

# THEORY AND ITS APPLICATION IN BIOLOGICAL ANTHROPOLOGY

## ARKY 617 (Winter 2016)



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**Office hours:** Thursday 12:30-1:30 *and*  
by appointment

### COURSE DESCRIPTION

From Plato to Darwin to contemporary research in biological anthropology, the goal has been to explain biological variation. Why do we see such biological diversity? Why do humans and non-human primates vary as they do? I've designed this seminar to explore the history of these questions, the development of relevant theory, and contemporary work on the topic of human and non-human primate variation. In particular, we will focus on basic issues in the study of evolutionary theory as it applies to biological anthropology. This should provide you with a theoretical foundation for your own consideration of variation. We will spend the first half of the course considering the principles of evolutionary biology. The remainder of the semester will focus on the application of this theory to human and non-human primates. While evolutionary biology provides the theoretical foundation for this course, primates are both biological and cultural animals. Consequently, this course will take a biocultural approach; that is, we will consider observed variations in light of both the biological and cultural variables which may be related to the phenomena of interest.

The course assumes some prior coursework in molecular and population genetics and evolutionary theory, such as that covered in entry-level biology and biological anthropology courses. Course content and structure will be geared to the level of students in the master's program who have completed some of their coursework, but have yet to fully embark on their thesis.

It is acknowledged that many students may find greater relevance of some aspects of evolutionary theory to their research interests. This affinity will be respected in the sense that no student will be forced to apply the less-relevant aspects of evolutionary theory to their area of study. However, all students will be expected to gain a familiarity with materials covered in the course. For example, evo-devo and the debate concerning adaptation may not be directly relevant to all students' work, but students should be able to provide a brief description of the implications of these topics to their area of research.

## COURSE OBJECTIVES

*By the end of the course, students will be able to:*

- (1) Describe, in some detail, the history of science as a way of knowing and the development of evolutionary theory;
- (2) Justify their use of the scientific or other method in their own research;
- (3) Describe the state of the science of evolutionary biology and identify key questions in the field of evolutionary theory;
- (4) Summarise and critique the application of evolutionary theory to their sub-discipline of biological anthropology;
- (5) Verbally articulate the application of evolutionary theory to their particular research topic in a concise and compelling manner.

## READINGS

The bulk of the readings will come from selected book chapters and journal papers. Many of these are available as pdf files at the class Blackboard website. In addition, we will use the following book.

Darwin, Charles 1859. *On the Origin of Species*. **1<sup>st</sup> Edition**.

## ORGANIZATION

1. Meetings of the seminar will be devoted to discussion of selected topics. It is expected that you will accept the professional responsibility to carefully read the materials assigned and participate actively in the discussion.
2. Worksheets and/or essays will be assigned for each topic and collected periodically. All written work must be typed.
3. Each member of the seminar will be responsible for leading two class meetings and individually leading one class meeting.
  - a. *Round one*: Students will choose class #3, 4, 5, or 6 to lead.
  - b. *Round two*: The topics covered here will be determined by the students with input from me. The individual leading this class will also be responsible for handing in a 2500-3000 word summary-critique of the state of the science on the topic.

## EVALUATION

Readings and Discussion

30%

Due date: weekly

Each week a selection of readings and questions will be assigned. Questions will be designed to ensure comprehension of the material and to facilitate discussion. I will occasionally collect your answers to evaluate your understanding of the assigned material. The discussion should reflect a critical evaluation of the material presented. A critical evaluation requires a clear understanding of the evidence presented and a careful consideration of alternative explanations for the outcomes. It is to your advantage to cite relevant literature when discussing particular papers and topics. This literature may be from earlier class meetings and, hopefully, from material you have covered elsewhere.

Leading class (first time)

10%

Due date: depends on class lead

Leading class (second time)

15%

Due date: depends on class lead

Leading a class requires you to do the following:

1. *Select articles for the class* (due 11 days prior to the class):

These articles should provide the students with a bit of history on the topic as well as the state of the science. The class leader must send the articles selected to me at least 11 days prior to the class so that I have a bit of time to evaluate them before you post them for the other students. I generally have a list of papers which will provide you with a starting point on the topic. For the first class that you lead, you will have less flexibility in choosing articles as I want to ensure that the seminal pieces on each topic are covered.

