

ENTO 8250 INSECT PHYSIOLOGY – SPRING SEMESTER 2011

Course Information

Instructor: Mark R. Brown, BioSci 524, 706-542-2317

Office Hours: Thursdays 4:00-6:00 PM or by appointment; also contact me at ‘mrbrown@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 research in the physiology and molecular biology of insects.

Textbooks - Your choice:

Physiological Systems in Insects 2nd edition 2007, Academic Press, Marc Klowden

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

Insect Physiology and Biochemistry 2nd edition 2008, CRC Press, James L. Nation

Lectures:

Summaries of each topic, as drawn from textbooks and the current literature, will be presented in the class lectures. Each student is expected to read and gain background knowledge from the suggested textbooks and review or journal articles. Supplemental textbooks and journals listed below are available in the Science Library for additional reading and preparing the research paper and literature reports. Questions 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. 2003 *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*, eighth 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 essay questions and short definitions of terms. 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 was 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
Essay (200 total)	
Outline and reference list	25
Draft	25
Final	120
<u>Oral presentation</u>	<u>30</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 request and receive my permission to collaborate. Be sure to acknowledge the assistance. It is my responsibility to uphold the University's academic honesty policy and to report any suspicion of dishonesty to the Office of the Vice President for Instruction. See "A Culture of Honesty" at the UGA website: http://www.uga.edu/honesty/ahpd/culture_honesty.htm.

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

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:

- Directly quoting all or part of another person's written or spoken words without quotation marks, as appropriate to the discipline;
- Paraphrasing all or part of another person's written or spoken words without notes or documentation within the body of the work;

- Presenting an idea, theory or formula originated by another person as the original work of the person submitting that work;
- Repeating information, such as statistics or demographics, which is not common knowledge and which was originally compiled by another person;
- 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

Select and read a primary research article—not a review—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*, *Naturwissenschaften*, *Current Biology*, *Science*, or *Nature*. Write a double-spaced, two-page review of the article by answering the following questions in a narration under each heading. Include a copy of the article read for the report. No references need to be provided.

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. What methods were used in the experiments?
4. What controls were needed?
5. What conclusions were drawn from the experiments described?

Summary and Relevance/Future Studies

6. Were the conclusions justified by the results presented?
7. How could the paper or studies be improved or elaborated by additional studies?
8. Does the chosen insect offer special advantages for this research?

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.

Insect-Vertebrate System Essay

This paper will be a compare/contrast essay on an assigned organ system common to insects and vertebrate animals. It will be organized to cover each of the following levels: overall function, environmental constraints, morphology, physiology, and biochemistry. At each level, the vertebrate and insect system should be compared/contrasted. The final paper (20 or more pages of double-spaced text, including references) will be submitted in the same form and bibliographic style as articles in the *Annual Review of Entomology*. Only 4 half-page figures will be allowed. 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 weeks of class. Please check this year's syllabus for deadlines to submit the draft outline/reference list, draft, and completed paper. The draft outline of the paper should be 2 pages with an additional reference list of 15 or more papers, reviews, or textbooks published in the last 10 years

that will be consulted for the paper. Later, a near complete draft will be submitted, and I will read it and suggest changes that should be made or additional topics.

ENTO 8250 LECTURE SCHEDULE Spring 2011: M, W, F 3:35-4:25 pm, BioSci 426

DATE	TOPIC
F Jan 14	1. Class Organization and Overview
W Jan 19	2. Molecules, Cells, and Organs
F Jan 21	3. Techniques, Genomics, and -Omics galore
M Jan 24	4. Female Reproduction
W Jan 26	5. Egg Structure/Physiology
F Jan 28	6. “ <i>Drosophila</i> as a Model Organism” Video and discussion of Gilbert paper
M Jan 31	LITERATURE REPORT & DISCUSSION
W Feb 2	7. Embryonic development
F Feb 4	8. Ecdysteroid Hormones
M Feb 7	9. Juvenile Hormones
W Feb 9	10. Peptide Hormones
F Feb 11	11. Other Biochemical Messengers and Signal Transduction
M Feb 14	LITERATURE REPORT & DISCUSSION; ESSAY OUTLINE/REFERENCES DUE
W Feb 16	12. Integument: Structure and Function
F Feb 18	13. Integument: Physiology of Molting
M Feb 21	14. Growth and Metamorphosis—Judy Willis
W Feb 23	15. Growth and Metamorphosis—Judy Willis
F Feb 25	16. Digestion
M Feb 28	LITERATURE REPORT & DISCUSSION
W Mar 2	17. Digestion and Nutrition
F Mar 4	18. Fat Body and Metabolism. Preview of Exam Questions
M Mar 7	19. Excretion
W Mar 9	20. Respiration
F Mar 11	FIRST HALF EXAM
M Mar 21	21. Circulation
W Mar 23	22. Immunity
F Mar 25	23. Male Reproduction
M Mar 28	LITERATURE REPORT & DISCUSSION; ESSAY DRAFT DUE
W Mar 30	24. Reproductive Physiology
F Apr 1	25. Nervous System
M Apr 4	26. Vision
W Apr 6	27. Mechanoreception
F Apr 8	28. Olfaction/Chemical Ecology
M Apr 11	LITERATURE REPORT & DISCUSSION
W Apr 13	29. Muscle Systems
F Apr 15	30. Environmental Physiology/Aging
M Apr 18	31. Thermoregulation
W Apr 20	32. Photoperiodism
F Apr 22	33. Diapause, Dormancy, and Migration
M Apr 25	34. Insecticide toxicity and resistance
W Apr 27	Oral Reports; ESSAY FINAL DUE; Preview of Exam Questions
F Apr 29	Oral Reports
M May 2	Oral Reports
	Oral Reports
May 4-6, 9, 10	Finals Week - Second Half Exam sometime

WEB SITES OF INTEREST

http://www.faculty.ucr.edu/~insects/	Insect Physiology Online
http://www.vectorbase.org/index.php	Tick and mosquito genomics site and other relevant information
http://www.entnemdept.ufl.edu/walker/ufbir/	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://everest.ento.vt.edu/~carroll/insect_video_dissection.html	Cockroach dissection video clips
http://ase.tufts.edu/biology/labs/trimmer/	Trimmer lab: <i>Manduca</i> neurobiology and Firefly flash
http://silkbase.ab.a.u-tokyo.ac.jp/cgi-bin/index.cgi	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.ent.iastate.edu/list/	Iowa State Entomology Index of Internet Resources
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=PubMed&cmd=Search&term	PubMed – best site to search for articles on insect biochemistry, molecular biology, and physiology

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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: