Bi 464/564 Biological Clocks
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Syllabus Winter 2013

The two great rhythms of the biosphere are the daily and seasonal variations in temperature, moisture, and resources. Plants and animals anticipate and prepare in advance for these environmental variations through the use of innate biological clocks. This course covers the phenomenon of biological time keeping at ecological, evolutionary, behavioral, physiological, neurological, and molecular, levels. The outcome of virtually every experiment from molecular to ecological in the lab or field with eukaryotes depends upon the time of day or year at which one runs those experiments. Likewise, the efficacy of therapeutics and surgery can depend upon the time of day or year at which they are administered.

Note: This course continues to undergo major revisions due to (1) the text* becoming outdated, (2) unanimous opinion of the last two classes that, after the first 2-3 weeks, readings from the original literature, in combination with lecture, were much more informative than the text and (3) continued advances reported in the primary literature. Consequently, portions of the text will be assigned only during Weeks 1-3; thereafter, all reading assignments will be from the original literature. Five copies of the text are on 2-hr reserve in the Science Library. Reading and lecture slides for each week will be available by midnight Saturday beforehand.

Three of the four hours each week will be devoted to lecture; the fourth hour will be used for discussion or exams. Discussion consists primarily the interpretation of data. I'll put data up on the screen, roll the dice, and if you number comes up, you have to discuss the data, why it is important, and what organism gave rise to those data. Past students have said this not-for-credit portion of the class is the most nerve-racking but also where they learned the most from discussion. Previously, there were undergraduate journal-club presentations of original papers from the literature, which proved beneficial to the presenter, but not to the audience. If someone would like to try this avenue in lieu for partial credit, we can discuss it as a class.

**Chronobiology* by Dunlap et al. 2004. Sinauer Associates, Sunderland, MA. Do not buy this text as multiple copies are on 2-hour reserve in the Science Library.

Major topics and events.

Weeks 1-2: Layout of course and **Basic concepts**
Week 3. First 1-hour exam Wednesday: **Test** on Weeks 1-2, 15% of grade.
Weeks 3-7. **Daily timing: circadian rhythmicity**
Week 8. Monday: 2-hr **Test** on Weeks 3-7, 50% of grade. Lecture on Wednesday
Week 8(Wednesday) – Week 10 (Monday).
Seasonal timing: Photoperiodism and circannual rhythms.
Week 9. Undergraduate reports due Wednesday by class**
Week 10. Wednesday 1st hour, 1-hr **Test** on seasonal timing (15% of grade)

Week 10, Wednesday 2nd hour: Lecture, **Some human applications**
Final Exam: Graduate symposium***

** Undergraduate reports will consist of a review paper concerning pleiotropic effects of a circadian rhythm gene in *Drosophila*. The gene will be assigned by lot during discussion of week 3. I'll nominate the best paper for the UO Library Research Award (http://library.uoregon.edu/general/libaward.html). To qualify for an "A" on this paper, students will have to write a sufficiently comprehensive report such that I can't find a relevant insect paper they have missed within ½ hour of my searching on the internet. Reviews are to be submitted to me in the form of a MS Word document (.doc or .docx) with tables and figures embedded in the text in the format of a *Journal of Biological Rhythms* review article. Submitted (ungraded) reviews will be forwarded to all members of the class.

*** During the final exam, **Graduate students** will present a 35 minute talk (+ 5 min question-answer session) on applications of biological clocks to their dissertation research (worth **20% of the graduate grade**). The goal is to encourage active researchers not directly involved with biological timekeeping to think about how biological clocks affect their research; for students actually doing research in the area of biological clocks, their talk will provide the class with a vision of what is directly involved in using or exploring biological clocks and will enable them to present their research and answer questions before an entire audience cognizant of biological clocks. Undergraduates will fill out a check list of their reaction to the talk (worth **5% of the undergraduate grade**) and the check lists will be given to the speaker.

- Power Point presentations are required.
- Start out by presenting the broader question being approached
- Introduce the organism and why it is appropriate for your research
- List specific hypotheses to be or being tested
- Describe potential outcomes and how these outcomes will
  - answer the broader question
  - change how you or the rest of the world will approach future research

Remember, good talks resolve issues, they do not merely "contribute to our understanding of…."

GRADES ☹

Undergraduate:

- Exams 1st hour exam = 15%; 2nd 2-hr exam = 45%; 3rd 1-hr exam = 15%
- Pleiotropy paper 20%; Symposium participation 5%

Graduate:

- Exams 1st hour exam = 15%; 2nd 2-hr exam = 50%; 3rd 1-hr exam = 15%
- Symposium talk = 20%