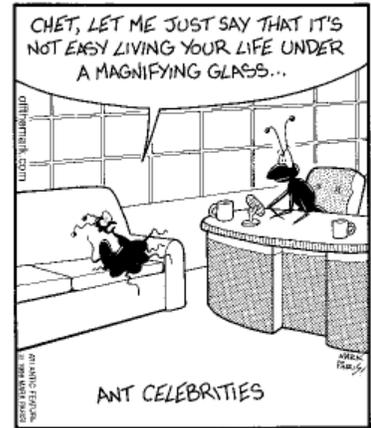


ENTO 313

Biology of Insects

Spring 2013



Purpose:

Insects are everywhere (well, almost everywhere). According to our best estimates, insect species—about 1 million described so far—make up more than half of all described species on the planet, and some 10 million million million (yes, thrice) individuals are alive at any time, occurring practically in every environment. So, more likely than not, you are bound to interact with and be affected (mostly positively) by them in your everyday life. Because insects are so ubiquitous and important, it will benefit you to know the essentials about them, particularly if your career interests revolve around the biological sciences in general. The purpose of the course, therefore, is for you to gain a basic understanding of insect biology, taxonomy, and ecology, and appreciate that entomology is much, much more than controlling pests or catching butterflies.

Catalog

Description:

Two lecture hours and three laboratory hours per week (3 credits). Study of the orders and important families of insects and related arthropods, including general biology, relationships with plants and other animals, and characteristics used in identification.

Prerequisites: Three hours of biological science.

Expected

Outcomes:

By the semester's end, students should be able to synthesize the information presented in course lectures and laboratories so that they can intelligently discuss and apply it in their daily lives. Specifically, students should be able to correctly address questions or critically analyze information concerning:

- The impacts that insects have on humans and human societies
- The reasons insects are so successful as a taxonomic group
- The habits of common insect groups
- The importance of insects in our everyday lives

These outcomes will be evaluated during the semester through examinations and assignments, and in the final examination. Particularly, these outcomes will be evaluated in the final examination, which includes broad, long-essay type questions in which students are asked to explain various concepts covered during the semester to layperson and professional audiences. The goal of these questions is that students will synthesize relevant information that has been presented in the course (and in other courses and venues) to construct (and demonstrate) knowledge that they can effectively transfer to audiences of different levels, such as lay and professional audiences.

Instructor:

Julio Bernal, Associate Professor, juliobernal@tamu.edu, (979) 862-8378, Entomology, Rm. 116 Biological Control Facility, West Campus (nr. corner University (FM60) and Agronomy)

Office hours:

Flexible; simply call or email in advance.

Lecture: Two lectures/week: 9:35-10:25 AM, HPCT 208 on Tuesdays and Thursdays

Laboratory: One session/week: 5:20-8:00 PM, HPCT 207 on Tuesdays

Texts: Gullan, P. J., Cranston, P. S. 2010. *The insects: An outline of entomology*. Blackwell Publishing, Ltd., Malden, MA, USA (Fourth edition). ***This book will be especially useful if you miss any lectures. Otherwise, taking good notes and studying all handouts should be sufficient for you to do well in the course.***

George C. McGavin, G. C., Lewington, R. (illustrator). 2001. *Essential Entomology: An Order-by-Order Introduction*. Oxford University Press, New York, USA. ***I recommend that you purchase this book because it will help you do well in the lab and lecture portions of the course.***

Additional course-related material will be handed out, delivered via email, and/or posted at elearning.tamu.edu (direct access URL: TBA)

TA: Milena Chinchilla (milena111@neo.tamu.edu), (832) 677-5684 (cell); office hours at Entomology Field Laboratory (Bldg. 861), by appointment and see Laboratory syllabus for office hours.

Grading: Semester grades are based on 720 points (not including 72 bonus points), as described below:

Lecture	#	Points	total
Mid-term exam 1	1	60	60
Mid-term exam 2	1	80	80
Final exam	1	100	100
Homework questions sets	26	variable	120
Active participation	---	32	
Passive participation		16	
Laboratory			
Discussion readings	10	12	120
Laboratory exams	2	60	120
Insect collection	1	120	120
Laboratory participation	---	24	
TOTAL POINTS			720

Grade assignment: $\geq 90\%$ = **A**; 80-89% = **B**; 70-79% = **C**; 60-70% = **D**; $< 60\%$ = **F**.

Objectives: The course is broken down into three parts (see *Tentative lecture schedule* below). The specific objectives—that is to say, what I expect you to learn—for each part of the course are the following:

Part 1: (i) You should have a good understanding of why insects are so important from the economical and ecological perspectives. The goal is for you to appreciate the impacts that insects have upon society and their tremendous importance as ecosystem components.
(ii) You should know basic insect morphology and physiology, and understand how both contribute to the success of insects as a group of organisms. The goals are for you to acquire the knowledge needed for identifying insect orders based on morphology, and appreciate the adaptations that allow insects to be successful in their environments.

Part 2: You should understand how insects evolved and their relationships with other groups of organisms, the bases for insect taxonomies, and the main biological and morphological features

of the insect Orders. The goal is for you to comprehend that insect adaptations—including morphological, life history, and behavioral adaptations, among others—are the result of evolutionary processes, and that they permit insects to be successful in their environments, and that by studying such adaptations scientists can uncover underlying natural relationships among insect groups, and so propose systems for classifying insects.

Part 3: You should become familiar with the evolution, biology, and ecology of several of the most ubiquitous groups of insects, based on their feeding habits and lifestyles, particularly herbivores, carnivores, and eusocial insects. The goal is for you to understand the habits and lifestyles common of many of the insects around you, the reasons for living as they do, and the manners in which they interact with other insects and organisms.

Schedule: A tentative schedule for lectures is shown below. It is subject to change to accommodate unexpected events or unanticipated delays/rapid progress in accomplishing the established course objectives (see above). A detailed laboratory schedule will be provided by your TA.

TENTATIVE—Lecture Schedule Spring 2013—TENTATIVE

WEEK	LECTURE	TITLE	SUPPL.* READINGS
		PART 1	
1/14	1	Introduction: What entomology is and why insects matter (in part)	1
	2	Variety and numbers: How many and why so many insect species	2
1/21	3	Size matters: Hazards and advantages of being small (like an insect)	3
	4	Built for success: The insect body inside and out	4
1/28	5	Built for success: The insect body inside and out, <i>cont.</i>	4
	6	Built for success: The insect body inside and out, <i>cont.</i>	4
2/4	7	How insects function: Essential physiology	5
	8	How insects function: Essential physiology, <i>cont.</i>	5
2/11	9	How insects function: Essential physiology, <i>cont.</i>	5
	10	How insects grow, develop, and reproduce	6
		PART 2	
2/18	---	<i>Mid-term Exam I: lectures 1-9 (during Tuesday lecture)</i>	
	11	What is it? Classification, nomenclature, phylogeny, and evolution	7
2/25	12	What is it? Classification, nomenclature, phylogeny, and evolution, <i>cont.</i>	7
	13	What is it and what does it do? The insect orders	8
3/4	14	What is it and what does it do? The insect orders, <i>cont.</i>	8
	15	What is it and what does it do? The insect orders, <i>cont.</i>	8
3/11		SPRING BREAK	
3/18	16	What is it and what does it do? The insect orders, <i>cont.</i>	8
	17	What is it and what does it do? The insect orders, <i>cont.</i>	8
3/25	18	What is it and what does it do? The insect orders, <i>cont.</i>	8

	---	<i>Mid-term Exam II: lectures 10-17 (during Thursday lecture)</i>	
4/1	19	What is it and what does it do? The insect orders, <i>cont.</i>	8
		P A R T 3	
	20	Ultimate herbivores: Shrewd plant feeding insects and defensive plants	9
4/8	21	Ultimate herbivores: Shrewd plant feeding insects and defensive plants, <i>cont.</i>	9
	22	Ultimate herbivores: Shrewd plant feeding insects and defensive plants, <i>cont.</i>	9
4/15	23	Mini-carnivores and their prey: Predatory insects	10
	24	Of unwelcome guests and deceitful hosts: Parasitoid insects	10
4/22	25	Of unwelcome guests and deceitful hosts: Parasitoid insects	10
	26	Mimes, mimics, and foul insects: Insect self defense	11

***Supplementary Readings** are for independent study of lecture material covered in the classroom.

Supplementary readings (from Gullan & Cranston textbook)

1: Sections 1.1, 1.2, 1.5, 1.6, Box 1.3

2: Section 1.3, Boxes 1.1, 1.2

3: None

4: Chapter 2

5: Chapters 3, 4 (except Section 4.5), Boxes 3.3, 3.4

6: Chapter 5 (except Sections 5.3, 5.5, 5.7, 5.11),
Boxes 5.1, 5.2, 5.3, Sections 6.1, 6.2, 6.3

7: Sections 1.4, 8.1-8.4, Chapter 7, Box 7.1

8: Taxoboxes 1-29 (also *McGavin & Lewington*
textbook)

9: Chapter 11

10: Chapter 13 (except Section 13.4)

11: Chapter 14

Attendance

Attendance to lectures and laboratories is essential for students to understand the information presented in the course, and to generally do well and benefit from the course. Moreover, attendance is additionally important because participation points are assigned on the bases of attendance, and participations *during* lecture and laboratory sessions.

Mid-term examinations and Final examination

The two *Mid-term examinations* will be held during regularly scheduled lecture (or laboratory, as warranted) times, and the *Final examination* will be held according to the University-wide final examinations schedule (typically at the Registrar's web site, <http://registrar.tamu.edu/General/FinalSchedule.aspx>, as of August 2011).

Mid-term examination questions will come from material covered in lectures; bonus questions, taken from *Discussion readings* (see *Laboratory syllabus*), will be included in each *mid-term examination*. Thus, to do well in the *mid-term examinations* portion of the course it is essential that students attend lectures and study the *Discussion readings*.

The *Final examination* will include broad, "comprehensive" essay-type questions that will evaluate the course's *Expected outcomes* (see above).

Missed examinations (including *Laboratory examinations*). Students unable to take an exam on a scheduled date should contact the instructor immediately (before or after—preferably before—the exam date) so that they are given an opportunity to take the missed exam as soon as possible. Moreover, in order for students to be given the opportunity to take a missed exam it is essential that they (i) have a legitimate University-approved excuse, and (ii) provide adequate documentation substantiating the excuse (regulations at <http://student-rules.tamu.edu/>, as of August 2011). Students that miss an exam and lack a legitimate excuse and adequate documentation will be assigned a score of zero points (0 points) on the corresponding exam.

Homework questions sets

A set of *Homework questions*, typically consisting of 3-5 questions, is provided at the beginning of each lecture. These questions address key themes for each lecture, and are intended to help students prepare for examinations.

Selected *Homework questions* will be incorporated *verbatim* into *mid-term examinations*. So, in addition to the points assigned to *Homework questions* (up to 120 points), students may do better in *mid-term examinations* by correctly addressing and studying these questions. Students will submit the prior week's *Homework questions*, usually two sets, on Tuesdays during laboratory. These should be prepared using a word processor (so that students keep an electronic copy of their work), and submitted in hard-copy. Late submissions will be acceptable **only** (i) with a legitimate University-approved excuse, and (ii) as supported by corresponding adequate documentation substantiating the excuse (regulations at <http://student-rules.tamu.edu/>, as of August 2011). Students that do not turn in *Homework questions* or turn them in late, and lack a legitimate excuse and adequate documentation will be assigned a score of zero points (0 points) on the corresponding set of questions. Students are responsible for answering these questions correctly: The Instructor or TA will assist individual students as requested.

Lecture and laboratory participation

Participation during laboratory or lecture sessions is strongly encouraged. For the Lecture component of the course, any form of participation (e.g., question, comment, suggestion, etc.) relevant to the course is counted as an "active participation," and classroom attendance is counted as "passive participation." The student with the greatest number of participations by the semester's end will be assigned full credit (32 points for active, and 16 points for passive); all other students will be prorated according to their respective numbers of participations. Bonus points are available in the course's Laboratory component (24 points), and criteria for their assignment is explained in the Laboratory Syllabus

Discussion readings

Discussion readings are designed to expand on topics covered during lectures, and examine additional topics not specifically addressed during lectures. A list of *Discussion readings* is provided in the Laboratory Syllabus.

Laboratory examinations

Laboratory examinations will cover curation techniques, internal and external morphology, and insect development, and taxonomy of insect orders and common families. Missed *Laboratory examinations* will be handled as described above (see "Mid-term examinations and Final examination"). Further details are provided in the Laboratory Syllabus.

Insect collection

The purpose of the *Insect collection* is to familiarize student with collecting techniques, different insect habitats, specimen identification, and curation techniques. Collections are due as indicated in *Laboratory syllabus*. Complete details concerning the *Insect collection* will be provided separately.

Other information

Students are strongly encouraged to communicate to the instructor, or to the Teaching Assistant, any problems or difficulties that they encounter as early as possible during the semester. Contact information for both is noted above. The instructor and TA are able to help only those students that communicate with them, and they will be better able to help if contact is made as soon as students feel the need to do so.

It is important that students attend lectures and laboratories so that they do well in the course. Only a small minority of students are capable of doing fairly well in exams without attending lectures and laboratories, and a few others may do well due to their good fortune: Unless a student knows for a fact that he/she belongs in any of these two student categories, it is unlikely that he/she will do well in exams without attending lectures.

While e-mail communication is encouraged, **student work will not be accepted if delivered via email.**

ADA and academic integrity statements

The *Americans with Disabilities Act* (ADA) requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accomodation of their disabilities. If you believe that you have a

disability requiring an accomodation, please contact the *Department of Student Life, Services for Students with Disabilities*, in Cain Hall (979 845 1637).

Cheating of all types, including during exams and plagiarism in general, will not be tolerated. Rules and regulations concerning scholastic dishonesty, including cheating in exams or other assignments are available at the Honor Council website (at <http://aggiehonor.tamu.edu/>, as of August 2011). As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., of others. In accordance with this definition, *THE STUDENT IS COMMITTING PLAGIARISM IF HE OR SHE COPIES THE WORK OF ANOTHER PERSON AND TURNS IT IN AS HIS OR HER OWN, EVEN IF THE STUDENT RECEIVES PERMISSION TO DO SO FROM THAT PERSON.*

PLAGIARISM INCLUDES IDENTICAL WORK (VERBATIM TEXT) RESULTING FROM A TEAM EFFORT, PARTICULARLY IF THE EFFORT CONSISTED IN DIVIDING THE TASK AT HAND AMONG TEAM MEMBERS, SUBSEQUENT INDEPENDENT WORK BY TEAM MEMBERS, AND SIMPLE JUXTAPOSITION OF THE INDEPENDENT PIECES OF WORK.

Laboratory safety

The Department of Entomology is committed to the safety of all students and employees participating in teaching laboratories. To ensure that a safe environment is maintained in our teaching laboratories, it is expected that all students will adhere to general safety guidelines and emergency procedures, as well as course-specific and activity-specific safety instructions provided by faculty and teaching assistants. Laboratory safety and emergency procedures will be reviewed during the first class period and you will be asked to sign your acknowledgement of these instructions before attending further classes in this course. **Revised 1/14/13**