

# Infectious Disease Ecology & Evolution

BIOL 354

## Course Instructor

**Dr. Doug Woodhams,**

Office hours: MWF 11:00-12:00

Integrated Sciences Complex 5760

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[douglas.woodhams@umb.edu](mailto:douglas.woodhams@umb.edu)

## Meeting time and place

**MWF 10:00-10:50am**

**University Hall Y01-1350**

## Required Text

Schmid-Hempel, P. 2011.  
*Evolutionary Parasitology*.

Electronic resource available  
online by searching under  
"Evolutionary Parasitology"

<http://voyager.lib.umb.edu/vwebv/enterCourseReserve.do>



Olaf Hajek, *The New York Times*

*"The pathogen is nothing.  
The terrain is everything."*

*-Louis Pasteur*



## Course Description

The ecology and evolution of infectious diseases encompasses interactions among hosts, pathogens and parasites, and their environments. Disease emergence, including zoonotic diseases that spread from wildlife to humans, is increasing with ecological change. Thus, prediction and prevention of disease outbreaks is an interdisciplinary task and requires knowledge of human and veterinary medicine, microbiology, immunology, ecology, and evolution.

Students will be given an overview of the variety and ubiquity of disease systems, and introduced to conceptual and theoretical underpinnings of disease causation, transmission, emergence, management, and host-parasite coevolution.

This course includes student-led discussions of primary literature.

Attendance is not graded, but lecture notes **will not** be provided, and participation in paper discussions, class and team assignments, and pop quizzes will count toward the final grade.



### Assignments

- 1) Team assignment: Diagrams of pathogens and parasites with life cycles, from a focal host
- 2) Team presentations: Choose a wildlife disease and focus on disease causation in terms of host, pathogen, and environmental factors and mode of transmission
- 3) Midterm exam (multiple choice)
- 4) Writing assignment: Interpreting scientific papers
- 5) Team project on immune defenses of invertebrates
- 6) Epidemiological curves and disease models report
- 7) Take-home written exam.

*As we start each unit, Dr. Woodhams will provide templates for the presentations and assignments, the rubric for grading, and more specific instructions.*



# Grading Scale

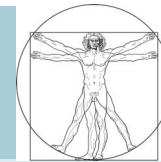
Grade	Grade points	Percentage
A	4.0	94-100
A-	3.7	90-93
B+	3.3	87-89
B	3	83-86
B-	2.7	80-82
C+	2.3	77-79
C	2	73-76
C-	1.7	70-72
D+	1.3	67-69
D	1	63-66
D-	.7	60-62
F	0	Below 60

The final grade will be given as a letter based on a percentage of 200 points, 20 points for each assignment, and 40 points each for participation & exam.



<http://www.frontiersinzoology.com/content/8/1/8/abstract>

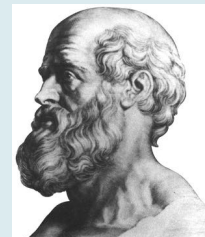
Assignment	Points	Due date
Team diagrams: parasites of a focal host and their life-cycles	20	Fri. 9/14
Team presentation 1: on a wildlife disease	20	Fri. 9/21
Mid-term Exam	20	Fri. 10/19
Writing assignment: Interpreting scientific papers	10+10	Fri. 11/2
Team project: Immune defenses of invertebrates	20	Wed. 11/14
Epidemic curves and disease models report	20	Mon. 12/3
Participation and Monday journal discussion summaries	40	Every class period
Final exam: take-home written exam	40	Mon. 12/17
Extra credit: Book report	10	Wed. 11/28
<b>Total possible (graded out of 200):</b>	<b>210</b>	



“Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces for they are not at all alike, but differ much from themselves in regard to their changes. Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun; for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun.

From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of common diseases, so that he will not be in doubt as to the treatment of the diseases, or commit mistakes, as is likely to be the case provided one had not previously considered these matters. And in particular, as the season and the year advances, he can tell what epidemic diseases will attack the city, either in summer or in winter, and what each individual will be in danger of experiencing from the change of regimen. For knowing the changes of the seasons, the risings and settings of the stars, how each of them takes place, he will be able to know beforehand what sort of a year is going to ensue.

- *Airs, Waters and Places*, Hippocrates





The corpse flower, *Rafflesia arnoldii*, is a holoparasite found in the rainforests of Indonesia. The plant is non-photosynthetic and usually parasitizes the vine *Tetrastigma*. Producing the largest flower in the world, the scent of rotting flesh attracts insect pollinators, and tree shrews eat the fruit and disperse seeds.

## Technology policy

Computer programs for learning disease ecology and evolution are great. Texting, emailing, instant messaging and other activities unrelated to class are not great... and not allowed.



## Learning Objectives

1. To learn core principles in disease ecology
2. To gain in-depth knowledge of focal wildlife disease systems
3. To become skilled at interpreting and discussing primary literature

Entomopathogenic fungi can manipulate host behavior, are host specific and highly virulent. They are sometimes used as biocontrol agents against plant pests such as locusts.



## Useful websites

<http://wdin.blogspot.com/> Wildlife Disease News Digest

<http://eemb40.blogspot.com/> Ecology of Disease course, UC Santa Barbara

<http://parasiteecology.wordpress.com/> Parasite Ecology blog

<http://www.cdc.gov/ncezid/> National Center for Emerging and Zoonotic Infectious Diseases

<http://www.cdc.gov/> Center for Disease Control

<http://www.wildlifedisease.org> Wildlife Disease Association

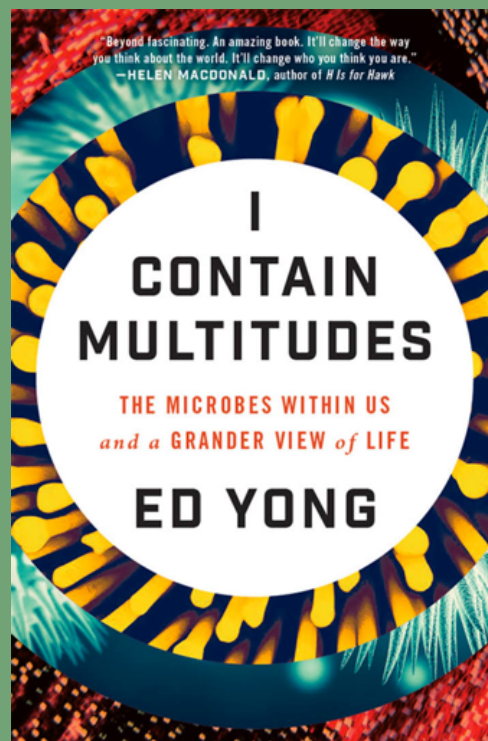
[http://microbiology.usgs.gov/wildlife\\_fish\\_health.html](http://microbiology.usgs.gov/wildlife_fish_health.html) U.S. Geological Survey - Wildlife Disease

<http://www.apsnet.org/> The American Phytopathological Society

[http://bugs.bio.usyd.edu.au/learning/resources/Myecology2/UsesOf\\_Fungi/primaryProduction/fungi\\_Diseases.shtml](http://bugs.bio.usyd.edu.au/learning/resources/Myecology2/UsesOf_Fungi/primaryProduction/fungi_Diseases.shtml) Diseases of Fungi

## Extra Credit

Book report due: November 29, 2017



<http://lnu.se/research-groups/zee-zoonotic->

### Accommodations for Students with Disabilities:

The University of Massachusetts Boston is committed to providing appropriate academic accommodations for all students with disabilities. If you have a disability and feel you will need accommodations in this course, please contact:

The Ross Center for Disability Services:

Campus Center, Upper Level, Room 211 ([617-287-7430](tel:617-287-7430)).

Website: <http://www.umb.edu/academics/vpass/disability/>



### Course Policies:

- ❖ **Participation and Attendance** – Students are expected to be respectful of each others' time and effort by arriving promptly, thoughtfully participating in discussions, and taking responsibility for helping create a positive learning environment. Attendance will not be taken; however, students will learn more by being present. Top grades typically follow attendance and completion of assignments. Lecture notes will not be provided by the professor, so note taking is essential, and pop quizzes will be counted toward participation.
- ❖ **Late Work** – Late work is not accepted unless there is a documented emergency or illness.
- ❖ **Team Work** – Several team-based assignments are included in this course. Grades will incorporate individual effort, team success, and peer evaluation. Time will be provided in class for some team exercises, but students may need to meet outside of class to coordinate some assignments.

## Academic Integrity and the Code of Student Conduct

### Code of Conduct and Academic Integrity

It is the expressed policy of the University that every aspect of academic life, not only formal coursework situations, but all relationships and interactions connected to the educational process shall be conducted in an absolutely and uncompromisingly honest manner. The University presupposes that any submission of work for academic credit is the student's own and is in compliance with University policies, including its policies on appropriate citation and plagiarism. These policies are spelled out in the Code of Student Conduct. Students are required to adhere to the Code of Student Conduct, including requirements for academic honesty, as delineated in the University of Massachusetts Boston Graduate Catalogue and relevant program student handbook(s).

You are encouraged to visit and review the UMass website on *Correct Citation and Avoiding Plagiarism*: <http://umb.libguides.com/citations>

Penalties for academic misconduct in the course, including plagiarism and cheating, are strictly enforced, and the penalties are very serious. Penalties include an F in the assignment or exam, an F in the course, or suspension from the University. If you have questions about what constitutes plagiarism or other forms of academic misconduct, see Prof. Woodhams **before** completing an assignment or exam.

**Ignorance of the rules does not excuse any academic conduct violation.**

**The University defines violations to include, but not be limited to, the following:**

- Submitting as one's own an author's published or unpublished work (e.g. material from a journal, internet site, newspaper, encyclopedia), in whole, in part, or in paraphrase, without fully and properly crediting the author.
- Submitting as one's own work or materials obtained from another student, individual, or agency without full and proper attribution.
- Submitting as one's own work material that has been produced through unacknowledged or unauthorized collaboration with others.
- Submitting substantially the same work to more than one course (i.e., dual or multiple submission) without prior approval from all instructors involved.
- Using any unauthorized material during an examination, such as notes, tests, calculators, cell phones, or other electronic devices.
- Obtaining answers to examination questions from another person with or without that person's knowledge; furnishing answers to examination questions to another student; using or distributing unauthorized copies of or notes from an examination.
- Submitting as one's own an examination taken by another person; or taking an examination in another person's place.
- Interfering with an instructor's ability to evaluate accurately a student's competence or performance; misleading any person in connection with one's academic work.

### **Student Code of Conduct:**

[http://www.umb.edu/life\\_on\\_campus/policies/community/code](http://www.umb.edu/life_on_campus/policies/community/code)