

Evolutionary Medicine

Spring 2014

Tuesday 1:55-2:45 pm, Thursday 1:55-3:50 pm
2318 Turlington Hall

Dr. Alyson Young
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Course Description

This course explores Darwinian medicine and the application of modern evolutionary theory to understanding health and disease among contemporary human populations. Evolutionary insight is yielding important advances in understanding the nature of disease and evolutionary approaches are becoming widely used for both disease surveillance and control. This course focuses on the principles of evolutionary medicine and emphasizes the difference between proximate and ultimate explanations of disease patterns and how these different explanations shape our view of human health.

This course will cover a diverse range of themes related to evolutionary medicine including:

- Human adaptation vs. human adaptability: Constraints, trade-offs, and competition
- Evolution of pathogens, parasites, and virulence
- Human immune function and other protective mechanisms
- “Diseases of civilization” or past environments and their impact on modern patterns of health and illness
- The role of evolution in shaping reproduction, childbirth, and young child health
- The neurobiology of stress and its long term impacts on health and function
- Evolutionary components of emotion, addiction, and mental health

Required text:

Nesse, R. and G.C. Williams (1996) *Why We Get Sick: The New Science of Darwinian Medicine*. Vintage Books: New York.

Recommended text:

Stearns, S. and J. Koella (2008) *Evolution in Health and Disease*. 2nd Edition. Oxford University Press, New York.

Additional readings will be provided electronically.

Course Requirements and Grading

Final grades are based on a total of 275 points. Point totals are calculated based on participation in discussion, the midterm exam and the final research project. At any point you can calculate your grade in the course by dividing your points received by the total number of points for assignments thus far. There is no curve in this class.

Class Participation (50 pts.): I expect students to attend each class meeting and to take an active part in class discussions and activities. Active participation includes attendance but also requires that you read all assigned readings and prepare thoughtful questions and critical discussion points in advance of class meetings. I will evaluate your participation based on the *quality* of your contributions and not simply on how often you speak in class. The purpose of evaluating your participation is to encourage you to prepare for class and to promote thoughtful analysis and discussion.

In this class, participation will be divided into two components:

- 1) **Class participation** and discussion (30 pts.)
- 2) **Five blog posts** on the weekly readings (20 points). Posts must be uploaded to E-Learning the Friday the week that the material is covered in class and must be at least 250 words each with proper grammar and spelling. (Hint: I would recommend planning ahead to pick the topics you want to discuss and doing a post at least every two weeks.)

Research Poster (175 pts):

You will be required to present a research project on a topic of your choice that relates to evolutionary medicine. In lieu of the typical research paper you will present a poster detailing the results of your research during the last week of classes.

Development of the research project will occur throughout the semester:

- 1) **Research topic (25 pts):** You are required to submit a poster proposal outlining the topic of your research project by **Feb. 13**; this brief proposal should describe the topic, including why the topic is important, and should identify some of the key questions or issues your project will explore.
- 2) **Abstract and annotated bibliography (50 pts):** A 250-300 word proposal abstract (25 pts.), and an annotated bibliography (25 pts.) with at least 10 carefully selected references from scholarly literature are due **March 13**.
- 3) **Poster submission (50 pts.):** You must submit your final poster (electronically) by **April 15**.
- 4) **Research forum (50 pts.):** The final poster will be presented in class on either **April 17 or 22**.

Midterm exam (50 pts)

The midterm is a take home exam that is due **Feb. 27**. The exam covers the basic concepts and terminology necessary for an adequate understanding of evolutionary approaches to human health.

Grades

Final grades will be based on the following scale: A (94-100), A- (90-93.99), B+ (87-89.99), B (84-86.99), B- (80-83.99), C+ (77-79.99), C (74-76.99), C- (70-73.99), D+ (67-69.99), D (64-66.99), D- (60-63.99), E (<59.99). Grades are awarded on the basis of points received in the class and are not curved or rounded up.

Policy on Late Assignments

You are required to complete all assignments by the stated due dates. Late assignments will lose one half-letter grade for each day past the deadline. There are no make-up opportunities for any assignment, as you will have ample time to complete each requirement. I will not assign grades of "incomplete" except in the most unusual, extreme circumstances (i.e. alien abduction). You must provide documentation of such circumstances from an appropriate authority.

Academic Honor Code

Students are expected to uphold the Academic Honor Code of the University of Florida. The Academic Honor Code is based on the premise that each student has the responsibility (1) to uphold the highest standards of academic integrity in the student's own work, (2) to refuse to tolerate violations of academic integrity in the University community, and (3) to foster a high sense of integrity and responsibility on the part of the University community. Please see the following website for a complete explanation of the Academic Honor Code: www.registrar.ufl.edu/catalog/policies/students.html.

Americans with Disabilities Act

Students with disabilities, who need reasonable modifications to complete assignments successfully and otherwise satisfy course criteria, are encouraged to meet with the instructor as early in the course as possible to identify and plan specific modifications. Students requesting accommodation must first register with the Dean of Students Office and then provide documentation to the instructor. For more information about services available to University of Florida students:

Dean of Students Office Disability Resource Center

202 Peabody Hall or 0020 Reid Hall

Phone: (352) 392-1261 Phone: (352) 392-8570

University of Florida Counseling Services

Resources are available on-campus for students that feel like they are struggling in their personal or academic life. These resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling
- Student Mental Health, Student Health Care Center, 392-1171, personal counseling
- Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual counseling
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

Course Schedule, Readings, and Assignments

This is a preliminary schedule of topics and readings. The syllabus is a guide for the course and may be subject to change with advance notice. Students are expected to complete the readings for a particular class before that class begins.

Date	Topic	Readings
Week 1 (Jan 7, 9)	Introduction & overview	RN Ch 1 Stearns, Nesse, and Haig (2008) Gluckman, Low, Buklijas, Hanson and Beedle (2011) Nesse (2008)
Week 2 (Jan 14, 16)	Evolution, adaptation, and natural selection	RN Ch 2 Ulijaszek (1997) Gould and Lewontin (1979) Greaves (2008)
Week 3 (Jan 21, 23)	Life history constraints	Gluckman, Beedle, and Hanson (2009) Bribiescas and Ellison (2008) Harshman and Zera (2007)
Week 4 (Jan 28, 30)	Evolutionary genetics and microevolution	RN Ch 7 Lewis (2008) Kidd and Kidd (2008)
Week 5 (Feb 4, 6)	Host-pathogen interaction and the “evolutionary arms race”	RN Ch 3, 4 Bergstrom and Feldgarden (2008) Koella and Turner (2008) Read and Mackinnon (2008)
Week 6 (Feb 11, 13) Research topic due Feb 13	Toxins, allergies and injury	RN Ch 5, 6, 11 Flaxman and Sherman (2000) Rook, Lowry, and Raison (2013)
Week 7 (Feb 18, 20)	Somatic trade-offs: Growth, maturation and senescence	RN Ch 8 Ackermann and Pletcher (2008) Austad and Finch (2008)
Week 8 (Feb 25, 27) Midterm due Feb 27.	Evolutionary obstetrics and genetic conflicts of pregnancy	RN Ch 13 Robillard, Dekker, Chanout, Chaline, and Husley (2008) Haig (2008) Leidy Sievert (2008)
Week 9 (Mar 4, 6)	<i>No class SPRING BREAK</i>	
Week 10 (Mar 11, 13) Abstract and annotated bibliography due Mar 13.	Legacies of evolutionary history	RN Ch 9 Ewald (2008) Wiley (2008)
Week 11 (Mar 18, 22)	<i>No class SfAA meetings</i>	
Week 12 (Apr 1, 3)	Nutrition, metabolism, and more on “diseases of civilization”	RN Ch 10, 12 Kuzawa, Gluckman, Hansen, and Beedle (2008) Lieberman (2008) Leonard (2008)
Week 13 (April 8, 10)	Evolutionary aspects of emotional health and behavior	RN Ch 14 Flinn (2008) Strassmann and Mace (2008) Nepomnaschy and Flinn (2009)
Week 14 (April 15, 17) Electronic version of poster due April 15	Wrap up and begin student presentations	RN Ch 15
Week 15 (April 22)	Student presentations	

Supplementary Reading List (available on e-Learning)

- Ackermann, M. and S. Pletcher (2008)** Evolutionary biology as a foundation for studying aging and aging-related disease. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 241-252.
- Austad, S. and C. Finch (2008)** The evolutionary context of human aging and degenerative disease. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 301-311.
- Bergstrom, C. and M. Feldgarden (2008)** The ecology and evolution of antibiotic resistant bacteria. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 125-137.
- Bribiescas, R. and P. Ellison (2008)** How hormones mediate trade-offs in human health and disease. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 77-92.
- Ewald, P. (2008)** An Evolutionary Perspective on the causes of chronic diseases: Atherosclerosis as an illustration. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 350-367.
- Flaxman, SM and PW Sherman (2000)** Morning sickness: a mechanism for protecting mother and embryo. *Quarterly Review of Biology*. 75(2): 113-148.
- Flinn, M. (2008)** Why Words Can Hurt Us: Social Relationships, Stress and Health. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 242-258.
- Gluckman, P., A. Beedle, and M. Hanson (2009)** Evolution of life Histories. In *Principles of Evolutionary Medicine*. Oxford University Press. Pp. 257-276.
- Gluckman, P., Low, F., Buklijas, T., Hanson, M., and A. Beedle (2011)** How evolutionary principles improve the understanding of human health and disease. *Evolutionary Applications* 4(2): 249-263.
- Gould, S. J. and R. C. Lewontin (1979)** The Spondrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme *Proc. R. Soc. Lond.* (205)1161: 581-598.
- Greaves, M. (2008)** Cancer: evolutionary origins of vulnerability. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 277-287.
- Haig, D. (2008)** Intimate relations: Evolutionary conflicts of pregnancy and childhood. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 65-76.
- Harshman, L. and A. Zera (2007)** The cost of reproduction: the devil in the details. *Trends in Ecology and Evolution*, 22(2): 80-86.
- Kidd, K. and J. Kidd (2008)** Human genetic variance of medical significance. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 51-62.
- Koella, J. and P. Turner (2008)** Evolution of parasites. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 229-237.
- Kuzawa, C., P. Gluckman, M. Hanson, and A. Beedle (2008)** Evolution, developmental plasticity, and metabolic disease. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 253-264.
- Leidy Sievert, L. (2008)** Should Women Menstruate? An Evolutionary Perspective in Menstrual –Suppressing Oral Contraceptives. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J. McKenna. Oxford University Press. Pp. 181-195.
- Lende, D. (2008)** Evolution and Modern Behavioral Problems: The Case of Addiction. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 277-290.

- Leonard, W. (2008)** Lifestyle, diet, and disease: comparative perspectives on the determinants of chronic health risks. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 265-276.
- Lewis, S. (2008)** Evolution at the intersection of biology and medicine. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 399-415.
- Lieberman, L. (2008)** Diabetes and Darwinian medicine: The evolution of an epidemic. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 72-95.
- Nepomnaschy, P. and M. Flinn (2009)** Early life influences on the ontogeny of the neuroendocrine stress response in the human child. In *Endocrinology of Social Relationships*. Edited by P. Ellison and P. Gray. Harvard University Press. Pp. 364-384.
- Nesse, W. (2008)** The importance of evolution for medicine. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 416-433.
- Read, A. and M. Mackinnon (2008)** Pathogen evolution in a vaccinated world. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 139-152.
- Robillard, P., G. Dekker, G. Chanout, J. Chaline, and T. Husley (2008)** Possible Role of Eclampsia/Preeclampsia in Evolution of Human Reproduction. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 216-226.
- Rook, GA., Lowry, C. and C. Raison (2013)** Microbial ‘Old Friends’, immunoregulation and stress resilience. *Evolution, Medicine, and Public Health*, pp. 46-64.
- Strassmann, B. and R. Mace (2008)** Perspectives on human health and disease from evolutionary and behavioral ecology. In *Evolution in Health and Disease* (2nd ed.) Edited by S. Stearns and J. Koella. Oxford University Press. Pp. 109-121.
- Turner, B., K. Maes, J. Sweeney, and G. Armelagos (2008)** Human evolution, diet, and nutrition: When the body meets the buffet. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 55-71.
- Ulijaszek, S. (1997)** Human adaptation and adaptability. In *Human Adaptability: Past, Present, and Future*. Edited by S. Ulijaszek and R. Huss-Ashmore. Oxford University Press. Pp. 7-16.
- Wiley, A. (2008)** Cow’s milk consumption and health: An evolutionary perspective. In *Evolutionary Medicine and Health*. Edited by W. Trevathan, E.O. Smith, and J.J. McKenna. Oxford University Press. Pp. 116-133.