

ANTH 362: HUMAN BIOLOGICAL VARIATION (SYLLABUS VERSION 3/30/10)

Spring Quarter 2010

207 Chapman MW 4:00-5:20 pm

(4 Credit Hours; Satisfies SC & IP requirements)

Instructor: Dr. Josh Snodgrass

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Prerequisite: ANTH 270 (or permission of the instructor)

Course Description: Genetic and biological structure of human populations; population dynamics and causes of diversity; analysis of genetically differentiated human populations and their geographic distribution.

Extended Course Description: This is a science group satisfying course that examines key issues related to human biological variation, with a focus on human adaptation and evolutionary medicine. This course examines genetic and phenotypic variation in contemporary human populations. It uses an evolutionary biocultural framework to understand how adaptation to various ecological stressors (e.g., temperature, solar radiation, altitude, and nutrition) promotes human biological diversity. In addition, the course focuses on how recent cultural changes (e.g., agriculture, industrialization, and urbanization) shape human variation and health, with an emphasis on chronic diseases such as obesity, cardiovascular disease, and diabetes. This course uses a scientific approach, drawing on the methods, theories, and bodies of knowledge from various scientific disciplines, including anthropology, evolutionary biology, human physiology, nutritional science, medicine, and epidemiology.

This course has three main sections:

Section 1 concentrates on describing human biological variation. This section begins with an historical overview of approaches to classifying human biological diversity. This includes a discussion of the rise and fall of the concept of “race” in anthropology. This section of the course also describes how genetic and environmental factors shape human skeletal variation, and discusses how knowledge of skeletal variation is used in applied fields such as forensic anthropology.

Section 2 focuses on understanding the factors that shape biological variation in contemporary human populations. This section of the course uses an evolutionary approach and, in particular, relies on life history theory and biocultural theory to understand the forces that shape variation within and between contemporary human groups. This section of the course also describes how genetic tools allow us to document evolutionary change and detect recent selection in human populations. Further, this section of the course describes how specific environmental stressors, such as temperature, solar radiation, and hypoxia, shape contemporary human biological variation.

Section 3 introduces students to the basic principles of evolutionary medicine, and emphasizes differences between proximate and ultimate explanations of patterns of human health and disease. This section of the course uses the evolutionary medicine framework to examine infectious diseases, and includes a discussion of how major cultural transitions in human history have altered exposure to infectious disease. This section of the course pays particular attention to chronic diseases such as cancer, obesity, diabetes, and cardiovascular disease.

Course Format: Lecture, in-class discussion, and required weekly laboratory sections.

Required Readings:

- 1) Pollard TM. 2008. *Western Diseases: An Evolutionary Perspective*. Cambridge University Press, 223 pages.
- 2) Assorted articles and book chapters (available on Blackboard)

Expectations and Grading: Regular attendance at lectures and participation in laboratory sections are required. Grades are based on a midterm exam, quiz, a research paper, lab exercises, lab section attendance, and submission of weekly reading questions. Required readings are essential to passing exams, completing lab assignments, and participating in lab section activities.

Midterm Exam (Monday, 4/26)	30%
Quiz (Wednesday, 5/12)	10%
Research Paper (Due Finals Week)	30%
Reading Questions (3 questions due each week, except week 1)	10%
Lab Exercises (3 <i>short</i> lab write-ups)	15%
Lab Section Attendance	5%

Grades will be assigned as follows: A = 90-100%, B = 80-89%, C = 70-69%, D = 60-69%, F < 60% (with minus and plus grades assigned at appropriate cutoffs).

The grading system used in this course is as follows:

- A** – Outstanding performance relative to that required to meet course requirements; demonstrates a mastery of course content at the highest level.
- B** – Performance that is significantly above that required to meet course requirements; demonstrates a mastery of course content at a high level.
- C** – Performance that meets the course requirements in every respect; demonstrates an adequate understanding of course content.
- D** – Performance that is at the minimal level necessary to pass the course but does not fully meet the course requirements; demonstrates a marginal understanding of course content.
- F** – Performance in the course, for whatever reason, is unacceptable and does not meet the course requirements; demonstrates an inadequate understanding of the course content.

Exams and assignments must be taken/turned in at the scheduled time—**under no circumstances will make-up exams or assignment extensions be given without a documented excuse** (e.g., signed note from your doctor). If you will not be able to take an exam or turn in an assignment, you **must** notify me in advance (preferably by e-mail).

Midterm Exam: The midterm exam will be based on lectures, readings, videos, and discussions, and will include objective (multiple choice & matching), fill-in-the-blank, short answer (2-3 sentences), and short essay sections (4-5 sentences). A **quiz** during week 7 will cover the climatic adaptation lectures (i.e., the four lectures after the midterm).

