

## ENTO 8250 INSECT PHYSIOLOGY – SPRING SEMESTER 2017

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**Office Hours:** Thursdays 4:00-6:00 PM or by appointment; also contact me by email 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 among all animals and the consequences for chemical, genetic, and biological control of insect pests.
3. Examine new research findings and directions in the physiology and molecular biology of insects.

### **Course learning outcomes after completing the course:**

1. Know and use names and terms specific to insect tissues and physiology.
2. Obtain and integrate information pertaining to specific physiological systems.
3. Explain cellular and molecular basis of specific physiological processes.
4. Communicate through speech and writing in exams an understanding of principles of insect physiology obtained from lecture notes and extracurricular reading of a textbook and review literature.
5. Give examples of how basic research in insect physiology contributes to biomedical advances and pest control applications.
6. Choose primary research publications relevant to the topic chosen for the review paper and synthesize information from these papers to write and organize a comprehensive review paper in a standard journal format.

### **Textbooks - Your choice:**

**Physiological Systems in Insects** 3<sup>rd</sup> edition 2013, Academic Press, Marc Klowden

**The Insects: Structure and Function** 5<sup>th</sup> edition 2013, Cambridge University Press, R. F. Chapman

**Insect Physiology and Biochemistry** 3<sup>rd</sup> edition 2015, 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 online through the UGA library and 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

*Advances in Insect Physiology*

*Annual Review of Entomology*

*Current Opinion in Insect Science* – series of topic-related short reviews in each volume

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

Capinera, J. L. (Ed.) 2008 *Encyclopedia of Entomology*. Springer.

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

Gilbert, L. I. (Editor-in-Chief) 2005 *Comprehensive Molecular Insect Science*, 6 volumes, 3300 pp.

Elsevier. UGA library electronic access: <http://www.sciencedirect.com.proxy-remote.galib.uga.edu/science/referenceworks/9780444519245>

- Harrison FW and Locke M (Eds.) 1998 *Microscopic Anatomy of Invertebrates*, Vol. 11 A-C, *Insecta*. Wiley-Liss.
- Harrison, J. F., Woods, H. A., and Roberts, S. P. 2012 *Ecological and Environmental Physiology of Insects*
- Hoy, M. 2013 *Insect Molecular Genetics*, 3<sup>rd</sup> 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.
- Resh, V. and Cardé R. 2009 *Encyclopedia of Insects*, Academic Press.
- Wigglesworth, V.B. 1972. *Principles of Insect Physiology*. Chapman and Hall, London (The comprehensive text until the 1970s) or 1984. *Insect Physiology*, eighth edition, condensed version

### Journals

*Arthropod Structure and Development*  
*Journal of Experimental Biology*  
*Journal of Insect Physiology*  
*Journal of Insect Science* (Online journal)  
*Insect Biochemistry and Molecular Biology*  
*Archives of Insect Biochemistry and Physiology*  
*Insect Molecular Biology*  
*Physiological Entomology*

### Reference database sites

PubMed and Web of Science – best sites to search for articles on insect biochemistry, molecular biology, and physiology – **last resort Google**.  
 UGA Science Library for searches and download EndNote: <http://guides.libs.uga.edu/ent>

**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 each day late.**

First half exam	100
Final half exam	100
Literature reports 5 X 20 points	100
Weekly pop quizzes 15 X 2 points	30
Essay (170 total)	
Outline and reference list	10
Draft	10
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](http://www.uga.edu/honesty/ahpd/culture_honesty.htm).

### **Most frequent occurrence of Academic Dishonesty – 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 one year old from the one of the journals listed above or from a general interest journal, such as Science, Nature, or Journal of Experimental Biology. Write a double-spaced, two page review of the article by addressing or following the points under each heading. Give the full citation for the paper at the beginning and include a copy of the article read for the report. All submitted text must have 1” margins maximum, Times Roman 12 font, and no figures. 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 question or issue addressed in the paper?
2. What specific question(s) did the authors intend to answer with the research?

#### Conclusions

3. Provide an overview or summary of the methods and controls used in the experiments.
4. Provide an overview or summary of the conclusions drawn from the experiments.

#### Summary and Relevance

5. How did the conclusions/results answer the original question or advance knowledge in this area?
6. How could the paper or studies be improved or elaborated by additional studies?
7. What did you learn or appreciate from this paper that may be relevant to your research or interests?

#### 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 will be a review of a selected topic pertaining to the physiology, biochemistry, or molecular biology of insects, based on an in-depth survey of the current literature. Choose a topic that is different than your research area. The background for the paper can be drawn from older publications, but the text must emphasize recent work (<5 years). The paper (minimum of 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*. All submitted text must have 1" margins maximum and Times Roman 12 font, with a maximum of 4 half-page figures (fully cited). 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 (15-20 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 outline/reference list, a draft, and the 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 5 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.

## Resources for Academic Assistance

### UGA Division of Academic Enhancement

**Collaborative Academic and Retention Effort (CARE)** <http://dae.uga.edu/student-resources/care/>  
**Writing Tutoring** <http://dae.uga.edu/tutoring/writing-tutoring/>

**UGA Writing Center** - <https://writingcenter.english.uga.edu/wc/pages/34>

For appointment: <https://uga.mywconline.com/>

**UGA CAPS** - <https://www.uhs.uga.edu/caps/welcome>

This site provides a list of services available to all UGA students. Counselors can assist with test anxiety and time management. Information and appointments: 706-542-2273 or login at the UHC Patient Portal ([https://patientportal.uhs.uga.edu/login\\_dualauthentication.aspx](https://patientportal.uhs.uga.edu/login_dualauthentication.aspx))

**ENTO 8250 LECTURE SCHEDULE Spring 2017: M, W, F 3:35-4:25 pm, BioSci 426**

<u>DATE</u>	<u>TOPIC</u>
F Jan 6	UGA classes cancelled
M Jan 9	1. Class Organization and Overview/2. Organs, Cells, and Molecules
W Jan 11	3. Genomics and other general molecular techniques: Kevin Vogel
F Jan 13	4. Female Reproduction
W Jan 18	5. Egg Structure/Physiology
F Jan 20	6. " <i>Drosophila</i> as a Model Organism" Video
M Jan 23	LITERATURE REPORT & DISCUSSION
W Jan 25	7. Embryonic development
F Jan 27	8. Ecdysteroid Hormones
M Jan 30	9. Juvenile Hormones
W Feb 1	10. Peptide Hormones
F Feb 3	11. Other Biochemical Messengers and Signal Transduction
M Feb 6	LITERATURE REPORT & DISCUSSION
W Feb 8	12. Integument: Structure and Function
F Feb 10	13. Integument: Physiology of Molting
M Feb 13	14. Growth and Metamorphosis
W Feb 15	15. Digestion
F Feb 17	16. Nutrition
M Feb 20	LITERATURE REPORT & DISCUSSION; ESSAY OUTLINE/ REFERENCES DUE
W Feb 22	17. Fat Body and Metabolism
F Feb 24	18. Respiration; Preview of Exam Questions
M Feb 27	19. Circulation
W Mar 1	20. Immunity
F Mar 3	FIRST HALF EXAM
M Mar 13	21. Excretion
W Mar 15	22. Male Reproduction
F Mar 17	23. Reproductive Physiology
M Mar 20	LITERATURE REPORT & DISCUSSION
W Mar 22	24. Nervous System
F Mar 24	25. Vision
M Mar 27	26. Mechanoreception; ESSAY DRAFT DUE
W Mar 29	27. Olfaction/Chemical Ecology
F Mar 31	28. Muscle Systems
M Apr 3	LITERATURE REPORT & DISCUSSION
W Apr 5	29. Environmental Physiology/Aging
F Apr 7	30. Photoperiodism
M Apr 10	31. Thermoregulation
W Apr 12	32. Diapause, Dormancy, and Migration
F Apr 14	33. Insect-Microbe Interactions: Kevin Vogel
M Apr 17	34. Insecticide toxicity and resistance
W Apr 19	Oral Reports; REVIEW PAPER FINAL DUE
F Apr 21	Oral Reports; Preview of Exam Questions
M Apr 24	Oral Reports
W Apr 26	Oral Reports
F Apr 28	Final exam 3:30-6:30 pm

## RELEVANT WEB SITES

<a href="http://www.ted.com/playlists/5/insects_are_awesome.html">http://www.ted.com/playlists/5/insects_are_awesome.html</a>	10 TED talks on different insects and their biology
<a href="http://www.faculty.ucr.edu/~insects/">http://www.faculty.ucr.edu/~insects/</a>	Insect Physiology Online
<a href="http://www.vectorbase.org/index.php">http://www.vectorbase.org/index.php</a>	Tick and insect vector genomics site and other relevant information
<a href="http://www.entnemdept.ufl.edu/walker/ufbir/">http://www.entnemdept.ufl.edu/walker/ufbir/</a>	University of Florida Book of Insect Records
<a href="http://www.fruitfly.org">http://www.fruitfly.org</a>	Drosophila Genomics Site and links to many other resources
<a href="http://flybase.bio.indiana.edu">http://flybase.bio.indiana.edu</a>	FlyBase: A Database of the Drosophila Genome
<a href="http://flybase.bio.indiana.edu/allied-data/lk/interactive-fly/aimain/1aahome.htm">http://flybase.bio.indiana.edu/allied-data/lk/interactive-fly/aimain/1aahome.htm</a>	Interactive Fly-- A cyberspace guide to Drosophila genes and their roles in development
<a href="http://www.bio.umass.edu/biology/kunkel/cockroach.html">http://www.bio.umass.edu/biology/kunkel/cockroach.html</a>	Cockroach home page and links to other roach labs
<a href="https://i5k.nal.usda.gov/">https://i5k.nal.usda.gov/</a>	Insect and arthropod genome databases and tools
<a href="http://ase.tufts.edu/biology/labs/trimmer/">http://ase.tufts.edu/biology/labs/trimmer/</a>	Trimmer lab: Neuromechanics of locomotion in lepidopteran larvae
<a href="http://silkbase.ab.a.u-tokyo.ac.jp/cgi-bin/index.cgi">http://silkbase.ab.a.u-tokyo.ac.jp/cgi-bin/index.cgi</a>	Silkworm genome/EST databases
<a href="http://lepbase.org/">http://lepbase.org/</a>	International Lepidopteran genome database
<a href="http://ecdybase.org/">http://ecdybase.org/</a>	Ecdysteroid database
<a href="http://hymenopteragenome.org/beebase/?q=home">http://hymenopteragenome.org/beebase/?q=home</a>	Honeybee and other bees genome database & other resources
<a href="http://jinsectscience.oxfordjournals.org/">http://jinsectscience.oxfordjournals.org/</a>	Journal of Insect Science
<a href="http://www.st-andrews.ac.uk/~wjh/jumping/contents.htm">http://www.st-andrews.ac.uk/~wjh/jumping/contents.htm</a>	How grasshoppers jump
<a href="http://www.ent.iastate.edu/list/">http://www.ent.iastate.edu/list/</a>	ISU Entomology index of internet resources
<a href="http://igtrcn.org/">http://igtrcn.org/</a>	The purpose of the NSF-funded Insect Genetic Technologies RCN is to disseminate advanced technologies for genome modification of insects through symposia, technical workshops, and training fellowships.
<a href="https://www.youtube.com/user/llkeeley/videos">https://www.youtube.com/user/llkeeley/videos</a>	Numerous videos explaining different physiological and chemical processes in insects. Produced by Larry Keeley, a retired insect physiologist.

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**Spring 2017**

Name \_\_\_\_\_

Current degree program/department \_\_\_\_\_

Other degrees/majors and universities/colleges attended:

Please list relevant courses from your course record:

Research interests: