Evolutionary Medicine
Spring 2010
BSC 4933

Instructor: Lynn B. Martin
Email: lmartin@cas.usf.edu
Office: SCA 130

Time: 8:00 – 9:15, Tues & Thurs
Room: LIF 263
Office hours: 9:30 – 11, Tuesdays

Course description:
This 3 credit course will use a Darwinian perspective to investigate problems in health and disease. The course will consist of lectures and out-of-class reading and writing and comprise four topics:

i) the value of strong inference and the comparative method
ii) basic evolutionary biology including natural selection and adaptation
iii) basic vertebrate immunology, physiology and disease biology
iv) selected topics in evolutionary medicine

The goal of the class is to encourage you to think about human health from both top-down (evolution and ecology) and bottom-up (physiology and genetics) perspectives.

Texts: (available at the USF bookstore, Amazon, BN.com, etc.)
Nesse and Williams, Why We Get Sick: The New Science of Darwinian Medicine
Williams, Adaptation and Natural Selection
Ewald, Plague Time: The New Germ Theory of Disease

Grading:
Evolution paragraph 15 points
Exam I 100 points
Exam II 100 points
Exam III 100 points
Exam IV 100 points
Book report I 50 points
Book report II 50 points
Term paper 100 points

No make-ups will be allowed and no extensions will be given without a valid excuse (hospitalization, military duty, accident). If you believe you are entitled to an extension, you must make your case within 2 days of the assignment due date. Otherwise, you will earn a “0” for that assignment – no exceptions.

Grading scale: (The plus/minus scale will not be used)
A – 90 and above; B – 89-80; C – 80-79; D – 69-60; F – 59 and below.

No extra credit will be given and grades will NOT be curved.

Attendance: USF policy mandates that you attend the first class meeting, or be dropped from the class roster. Attendance will not be taken, but excessive tardiness is unacceptable in spite of the early class time. If you arrive to class more than 5 minutes late, you will not be allowed to enter. As make-up assignments are not available, if you arrive late you will receive a zero for that assignment.
**NOTE:** Last day to drop course with grade of “W” is March 14.

**TENTATIVE SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
<th>Assignment due</th>
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<tbody>
<tr>
<td>January</td>
<td>Syllabus and Intro</td>
<td>NW 1&amp;3, Ewald intro</td>
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<td>12</td>
<td>Comparative method</td>
<td>Ewald preface</td>
<td>Evolution paragraph</td>
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<td>14</td>
<td>Natural selection</td>
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<td>Term paper, books</td>
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<tr>
<td>19</td>
<td>Adaptation</td>
<td>NW2, Stearns, Will 1&amp;2</td>
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<td>21</td>
<td>Genotype/Phenotype</td>
<td>Will 3, West-Eberhard</td>
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<td>26</td>
<td>Trade-offs</td>
<td>Will 6, Stearns 7 &amp; 10</td>
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<td>February</td>
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<tr>
<td>2</td>
<td>EXAM I</td>
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<td>4</td>
<td>Arms races</td>
<td>Ewald, 9-42</td>
<td>Book report 1 due</td>
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<td>9</td>
<td>Infectious disease</td>
<td>Ewald, 43-70</td>
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<td>11</td>
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<td>Ewald, 71-106</td>
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<td>Ewald, 107-166</td>
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<td>Ewald, 167-244</td>
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<td>March</td>
<td>EXAM II</td>
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<td>2</td>
<td>Injury</td>
<td>NW 5</td>
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<td>4</td>
<td>Toxins</td>
<td>NW 6</td>
<td>Book report 2 due</td>
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<td>8 – 13</td>
<td>Spring Break</td>
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<td>16</td>
<td>Genes and disease</td>
<td>NW 7</td>
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<td>18</td>
<td>Obesity and Jaundice</td>
<td>none</td>
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<td>23</td>
<td>Aging</td>
<td>NW 8</td>
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<td>25</td>
<td>Legacy of history</td>
<td>NW 9&amp;10</td>
<td>Term paper to peers</td>
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<td>April</td>
<td>EXAM III</td>
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<td>1</td>
<td>Allergy</td>
<td>NW 11 and Profet 1991</td>
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<td>6</td>
<td>Cancer</td>
<td>NW 12 and Hobohm 2009</td>
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<td>Sex</td>
<td>NW 13</td>
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<td>Term paper peer critique</td>
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<td>15</td>
<td>Mental disorders</td>
<td>NW 14</td>
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<td>20</td>
<td>Ecological immunology</td>
<td>primary literature</td>
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<td>22</td>
<td>Psychoneuroimmunology</td>
<td>primary literature</td>
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<td>26</td>
<td>Evolution of medicine</td>
<td>NW 15</td>
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<td>REVIEW PAPER</td>
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<td><strong>Topic due:</strong> <strong>March 19, 2010</strong></td>
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<td><strong>Term paper draft due to me and your peers:</strong> <strong>March 25, 2010</strong></td>
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<td><strong>Final paper due:</strong> <strong>beginning of class, April 26, 2010</strong></td>
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<td><strong>Papers turned in after the deadline will not be accepted</strong></td>
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This assignment gives you an opportunity to apply the principles of Darwinian medicine to a specific disease. As scientific writing may be new for many of you, you will turn in a draft version of your paper to me and to 2-3 of your peers before the final deadline. I will grade this document as I would the final version, which will give you an impression of
what I expect, and your peers will critique it and give you a grade following the same rubric. Details for peer-review will be provided as the date approaches.

