

ENTO 8250: INSECT PHYSIOLOGY: COURSE INFORMATION Spring 2006

Instructor: Mark R. Brown, BioSci 524, 542-2317

Office Hours: Thursdays 4:00-6:00 PM or by appointment; also contact me at 'mbrown@bugs.ent.uga.edu' with any questions or comments.

Course objectives:

1. Integrate knowledge of molecular, cellular, and tissue processes with an understanding of insects as organisms.
2. Appreciate the evolutionary conservation of these mechanisms and its consequences for all animals.
3. Identify emerging areas of research in insect physiology and molecular biology.

Textbooks:

The Insects: Structure and Function. 1998, 4th ed. Cambridge University Press, R. F. Chapman.

Insect Physiology and Biochemistry. 2002. CRC Press, James L. Nation.

Physiological Systems in Insects. 2002. Academic Press, Marc Klowden.

Summaries of each topic, as drawn from textbooks and the current literature, will be presented in lecture. Each student is expected to gain background knowledge from textbook chapters or assigned papers. Review or journal articles for required reading will be in a box in the Conference room. Supplemental textbooks and journals listed below are available in the Science Library for additional reading and preparing the research paper and literature reports. Questions concerning the topics are welcome during lectures and paper presentations.

Supplemental Texts

Bate, M. and A. M. Arias (Eds.) 1993 *The Development of Drosophila melanogaster*. Cold Spring Harbor Laboratory Press, 1558 pp.

Blum, M. S. (Ed.) 1985 *Fundamentals of Insect Physiology*, John Wiley & Sons, New York, 598 pp.

Capinera, J.L. (Ed.) 2004 *Encyclopedia of Entomology*. Springer, 2580 pp.

Crampton, J. 1993 *Insect Molecular Science*, Academic Press, 280 pp.

Gilbert, L. I. (Editor-in-Chief) 2004 *Comprehensive Molecular Insect Science*, 6 volumes, 3300 pp. Elsevier.

UGA internet access: <http://www.sciencedirect.com/science/referenceworks/0444519246>

Harrison FW and Locke M (Eds.) 1998 *Microscopic Anatomy of Invertebrates*, Vol. 11 A-C, *Insecta*. Wiley-Liss.

Hoy, M. 2002 *Insect Molecular Genetics*, 2nd Edition. Academic Press.

Kerkut G. and Gilbert, L. (Eds.) 1985. *Comprehensive Insect Physiology, Biochemistry and Pharmacology*, Vol. 1-13. Pergamon Press, Oxford.

Lewin, B. *Genes VII or >*, Oxford University Press, New York.

Lodish, H. et al. *Molecular Cell Biology*, Scientific American Books, New York.

Mordue, W. et al. 1980. *Insect Physiology*, John Wiley, N.Y.

Resh, V. and Cardé R. 2003 *Encyclopedia of Insects*, 1266 pages, Academic Press.

Wigglesworth, V.B. 1984. *Insect Physiology*, eight edition. Chapman and Hall, London. (A condensed version)

Wigglesworth, V.B. 1972. *Principles of Insect Physiology*. Chapman and Hall, London (The comprehensive text until the 1970s)

Journals

Advances in Insect Physiology (annual or biannual).

Annual Review of Entomology (annual)

Arthropod Structure and Development

Journal of Insect Physiology

Journal of Insect Science (Online journal: <http://www.insectscience.org/papers/>)

Insect Biochemistry and Molecular Biology

Archives of Insect Biochemistry and Physiology

Insect Molecular Biology

Physiological Entomology

Grading: Exams will consist of short answers and essay questions. Final grades for the course will be based upon the following point system and curved according to the spread of points accumulated by individuals in the class. For the past few years, the curve has been: A, 450-500; B, 400-450; and C, <400. Reports and the research paper are due at the beginning of class on the assigned day. If assignments are late, the points will be reduced by one quarter of the total/day.

First half exam	100
Final half exam	100
Literature reports (five, 20 points each)	100
Topic review	150
<u>Oral presentation</u>	<u>50</u>
Total Points	500

Academic Honesty

All students are responsible for knowing the University's policy on academic honesty. All academic work submitted in this course must be your own unless you have received my permission to collaborate and have properly acknowledged receiving assistance. It is my responsibility to uphold the University's academic honesty policy and to report my suspicions of dishonesty to the Office of the Vice President for Instruction. See "A Culture of Honesty" at the UGA website:

http://www.uga.edu/ovpi/honesty/culture_honesty.htm

Examples of Academic Dishonesty. The following acts by a student are examples of academically dishonest behavior:

- a. **Plagiarism** - Submission for academic advancement the words, ideas, opinions or theories of another that are not common knowledge, without appropriate attribution to that other person. Plagiarism includes, but is not limited to, the following acts when performed without appropriate attribution:
 - i. Directly quoting all or part of another person's written or spoken words without quotation marks, as appropriate to the discipline;
 - ii. Paraphrasing all or part of another person's written or spoken words without notes or documentation within the body of the work;
 - iii. Presenting an idea, theory or formula originated by another person as the original work of the person submitting that work;

- iv. Repeating information, such as statistics or demographics, which is not common knowledge and which was originally compiled by another person;
- v. Purchasing (or receiving in any other manner) a term paper or other assignment that is the work of another person and submitting that term paper or other assignment as the student's own work.

Literature Reports

For the reports, a primary research article—not a review—will be selected that is relevant to a topic covered in the past two weeks and is less than two years old from the one of the journals listed above or from a general interest journal, such as *Journal of Experimental Biology*, *Science*, or *Nature*. A copy of the article will be included with each report. Consider the following questions while writing a double-spaced, two-page review of the article:

Purpose

1. As gathered from the Introduction and Discussion sections of the paper, what previous work led to the broad question or issue addressed in the paper?
2. What specific question(s) did the authors intend to answer with the research?

Conclusions

3. Were the experiments suitable to answer the question(s) asked?
4. Were the experiments performed with the proper controls?
5. What conclusions were drawn from the experiments described?
6. Were the conclusions justified by the results presented?

Summary and Relevance/Future Studies

7. Is the paper well organized and clearly written?
8. How could the paper or studies be improved or elaborated by additional studies?
9. Does the chosen insect offer special advantages for this research?
10. What is the relevance of this paper to your area of study or insect biology in general?

Literature Report Discussions

In 5-10 minutes, briefly introduce the research problem addressed in the paper, describe the most important finding/result using one or two key figures/experiments in class, and answer questions. If one is unfamiliar with the topic or methods, find and read supporting information or past reports.

Topic Review

This paper will be a review of a selected topic pertaining to the physiology, biochemistry, or molecular biology of insects, based on an exhaustive, in-depth survey of the current literature. The paper (15 to 20 pages of double-spaced text, including references) should be written in the same form and bibliographic style as articles in the *Annual Review of Entomology*. Spelling, grammar, sentence and paragraph construction, and overall organization will be considered for the grade. An oral presentation of the report will be given to the class (20 min) followed by a discussion period (5 min.) during the last week of class. Please check this year's syllabus for deadlines to pick a topic and to submit the draft and completed paper.

