

Biology 434 - Parasitology Course Syllabus – Fall 2006

I. Instructor Information

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Office Hours: Tuesday and Thursday, 9-10:00 a.m., Wednesday, 1:30-3:30 p.m., and by appointment

II. Course Information

A. Meeting Times and Places

Lecture: 11 - 12:15 p.m., TTh, KC 200; Lab: 2-4:00 p.m., M, KC 200

B. Textbook, Supplementary Readers and Laboratory Manual

Textbook: Roberts, L. S. and J. Janovy, Jr. 2004. *Foundations of Parasitology*. 7th edition. McGraw Hill, Boston.

Supplementary Readers: Desowitz, R. S. 1987. *New Guinea Tapeworms and Jewish Grandmothers: Tales of Parasites and People*. W.W. Norton and Company, New York.
Zimmer, C. 2000. *Parasite Rex: Inside the Bizarre World of Nature's Most Dangerous Creatures*. The Free Press, New York.

Lab Manual: A lab manual for the course can purchased from Pat Akrabawi in room KC 219. There will be a fee of \$8.00 (cash only) to cover the printing costs of the laboratory manual.

C. Course Description

Lectures: The lectures for this course will provide you with an introduction to the general biology of the parasitic protozoans, helminths, and arthropods of humans and domestic animals. Lectures will emphasize the morphology, form and function, life cycles, symptomatology, and pathogenesis of representative taxa from these major parasitic groups. This information will be useful to you when you study animal and protozoan parasites in the laboratory. Moreover, with this foundational understanding of parasitology in place, you will be in a better position to appreciate the impact that parasites have had on human civilizations throughout history (see section titled "Additional Readings" below), the applications of parasites to pure and applied research

programs (see section titled "Journal Articles" below), and the recent contributions of parasitism to our general understanding of the ecology and evolution (see section titled "The Ecology and Evolution of Parasites" below) of organisms. It has been estimated that over 60% of the species on this planet employ parasitic lifestyles. Thus, it is time, as Peter Price so resoundingly stated in his celebrated book *Evolutionary Biology of Parasites* "to extend the concepts in ecology and evolution, developed largely from an appreciation of larger organisms (i.e. the less representative and the more unusual), to include realistic concepts relevant to the very small and the very specialized."

Labs: The labs will provide you with an opportunity to identify and study commonly occurring parasites. Emphasis will be placed on the taxonomy, morphology, life cycles, and histopathology of parasites of humans and domestic animals. The laboratory has two main components: prepared specimens and necropsy (=dissection) of hosts. An examination of fixed and stained material is an essential first step to deciphering the biology of animal and protozoan parasites. Each week you will be given handouts that provide you with general information for each of the parasites that you are required to study. Your textbook will also be an invaluable source of information as you begin to examine and learn the various parasites that are presented during the lab period. Incidentally, there are numerous internet sites that provide information regarding the biology of parasites. You will find a great deal of this information helpful to you as you study prepared specimens in the lab. I have provided links to several sites on my homepage (<http://faculty.evansville.edu/de3/>). In an effort to fully appreciate the biology of parasites, it is also important to examine them in their natural habitats. Thus, we will periodically be performing necropsies on hosts in the laboratory in an attempt to get a look at a few of parasites *in situ*. One of the best sources of parasites in a class like this is from animals that have met their demise on our highways and byways. Be on the lookout for roadkills; the fresher the better! If you find a "worthy specimen," put it in a plastic bag and bring it to me so that I can store it in the lab freezer. The organs and tissues of game animals are another good source of parasites. If you know someone who is fishing or hunting deer, rabbits, ducks, quail, etc. this fall, ask them to save various body parts, including the liver, gizzard, and intestinal tract. During the last lab, we will examine our treasure trove of materials for parasites. Actually, you are encouraged to collect and examine roadkills and/or animal organs for parasites at any time during the semester. In partial fulfillment of this course, you will be required to make a prepared slide of an animal parasite that you recovered from a necropsy. Your slide will be prepared in precisely the same way that they prepare slides for museum collections throughout the world. Your completed specimen slide will be due by 4:00 pm on December 4th. Details on the preparation of preserved slides will be forthcoming. There will be two lab exams during the course of the semester that will be based on the materials that you have studied in the lab (see the lab syllabus for the precise dates).

WebWatch Assignment: The internet is replete with information regarding the biology of parasites. In partial fulfillment of Biology 434, you are required to search the internet for parasitological oriented web sites and choose a site for which you will eventually create a

brief synopsis. Your summary must include the following: an original, creative title, a representative image/visual from the site, ~2 typed pages of text that captures the essence of the site, and the URL of the site. For an example of the kinds of information I am looking for in your synopsis see the NetWatch in the Departments section of the journal *Science*. The WebWatch assignment is due in class on November 16th. If you receive a grade lower than an A on this assignment, you are encouraged to re-submit it once you have made the recommended corrections/improvements. Upon re-submitting your synopsis, you could possibly receive a letter grade (maximum) increase. Re-submissions are due November 27th in lab. You must turn in the original summary along with your re-submitted version.

