



Anthropology 279: Darwinian Medicine Spring, 2009

Tuesday and Thursday, 1:15 - 2:40 pm, Lecture Hall Room 14

Course Description:

Darwinian Medicine is a new, rapidly growing field that seeks to understand human health from an evolutionary perspective and to apply this understanding to improving health practices and interventions. The principles and applications of this field will be explored with an emphasis on health conditions and medical practices.

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Course Plan:

This course is unique. There are no prerequisites, so the background of the students will be very diverse. Some of you may have studied evolution previously as biology or nursing students, and some not. Some of you may have exposure to or experience with the medical sciences; others, not. To ensure we all share the same understanding and logic, as well as the language with which to discuss the material precisely, the course will begin with basic evolutionary theory and background. This will require some memorization of terms and definitions, as well as understanding several logical processes and arguments. The materials for the rest of the course will build on these logical arguments, and will be presented using the language established. Therefore, if you do not understand anything in this portion of the course, it is **critical** for you to get clarification immediately and make sure you understand it before we move forward. Once we have established this common understanding, we will begin to apply the logic of evolutionary theory to the study of medicine. If we are so elegantly evolved, the product of millions of generations of natural selection: why are we so easily felled by the common cold?, why do “genetic” diseases still exist?, and why don’t we live forever? The logical framework for approaching disease and disorders from an evolutionary perspective will be developed. Specific diseases and disorders will be presented as case studies. By the end of the course, you should be evolutionarily sophisticated enough to analyze novel diseases/disorders within the framework presented, and generate expectations/predictions about why the disease/disorder exists, how it operates, what the keys to the balance are, and what we might expect in the future.

General class meeting information:

I will be respectful of you and your schedules, needs, etc. So please be respectful of me and your fellow students as well. This means **not** using your cell phone, being late, leaving early, eating your lunch, reading the newspaper, listening to your radio/CD/MP3 player, working on your handheld or laptop computer during class, etc. You should be listening, taking notes, and participating in class activities and discussions. If you don't want to do that, don't come to class. Anyone engaging in inappropriate behavior will be asked to stop; and failing that request, will be asked to leave. Repeated breaches of classroom etiquette will be taken up on an individual basis. I am not here to police you, so please don't put me in that position – it feels bad to everyone.

That being said, this needs to be an interactive classroom. You need to ask questions, challenge me with any thoughts you have (especially if they seem to conflict with what I am teaching), and participate in class discussions and activities. If I don't have a window into what and how you're thinking, it will be very difficult for me to make sure you end up with your understanding in the right place. If you don't actively participate, you will not get the most out of the course (at best), and you might be missing critical information or logic that prohibits an accurate understanding (at worst). Participating also makes class more fun and interesting!!

Exams:

There will be two exams. Each exam is worth **20 percent** of your grade. Material from the required readings and classes will be included on the exams. During the class meeting **immediately preceding** the exam you will have the opportunity to ask questions (a “review session”). **Your job is to bring questions if you have them.** I will not “lecture” for the review, so if you don't bring questions, there will not be much of a review! Please make good use of the opportunity for further discussion and clarification. Exams typically consist of true-false, multiple choice, short answer, and essay portions. I intend to test your understanding rather than just your memorization skills, so you should make a serious attempt not only to know the “facts”, but also to understand the arguments, logic, ideas, theories, and perspectives being presented, and be able to apply them to novel situations. The final exam will be cumulative in the sense that the logic of the course is cumulative. That is, materials presented later in the course build upon concepts presented earlier in the course. Make-up exams are **all essay** and are given **only if permission of the instructor is obtained PRIOR to the scheduled exam time.** *Please note:* a student sending me an email that says “I can't make it to the exam” does **not** automatically mean that I will agree to give a make-up exam. Make-up exams are reserved for **dire emergency situations only**, by discretion of the instructor.

The midterm exam is scheduled for Thursday, Feb. 19th during normal class time (1:15 – 2:40 pm), in the normal classroom (LH, Room 14).

The final exam is scheduled for Tuesday, May 12th, from 2-4 PM in LH 001. If you have an unavoidable conflict with that date/time, you **MUST** notify me prior to April 30th.

Exam etiquette

You are expected to show up on time. Once the exam is handed out, no one will be admitted, and no one will be allowed to leave the room unless they are done with their exam (excepting dire emergencies). You are required to keep your student ID on your desk at all times. The TA's and Instructor will be walking around to check them. If you have any questions or do not understand something, raise your hand, and one of us will quietly come over and try to help you the best we can without giving away what we are trying to test. There is to be no talking or communicating of any kind with other students. There are to be no cell phones, walkmans, IPOD's or MP3 players, radios, handheld computing devices or Palm Pilots, or any other sort of electronic devices brought

into the examination room. If we see them, we will confiscate them for the duration of the test, and you will have to re-claim them afterwards. No books, papers, notes, or written materials of any kind will be allowed. No sunglasses or baseball hats are to be worn during the exam; same confiscation policy. Cheating will not be tolerated. If anyone is caught talking to their neighbors, looking at their neighbor's work, exchanging papers, or cheating in any other way (including electronically), exams will be taken and the offender asked to leave the room, with a resultant grade of F for the course. No second chances will be given under any circumstances.

Assignments: Three assignments will be required. Due dates are shown in the schedule. Details will be covered in class when the assignments are given. Each is worth 15% of your grade. **Assignments will be marked down 5 points for every day they are late.**

Papers:

You are responsible for writing a short paper (15% of your grade). It should consist of the following: cover page, text of 5-pages double-spaced (12-point font, ¾-inch margins all around), and bibliography page (citation format does not matter as long as you include all the necessary information and are consistent).

Topic: Pick a medical topic from the syllabus. Read the “additional readings” on that topic, and use them (and others, if you wish) as sources. Compare and contrast the Darwinian medicine approach to this topic to the “traditional” medical understanding of that phenomenon. (This requires you to find sources about the traditional medical understanding; a good place to start is in the introduction to any of the Darwinian medicine papers—who are they citing and contrasting themselves to? These additional sources do not need to be cleared with me.) In your compare/contrast, focus on the following sorts of questions: What are the strengths and weaknesses of each approach (Darwinian and traditional)? Are the approaches contradictory or synergistic, and why? Which do you agree with, and why?

If you have a topic or relevant references that you would like to use that do not appear on the reading list, please see me before proceeding. I will discuss the issue with you, review the materials (if necessary), and let you know if the materials are appropriate for use in this class. Do *not* move forward without approval!

Due date is: **Thursday, April 23rd.** **No late papers will be accepted.** Papers can be turned in early. If you get to work on them in a timely fashion, last-minute illness or other demands on your schedule will not prevent you from completing and turning in the paper by the due date.

Papers **MUST** be turned in **BOTH** electronically and in hard copy. The electronic file should be named using your last name (so I can identify the author by the file name), and should be put in the Digital Dropbox in the Blackboard space for the course. Make sure you **SEND** the file (don't just “put” it there; “send” it so I can access it!). Electronic files **MUST** be in the Digital Dropbox **PRIOR** to class time on April 23rd. Hard copy must be put into our hands at the beginning of class on April 23rd or before.

The paper is *in lieu* of an essay portion on your final exam.

About writing in general:

This is not an English class, nor is it a composition class. However, in order for me to understand and give you credit for the ideas you are trying to convey, those ideas must be expressed in a manner that lends itself to such understanding. In short, that means, “English counts”. Your language usage, grammar, style, sentence

construction, and punctuation **do** matter, because they affect the meaning of what you write. So please take care to write at a collegiate level in a clear, concise, and professional manner to properly convey your meaning.

If you need help writing at the collegiate level, tutors are available at the **BU Writing Center**, located in LN 1209; (607) 777-6725. Please also visit their website for information about how the service works: <http://writingcenter.binghamton.edu/>. If you intend to take advantage of this service, be sure to do so well in advance of the due date for the paper. You need to bring a draft of your paper, the assignment, and your research notes, etc. to the initial appointment. Several appointments may be necessary for the revision process.