Research Paper: A 10-12 page (double-spaced) research paper on a topic of choice related to evolutionary medicine will be due during finals week. This research paper will require you to apply the evolutionary medicine framework to a health issue. A list of possible topics will be provided.

Reading Questions: Once per week, each student will upload three short discussion questions onto Blackboard. These questions should be drawn from the assigned readings for the week. Please submit questions the night before either Monday or Wednesday's class. We may use these questions in class to help foster discussion.

Accommodations: Appropriate accommodations will be provided for students with documented disabilities. If you anticipate needing accommodations in this course, please make arrangements to meet with me soon.

Schedule & Readings:

Week	Date	Topics	Required Readings
1	3/29 3/31	<p>Course Overview & Requirements</p> <p>Setting the Stage: Human Evolutionary Biology & Evolutionary Medicine; Are Humans Still Evolving?</p> <p>Historical Perspectives on Human Variation: The Rise and Fall of the Race Concept</p> <p>Lab 1: An Introduction to Craniometry, Anthropometry, & the Methods of Physical Anthropology</p>	<p><u>For Monday:</u> 1) Ward 2009 2) Nesse & Williams 1998</p> <p><u>For Wednesday:</u> Mielke et al. 2006 (Ch 1)</p>
2	4/5 4/7	<p>Human Skeletal Variation I: Age, Sex, Stature, Identification of the Individual</p> <p>Human Skeletal Variation II: Applied Skeletal Variation and the Concept of Race</p> <p>Lab 2: Modern Human Skeletal Variation; Applied Human Variation (Forensic Anthropology) <i>--Due in lab on 4/21--</i></p>	<p><u>For Monday:</u> White 2005</p> <p><u>For Wednesday:</u> Sauer 1992</p>
3	4/12 4/14	<p>Human Evolutionary Biology Today: Population Thinking & Biological Anthropology; Human Adaptation & Adaptability; Revisiting Race—Untangling Biology & Genetics</p> <p>Video—<i>The Life of Mammals: Food for Thought</i> (Dr. Snodgrass at the Human Biology Association meeting in Albuquerque)</p> <p>No labs this week—Melissa at the HBA meeting too!!</p>	<p><u>For Monday:</u> 1) Saletan 2009 2) Baker 1997 3) Gravlee 2009</p>
4	4/19 4/21	<p>Human Genetic Variation: Documenting Evolutionary Change; What Makes Us Human? Evidence for Recent Selection</p> <p>Human Genetic Variation: Genetics and the Concept of Race (Discussion of Harmon 2006)</p> <p>Lab 3: Population Genetics Lab Reading: Jurmain et al. Ch. 15 (pp. 436-445)</p>	<p><u>For Monday:</u> Pollard 2009</p> <p><u>For Wednesday:</u> Madrigal & Barbujani 2007</p>

5	4/26	Midterm Exam (In Class)	
	4/28	Climatic Adaptation: Heat Lab 4: Body Size, Proportions & Thermal Stress <i>--Due in lab on 5/5--</i>	<u>For Wednesday:</u> 1) Kormondy & Brown Ch7 2) Ruff 1993
6	5/3	Climatic Adaptation: Cold	<u>For Monday:</u> Snodgrass et al. 2007
	5/5	Climatic Adaptation: Solar Radiation Lab 5: Cold Stress, Symmetry, & Muscular Strength	<u>For Wednesday:</u> Mielke et al. 2006 Ch11
7	5/10	Climatic Adaptation: High Altitude	<u>For Monday:</u> Beall 2001
	5/12	1st 30 Minutes of Class: Quiz on Climatic Adaptation 2nd Part of Class: Evolutionary Medicine: History & Theoretical Approach Lab 6: Oxygen Saturation and Skin Reflectometry <i>--Due in lab on 5/19--</i>	<u>For Wednesday:</u> 1) Nesse & Stearns 2008 2) Pollard Ch. 1
8	5/17	Evolutionary Medicine: Infectious Disease; Changing Disease Patterns	<u>For Monday:</u> Pollard Ch. 2
	5/19	Evolutionary Medicine: Asthma, Allergy, & Autoimmune Disease Lab 7: Health (Biomarkers of Health & Physiology)	<u>For Wednesday:</u> Pollard Ch. 7
9	5/24	Evolutionary Medicine: Obesity, Type 2 Diabetes, and Cardiovascular Disease	<u>For Monday:</u> 1) Pollard Ch. 3 2) Pollard Ch. 4
	5/26	Evolutionary Medicine: Depression & Stress Lab 8: Human Energetics (Diet & Physical Activity) <i>Lab Reading: Leonard 2004</i>	<u>For Wednesday:</u> 1) Pollard Ch. 8 2) Sapolsky 2005
10	5/31	No Class—Memorial Day	
	6/2	Evolutionary Medicine: Cancer Lab 9: Video: Stress—Portrait of a Killer	<u>For Wednesday:</u> Pollard Ch. 5
	6/9	No Final Exam: Research Papers Due Wednesday, 6/9 by 5pm	

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Required Course Readings

Week 1

Ward P. 2009. What will become of *Homo sapiens*? *Sci Am* (Jan.), pp. 68-73.

