

Light and Life: The Relationship between Light and Life in the Natural World (Bio PI 1130)

Tuesdays and Thursdays 8:40-9:55, 114 Plant Sciences Bldg.

Randy Wayne
Office/Lab: 203 Plant Sciences Bldg.
Tel: 607 255 8904
Email: row1@cornell.edu
Office hours: Friday 9AM-11 AM

Syllabus

Light and Vision: There is more than meets the Eye

January 28. Light, the eye and the mind: Historical introduction to the elements of vision.

February 2. Geometrical optics and image formation

February 4. Development, anatomy and physiology of the eye

February 9. Eye color and its inheritance

February 11. Color and color vision

February 18. Animal eyes and the Darwinian theory of the evolution of the human eye

February 23. Charles Darwin, Samuel Wilberforce, and how we see the color of ants

Light and Energy

February 25. First light: Big bang cosmology

March 1. Production of sunlight and chemical spectroscopy

March 3. Photosynthesis: Converting radiant energy into chemical energy

March 8. Photosynthesis: Converting radiant energy into chemical energy

March 10. Chemical History of the Candle: Converting hydrocarbons into light

March 15. Cellular Respiration: Converting carbohydrate into chemical energy without emitting visible light

March 17. Prelim 1 (Take home available online at 8 AM and due by 12 noon)

Living Light

March 22. Luminescence: Production of light by living organisms

Using Light to Keep Track of Time and Determine Orientation in Space

March 24. Photomorphogenesis in plants

April 5. Field Trip to Rare and Manuscript Collection in Kroch Library

April 7. Field Trip to Rare and Manuscript Collection in Kroch Library

April 12. Melanopsin, circadian rhythms and wellness in humans

Seeing the Invisible: The Photon

April 14. Ultraviolet light and wellness, ozone layer, vitamins, DNA repair, fluorescence

April 19. Plant and animal coloration: Pigments, attraction, camouflage and mimicry

April 21. Plant and animal colorations: Iridescence, sexual attraction and the wave nature of light

April 26. Using the properties of light and pigments to make microscopic organisms, including germs, visible

April 28. Polarized light and bee vision

May 3. Red, blue and purple dyes

May 5. What is light and what is life?

May 10. Prelim 2. (Take home available online at 8 AM and due by 12 noon). Calendars are also due.

Final Paper due at scheduled final exam time (TBD between May 16 and May 24)

Lecture Notes

My lecture notes will be available on Blackboard following each lecture.

Expectations and Grading:

Calendar: 20% You can make your calendar using any program you choose, including Microsoft Publisher, which is available in Mann Library. You must take a minimum of 12 photographs (with your cell phone camera) that document various aspects of light and life. You must attach a written description, one paragraph to one page long for each photograph that

describes how each photograph documents an important aspect of light and life. Save the calendar and the accompanying documentation as a pdf. You can have your calendar printed on cardstock and bound at the Copy Center at Olin Library for a fee. You can turn in this calendar or turn in a collated printed version on normal paper. In either case, you will get it back. I will post the pdfs of your calendar on a class website.

I will make time at the beginning of each class period for people to present and describe a picture that relates to the last lecture.

Prelim 1: 20% The prelim will be a combination of short essay questions and problem solving.

Prelim 2: 20% The prelim will be a combination of short essay questions and problem solving.

Final Paper: 20% This is a creative writing project (approximately 10 pages long) in which you use your scientific knowledge and creative writing skills to communicate to a lay audience the beauty and importance of light and life.

Class participation: 20% You will be expected to attend each class. You will be expected to do the readings (posted on Blackboard), participate in class discussions and draw and present concept maps (<http://cmap.ihmc.us/>). You will be expected to solve problems on the board. You will be expected to participate in the demonstrations and experiments. You will *not* be required to perform a dissection of a cow eye.

Academic Integrity

College is a time for you to find and develop your character, interests and skills. I expect that you will be described as someone who is honest, who sees the light, who reflects on the past and who envisions a bright future. The Cornell University Code of Academic Integrity states that, *“Absolute integrity is expected of every Cornell student in all academic undertakings. Integrity entails a firm adherence to a set of values, and the values most essential to an academic community are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others. Academic integrity is expected not only in formal coursework situations, but in all University relationships and interactions connected to the educational process, including the use of University resources. While both students and faculty of Cornell assume the responsibility of maintaining and furthering these values, this document is concerned specifically with the conduct of students.*

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. In addition, Cornell students have a right to expect academic integrity from each of their peers.”

Specific examples of code violations can be found at:
<http://cuinfo.cornell.edu/Academic/AIC.html>.