Academic Honesty:

I expect each student enrolled in this course to practice academic honesty. That means each of you is individually responsible for attending class, doing the readings, and completing all assignments by yourself (readings, writings, exams), and that only such independent accomplishment will serve as the basis of your grade. While I encourage you to discuss ideas with one another (as well as with the teaching assistants and with me), each of you is independently accountable for undertaking the labor involved in completing all course materials and assignments. Thus, in this course you must submit your own written work only; take exams by relying solely on the knowledge and understandings you have acquired; use quotation marks around each statement you take from a published (or internet) source (and identify the author and source of the quotation); give references for all published works (authors, texts, websites, etc.) on which you draw (and not only by directly quoting) for your written assignments; etc. Any incident of academic dishonesty will result, minimally, in an automatic “F” for the course. It could also result in letters of reprimand, probation, and /or in suspension or expulsion from the University.

I encourage each of you to read in full the *Bulletin* section that clarifies the Student Academic Honesty and Integrity Code (available at <http://bulletin.binghamton.edu/integrity.htm>). The *Bulletin* provides definitions of various kinds of academic dishonesty, including cheating on examinations, multiple submissions, unauthorized collaboration, fabrication and misrepresentation, forgery, sabotage, and bribery, as well as plagiarism. Reading these definitions should aid you in identifying and thereby avoiding academic dishonesty.

Binghamton University has joined an on-line plagiarism prevention and detection service, “Turnitin.com”. **By registering for this course, you agree that any written work you submit may be submitted by the teaching staff for a textual similarity review by Turnitin.com.**

Grades:

Your grade for the course will be computed as follows:

- 20% midterm exam (Thurs., Feb. 19th)
- 15% 1st assignment (Diet & Toxins; due Tues., Mar. 10th)
- 15% 2nd assignment (Antibiotic Resistance; due Thurs., Mar. 26th)
- 15% 3rd assignment (Sex & Reproduction; due Tues., Apr. 21st)
- 15% paper (electronic & hard copy due by class time, Thurs., Apr 23rd)
- 20% final exam (Tues., May 12th, from 2-4 PM in LH 001)
- 100%

Letter grades for the course will be assigned as follows:

92 – 100%	A	78-79.99%	C+
90-91.99%	A-	72-77.99%	C
88-89.99%	B+	70-71.99%	C-
82-87.99%	B	62-69.99%	D
80-81.99%	B-	0-61.99%	F

I will be happy to make corrections to any grades that you suspect of being errors. However, unless there is a demonstrable error (mathematical error, for example, if I added up your points incorrectly), grades cannot be revised. Please do not come to me with queries like “but I’m only a few points from a B, can’t you bump it up?”, or “can’t you re-read my paper and see if you can’t eek out another point for me so my grade will go up?” Unfortunately, the inherent nature of grading systems means that there are always people “on the boundaries” between grades; but the line has to be drawn somewhere. This syllabus describes exactly what you need to do to earn certain grades, and if you do it, you will certainly get the corresponding grade (barring true error, which will be corrected). It would be unfair to everyone if I re-evaluated single papers without also reconsidering everyone else’s papers (since I apply fairly objective criteria in grading them in the first place), and it would be blatantly unethical for me to just change your grade for no reason (so I will not do it).

Books, Readings, and Assignments: The **two** textbooks for the class are:

R.M. Nesse and G.C. Williams. Why We Get Sick: The New Science of Darwinian Medicine. New York: Times Books (Random House), 1994. (This text is abbreviated **WWGS** in the reading schedule.)

Trevathan, W.R., E.O. Smith, & J.J. McKenna, *eds.* Evolutionary Medicine. New York: Oxford University Press, 1999. (This text is abbreviated **EM** in the reading schedule.)

In the reading schedule, the readings listed from the textbooks (**WWGS** and **EM**) are **required**. The readings complement the class materials. Content from the readings may not be covered directly in class, but unless you ask questions, I will assume that you understand the readings and have no questions about them. If you read the material for each day **prior** to coming to class, you will be better prepared to ask questions as well as integrate the material from the readings with the material covered during class.

In addition, there are **optional additional** readings listed for each topic. In the reading schedule, these are denoted with a number in parentheses next to them, corresponding to the numbered bibliography at the end of the syllabus. Many of these readings are the original, primary journal articles from which much of the text of the two textbooks are derived. Some of them are more difficult to read, and are written at a higher scientific level than are the texts, since they are aimed at professional researchers and scholars in the field. However, if a particular topic interests you, or if you want more information and/or more detail in various areas, they are provided for your use. The *additional* readings are posted to Blackboard, under the “Course Reserves” section.

The paper you are required to write for the course draws on the *additional* readings.

On the following pages, you will find the schedule of topics, assigned required and additional readings, assignments and paper due dates, and exams for the course, listed by date.

Students with disabilities:

Students with disabilities should identify themselves to me *immediately*, and bring me the written recommendations from the Office for Services for Students with Disabilities, so that we can make arrangements to accommodate your needs.

Student Athletes and Student with Other School Commitments:

Students with commitments to athletic teams or other traveling school teams or clubs (debating, etc.) should identify themselves to me *immediately*, and bring me the written schedule of meets and traveling days that conflict with class, so that we can discuss the situation and plan accordingly.

E-mail policy:

The TA's and Instructor will **attempt** to reply to e-mail messages within 2 working days. However, electronic as well as scheduling issues may prevent us from always being able to do so. Thus, you should **not** rely on email for any crucial, time-dependent correspondence. Also, please note that email is **not** the appropriate avenue for students to ask questions concerning course content. If you have a question about course materials, please ask it **during class** so that everyone can benefit from the chance for clarification. If you email any of us with a content-related question, we may email you back saying "ask it in class".

CLASS SCHEDULE: READINGS, ASSIGNMENTS, PAPERS & EXAMS

Date	Topics, Assignments, Etc.	Reading & Additional Reading (numbers in () refer to the bibliography)
Tues., Jan. 27 th	Introduction to course	---
Thurs., Jan. 29 th	Nature of Science (checks lab activity)	---
Tues., Feb. 3 rd	Science and Evolutionary theory, history, proximate and ultimate	WWGS, Ch.1-2 EM, Foreword & Introduction <i>Additional Reading:</i> Nesse 2001a (35)
Thurs., Feb. 5 th	Mechanism of evolution by natural selection	Nesse & Williams, 1998 (42) Nesse 2000 (34) Nesse 2005b (40)
Friday, Feb. 6th : Add/Drop Deadline		
Tues., Feb. 10 th	Genetics: the modern synthesis, the unit of selection, and Nature vs. Nurture	---
Thurs., Feb. 12 th	Thinking like a Darwinian: the categories of “things gone wrong” and how to approach medical phenomena from an evolutionary perspective; evolutionary hypothesis testing	EM, Ch. 2-3
Tues., Feb. 17 th	Review for midterm exam	Bring any/all questions re: exam to class on Feb. 17th!
Thurs., Feb. 19 th	Midterm Exam: Evolution basics	---
Tues., Feb. 24 th	The EEA, legacies & diseases of civilization	WWGS, Ch. 9-10 EM, Ch. 12-13, 18
Thurs., Feb. 26 th	Introduction to diet & toxins New Assignment: Diet & Toxins	WWGS, Ch. 5 WWGS, Ch. 6 <i>Additional Reading:</i>
Tues., Mar. 3 rd	Diet & toxins, cont'd.	Flaxman & Sherman 2000 (23) Fessler 2002 (22)
Thurs., Mar. 5 th	Review midterm exam? Working time for diet & toxins assignment; bring a calculator!	Gerber <i>et al</i> 1999 (26) Billing & Sherman 1998 (4)

Assignment Due: Diet & Toxins		
Tues., Mar. 10 th	Introduction to infectious disease; emerging infections	WWGS, Ch. 3-4 EM, Ch. 10-11 <u>Additional Reading:</u> Diamond 1992a (8) Diamond 1992b (9) Ewald 2004 (16) Ewald 1996 (15) Lederberg 1998 (31) Ewald 1992 (14) Ewald <i>et al</i> 1994 (17) Ewald & Cochran 2004 (18)
Thurs., Mar. 12 th	Evolution of virulence; antibiotic resistance; Video: Why does evolution matter now? New Assignment: Antibiotic Resistance (& working time for assignment)	Cooper <i>et al</i> 2002 (7) Chapman <i>et al</i> 2005 (5) Cohen 1992 (6) Levy 1998 (33) Grady 1993 (24)
Tues., Mar. 17 th	Infectious etiology of chronic disease; Wrap-up on infectious disease	Ewald <i>et al</i> 1994 (17) Ewald & Cochran 2004 (18)
Thurs., Mar. 19 th	Working time for infectious disease assignment (& video: Evolution of Antibiotic Resistance)	Cooper <i>et al</i> 2002 (7) Chapman <i>et al</i> 2005 (5) Cohen 1992 (6) Levy 1998 (33) Grady 1993 (24)
Tues., Mar. 24 th	Working time for infectious disease assignment Discuss Paper Assignment	
Assignment Due: Antibiotic Resistance: Individual Packets AND Group Projects		WWGS, Ch. 7 <u>Additional Reading:</u> Allison 2004 (1)
Thurs., Mar. 26 th	Genes and disease Aging	WWGS, Ch. 8 <u>Additional Reading:</u> Olshansky 2004 (47) Olshansky 2003 (46) Gavrilov & Gavrilova 2002 (21) Diamond 1996 (10)
Friday, Mar. 27th : Withdrawal Deadline		
Tues., Mar. 31 st	Cancer Discuss Paper Assignment: Questions?	WWGS, Ch. 12 EM, Ch. 17 <u>Additional Reading:</u> Eaton <i>et al</i> 2002 (13) Eaton <i>et al</i> 1994 (12) Greaves 2002 (25)
Thurs., Apr. 2 nd	Introduction to sex & reproductive health New Assignment: Sex & Reproductive Health	WWGS, Ch. 13 EM, Ch. 6-8, 16 <u>Additional Reading:</u> Profet 1993 (50) Haig 1993 (27) Strassman 1996 (52) Hall 2004 (26) Baker & Bellis 1993a (2) Baker & Bellis 1993b (3)

**Tues., Apr. 7th - Thurs., Apr. 9th
No class; Spring Break (Sat., 4/4 – Mon., 4/13)**

Tues., Apr. 14 th	Sex & reproductive health, cont'd.	---
Thurs., Apr. 16 th	Sex & reproductive health: Gender differences in mortality	Kruger & Nesse article (30)
Tues., Apr. 21 st	Assignment Due: Sex & Reproductive Health Review Paper Requirements, citation, writing, organization, language, etc. Introduction to addictions: methamphetamine	EM, Ch. 15 <u>Additional Reading:</u> Nesse <i>et al</i> 2002 (44) Nesse & Berridge 1997 (43) Sullivan & Hagen 2002 (53) Lende & Smith 2002 (32) Panksepp <i>et al</i> 2002 (48) Dudley 2002 (11) Hill & Chow 2002 (28) Gerald & Higley 2002 (22) Newlin 2002 (45)
Thurs., Apr. 23 rd	Papers Due—BOTH electronic copy in Digital Dropbox BEFORE class AND in hard copy at beginning of class-- no late exceptions! Addictions, cont'd.	
Tues., Apr. 28 th	Emotions, cognition, and mental disorders	WWGS, Ch. 14 EM, Ch.14
Thurs., Apr. 30 th	Nesse video on Darwinian Psychiatry Notify instructor of conflicts w/ final exam!	<u>Additional Reading:</u> Nesse 2005a (39) Nesse 2005c (41) Nesse 2004 (38) Keller & Nesse 2005 (29)
Tues., May 5 th	Applying Darwinian Medicine	WWGS, Ch. 15 <u>Additional Reading:</u> Nesse 2001c (37) Trevathan 1995 (54) Stearns & Ebert 2001 (51)
Thurs., May 7 th	<i>Review for final exam</i>	Williams & Nesse, 1991 (55) Bring any/all questions re: exam to class on May 7th!
FINAL EXAM: Tuesday, May 12th 2-4 PM in LH 001		

FULL BIBLIOGRAPHY: ADDITIONAL READING
(ALL AVAILABLE IN THE “COURSE RESERVES” SECTION ON BLACKBOARD)