You may choose any disease, symptom, or health problem that interests you. Just get it approved by me before hand if it is not on the list below. Remember: the idea is to apply Darwinian principles to a medical topic. Do not review the topic as you would for a typical pre-health science class.

- Hypertension
- Inflammatory bowel disease
- West Nile Virus
- Osteoarthritis
- Hepatitis
- Marfan syndrome
- Hemophilia
- Osteoporosis
- Wilson’s Disease
- Tuberculosis
- Acute myelogenous leukemia
- Sleeping sickness
- Multiple sclerosis
- Coronary heart disease
- Prion diseases
- Pre-eclampsia
- Rheumatoid arthritis
- Gout
- Muscular dystrophy
- Acne
- Peptic ulcers
- Specific allergies
- Alzheimer’s Disease
- Obsessive-compulsive disorder
- Dengue hemorrhagic fever
- Huntington disease
- Asthma
- Depression
- Erythroblastosis fetalis
- Lupus
- Precocious puberty
- Cystic fibrosis
- Psoriasis
- Hemochromatosis
- HIV/AIDS
- Opportunistic nosocomial infections
- Panic attacks
- Schizophrenia
- Seasonal affective disorder
- Menopause
- Heterothermia
- Immunoregulation
- H5N1 influenza
- Cervical cancer

Format: maximum 4 pages (1.5-spaced, Arial, 10 point, 1” margins).
Your paper should be written in the format of a peer-reviewed journal, such as Medical Hypotheses. Follow the format below to produce the most concise, well-designed paper.

I. Describe the disease, symptom or phenomenon you are trying to explain. This section should define the problem and provide a brief summary of its epidemiology and proximate causes. You can probably get much of this from a medical textbook. (1 page)

II. Use the ideas below to help you shape your hypotheses to test. Your hypotheses should be set up as alternative or interconnected explanations. For most diseases you will want to consider all of the potential reasons below (2 pages):

A. Our bodies were shaped to cope with a different environment (or, certain genes cause disease only in the modern environment) than those in which we currently live
B. Design cannot be better because of constraints of all systems (e.g., tradeoffs and physical impossibilities)
C. Design cannot be better because of constraints peculiar to evolved organisms (e.g., path dependence and chance factors such as rare mutations)
D. The genes and traits in question increase reproduction at the expense of health (e.g., antagonistic pleiotropy)
E. The phenomenon is not a disease but a defense
F. Pathogens evolve faster than we do (resulting arms races and their complications)

III. Summarize your conclusions based on which hypotheses you found the most support for and discuss what other studies or evidence would help further resolve the issue. (1 page)

References: You must use references from primary literature, not Wikipedia or the like. This will mean going to the library and using academic journals and books. If you are not comfortable using library resources, please ask librarians for help well in advance!

Formats: When you cite a reference, use the format below. The final paper should include at least 7 references. The bibliography is NOT included in the page limit.


Book reports
Each person will be responsible for reading and reporting on two books. Reports should not exceed 2 pages. All reports should be 1.5-spaced in Arial, 10-point font (1” margins). Grading emphasis will be placed on your ability to demonstrate understanding of the material, although grammar will be evaluated if necessary.

Each report must consist of:
1. An overview of the book, emphasizing its main message.
2. Three quotations from the book. In 1-2 sentences, describe why these statements are important to the book’s main message and what pertinence they have to the course.
3. Your assessment of the author’s perspective. During the course, we will discuss several controversial topics. In your opinion, was the author biased in favor of one viewpoint or another?

Suggested Books
Several books are quite long, so consider carefully before selecting a book. The object of this exercise is to expose you to different authors and evolutionary theory relevant to medicine. You are welcome choose a book not on the list, but get my permission first.

Evolution: General
Bell, G. The Basics of Selection.
Mayr, Ernst and Jared Diamond. What Evolution Is.
Richard Dawkins: The Ancestor's Tale: A Pilgrimage to the Dawn of Evolution
Ernst Mayr: What Makes Biology Unique?
Geerat J. Vermeij: Nature: An Economic History
Stephen R. Palumbi: The Evolution Explosion

**Evolution and Disease**
Paul Ewald. Evolution of Infectious Disease.
McNeill, W. Plagues and Peoples.
Garrett, Laurie. The Coming Plague
Kolata, Gina. Flu: The Story of the Great Influenza Pandemic of 1918
Zimmer, Carl. Parasite Rex
Rosenberg, C. The Cholera Years: The United States in 1832, 1849, and 1866.
Handelman, S. and K. Alibek. Biohazard
Greaves, M. F. Cancer: The Evolutionary Legacy

**Evolution and Human Nature**
Wright, R: The moral animal: The new science of evolutionary psychology.
McKeown, Thomas. The Origins of Human Disease.
Sapolsky, R. The Trouble with Testosterone: And Other Essays on the Biology of the Human Predicament.
Hrdy, S. Mother Nature: Maternal Instincts and How They Shape the Human Species.

**Evolution and Natural History**
Williams, G.C. The Pony Fish's Glow: and Other Clues to Plan and Purpose in Nature.
Weiner, J. Song of the Dodo.

**Other important notes:**
1. Students who anticipate missing class due to a religious observance must submit notification in writing by the third class. Other absences are not excusable and NO LATE ASSIGNMENTS WILL BE ACCEPTED.

2. The content of the course is the sole property of the instructor and may not be reproduced or distributed in any form for sale. PowerPoints of lectures will be available
on BlackBoard within 24h of a lecture, if not earlier. They will not contain all of the information for which you are responsible. You must take notes to excel.

3. Assignment due dates and lecture content are subject to change, so your attendance is critical.

4. S-U grades must be negotiated in writing within the first three weeks of the term.

5. An “I” grade indicates incomplete coursework and may only be awarded when only a small portion of coursework is incomplete and when the student otherwise has a passing grade. A Biology department “Incomplete Grade Contract” must be completed before the “I” grade is given.

6. No cell phones, PDAs, or other electronic devices are allowed in the classroom. Any use of these devices is grounds for dismissal from the class that day; second offenses will result in permanent dismissal.

7. Disruption of academic process is an act by a student in a classroom or teaching environment which in the reasonable estimation of a faculty member: i) distracts attention from the academic material (e.g., persistent, disrespectful or abusive disruptions), or ii: presents danger to the health, safety or well-being of class participants. These acts will not be tolerated.

8. Uncollected assignments will not be retained longer than 90 days from the due date. Grades cannot be disputed beyond 90 days from their assignment.

9. Academic dishonesty will not be tolerated and you will be held to all academic policies and standards of the USF. Any form of cheating is academic dishonesty. ‘Cheating’ is defined by the University as (1) unauthorized granting or receiving of aid during the prescribed period of a course-graded exercise (students may not consult written materials such as notes or books, may not look at the paper of another student, nor consult orally with any other student taking the same test); (2) a student’s asking another person to take an examination for or in place of him/her; (3) taking an examination for or in place of another student; (4) stealing visual concepts, such as drawings, sketches, diagrams, musical programs and scores, graphs, maps, etc., and presenting them as one’s own; (5) stealing, borrowing, buying, or disseminating tests, answer keys, other examination materials, research papers, creative papers, speeches, other graded assignments, text or phrases from websites, etc., except as officially authorized; (6) stealing or copying of computer programs and presenting them as one’s own. Engaging in plagiarism is academic dishonesty, even though a student may plagiarize without any intent to be dishonest. ‘Plagiarism’ is defined by the University as literary theft consisting of the unattributed quotation of the exact words of a published text, or the unattributed borrowing of original ideas by paraphrase from a published text. Plagiarism detection software (e.g., SafeAssign) may be used on your assignments.

10. No make-ups or extensions will be made without a valid excuse. If you believe you are entitled to an extension, you must make your case within 2 days of the assignment due date. Otherwise, you will earn a “0” for that assignment. Valid excuses include medical emergencies (individual or immediate family only), legal (accident or court case; individual only), or funerary (immediate family only). Reasons for requesting a make-up must relate specifically to the time period of the missed coursework. Reasons for
requesting a make-up must be documented in writing by an involved professional. The instructor retains the right to make additional inquiries concerning the documentation. The instructor retains the right to give a make-up that is different in exact content and/or style than the missed coursework. A staff member is not permitted to administer a make-up. Chronic attendance problems for reasons beyond a student’s control may warrant withdrawal from the course. You should see the Undergraduate Program Assistant for information concerning late withdrawals and refund of fees.

11. In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Blackboard, Elluminate, Skype, and email messaging and/or an alternate schedule. It’s the responsibility of the student to monitor Blackboard site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

12. Do not email me with class concerns or requests. I likely will not answer. If you have an issue or question, come to me before or after class or during my office hours when I will be happy to assist you and will do my utmost to remedy your problem. We are all very busy, but to expect (instantaneous) responsiveness via electronic communication is to expect too much.