ENTOM 2030 - Honey Bees: Their intriguing biology and interactions with humans through the ages

(AKA "Bees and Us")

- 3 weeks winter offering (Jan 2-Jan 19, 2024)
- 3 credits, online, asynchronous, self-paced.



Teaching team

Instructor: Dr. Marina Caillaud: cmc27@cornell.edu

Zoom Office hours: W/F 3-4 pm Jan 2-Jan 20 (OR BY APPOINTMENT)

Zoom link: TBA

General Behavior in class

We consider this classroom to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. We support an inclusive learning environment where diversity and individual differences are understood, respected, appreciated, and recognized as a source of strength. We expect that **all members of the teaching team as well as all students enrolled in this course,** will respect differences and demonstrate diligence in understanding how other peoples' perspectives, behaviors, and worldviews may be different from one's own. Degrading, abusing, harassing, exploiting, or dismissing others is not acceptable behavior in this course.

Land acknowledgement for Cornell University's Ithaca campus

Cornell University is located on the traditional homelands of the Gayogo hó:no' (the Cayuga Nation). The Gayogo hó:no' are members of the Haudenosaunee Confederacy, an alliance of six sovereign Nations with a historic and contemporary presence on this land. The Confederacy precedes the establishment of Cornell University, New York state, and the United States of America. We acknowledge the painful history of Gayogo hó:no' dispossession and honor the ongoing connection of Gayogo hó:no' people, past and present, to these lands and waters. This land acknowledgment has been reviewed and approved by the traditional Gayogo hó:no' leadership.

Course description

Honey bees have been an object of fascination for mankind since prehistoric times. The complexity of their communal life has intrigued many observers and scientists, and they have long been prized for their honey as well as their beeswax. Honey bees, along with many wild bees are essential coworkers in agriculture because of their pollination services, and they are increasingly seen as important partners for sustainable agriculture that limits the use of pesticides. This course aims to offer an exploration of one of the most amazing life forms we know. Topics covered include chemical ecology, insect physiology, beekeeping, behavioral ecology, pollination biology, sociobiology and Conservation Biology.

Learning Objectives

By the end of this course, you should be able to:

- 1.Understand the basic biology of honey bees, their diversity, their place in the evolutionary history of life on planet Earth, their unique anatomy/ physiology, behavior, social complexity, chemical world, and environmental adaptations
- 2.Explain how <u>Apis mellifera</u>, the European honey bee differs from other honey bees (including the so-called "killer bee", and from the other 20,000 bee species of the world)
- 3.Analyze the relationships between honeybees and humans throughout history: How have they influenced our history? How important are honey bees for our current agricultural systems? How have humans impacted bees throughout their history?
- 4. Describe the role of honey bees and wild bees in current agricultural systems, evaluate the
 potential impact of the current decline of populations of many of those bee species on food
 supply for both humans and livestock, and identify strategies that can mitigate bee decline and
 lead to sustainable agriculture
- 5.Demonstrate self-directed learning in biology by finding and then utilizing credible information sources available to the educated layperson, including articles from the primary scientific literature
- 6.Communicate clearly and effectively about controversial issues that relate to bee biology, and understand that these skills are crucial to life as an informed citizen, and as a clear communicator of your thoughts and opinions generally

Required Weekly Homework:

- Annotate 7-8 documents, usually videos or news articles
- Watch 7-8 pre-recorded lecture videos
- Complete 7-8 short quizzes administered through Canvas
- Complete 2-4 personal exploration activities and submit written answers to questions included in these activities
- Post 1 written reflection based on a prompt on the Canvas discussion board

ALL MATERIAL WILL BE RELEASED ON MONDAYS AT 7 AM AND ALL WEEKLY ASSIGNMENTS WILL BE DUE THE FOLLOWING SUNDAY AT MIDNIGHT

Note - This course fulfills:

- Distribution requirements: this class fulfills BIONLS-AG, OPHLS-AG, CU-SBY.
- Note to future veterinary medicine students: as of 2017, the United States federal government made honey bee medicine (ex: prescription of antibiotic treatments) the purview of veterinarians

Course Website:

- Course documents (lecture videos, pdf files of readings, etc.), assignments, and other course information are available through Canvas.
- Canvas is also where you will submit ALL graded assignments.
- Please use the Canvas Gradebook feature to check individual scores for EACH graded assignment (quiz, discussion post, exam, etc.) and contact cmc27@cornell.edu if you have any concerns.

<u>Assessment</u>

This course is self-paced however there are weekly deadlines for the many assessments that we will use throughout the course to explore what you've learned, and to ensure consistent progress on all six of the stated learning goals. LATE SUBMISSIONS WILL BE ACCEPTED BUT WE WILL TAKE 10% OFF FOR EVERY 24H DELAY IN SUBMITTING ASSIGNMENTS.

- Pre-lecture collaborative annotations (video or reading) using Perusall (11%)
- Open book post-lecture quizzes (23%)
- Weekly whole-class Bee posts (6%)
- Weekly personal explorations (18%)
- Open-book exams administered online through Canvas (n=3, 14% for each, total= 42%). Each of them is based on 1 week of instruction, meaning that the final exam is NOT comprehensive
- Extra-credit (1%)

Grading explained

We will not grade "on a curve." We use the grading standard described below as our criterion. Questions about grades (quizzes, exams, etc.) must be submitted in writing to <u>cmc27@cornell.edu</u> **within 7 days** after the grades are first posted or the work is first returned to the class

Grading Scheme

A + = 98.0+, A = 92.0 - 97.9, A - = 90.0 - 91.9 B + = 88.0 - 89.9, B = 82.0 - 87.9, B - = 80 - 81.9 C + = 78.0 - 79.9, C = 72.0 - 77.9, C - = 70 - 71.9 D + = 68.0 - 69.9, D = 62.0 - 67.9, D - = 60.0 - 61.9 F = Below 60.0

1. **Pre-lecture collaborative annotation (11%)**: For each lecture, we will assign pre-lecture material such as videos and short readings that will be a graded collaborative annotation using Perusall. Guidelines for how to complete those collaborative annotations can be found on Canvas. ASSESSMENT OF LEARNING GOALS 1-4

2. Post-lecture Quizzes (23%): In order to encourage students to stay current with the course material and pre-lecture assignments, a short quiz consisting in Multiple choice questions will be

administered after every lecture. <u>These quizzes will be open-book</u>. ASSESSMENT OF LEARNING GOALS 1-4

3. Weekly whole-class Bee post (6%): We are going to miss talking to you each week like we would during an in-person class, and we also want to give you a chance to share your thoughts with each other. Each week we will assign 1 Canvas discussion board post based on a specific prompt. You should also expect to post responses to your classmates' posts each week, to ensure that ideas are being exchanged. ASSESSMENT OF LEARNING GOALS 5-6

4. Weekly personal explorations (18%): You will have a chance to explore more deeply the material covered in this course as part of 2-4 weekly activities. ASSESSMENT OF LEARNING GOALS 1-6

5. Exams (42%): We will administer through Canvas THREE online exams (worth 14% each). Exams will include Multiple Choice Questions. *Exams will be open-book*. ASSESSMENT OF LEARNING GOALS 1-4

6. Extra credit (1%). We have identified two extra credit assignments that you can complete throughout the course. Up to 1 point of extra credit can be earned towards your final course grade (that is, 1%). You may also suggest an extra credit assignment if you have an idea for one, but do not begin working on it until you have discussed your idea with Dr. Caillaud (cmc27@cornell.edu). ASSESSMENT OF LEARNING GOAL 5

Study skills and study groups

Now is a good time to review some **essential study skills, routines, and tips** that will help you be successful this semester (check resources here: <u>learning center Cornell</u>). In particular, note that studying with peers is a great way to connect with other Cornell students and is a powerful tool for learning. **Find study partners!** Finding people to study with can be challenging and Cornell's Learning Strategies Center (<u>LSC website</u>) helps match you with study partners. To find out more about study groups and partners, and to sign-up for study partners for class you are in, visit the LSC's <u>Studying together website</u>.

Additional notes regarding the whole-class Bee posts:

We will be using a class discussion board powered by Canvas for class discussion. There will be 1 prompt per week, and you will have to address the prompt. You will also be invited to comment on the answers provided by other students. *Please note that your posts should remain respectful, meaning that abusive or offensive language should not be used, and that personal attacks will not be tolerated.* You are expected to respect the diversity of all students' perspectives and refrain from using derogatory language targeting the gender, sexuality, religious affiliation, ability level, or ethnicity of others.

Academic Integrity:

Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. A Cornell student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. More information about the Cornell's code of academic integrity can be found at https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/e/5276/files/2020/01/Academic-IntegrityPamphlet-2019-VD.pdf

A student found to be plagiarizing graded assignments will be charged with a formal academic integrity violation in accordance with the rules of the student's respective college. If found guilty, the student will receive a failing grade for the course.

If you are encountering specific challenges in our course, please approach us before compromising your integrity to make the grade. We can work together on an accommodation that will support your efforts to be successful in this course.

<u>Chat GPT, Bard, Bing, and any other AI-based study tool</u> (FYI, these guidelines were written with assistance from GPT-4 (2))

The guidelines below aim to promote the ethical and effective use of AI tools in our learning environment, while preventing instances of academic dishonesty. They are in line with CU's commitment to academic integrity and innovative learning experiences. They will allow you to harness the power of AI to enhance your learning experience while maintaining the highest standards of academic integrity.

- Al tools like ChatGPT can be extremely valuable in supporting your research, learning, and study. You're encouraged to use these tools for:
 - Exploring topics of interest
 - Enhancing your understanding of complex concepts
 - Helping with brainstorming ideas
 - Proofreading and improving your writing style
 - You also need to understand the Limitations of AI Tools
 - Al tools are not infallible sources of information. While they can provide helpful insights, they
 may not always be accurate or up-to-date. Always cross-check information with other
 reliable academic sources.
- If you use these tools, the work you produce must be your own
 - Your assignments and exams should be original expressions of your understanding and learning. Al tools can assist in your research and exploration of topics, but the final work should be yours. Copying and pasting content generated by Al tools and presenting it as your own work is not acceptable.
 - If you use information gained from AI tools, be sure to paraphrase it in your own words and cite the sources accordingly. Directly quoting the AI's response without proper attribution will be considered as plagiarism.
- Do not use AI tools during quizzes and exams. These assessments are meant to evaluate your personal understanding and should be completed independently.
- If you're unsure whether using an AI tool is appropriate in a specific situation, consult Dr Caillaud (<u>cmc27@cornell.edu</u>). She can provide clarity and ensure that you're using these tools ethically and effectively.

Just to be clear, below are <u>ACCEPTABLE USES of AI tools</u>:

- Coursework Assistance: use to provide explanations of complex topics, summarize reading materials, and offer a second perspective on various subjects, making it a useful tool for studying. For example, you can ask AI tools to explain certain concepts or theories from your lecture notes. It's a quick and efficient way to understand complex material, or review key concepts before a test or quiz.
- 2. **Writing Support**: help generate ideas for essays, assist in outlining, proofread, provide language translation, and even generate references in appropriate formats. It can help you expand on your ideas, providing suggestions for better structure and organization.
- 3. **Research**: help you in your research process. While it doesn't replace thorough, academic research, it can provide a starting point by summarizing complex ideas or concepts.
- 4. **Scheduling and Task Management**: help organize your time and tasks. It can be a useful tool for reminding you of due dates and helping prioritize your workload.
- 5. **Practice Debating**: use to play devil's advocate in a debate or to help flesh out both sides of an argument. This can be helpful when preparing for a presentation or a class discussion.

And below are UNACCEPTABLE USES of AI tools:

- 1. **Plagiarism**: Using the content generated in your assignments, essays, or research without proper citation is plagiarism, just as if you were using someone else's work. Always give credit where it's due.
- 2. **Generating Offensive Content**: Using AI tools to generate content that's offensive, harassing, or harmful to others is unacceptable. This includes creating discriminatory, violent, or explicit content.
- 3. **Cheating**: Using AI tools to cheat on exams or tests is not acceptable. Academic integrity is important, and it's crucial to respect the rules and guidelines of Cornell University.

Last, beware on becoming TOO dependent on these AI tools. Relying on AI tools for all learning or information can lead to a lack of critical thinking and independent research skills. It's important to use them as a supplementary tool, not as the primary source of knowledge or learning.

Religious Observances:

Students are entitled to be excused for religious observances. Because our course is being delivered online and you will be able to explore the materials at your own pace, we expect most religious observances will not prevent you from completing your work by any posted deadlines. However, if you need to make up any assignment due to a religious observance, please let us know. You must notify us *at least* one week in advance, and you will be required to make up any work missed for religious observances.

Accommodations for students with special needs

If you have, or think you may have a disability, please contact Student Disability Services for a confidential discussion: <u>sds_cu@cornell.edu</u>, 607-254-4545, sds.cornell.edu.

Your access in this course is important to us. Please request your accommodation letter early in the course, or as soon as you become registered with SDS, so that we have adequate time to arrange your approved academic accommodations.

- Once SDS approves your accommodation letter, it will be emailed to both you and me. Please follow up with Dr Caillaud (cmc27@cornell.edu) to discuss the necessary logistics of your accommodations.
- If you are approved for exam accommodations, please consult with Dr Caillaud (cmc27@cornell.edu) at least one week before the scheduled exam date to confirm the testing arrangements.
- If you experience any access barriers in this course, such as with printed content, graphics, online
 materials, or any communication barriers, reach out to Dr Caillaud (<u>cmc27@cornell.edu</u>). We can
 make the documents we use in this course ADA compliant.
- If you need an immediate accommodation, please speak with Dr Caillaud (cmc27@cornell.edu) after class and/or send an email message to SDS at <u>sds_cu@cornell.edu</u>.

Third party notes

All materials created by the faculty and staff of ENTOM 2030 are copyrighted by Cornell University. Commercial note takers, audio recorders, video recorders, and photos are not allowed in our classes or discussion sections. Commercial vendors may approach you and encourage you to provide them with course materials, such as notes and papers, which they may then post for distribution on third-party internet sites. Some vendors falsely convey that this behavior is legal or sanctioned by the course faculty – this is not true: we do not allow this kind of activity and such unauthorized behavior

violates copyright laws and could result in an Academic Integrity violation for you if you share our copyrighted materials. Do not provide any course information to third-party vendors and do not accept course content from third-party vendors. We will provide you with all of the information you need, and when you get the information from us, you will know that it is accurate and relevant to this semester's course offering.

WEEK	CLASS		TOPIC
1	1		Introduction (overview of the class, logistics, expectations)
			Module 1. What makes a bee a bee?
	2		Where are honey bees placed in the tree of life? What is their evolutionary history?
	3		Different kinds of Western honey bees including "Killer bees"
	4		The other 20,000 bee species!
	5		How are honey bees built? Anatomy/Physiology I
	6		How are honey bees built? Anatomy/Physiology II
	7		The sting: all about the honey bee venom!
	Exploration 1		Discover why insect (including bees) collections like the CUIC are highly valuable
	Exploration 2		Examine the external anatomy of a worker honey bee (online "lab")
	Exploration 3		Explore the way honey bees are portrayed in art, myths and popular culture
	Exploration 4		Analyze a recent research article : can honey bees really add and subtract?
			Exam 1 on TBA (material from week 1)
			Module 2. Life in the nest
2	8		From eggs to either workers, queens or drones: How?
	9	Π	Honey bees are eusocial : what does it mean?
	10		Where do they live? The hive structure
	11	Π	How do they communicate? Dance language and acoustic signals
	12	Π	How do they communicate? Chemical signals (Pheromones)
		Π	Module 3. Solving problems as a group
	13	Π	How do honey bees find flowers and other necessary resources?
	14		Honey bee democracy and swarm intelligence I
	15		Honey bee democracy and swarm intelligence II
	Exploration 5		Design a garden that is suitable for social <u>and</u> solitary bees
	Exploration 6		Investigate a mysterious observation: yellow rain in South East Asia in the late 1970s
	Exploration 7		Analyze the tenets of swarm intelligence in honey bees and discuss whether those could work in human societies

		Exam 2 on TBA (material from week 2)
		Module 4. Beeconomics
3	16	Honey bees and other bees are instrumental for pollinating our foods
	17	Is this "real" honey? Honey and honey fraud
	18	Honey bees make other important products besides honey
	19	Beekeeping around the world
		Module 5-Pollinator decline and bee conservation
	20	Evidence for pollinator decline, and possible causes.
	21	Pesticides encountered by bees, and their effects
	22	Parasites and Diseases of bees I - Macroscopic organisms
	23	Parasites and Diseases of bees II - Microscopic organisms
	Exploration 8	Examine claims of medical benefits of products from the hive (ex:royal jelly, venom)
	Exploration 9	Debate whether we should ban neonicotinoids altogether
		Final Exam (Exam 3) on Friday January 19 (material from week 3 only, NOT COMPREHENSIVE)