- 1) Allison, A.C. 2004. Two lessons from the interface of genetics and medicine. *Genetics* 166: 1591-1599.
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- 3) Baker, R.R., and M.A. Bellis. 1993b. Human sperm competition: ejaculate manipulation by females and a function for the female orgasm. *Animal Behaviour* 46(5): 887-909.
- 4) Billing, J., and P.W. Sherman. 1998. Antimicrobial functions of spices: why some like it hot. *Quarterly Review of Biology* 73(1): 3-49.
- 5) Chapman, C.A., T.R. Gillespie, & T.L. Goldberg. 2005. Primates and the ecology of their infectious diseases: how will anthropogenic change affect host-parasite interactions? *Evolutionary Anthropology* 14: 134-144.
- 6) Cohen, M.L. 1992. Epidemiology of drug resistance: Implications for a post-antimicrobial era. *Science* 257(5073): 1050-1055.
- 7) Cooper, V.S., M.H. Reiskind, J.A. Miller, K.A. Shelton, B.A. Walther, J.S. Elkinton, & P.W. Ewald. 2002. Timing of transmission and the evolution of virulence of an insect virus. *Proceedings of the Royal Society of London B* 269: 1161-1165.
- 8) Diamond, J. 1992a. The return of cholera. *Discover* 13(2): 60-66.
- 9) Diamond, J. 1992b. The arrow of disease. *Discover* 13(10): 64-73.
- 10) Diamond, J. 1996. Why women change. *Discover* 17(7): 130-137.
- 11) Dudley, R. 2002. Fermenting fruit and the historical ecology of ethanol ingestion: is alcoholism in modern humans an evolutionary hangover? *Addiction* 97: 381-388.
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- 15) Ewald, P.W. 1996. Guarding against the most dangerous emerging pathogens: insights from evolutionary biology. *Emerging Infectious Diseases* 2(4): 245- 258.

- 16) Ewald, P.W. 2004. Evolution of virulence. *Infectious Disease Clinics of North America* 18: 1-15.
- 17) Ewald, P.W., C.A. Mims, P.J. Lachmann, A.L. Hughes, J.D. Gillett, & C.E. Parker. 1994. Evolution of mutation rate and virulence among human retroviruses [and discussion]. *Philosophical Transactions of the Royal Society of London B* 346: 333-343.
- 18) Ewald, P.W., and G.M. Cochran. 2000. *Chlamydia pneumoniae* and cardiovascular disease: an evolutionary perspective on infectious causation and antibiotic treatment. *Journal of Infectious Diseases* 181(Suppl.3): S394-401.
- 19) Fessler, D.M.T. 2002. Reproductive immunosuppression and diet: an evolutionary perspective on pregnancy sickness and meat consumption. *Current Anthropology* 43 (1): 19-61.
- 20) Flaxman, S.M., and P.W. Sherman. 2000. Morning sickness: a mechanism for protecting mother and embryo. *Quarterly Review of Biology* 75(2): 113-148.
- 21) Gavrilov, L.A., and N.S. Gavrilova. 2002. Evolutionary theories of aging and longevity. *The Scientific World Journal* 2: 339-356.
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- 42) Nesse, R.M., and G.C. Williams. 1998. Evolution and the origins of disease. *Scientific American* 279(5): 86-93.
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- 55) Williams, G.C., and R.M. Nesse. 1991. The dawn of Darwinian medicine. *Quarterly Review of Biology* 66(1): 1-22.

**ADDITIONAL READING: BOOKS RELATED TO DARWINIAN MEDICINE
(not available on Blackboard; requesting hard-copy reserve in the library)**

- 1) Boaz, N.T. 2002. Evolving Health: The Origins of Illness and How the Modern World is Making Us Sick. New York: John Wiley & Sons.
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- 4) Ellison, P.T., ed. 2001. Reproductive Ecology and Human Evolution. New York: Aldine de Gruyter.
- 5) Ewald, P.W. 1994. Evolution of Infectious Disease. New York: Oxford University Press.
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- 9) Stearns, S.C., ed. 1999. Evolution in Health and Disease. New York: Oxford University Press.
- 10) Trevathan, W.R., E.O. Smith, & J.J. McKenna, eds. 2008. Evolutionary Medicine and Health. New York: Oxford University Press.