Research Article Summary: In an effort to become familiar with parasitological research, each member of the class will be required to write a summary to a primary research article during the course of the semester. Each student will also be required to present a verbal summary of the article during lab. The article you choose to summarize may come from a parasitological journal (e.g., *Journal of Parasitology*, *Parasitology*, *International Journal of Parasitology*, *Parasitology Today*, etc.) or a journal with more general science interests (e.g., *Science*, *Nature*, *Animal Behavior*, *Evolution*, *Ecology*, etc.). The article must address some ecological, evolutionary, or behavioral aspect of parasitism. In addition, the article must have been published within the past 5 years. It is strongly recommended that you discuss your article with me before proceeding with the summary. I would also like to have a copy of the article one week prior to your presentation date.

Information that should be included in your written summary of the article is as follows: an original title, approximately two typed pages of text, and the precise reference (e.g., author(s) name, date of publication, title of article, name of journal, and volume and page numbers of journal). You will also have approximately 15 minutes at the beginning of a designated lab period to present a verbal summary for your article. The exact date that your written summary is due and your verbal summary is to be presented will be decided within the first two weeks of class. Your summary deadline will correspond to one of the dates of the summary presentations indicated in the Lab Syllabus. You will have the option of re-submitting your summary for a higher grade one week following the original due date. Please turn in your original summary along with your re-submission. For examples of the spirit and content of the research article summary see Editors' Choice in the Departments section of *Science* or Samplings in the Departments section of *Natural History*. I will provide you with more detailed information on what is expected from the verbal summaries at a later date.

Additional Readings: In partial fulfillment of this course you are required to read two books, *New Guinea Tapeworms and Jewish Grandmothers* by Robert Desowitz and *Parasite Rex* by Carl Zimmer. In *New Guinea Tapeworms*, Desowitz discusses several parasites that have had a major impact on the health and welfare of human civilizations throughout the world. He alarmingly points out that in spite of technology and advances in modern medicine, humans have not been successful in controlling or eradicating

parasitic diseases. In fact, the wars we have waged with parasites have only intensified. When it comes to controlling the spread and the persistence of parasitic diseases, humans are quite frankly their own worst enemy. You will be given a quiz over the content of this book in class on October 3rd. *Parasite Rex* is a wonderful book about the ecology and evolution of parasites. Zimmer argues that parasites are marvels of adaptation and evolution. In addition, they have proven to be a very powerful force in shaping the evolution of their hosts. Zimmer gives us a bird's eye view of parasite evolutionary ecology through close interactions with some of the most respected parasitologists in the field today. I am certain that you will find the book to be both informative and entertaining. You will be given a quiz over the content of this book in class on October 26th. We will have an in depth discussion of *Parasite Rex* following the quiz. Also, you will be expected to come to class with two questions or statements pertaining to the information presented in the book. You are expected to generate 'developed' statements/questions that demonstrate your earnest attempt to read and reflect upon the material presented in this part of the book. Your quiz score will, in part, be based on the quality of the questions/statements that you submit to me. We will discuss as many of the questions as we possibly can during the class period. Some of your exam questions will be based on the ideas and information presented in Zimmer's book.

III. Evaluation

Your final grade will be determined using the following formula:

Exam 1 - 15%

Exam 2 - 15%

Final exam - 20%

Web watch - 5%

Research article summary - 10%

Reading quiz 1- 5%

Reading quiz 2 - 5%

Lab Exam 1 - 10%

Lab Exam 2 - 10%

Prepared Slide - 5%

The grading scale for this course is as follows:

93 - 100 = A

63 - 66 = D

90 - 92 = A-

60 - 62 = D-

87 - 89 = B+

>60 = F

83 - 86 = B

80 - 82 = B-

77 - 79 = C+

73 - 76 = C

70 - 72 = C-

67 - 69 = D+

IV. Attendance/Deadline Policy

Your participation in the classroom and laboratory is integral to the course. You are expected to attend all classes. If you miss class during a regular lecture session you are responsible for all work missed. The dates indicated for the exams and assignments (see lecture syllabus and lab syllabus) are considered final. If for some unforeseen reason you are unable to attend class on the day of a lecture or lab exam, on the day an assignment is due, or when you are scheduled to give a presentation, I will ask that you contact me immediately. Furthermore, I will request that you submit a note from the Office of the Dean of Students confirming the reason for your absence. If the reason for your absence complies with University policy governing excused absences, I will work with you on an arrangement that is appropriate for the exam/assignment/presentation that was missed. If you miss a lecture exam you will be given a re-test. If you cannot attend a lab exam you will be given an oral exam over the appropriate material. If you cannot be in class when an assignment/presentation is due you will be given an extension up to one-week. If you do not satisfy the terms of this request you will regrettably receive a zero for the lecture or lab exam missed. And in the case of a presentation or an assignment that has not been turned in on the specified due date, a letter grade will be subtracted for your performance for each day that it is overdue. If you miss an exam, presentation, or assignment date because of an official University event, you will be granted the same privileges, provided that the event has been properly authorized.

V. The Honor Code

In the performance of all work in this course each student is expected to adhere to the standards of ethical behavior as stated in the University of Evansville Honor Code (page 42, 2005-2007 Undergraduate Catalog). The following are expected:

1. students neither give nor receive assistance on exams
2. each report is the students own work
3. students avoid plagiarism in their written work
4. students deal forthrightly and honestly when consulting with faculty

If there is any reason to suspect that you have violated the University honor code, you will automatically receive a zero for the work in question. Your violation will be reported to the Office of the Dean of Students and will probably result in an Honor Council hearing. Any student found guilty and sanctioned by the Honor Council is entitled to an appeal.

VI. Lecture Schedule*

| <u>Week</u> | <u>Lecture Topic</u> | <u>Readings</u> |
|-------------|--|--------------------|
| 08/21 | Introduction: definitions; principles and concepts | Ch. 1, 2 |
| 08/28 | Introduction to parasitic protozoans, phylum Euglenozoa, class Kinetoplasta: <i>Trypanosoma</i> and <i>Leishmania</i> | Ch. 4, 5 |
| 09/04 | Other flagellated protozoans: phylum Retortamomada, order Diplomonadida; phylum Parabasalia, order Trichomonadida, order Opalinida; Amebas; phylum Apicomplexa: order Eugregarinorida and Eucoccidiorida | Ch. 6, 7, 8 |
| 09/11 | Phylum Apicomplexa: order Haemospororida; Phylum Ciliophora: order Vestibuliferida | Ch. 9, 10 |
| 09/18 | Introduction to phylum Platyhelminthes; Class Trematoda: subclass Aspidobothrea. <i>Aspidogaster</i> ; subclass Digenea form and function | Ch. 13, 14, 15 |
| 09/25 | Digenean diversity: orders, Strigeiformes, Echinostomatiformes, Plagiorchiformes, and Opisthorchiformes; Exam 1 | Ch. 16, 17, 18 |
| 10/02 | Class Monogenoidea: order Gyrodactylidea and Polystomatidea; class Cestoidea: form and function | Ch. 19, 20 |
| 10/09 | Fall recess; Tapeworm diversity | Ch. 21 |
| 10/16 | Tapeworm diversity cont.; phylum Nematomorpha, phylum Acanthocephala | Ch. 21, 31, 32 |
| 10/23 | Phylum Nematoda: form and function; orders Trichurida, Rhabditida, Strongylida, and Ascaridida | Ch. 23, 24, 25, 26 |
| 10/30 | Phylum Nematoda: orders, Oxyurida, Spirurida, Filaroidea, and Camallanina; Exam 2 | Ch. 27, 28, 29, 30 |
| 11/06 | Phylum Arthropoda: form and function; parasitic Crustaceans: subclass Branchiura | Ch. 33, 34 |
| 11/13 | Phylum Arthropoda: parasitic insects: orders Mallophaga and Anoplura | Ch. 36, 37 |
| 11/20 | Parasitic insects: order Siphonoptera Thanksgiving recess | Ch. 38 |
| 11/27 | Parasitic arachnids: subclass Acari: ticks | Ch. 40 |
| 12/04 | Parasitic arachnids: subclass Acari: mites | Ch. 40 |
| 12/13 | Final Exam (10:15 a.m.) | |

*This lecture schedule may be modified depending on the pace of the course

VII. Laboratory Schedule

| <u>Date</u> | <u>Topic/Activity</u> |
|-------------|--|
| 08/28 | Introduction to parasitology laboratory techniques and procedures |
| 09/04 | Protozoan parasites: <i>Trypanosoma</i> , <i>Leishmania</i> , <i>Trichomonas</i> , <i>Giardia</i> and <i>Chilomastix</i> |
| 09/11 | Protozoan parasites: <i>Entamoeba</i> , <i>Gregarina</i> , <i>Eimeria</i> , and <i>Toxoplasma</i> ; examine mealworms for gregarines Research article presentation #1 |
| 09/18 | Protozoan parasites: <i>Plasmodium</i> and <i>Balantidium</i> Research article presentation #2 |
| 09/25 | Lab Practical 1 |
| 10/02 | Trematodes: Aspidobothreans, Digeneans; examine snails for intramolluscan stages |
| 10/09 | Fall recess |
| 10/16 | Monogeneans and Cestodes; examine beetles for cysticerci Research article presentation #3 |
| 10/23 | Nematodes and Acanthocephalans Research article presentation #4 |
| 10/30 | Arthropods: parasitic crustaceans and insects (lice and fleas) Research article presentation #5 |
| 11/06 | Arthropods: Ticks and mites Research article presentation #6 |
| 11/13 | Road kill rapture |
| 11/20 | Lab Practical 2 |
| 11/27 | Road kill rapture cont. |
| 12/04 | Turn in completed parasite slide |