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LECTURE SCHEDULE

<u>DATE</u>	<u>TOPIC</u>
M Jan 9	1. Class Organization and Overview
W Jan 11	2. Molecules, Cells, and Organs
F Jan 13	3. Techniques, Genomics, and -Omics galore
W Jan 18	4. Female Reproduction
F Jan 20	5. Egg Structure/Physiology
M Jan 23	6. " <i>Drosophila</i> as a Model Organism" and Embryogenesis: Videos
W Jan 25	7. Embryonic development
F Jan 27	LITERATURE REPORT & DISCUSSION
M Jan 30	8. Ecdysteroid Hormones
W Feb 1	9. Juvenile Hormones
F Feb 3	10. Peptide Hormones
M Feb 6	11. Other Biochemical Messengers and Signal Transduction
W Feb 8	12. Integument: Structure and Function
F Feb 10	13. Integument: Physiology of Molting
M Feb 13	LITERATURE REPORT & DISCUSSION; REVIEW TOPIC OUTLINE DUE
W Feb 15	14. Growth and Metamorphosis—Judy Willis
F Feb 17	15. Growth and Metamorphosis—Judy Willis
M Feb 20	16. Digestion; Preview of Exam Questions
W Feb 22	17. Digestion and Nutrition
F Feb 24	18. Fat Body and Metabolism
M Feb 27	FIRST HALF EXAM
W Mar 1	19. Excretion
F Mar 3	20. Respiration
M Mar 6	21. Circulation
W Mar 8	22. Immunity
F Mar 10	LITERATURE REPORT & DISCUSSION
M Mar 20	23. Male Reproduction
W Mar 22	24. Reproductive Physiology
F Mar 24	25. Nervous System
M Mar 27	26. Vision
W Mar 29	27. Mechanoreception
F Mar 31	28. Olfaction/Chemical Ecology
M Apr 3	LITERATURE REPORT & DISCUSSION; RESEARCH PAPER DRAFT DUE
W Apr 5	29. Muscle Systems
F Apr 7	30. Environmental Physiology/Aging
M Apr 10	31. Thermoregulation
W Apr 12	32. Photoperiodism
F Apr 14	LITERATURE REPORT & DISCUSSION
M Apr 17	33. Diapause, Dormancy, and Migration
W Apr 19	34. Adaptation to Extreme Environments
F Apr 21	Catch up lecture
M Apr 24	Oral Reports; RESEARCH PAPER DUE
W Apr 26	Oral Reports
F Apr 28	Oral Reports; Preview of Exam Questions
M May 1	Reading Day-last day of classes
May 3-9	Second Half Exam 3:30-6:30 pm

WEB SITES OF INTEREST

http://www.faculty.ucr.edu/~insects/	Insect Physiology Online
http://mosquito.colostate.edu/tikiwiki/tiki-index.php	Mosquito Genomics Site and other relevant information
http://ufbir.ifas.ufl.edu	University of Florida Book of Insect Records
http://www.fruitfly.org	Drosophila Genomics Site and links to many other resources
http://flybase.bio.indiana.edu	FlyBase: A Database of the Drosophila Genome
http://flybase.bio.indiana.edu/allied-data/lk/interactive-fly/aimain/1aahome.htm	Interactive Fly-- A cyberspace guide to Drosophila genes and their roles in development
http://www.bio.umass.edu/biology/kunkel/cockroach.html	Cockroach home page and links to other roach labs
http://www.elsevier.com/homepage/san/insect/	Gateway to J. Insect Physiology, Insect Biochem. Molec. Biol, Arthrop. Struc. Develop.
http://www.blackwellpublishing.com/journals/imb/	Gateway to Insect Molec. Biol.
http://everest.ento.vt.edu/~carroll/insect_video_dissection.html	Cockroach dissection video clips
http://ase.tufts.edu/BIOLOGY/faculty/trimmer/	Trimmer lab: <i>Manduca</i> neurobiology and Firefly flash
http://www.ab.a.u-tokyo.ac.jp/silkbase/	Silkworm genome/EST databases
http://www.ab.a.u-tokyo.ac.jp/lep-genome/index.html	International Lepidopteran genome project
http://ecdybase.org/	Ecdysteroid database
http://titan.biotec.uiuc.edu/bee/honeybee_project.htm	Honeybee EST database
http://www.insectscience.org/papers/	Journal of Insect Science
http://www.st-andrews.ac.uk/~wjh/jumping/contents.htm	How grasshoppers jump
http://entochem.tamu.edu	TX A&M Insect Physiology page with several web movies of molecular/physiological processes
http://www.entomology.cornell.edu/Faculty_Staff/Danforth/322LabManual/322Lab.html	Insect Morphology class site with many subjects and instructions
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=PubMed&cmd=Search&term	PubMed

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Name _____

Current degree program/department _____

Other degrees/majors and universities/colleges attended:

Prerequisite courses are General Entomology and Biochemistry or Cell Biology. Please list relevant courses from your course record:

Research interests: