Applications of Evolution in Medicine, Human Behavior, and Agriculture

SAS 110, CRN# 88722, 4 units, MWF 11:00-11:50 in 1120 Hart Hall

Instructor: Jay Rosenheim

Prerequisites: BIS 2A, 2B, 2C (concurrent enrollment in 2C is fine)

INTRODUCTION:

Welcome to SAS110, *Applications of Evolution in Medicine, Human Behavior, and Agriculture*. The goal of this class is to use a basic understanding of evolutionary biology (as obtained from having successfully completed BIS2ABC) to understand key challenges faced by people across the full arc of a human life, or "from the womb to the tomb." The class will treat a number of topics in health and medicine ("Evolutionary medicine"), in human behavior ("sociobiology" or "evolutionary psychology"), and in agriculture ("Darwinian agriculture"). The class will be a blend of 'standard' lecture and discussions focused on the research literature, and an independent project that will culminate in a term paper.

Office hours: Because the class is small, I will not hold regular office hours. However, I will be happy to meet; just send me an e-mail (jarosenheim@ucdavis.edu) to set up an appointment.

GRADES:

Your grade in SAS110 will be based upon your grades on one midterm (100 points), a comprehensive final exam (200 points), and your term paper (50 points for the initial outline and annotated bibliography of at least 4 papers; 50 points for the first complete draft and expanded bibliography of at least 10 papers; and 100 points for the final draft with complete bibliography of at least 10 papers).

TERM PAPER		
Outline with initial bibliography of ≥4 papers (week 4)	10%	50 points
First complete draft with expanded bibliography of ≥10 papers (week 8)	10%	50 points
Final draft, 6-8 pages, with full bibliography of ≥10 papers (week 10)	20%	100 points
MIDTERM	20%	100 points
FINAL	40%	200 points
TOTAL	100%	**500 pts**

Exams will be based upon the material covered in the class meetings (lecture/discussions) and the readings.

Policy on late submissions of bibliography or drafts of term paper: procrastination is a terrible thing. To provide encouragement to develop good habits of timely work, I will deduct 2 points per day for late drafts of bibliographies or papers. Exceptions will be granted for medical/personal emergencies, of course. The submission deadline for the final draft of the term paper is firm, because grades must be turned in to the registrar promptly at the end of the quarter.

Bibliography: An important part of the class is giving you an opportunity to explore the primary research literature and learn how to read research papers with a critical eye. With this in mind, I hope that everyone will read at least one paper per week from a scientific journal (not a story in the popular press, or a write-up from someone's personal web-site) that will give you the background necessary to write your term paper. For any given topic, reading one or two good review papers can be extremely valuable; however, I want to encourage you to read papers from the primary research literature (i.e., original research studies, reported in detail, and published in a peer-reviewed scientific journal). As you read papers, add them to your bibliography, using the following format (this format is modified from PLoS ONE's style):

Published papers:
Hou WR, Hou YL, Wu GF, Song Y, Su XL, et al. (2011) cDNA, genomic sequence cloning and overexpression of ribosomal protein gene L9 (rpL9) of the giant panda (*Ailuropoda melanoleuca*). Genetics and Molecular Research 10:1576-1588.

Electronic journal articles:
Huynen MMTE, Martens P, Hilderlink HBM (2005) The health impacts of globalisation: a conceptual framework. Global Health 1:14. Available: http://www.globalizationandhealth.com/content/1/1/14. Accessed 25 January 2012.

Books:
Bates B (1992) Bargaining for life: A social history of tuberculosis. Philadelphia: University of Pennsylvania Press. 435 p.

Book chapters:
Hansen B (1991) New York City epidemics and history for the public. In: Harden VA, Risse GB, editors. AIDS and the historian. Bethesda: National Institutes of Health. pp. 21-28.

Please let me emphasize again that all articles should be taken from peer-reviewed journals and from books, and, with rare exceptions, **NOT from private web-sites or the popular press**.

Term paper: the goal of the term paper is to give you a chance to explore in some detail a topic that you find particularly interesting. I also want to give you a chance to develop your skills in (i) finding relevant scientific literature using a search engine (I'll give a quick tutorial on using the Web of Science); (ii) reading the primary research literature; and (iii) writing a cogent essay. You can use any of several formats for the term papers. You can write a 'mini-synthesis' of a topic of interest (covering what we currently know, and key questions being addressed

presently). Or, you can write a 'grant proposal' to conduct a study to explore a particular hypothesis of interest (the proposal would include a quick summary of past work and then outline plans for future research). Or, you could just take one paper and write a careful critique (maybe you find the paper unconvincing, or you think it is flawed in some way! So, explain why, and use other scientific evidence to support your case). The one thing I *do not* want you to do is to take one of my lectures and recapitulate it to me in a paper (that will be much less interesting for you and me both). Do some creative exploring/learning for the paper. It should be fun if you choose a topic that you find intriguing.

A note on plagiarism: Writing is hard work, but, like so much of what we do, improvement comes with practice. Copying someone else's writing (i.e., assembling a term-paper by cutting-and-pasting chunks of text written by other people) without putting the quoted text in quotation marks and citing the original source of the work is **plagiarism**. (I have placed UCD's policy on plagiarism on the course Smartsite – see that document if you are at all unclear about how to avoid plagiarism.) Plagiarized work will receive zero credit.

