

# CHEM 071: The Chemistry of Honeybees

Lecture (CRN 94334); M,W,F 10:50-11:40AM, (L/L-A Bldg; rm. A-161)

## GENERAL INFORMATION:

**Instructor:** Steve Flemer

**email:** [sflemer@uvm.edu](mailto:sflemer@uvm.edu)

**Office:** 110 Hills

**Office Hours:** M,W,F 12:00-1:00PM

**Class Website:** Please see the Course link on your UVM [Blackboard](#) page.

**Lecture:** The lecture will be used to introduce new material. Included in this syllabus is a tentative schedule covering the text and reading materials.

## GRADING CRITERIA:

**Personal Reflective Essay:** Students will be assessed on their understanding of the movie "Vanishing of the Bees" in a 1.5 - 2 page reflective essay describing the impact the movie had on them. A major component addressed in this essay will be students' personal opinions (preferably steeped in some degree of knowledge in the subject at this point) on solutions and practices which can help to reverse the detrimental honeybee decline in recent years. Counts for 15% of your course grade.

**Midterm Exam:** In-class examination consisting of a number of multiple choice, short answer, & conceptual questions pertaining to the material we have studied up to this point in the class. Counts for 25% of your course grade.

**Research Paper & Partnered PowerPoint Presentation:** Each student will write a 4-5 page referenced paper researching some topic in chemistry as it applies to honeybees. Students will be partnered together to produce an in-class PowerPoint presentation summary of the research topic. Rubric for the paper and presentation is included later in this syllabus. Counts for 25% of your course grade.

**Final Exam:** The Final Exam is cumulative and will consist of a number of multiple choice, short answer, & conceptual questions pertaining to the material we have studied over the course of the class. Counts for 25% of your course grade.

**Class Attendance, participation, general contribution:** Counts for 10% of overall course grade.

## **REQUIRED READINGS:**

### **Textbook:**

“Honey Bee Biology & Beekeeping” 2013 Revision, by Dewey Caron: Sold at the UVM bookstore. There will be reading assignments from this text given out to you prior to certain lectures. A specific listing of readings (and the lectures they correspond to) is at the end of this syllabus. It is expected that the assigned readings will be completed prior to showing up to the lecture for which they are assigned.

### **Various Readings and Handouts:**

There will be recurring handouts of various academic publications which will pertain to a particular lecture. These handouts will be available in the Course Materials folder on the course’ BlackBoard site. A specific listing of these papers (and the lectures they correspond to) is at the end of this syllabus. It is expected that the assigned papers will be read prior to showing up to the lecture for which they are assigned.

## **ACADEMIC INTEGRITY:**

Offenses against the Code of Academic Integrity (ie: Cheating) are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code will be forwarded to the Center for Student Ethics & Standards for further investigation.

## **WRITING ASSISTANCE FROM THE WRITING CENTER:**

For support and feedback at any point in the writing process, you can consult with a tutor at the Writing Center. For more information about the Writing Center, including a list of tutors and their majors/minors, see [www.uvm.edu/writingcenter](http://www.uvm.edu/writingcenter). To make an appointment online, go to [www.uvm.edu/tutor](http://www.uvm.edu/tutor). At the end of your session, you can request that the tutor email me a copy of your session description.

## RUBRIC FOR PERSONAL REFLECTIVE ESSAY:

Students will be assessed on their understanding of the movie in a reflective essay describing the impact the movie had on them. A major idea addressed in this essay will be students' personal opinions (preferably steeped in some degree of knowledge in the subject at this point) on solutions and practices which can help to reverse the detrimental honeybee decline in recent years.

1.5 – 2 pages; double spaced; size 12 font.

Graded out of 15 points.

Both hardcopy and e-file will be submitted by due date.

-10% per day late (1.5 points per day)

	<b>3</b>	<b>2</b>	<b>1</b>	<b>Comments</b>
<b>Adherence to Criteria</b> (page length, font, line spacing, etc)	Essay criteria all within the required parameters	Essay criteria mostly within the required parameters with some omissions	Essay criteria only partially within the required parameters with numerous omissions	
<b>Spelling &amp; Grammar</b>	Demonstrates full control of grammar and conventions. No spelling and/or syntax errors	Demonstrates partial control of grammar and conventions. Some spelling and/or syntax errors	Demonstrates little control of grammar and conventions. Multiple spelling and/or syntax errors making comprehension difficult	
<b>Language Use and Style</b>	Uses language that is unsuitable for the audience and purpose, with little or no awareness of sentence structure	Uses some imprecise language and voice, with a reasonable grasp of sentence structure	Uses language that is usually fresh and original, with with skillful and varied sentence structure	
<b>Structure &amp; Organization</b>	Essay was well structured and easily followed with the presentation of ideas in a creative, neat, and original manner.	Essay was of reasonable organization. Presentation of ideas could be neater and more cohesive.	Essay was not well organized. Presentation of ideas was somewhat confusing.	
<b>Depth of Reflection</b>	Demonstrates a thoughtful understanding of the writing task and the subject matter	Demonstrates an adequate understanding of the writing task and the subject matter. Could have been more thoroughly reflected on	Demonstrates limited understanding of the writing task and the subject matter. Should have been thought through more clearly	
			<b>Total:</b>	

## RUBRIC FOR RESEARCH PAPER AND PARTNERED PRESENTATION:

A written paper should be a final assessment of the topic you investigated in your project presentation. The content of the paper can use the flow of the accompanying PowerPoint presentation as a template. Students will be partnered by me well before the presentation is due.

### Research Paper:

4-5 pages; double spaced; size 12 font.

Reference page is required, IN ADDITION to the 4-5 page length of the paper.

At least three references must be cited, at least one of which should be a primary reference.

Both hardcopy and e-file of paper will be submitted by due date.

-10% per day late on the paper portion (1.5 points per day)

Graded out of 25 points, 15 points for the paper and 10 points for contribution to the partnered presentation.

						Comments & Score
Research Paper	<b>Adherence to Criteria</b> (page length, font, line spacing, references, etc)	Essay criteria all within the required parameters (3)		Essay criteria mostly within the required parameters with some omissions (2)		Essay criteria only partially within the required parameters with numerous omissions (1)
	<b>Spelling &amp; Grammar</b>	Demonstrates full control of grammar and conventions. No spelling and/or syntax errors (3)		Demonstrates partial control of grammar and conventions. Some spelling and/or syntax errors (2)		Demonstrates little control of grammar and conventions. Multiple spelling and/or syntax errors making comprehension difficult (1)
	<b>Language Use, Style, and Chemistry Relevance</b>	Language is fresh and original, with skillful sentence structure. High relevance to a chemistry topic (4)	Uses some imprecise language, with a reasonable grasp of sentence structure and chemistry relevance (3)	Language has some issues and colloquialism which is improper. Sentence structure needs work. Relevance to chemistry is a stretch (2)	Language is unsuitable for the audience. Little or no awareness on proper style. Low relevance to a chemistry topic (1).	
	<b>Structure &amp; Creativity</b>	Excellent layout of problem, progression of ideas, & suggestion of solution (5)	Reasonable layout of problem, progression of ideas, & suggestion of solution (4)	Adequate layout of problem, progression of ideas, & suggestion of solution (3)	Structure & creativity need work. Idea flow not well laid out (2)	Structure & creativity showed little effort (1)
Presentation	<b>Presentation &amp; Flow</b>	Excellent slide progression and topic flow. The speaking style and presentation were excellent (5)	Reasonably executed slides and topic flow. Adequate presentation (4)	Adequate slide presentation and topic flow. Slide progression a bit unclear and in need of work (3)	Slideshow could use more work & effort. Slides somewhat sterile and not good connection with speaking (2)	Slideshow were rushed and showed little effort. Speaking and slide content not showing effort (1)
	<b>Creativity</b>	Excellent use of graphics and description. Very original approach to problem/ possible solution (5)	Reasonable graphics and description. Adequate approach toward problem (4)	Average flow of graphics and spoken word. Approach toward problem not fully developed (3)	Use of graphics needs improvement. Approach toward problem seems somewhat muddled (2)	Unclear graphics and confusing description. Topic/problem not effectively presented (1)
<b>Total:</b>						

# TENTATIVE LECTURE SCHEDULE

## - Biology & Form of the Honeybee

Preparatory Readings: - *Honey Bee Biology: Chapters 2, 4, & 5*

## - Life Inside the Hive

Preparatory Readings: - *Honey Bee Biology: Chapters 1 & 6*

## - Generalities of Beekeeping

Preparatory Readings: - *Honey Bee Biology: Chapters 11 & 12*

## - Pathogens & Parasites in Honeybee Colonies

Preparatory Readings: - *Honey Bee Biology: Chapters 19 (all) & 20 (pp. 331-352)*  
- *Appl. Microbiol. Biotechnol. Paper: "Honeybee Pathology: Current Threats to Honeybees and Beekeeping"*  
- *Apidologie Paper: "Pesticides & Honeybee Toxicity"; pp 4-7*

## - Movie: "Vanishing of the Bees" (1:28)

## - Basics of Organic Chemistry: Structure & Functional Groups

Preparatory Readings: - *Preview Instructor Notes for this lecture*

## - Basics of Biochemical Structure & Function

Preparatory Readings: - *Preview Instructor Notes for this lecture*

## - Honeybee Sustenance: The Chemistry of Honey & Pollen

Preparatory Readings: - *Honey Bee Biology: Chapter 16; pp 253-258; 263*  
- *Bee Culture article: "The Chemistry of Honey"*  
- *African Zoology Paper: "Bee Food: the Chemistry & Nutritional Value of Nectar & Pollen"*  
- *Hindawi Paper: "Bee Pollen: Chemical Composition & Therapeutic application"; (parts 1 & 2; pp 1-2)*  
- *Global J. Biotech. & Biochem. Paper: "Chemical Composition & Nutritional Value of Palm Pollen Grains"*

## - Honeybee Shelter: The Chemistry of Beeswax & Propolis

Preparatory Readings: - *Honey Bee Biology: Chapter 16; pp 260-261; 265*  
- *Honeybee Nests Paper: "The Chemistry of Beeswax"*  
- *Hindawi Paper: "Recent Progress of Propolis for its Biological and Chemical Compositions and its Botanical Origin"*  
- *Molecules Paper: "Recent Advances in the Chemical Composition of Propolis"*

## - Pesticides and their Effect on Honeybee Health

Preparatory Readings: - *Honey Bee Biology: Chapter 20 (pp. 352-355)*  
- *Apidologie Paper: "Pesticides & Honeybee Toxicity"; pp 1-3, 7-13*

## - Movie: "More Than Honey" (1:28)

- Honeybee Defenses: The Chemistry of Honeybee Venom

- Preparatory Readings:
- *Bee Culture* article: “*The Chemistry of Ouch*”
  - *Endeavour Paper*: “*Honeybee Venom: A Rich Source of Pharmacologically Active Peptides*”
  - *Bee Product Science Paper*: “*Bee Venom; Composition, Health, Medicine: A Review*”; pp 1-5

- Honeybee Communication: The Chemistry of Honeybee Pheromones

- Preparatory Readings:
- *Honey Bee Biology*: Chapter 8
  - *Journal of Chemical Ecology Paper*: “*Pheromone Communication in the Honeybee*”

- Healing/Medical Potential of Honeybee Products

- Preparatory Readings:
- *Bee Product Science Paper*: “*Bee Venom; Composition, Health, Medicine: A Review*”; pp 5-11
  - *Hindawi Paper*: “*Bee Pollen: Chemical Composition & Therapeutic application*”; (parts 3, 4, & 5; pp 2-4)
  - *British Journal of Medicine Paper*: “*Use of Propolis in Cancer Research*”
  - *Microbiological Research Paper*: “*Royal Jelly: An ancient remedy with remarkable antibacterial properties*”

- Sustaining Honeybee Populations

- Preparatory Readings:
- *Reading*: “*Protecting our Food Systems: Responding to Honeybee Population Decline in Michigan*”
  - *PLOS Biology Paper*: “*What’s Killing American Honeybees?*”