Nesse RM, Williams GC. 1998. Evolution and the origins of disease. *Sci Am* (Nov.), pp. 86-93.

Mielke JH et al. 2006. Classifying human biological diversity: A brief history (Ch1) In: *Human Biological Variation*. Oxford U Press, pp. 3-21.

Week 2

White TD, Folkens PA. 2005. The skeletal biology of individuals and populations. In: *The Human Bone Manual*. Academic Press, pp. 360-418.

Sauer N. 1992. Forensic anthropology and the concept of race: If races don't exist, why are forensic anthropologists so good at identifying them? *Soc Sci Med* 34: 107-111.

Week 3

Saletan W. 2009. You: The updated owner's manual. *The New York Times*, July 29.

Baker PT. 1997. The Raymond Pearl Memorial Lecture, 1996: The eternal triangle—Genes, phenotype, and environment. *Am J Hum Biol* 9: 93-101.

Gravlee CC. 2009. How race becomes biology: Embodiment of social inequality. *Am J Phys Anthropol* 139: 47-57..

Week 4

Pollard KS. 2009. What makes us human? *Sci Am* (May), pp. 44-49.

Madrigal L, Barbujani G. 2007. Partitioning of genetic variation in human populations and the concept of race. In: Crawford MH (ed.) *Anthropological Genetics: Theory, Methods, and Applications*. Cambridge University Press, pp. 19-37.

Jurmain R et al. 2010. Population genetics section of Modern Human Biology: Patterns of Variation (Ch. 15). In: Jurmain et al. *Introduction to Physical Anthropology*, Wadsworth/Cengage, pp. 436-445.

Harmon A. 2006. Seeking ancestry in DNA ties uncovered by tests. *The New York Times*, April 12.

Week 5

Kormondy EJ, Brown DE. 1998. Human adaptation to cold and heat (Ch. 7). In: Kormondy EJ, Brown DE, *Fundamentals of Human Ecology*. Upper Saddle River: Prentice Hall. pp. 131-162.

Ruff CB. 1993. Climatic adaptation and hominid evolution: the thermoregulatory imperative. *Evol Anthropol* 2: 53-60.

Week 6

Snodgrass JJ, MV Sorensen, LA Tarskaia, WR Leonard. 2007. Adaptive dimensions of health research among indigenous Siberians. *Am J Hum Biol* 19:165-180.

Mielke JH, Konigsberg LW, Relethford JH. 2006. Skin pigmentation (Ch. 11). In: *Human Biological Variation*. Oxford U Press: Oxford, p. 280-302.

Week 7

Beall CM. 2001. Adaptations to altitude: A current assessment. *Annu Rev Anthropol* 30: 423-456.

Nesse RM, Stearns SC. 2008. The great opportunity: Evolutionary applications to medicine and public health. *Evol Applications* 1: 28-48.

Pollard TM. 2008. Introduction (Ch. 1). In: *Western Diseases*. Cambridge University Press.

Week 8

Pollard TM. 2008. An evolutionary history of human disease (Ch. 2). In: *Western Diseases*. Cambridge University Press.

Pollard TM. 2008. Asthma and allergic disease (Ch. 7). In: *Western Diseases*. Cambridge University Press.

Week 9

Pollard TM. 2008. Obesity, type 2 diabetes and cardiovascular disease (Ch. 3). In: *Western Diseases*. Cambridge University Press.

Pollard TM. 2008. The thrifty genotype versus thrifty phenotype debate: Efforts to explain between population variation in rates of type 2 diabetes and cardiovascular disease (Ch. 4). In: *Western Diseases*. Cambridge University Press.

Leonard WR. Human energetics. In: CJ Cleveland (ed.) *Encyclopedia of Energy (Volume 3)*. New York: Elsevier. pp. 173-182.

Pollard TM. 2008. Depression and stress (Ch. 8). In: *Western Diseases*. Cambridge University Press.

Sapolsky R. 2005. Sick of poverty. *Sci Am* (Dec.), pp. 92-99.

Week 10

Pollard TM. 2008. Reproductive cancers (Ch. 5). In: *Western Diseases*. Cambridge University Press.