Fall 2006 – Honors LS1510
Perspectives in the Life Sciences: The Botany of Charles Darwin

Prerequisites: none
Class meetings: TuTh 10:00-11:15, SL 424
Instructor: Dr. S. Harley
Office: SL409M, 626-7434; Office hours: 8:00-8:50 or by appointment
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Class Web Site: http://faculty.weber.edu/sharley/honors/honors.htm

Most classes devoted to the work of Charles Darwin focus on his voyage aboard the H.M.S. Beagle and his subsequent writings based on observations from that journey, notably *On the Origin of Species*. Consequently, students are left with the impression that after proposing that descent with modification (evolution) occurs by the process of natural selection, Darwin never did anything else. Rather, following the publication of *Origin*, Darwin published several more books about various studies he did at his home in Kent. The purpose of this class is to explore the post-*Origin* work of Charles Darwin, particularly that work which focused on plants.

As Janet Browne, author of a highly regarded two volume biography on Darwin, observed: “He had always been interested in the wider implications of botany, too, and considered plants as significant evidence for his theories;...” Darwin’s plant studies show how he examined and tested adaptations found in specific organisms that enhanced their survival under specific environmental conditions. Furthermore, as P. R. Bell wrote in his preface to *Darwin’s Biological Work: Some Aspects Reconsidered* (1959):

> “The contributions of Darwin to experimental biology have received less attention than his descriptive and theoretical work, but they were by no means unimportant. For example, he recognized the importance of plant physiology and pressed for the establishment of laboratories for its study. Starved though he was of equipment, his penetrating observations have been the origin of some of the most active branches of contemporary biology.”

Darwin’s experimental work included studies of plant movements, carnivorous plants, and pollination biology. His observations and conclusion were published in books that are still cited in research papers today. So, we will read portions of Darwin’s books and repeat some of his experiments with plants. His various writings are widely available online (such as at http://pages.britishlibrary.net/charles.darwin/ ). The online version of the syllabus at http://faculty.weber.edu/sharley/honors/honors.htm will have links to these writings and other sources. Also, to get a feel for Darwin the person, we will read the second volume of Browne’s biography, *Charles Darwin: The Power of Place*, which begins about one year before the publication of *On the Origin of Species*.

Texts:
Princeton, NJ.
We will go over one chapter of the book each week, beginning Thursday of the second week of classes. A review of the book is due at the end of the semester.
On the Various Contrivances by Which British and Foreign Orchids are Fertilised by Insects

The Movements and Habits of Climbing Plants

The Power of Movement in Plants

Insectivorous Plants

A general botany survey textbook is recommended, such as:

You might find The Online Biology Book authored by M. J. Farabee at Estrella Mountain Community College, in Avondale, Arizona, useful:
http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookTOC.html

Your online syllabus (http://faculty.weber.edu/sharley/honors/honors.htm) has links to notes that I have prepared for this class. These notes will have links to web sites on the topics.

Topics, Readings, Activities, etc.

1. Overview of Course Goals
Life Science General Education course
Botany
Charles Darwin

2. Who was Charles Darwin?
Overview of Darwin, his time, and his place as both an observational and an experimental naturalist
Videos:
A&E Biography: Charles Darwin
Stephen Jay Gould: Darwin's Revolution In Thought
Reading:
Darwin’s Delay
Darwin’s Sea Change, or Five Years at the Captain’s Table
Darwin’s Dilemma: The Odyssey of Evolution
T. H. Huxley. 1888. Obituary Notices of Fellows Deceased, Proceedings of the Royal Society, 44: i-xxviii. – online. (This obituary was published several years after Darwin’s death.).
Charles Darwin's Education (Wikipedia) – online
The Voyage of the Beagle (Wikipedia) – online
Assignment #1:
short essay questions about the videos

3. Plant Reproduction
*On the Various Contrivances by Which British and Foreign Orchids Are Fertilised by Insects*
Flower structure; pollination and fertilization.
Activities:
- dissection of flowers, growth of pollen tubes
Videos:
  - The Private Life of Plants: the Birds and the Bees
  - Nature: Obsession With Orchids
Reading:
See the list with the online syllabus for pages from “the orchid book” and links to appropriate web sites.

Assignment #2:
Ch. 4, pp 139-152, on *Listera ovata*. Summarize the key points as to how pollen is placed on insects and how *L. ovata* avoids self-fertilization. Other questions on the two videos and the lab work will also be provided.

Exam 1

4. Plant Growth and Development
*The Movements and Habits of Climbing Plants* and *The Power of Movement in Plants*
Plant development; environmental influences on plant development
Examination of tropisms, nastic movements, and nutations.
Activities:
- phototropism, gravitropism, thigmonasty
Video:
  - Private Life of Plants: Putting Down Roots
Reading:
See the list with the online syllabus for pages from the two movement books and links to appropriate web sites.

Assignment #3:
Essay questions about selected movies at the *Plants in Motion* website and the video

Exam 2
5. Metabolism

*Insectivorous Plants*

Leaf structure and photosynthesis.
Root structure and mineral nutrition
Examination of leaf modifications and criteria of carnivory

Activities:
- photosynthesis, enzymology of digestion, leaf anatomy

Video:
- *Carnivorous Plants* (Oxford Scientific Films)

Reading:
- See the list with the online syllabus for pages from *Insectivorous Plants* and links to appropriate web sites.

Assignment #4:
- answers to the questions about the activities and video

Exam 3

6. Summation

Grading:

Three exams (short answer and essay), 100 points each
Four assignment, 25 points each
Book review of *Charles Darwin: the Power of Place*, 50 points

Total points available: 450

Percentage cut offs to achieve a specific grade are as follows:

- A = 93%
- B = 83%
- C = 73%
- D = 63%
- A- = 90%
- B- = 80%
- C- = 70%
- D- = 60%
- B+ = 87%
- C+ = 77%
- D+ = 67%
- E < 60%

**Students with disabilities**

Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Services Center. SSD can arrange to provide course materials in alternative formats, if necessary.

**Student Behavior**

You are expected to comply with the Botany Department Statement of Expectations of Students.

http://departments.weber.edu(botany/Handbook/expectations.htm