles Darwin and Alfred Wallace.	1
Grammar and spelling	The answer is written using grammatically correct sentence structure and correct spelling.	1
TOTAL		10