Grades: Cut-offs for grades (points received out of a total possible of 500) will be as follows:

Some sort of A: ≥90% (≥450 points)
Some sort of B: 80-90% (400-450 points)
Some sort of C: 70-80% (350-400 points)
D: 60-70% (300-350 points)
F: <60% (<300 points)

If I write exams that turn out to be harder than I expect (it does happen sometimes . . .), then I will lower the cut-offs. I never raise the cut-offs. I encourage you to help one another learn the material.

READINGS:

We will not use a text for the class; instead, all required readings are posted on the course Smartsite. However, I have put five text-like books on Reserve in Shields Library. These books are good sources of background reading for many of the topics that we will tackle, and may also be good sources of potential topic ideas for term papers. These books are:

Buss, D. M. 2012. Evolutionary psychology: the new science of the mind, 4th ed. Pearson, Boston, MA.

Denison, R. F. 2012. Darwinian agriculture: how understanding evolution can improve agriculture. Princeton University Press, Princeton, NJ.

Perlman, R. L. 2013. Evolution & medicine. Oxford University Press, Oxford, UK.

Stearns, S. C., and J. C. Koella. 2008. Evolution in health and disease, 2nd ed. Oxford University Press, Oxford, UK.

Stearns, S. C., and Medzhitov, R. 2016. Evolutionary Medicine. Sinauer Associates, Sunderland, MA.

Podcasting: I will podcast the class lecture/discussions via the class Smartsite. If you miss a class session, please borrow someone's lecture notes (to see what was written on the board), and then you should be ready to listen to the podcast.

LECTURE/DISCUSSION SCHEDULE, and reading assignments

Lecture / Discussion	Date	Topic	Readings
1	Mon, April 3	Pregnancy and childbirth I	1-Haig 2008
2	Wed, April 5	Pregnancy and childbirth II	2-Carroll et al. 2014
3	Fri, April 7	Pregnancy and childbirth III	**Discussion:** 3-Robillard et al. 2011
4	Mon, April 10	Fat babies, infanticide, and genomic imprinting I	4-Hrdy 1999
5	Weds, April 12	Fat babies, infanticide, and genomic imprinting II	**Discussion:** 5-Crespi 2011
6	Fri, April 14	Weaning: genetic variation and lactose intolerance	6-Tishkoff et al. 2007
7	Mon, April 17	Young adults: genetic variation in taste receptors I	7-Hayes et al. 2011
8	Weds, April 19	Young adults: genetic variation and alcoholism I	8-Takeshita et al. 1993
9	Fri, April 21	Young adults: genetic variation and alcoholism II	9-Higuchi et al. 1994
10	Mon, April 24	Marriage: mate choice and the major histocompatibility complex I	10-Loisel et al. 2008
11	Weds, April 26	Marriage: mate choice and the major histocompatibility complex II	**Discussion:** 11-Wedekind et al. 1995
12	Fri, April 28 **Initial outline for paper due**	Marriage: mate choice and the major histocompatibility complex III	**Discussion:** 12-Ober et al. 1998
13	Mon, May 1	Adults raising children: autism, vaccines	**In class debate:** 13-Wakefield et al. 1998 13-Madsen et al. 2002
14	Weds, May 3	Adults raising children: autism, vaccines	
	Fri, May 5	**MIDTERM** (lectures 1-13)	
15	Mon, May 8	Adults raising children: vaccination and epidemics	15-Saint-Victor and Omer 2013
16	Weds, May 10	Adults raising children: autism, mutation, and parental age	**Discussion:** 16-Kong et al. 2012
17	Fri, May 12	Adult responsibility: crop breeding	17-Denison 2012
18	Mon, May 15	Adult responsibility: resistance to *Bt*-crops I	18-Tabashnik et al. 2013
19	Weds, May 17	Adult responsibility: resistance to *Bt*-crops II	
20	Fri, May 19	Adult responsibility: antibiotic resistance I	20-Andersson and Hughes 2010

21	Mon, May 22	Adult responsibility: antibiotic resistance II	**Discussion:** 21-D'Costa et al. 2011
22	Weds, May 24 **1st draft of term paper due**	Adult responsibility: *Toxoplasma* and mental illness	22a-Hoover et al. 2011 ***and*** 22b-Berdoy et al. 2000
23	Fri, May 26	Old age: cancer and mutation accumulation	23-Crespi and Summers 2005
	Mon, May 29	**MEMORIAL DAY** (vacation)	
24	Weds, May 31	Old age: cancer and multi-level selection	24-Calabrese and Shibata 2010
25	Fri, June 2	Old age: leukemia, a cancer model	25-Tomasetti and Vogelstein 2015
26	Mon, June 5	Old age: chemotherapy and the Red Queen	**Discussion:** 26-Khorashad et al. 2013
27	Weds, June 7 **Final draft of term paper due**	Epilogue, review	
	Tues, June 13, 8:00-10:00 AM	**FINAL EXAM** (cumulative)	