2. *Write discussion questions* (due 8 days prior to the class):

These questions should lead the rest of us to write a summary and critique of each assigned reading and to stimulate discussion. It is often a good idea to ask your peers to compare and contrast articles which reach different conclusions. You may wish to ask provocative questions to stimulate discussion. While questions asking for a description of the studies in question can help to ensure comprehension, they do not often generate discussion. Please send your questions to me electronically.

3. *Write an introduction to the topic* (due 8 days prior to the class):

The introduction must summarize why the topic is relevant, how it ties in with topics covered in other class meetings, and what you hope will be achieved in the class. This should be roughly one paragraph. Please send the introduction to me electronically.

4. *Introduce the topic in class*:

This should be designed to give the students some background on the topic and last 15-20 minutes. While you will want to provide relevant history and perhaps more detail than is available in the readings, you need to avoid covering the material we will discuss as a class; that is, don't answer the questions which have been provided to stimulate class discussion.

5. *Facilitate discussion*:

This is often the most challenging aspect of leading the class as it requires you to think on your feet, asking the class questions to stimulate critical evaluation of the topic covered. You might ask for alternative explanations of observed outcomes, what we can learn from the author(s) research methods, and how we might improve upon the study. When thinking about questions for step 2 above, it is a good idea to keep a few up your sleeve to stimulate discussion when necessary.

6. For second class lead - *Paper summarizing* the state of the science-

As above, the individual leading this class will be responsible for handing in a 2500-3000 word summary-critique of the state of the science on the topic they cover in the second class they lead. If your topic concerns an adaptation to a particular stress, you should summarize what we know today about various genetic, phenotypically plastic, and behavioural adaptations to this stress. If your topic concerns something like balanced polymorphisms, you must summarize what we know today about the mechanisms which maintain this condition.

In choosing a topic for the second class, you should choose one that is of interest to you, but not the topic you wish to cover in your term paper. I have provided a list of potential topics for the second class you lead. You do not have to choose one of these, I only provide them as they have proven interesting in the past.

**Paper Assignment #1:**

**10%**

**Due date: March 11**

The state of evolutionary theory in your sub-discipline: This assignment requires you to review at least 5 papers in your sub-discipline published in the last 20 years to assess the state of evolutionary theory in your sub-discipline. That is, is evolutionary theory used in these works? If yes, how? If not, how might the paper be strengthened via an inclusion of evolutionary theory? The papers considered must: (1) be seminal or at least very influential in the sub-discipline\*, (2) be drawn from disparate areas in the sub-discipline which address different questions and use different methods, (3) reflect at least different two schools of thought within the sub-discipline. In this paper, you should: (1) summarise the main points of the paper, (2) summarise the degree to which evolutionary theory\* explicitly or implicitly underlies the work (In this you must think about all aspects of evolutionary theory. Does the paper consider variation, mechanisms of evolution such as drift, mutation, gene flow, sexual & natural selection, etc.?) (3) critique, in light of evolutionary theory, the conclusions reached; (4) summarise the state of the sub-discipline's use of evolutionary theory. Essentially you should ask yourself whether or not each paper is well grounded in current evolutionary theory and may make recommendations for the direction of the discipline on the basis of your review. Note that I am only asking you to critique the paper as it relates to evolutionary theory; that is, you need not critique other perceived strengths / weaknesses of the paper. The paper must be 2000-3000 words and be submitted electronically.

\* Note that a "seminal paper" is one which is referenced very often and concerns the big, often theoretical, questions in the discipline. Examples include Wood et al. (1992) for human skeletal biology, Kappeler and van Schaik (2002) for primatology, Carroll (2000) for evo-devo, and Dufour (2006) for human population biology. While advances in methods are important, they rarely constitute seminal papers in the discipline.

Carroll (2000) Endless forms: The evolution of gene regulation and morphological diversity. *Cell* 101: 577-580.

Dufour (2006) Biocultural approaches in human biology. *American Journal of Human Biology*. 18:1-9.

Kappeler and van Schaik. 2002. Evolution of Primate Social Systems. *Int J Primatol* 23(4):707-740.

Wood et al. (1992). The Osteological Paradox: Problems of Inferring Prehistoric Health from Skeletal Samples. *Current Anthropology* 33(4): 342-370

Paper Assignment #2:                    2%                    Due date: March 22

Evaluating another student's work: Each student will read and evaluate another student's paper on the state of evolutionary theory in their subdiscipline. The critique will be returned directly to me and I will pass it along to the students. This paper must be submitted electronically.

Paper Assignment #3:                    (part of class lead #2)    When you lead your second class.

Term Paper Abstract:                    2%                    Due date: April 8

This is a summary of the term paper. It must be 200 words or less and be submitted electronically.

Presentation of Term Paper:        11%                    Due date: April 13\*

In class presentation of term paper: You will have a maximum of 20 minutes to describe your term paper. While you are free to use any type of media you wish to give this presentation, I will need to know, no later than 3 days prior to your presentation, if you will need anything in addition to a computer and digital projector. Note, this is not an opportunity to tell us what you are going to write about in your term paper, it is an opportunity tell us what your completed term paper has taught you; that is, your term paper should be finished before you present. I will give you feedback on your presentation to enable you to refine your term paper prior to turning it in.

Paper Assignment #4:                    20%                    Due date: April 18

Term paper: This should address a topic which is directly relevant to your research and demonstrate the application of evolutionary theory to your work. Many students have ended up using parts of this paper as either a chapter or section of their dissertation or thesis. **You must get my okay on your topic no later than 18 March.** The paper must be 5500-7000 words in length and must be submitted as a both an electronic and hard copy.

## Assignment Format, Deadlines, & Mark Breakdown

### Format for written work

- double space
- font: 12 point, Times New Roman
- 1 inch margins
- provide page numbers
- a separate title page is not necessary

- alignment – left (do not use the “justify” alignment)
- reference format- I don’t care what format you use as long as it is easy for me to determine the source for the point referenced.

**Deadlines**

Work will **not** be accepted after **4:00 pm** on the due date.

**Evaluation**

Your final mark for the course will be based on the following:

Assignment	Percentage of Mark
Readings and Discussion	30%
Leading class (first time)	10%
Leading class (second time)	15%
Paper Assignment #1: Evolutionary theory in your sub-discipline	10%
Paper Assignment #2: Review of another’s student’s work	2%
Paper Assignment #3: Term paper	20%
Term Paper Abstract	2%
Presentation of Term Paper	11%

**Letter grade assignment:** At the end of the course, the numerical marks will be summed and a final letter grade will be assigned based on the following basis:

<u>Percentage range</u>	<u>Letter grade</u>	<u>Percentage range</u>	<u>Letter grade</u>
95 or higher	A+	68-72	C+
90-94	A	64-67	C
85-89	A-	59-63	C-
81-84	B+	54-58	D+
77-80	B	50-53	D
73-76	B-	49 or lower	F

## SCHEDULE OF TOPICS

Class	Date	Leader	Topic
1	Jan. 13	Warren	Introduction
	Jan. 20	n/a	class canceled
2	Jan. 27	Warren	Fundamental concepts: Science, Biology, Lyell, and Malthus
3	Feb. 3	Warren & Gina	Fundamental concepts: Darwin
4	Feb. 10	Emily	The modern synthesis: mechanisms & processes of evolution
5	Feb. 12	Amy & Garielle	Sexual selection & Epigenetics
	Feb. 17		Reading Break ~ No Class
6	Feb. 24	Courtney	A Newer Synthesis: post-modern-synthesis developments
7	Mar. 2	Campbell & Benedikt	Evolutionary Developmental Biology (Campbell Rolian & Benedikt Hallgrimsson)
8	Mar. 9	Warren & Emily	Adaptation- levels, problems in defining adaptation (Warren) Adaptation to disease (Emily)
9	Mar. 16	Gina	Stress Theory-adaptation "upside down..."
10	Mar. 23	Garielle	The evolution and maintenance of polymorphism in populations
11	Mar. 29*	Courtney	Adaptation to hypoxia & thermal stress
12	Apr. 6	Amy	Adaptation to nutritional stress
13	April 18	n/a	Student presentations
	April 25	n/a	Term papers due

**Topic ideas for the second class you lead:** As noted above, you do not have to choose one of these. I only provide them as they have proved interesting to students in the past.

- Adaptation in humans: genetic, physiological, and behavioral mechanisms
- Stress Theory-adaptation “upside down...”
- Kin selection\*\*
- Sexual selection\*\*
- Group Selection vs. Individual Selection
- Adaptation to hypoxia & thermal stress

- Adaptation to infectious disease
- Adaptation to nutritional stress
- The evolution and maintenance of polymorphism in populations

\*\* We will cover this topic briefly when discussing the modern synthesis. As both are important mechanisms of evolution, there will be much more to learn about them.