Biology 433/533
Bacterial-Host Interactions
Instructor: Karen Guillemin
Class meeting: Mon, Wed 2:00-3:20 PM
42 LIB
Office hours: Friday 9:30-10:30 AM
Klamath 249C or by appointment
(kguillem@uoregon.edu)

Course description: Bio 433/533 will examine how animals co-exist with microorganisms. We will investigate the molecular mechanisms by which animal cells and associated microorganisms communicate, and how these communications affect the microbial community structure and the health of the host. The course is based on primary research literature, drawing on examples of different bacterial-host interactions in a number of model systems to illustrate basic principles about the molecular and cellular natures of these interactions. The course will emphasize critical reading of the literature and critical thinking. Students will be required to complete regular homework assignments on the readings. During the course, students will develop original research proposals that addresses unanswered questions in the field, using experimental approaches covered in the course, which they will present orally and submit as a final written research project.

Learning Objectives:
• Gain a sophisticated understanding of the emerging field of bacterial-host interactions in biology.
• Gain a working knowledge of modern molecular genetic experimental approaches using model eukaryotes and prokaryotes.
• Become a critical reader of scientific research articles in the biomedical literature.
• Develop the ability to formulate hypotheses about the mechanistic bases for biological phenomena.
• Become proficient at designing experimental strategies to test hypotheses about the mechanistic bases for biological phenomena.
• Learn to give a concise and compelling oral presentation that identifies a scientific question, proposes a hypothetical answer to this question, and lays out a novel strategy to test this hypothesis.
• Learn to write a compelling research proposal that identifies a scientific question, proposes a hypothetical answer to this question, and lays out a novel strategy to test this hypothesis.

Course website: All course material will be available through Blackboard (blackboard.uoregon.edu).

Assigned reading: For each topic covered, the assigned reading will consist of a current review article by leaders in the field and one or two original research articles. These will be posted, organized by week, in the Blackboard Course Documents Folder.

Homework assignments: Homework questions on the assigned reading and material covered in class will be posted as quizzes on Blackboard in the Course Assignments folder. These will consist of multiple choice and short essay questions that insure that students carefully read and understand the course material. The homework questions will usually be posted Thursday morning and will be due the following Monday before class. Students may save their answers and return to the questions as many times as they wish, but they must submit their answers by
1:45 PM on Blackboard. Students are permitted to discuss the questions with each other, but their answers must be their own independent work.

**Lecture notes:** The course format will be a combination of lectures, class exercises, and discussions. I will post my lecture notes on Blackboard AFTER the lecture. These notes are NOT a substitute for coming to class. If you must miss class, it is your responsibility to obtain detailed notes of the class discussion from a classmate.

**Office hours:** My office hour will be held on Fridays 9:30-10:30 AM in Klamath 249C. If you are not free at this time, you may schedule an appointment to meet with me at another time. You may also email me with questions or comments (kguillem@uoregon.edu). Please send messages from your uoregon account and include BI433 in the header. Your email correspondences are an extension of your class participation, so please maintain a professional tone. I will generally respond to email messages within one or two days.

**Students with disabilities:** The University of Oregon is working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact Disability Services in 164 Oregon Hall at 346-1155 or disbarrv@uoregon.edu.

**Grading policy:**

**Homework:** 30%. There will be six homework assignments which will be available as quizzes on Blackboard. No late homework assignments will be accepted.

**Proposal assignments:** Each student will be required to write and present an original research proposal that uses approaches covered in the course to address an unanswered question in the field of bacterial-host interactions. Students will develop their proposal throughout the course, as indicated on the class schedule. The components of this proposal development process will be contribute to the final course grade as follows:

- Abstract, abstract revision, experimental design, proposal feedback to classmates: each 5%
- Oral presentation: 15%
- Written research proposal: 25%

**Class participation:** 10%. Class participation is crucial for the success of this course. Attendance will be taken and students will be expected to come to class having read and thought about the assigned material and to participate in all class activities. Much of the assigned reading is recent and by no means accepted dogma. Students should read the papers critically and continually question how the authors derive their conclusions, what assumptions they made, and what future experiments could support or refute their conclusions. Such critical thinking will be required for the original research proposal.

**Grading for undergraduates versus graduate students:** Undergraduate and graduate students will be graded separately, based on different expectations of their background knowledge in scientific approaches. The expectations for the research proposal and scope of the project will be very different for the undergraduate and graduate students. The expectation for the undergraduate research proposal will be that the student describes a single experimental strategy to address an unanswered question. The graduate students will be required to write a longer proposal that employ several independent approaches to address a well-defined research question, similar in scope to a professional predoctoral research fellowship proposal.

**Academic integrity:** All students will be expected to adhere to the University's guidelines on academic integrity as outlined in the Student Conduct Code: http://studentlife.uoregon.edu/programs/student _judi _affairs/conduct-code.htm Students are encouraged to discuss class material with one another, including the reading and homework questions. However, all submitted written work, including answers to homework questions and components of the research proposal, must be the original work of each student. Proper citation of sources is required in all written work and oral presentations.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading and assignments</th>
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<tbody>
<tr>
<td>1</td>
<td>Sept 29</td>
<td><strong>No class meeting</strong></td>
<td>Please read assigned articles for Wednesday and complete <strong>Homework 1 due Tuesday 9/30 11:00 PM on Blackboard</strong></td>
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| 1    | Oct 1  | Why we should care about microbial-host interactions? Biological knowledge and human health | Review article: McFall-Ngai, et al., 2013  
Review article: Blaser and Falkow, 2009 |
| 2    | Oct 6  | How to study host-microbes interactions: a historical perspective and a modern example | Review article: Beutler and Rietschel, 2003  
Research article: Alegado, et al., 2012  
**Homework 2 due 1:45 PM on Blackboard** |
Research article: Ryu, et al., 2008  
**Homework 3 due 1:45 PM on Blackboard** |
| 3    | Oct 13 | A model for bacterial-regulated immune modulation: fruit flies        | Review article: Nyholm and McFall-Ngai, 2004  
Research article: Koropatnick, et al., 2004 |
Research article: Bouskra, et al., 2008  
**Homework 4 due 1:45 PM on Blackboard** |
| 4    | Oct 20 | A model for bacterial-regulated immune tolerance: zebrafish          | Review article: Kanther and Rawls, 2010  
Research article: Bates, et al., 2007  
**Homework 4 due 1:45 PM on Blackboard** |
| 4    | Oct 22 | Proposal writing overview  
Methodologies for analyzing microbial communities                      | Review article: Lozupone, et al., 2012  
Research article: Turnbaugh, et al., 2006 |
| 5    | Oct 27 | Environmental determinants of microbial communities                  | Research article: David, et al., 2014  
**Homework 5 due 1:45 PM on Blackboard** |
| 5    | Oct 29 | Host genetic determinants of microbial community assembly            | Review article: Spor, et al., 2011  
Research article: Carvalho, et al., 2012 |
| 6    | Nov 3  | Ecological framework for microbial community assembly                | Review article: Costello, et al., 2012  
**Proposal abstract and specific aims due 1:45 PM on Blackboard** |
| 6    | Nov 5  | Environmental interactions with host genetics and microbial factors  | Research article: Devkota, et al., 2012 |
| 7    | Nov 10 | Pathologic shifts in microbial communities: invasion by pathogens     | Review article: Stecher and Hardt, 2011  
Research article: Winter, et al., 2013  
**Homework 6 due 1:45 PM on Blackboard** |
| 7    | Nov 12 | Pathologic shifts in microbial communities: invasion by pathogens     | Research article: Hsiao, et al., 2014 |
| 8    | Nov 17 | Experimental approaches to defining bacterial-host interactions       | Research article: Goodman, et al., 2009  
**Revised abstracts and specific aims due 9:00 AM on Blackboard** |
| 8    | Nov 19 | Proposal writing workshop: refining specific aims                    | Feedback on group members’ abstracts due Nov 18, 6PM |
| 9    | Nov 24 | Experimental approaches to defining bacterial-host interactions      | Research article: Faith, et al., 2014  
**Outlined experimental design and expected outcomes** |
| 9    | Nov 26 | Proposal writing workshop: refining experimental design              | Feedback on group members' experimental design due Nov 25, 6PM |
| 10   | Dec 1  | Research proposal oral presentations (extended class time to be determined) |
| 10   | Dec 3  | Research proposal oral presentations (extended class time to be determined) |
| 11   | Dec 10 (WED) | Written research proposals due at 5 PM via Blackboard |
Reading (available on Blackboard)


