

Biology of the Prokaryotes: Syllabus Winter 2018

1. General information

Course number:	MB555
Credits:	3
Target audience:	First and second year Graduate students in Microbiology and other life sciences programs
Format:	Combined lecture and student presentation (generally one topic in two meetings per week)
Theme:	The secret social lives of microbes
Evaluation:	Presentation of one scientific paper by each student or group of students, proposal-writing component, final exam
Time:	Offered <u>every other</u> Winter term Mon and Fri 2:00-3:15 pm
Location:	Nash 404
Suitable textbooks:	Brock Biology of Microorganisms (Madigan, Martinko, Stahl, Clark), 14 th ed., 2015 The physiology and biochemistry of prokaryotes (White, Drummond, Fuqua), 4 th ed, 2012 Microbe (Swanson, Reguero, Schaechter, Neidhardt), 2 nd ed., 2016 - A copy of each will be on reserve in Valley Library Molecular genetics of bacteria (Snyder, Peters, Henkin, Champness), 4 th ed, 2013 – Valley Library online access
Instructor:	Dr. Martin Schuster

2. Schedule

Week	Day	Date	Content	Remarks
1.	M F	1/8 1/12	Course overview, bacterial physiology Paper discussion 1	All students
2.	M F	1/15 1/19	MLK Holiday Grant writing basics	No class
3.	M F	1/22 1/26	Microbial interactions Paper discussions 2, 3	Individual presentations
4.	M F	1/29 2/2	Cooperation, communication, and signaling Paper discussions 4, 5	
5.	M F	2/5 2/9	Syntrophy and cross-feeding Paper discussion 6, 7	Individual presentations
6.	M	2/12	Microbial competition	

	F	2/16	Paper discussion 8, 9	Individual presentations
7.	M	2/19	Development and oscillations	
	F	2/23	Paper discussion 10, 11	Individual presentations
8.	M	2/26	Mechanisms of phenotypic heterogeneity	
	F	3/2	Paper discussion 12, 13	Individual presentations
9.	M	3/5	Biofilms	
	F	3/9	Paper discussion 14, 15	Individual presentations
10.	M	3/12	Study section 1: Proposal evaluations	Group 1 only
	F	3/16	Study section 2: Proposal evaluations	Group 2 only
	M	3/19	Final exam	

3. Course policies

Lecture handouts will be provided as the course proceeds. These will correspond to most, but not all, slides used during lectures; spoken lecture material will frequently present more explanations and detail than is shown in handouts. Exam material will draw upon lecture content and assigned reading. Lecturers welcome questions during and outside class time. Office hours are immediately after class; additional appointments can be arranged by telephone, e-mail or during class. *Canvas* will be used for posting course material such as announcements, handouts, additional reading, practice tests, exam results and answer keys. Note the recommended prerequisites (see below) and contact Dr. Schuster if you lack standard prerequisites but have other experience that makes you confident you are prepared to take the course.

4. Evaluation

Each student will present one scientific paper during class, participate in the discussion of all papers, write a mini-grant proposal, participate in peer evaluation of proposals, and write a final exam. Depending on enrollment, some students will present their paper in groups of two. The final exam will be in class, closed book, and consist of short essay questions. Detailed information on the grant writing component can be found below. The final grade will be based on the cumulative performance in all of these components. There will be no make-up exams and no other make-up opportunities for any of the exam components, unless you are sick and can provide a doctor's note.

5. Learner outcomes

At the completion of the course, you should:

1. Have acquired advanced terminology relevant to microbiology;
2. Be able to describe basic concepts regarding physiology, cooperation, communication, competition, differentiation, and biofilm formation of bacteria
3. Be able to communicate and explain in writing key aspects of prokaryotic biology;

4. Be able to read, critically evaluate, present and explain original scientific literature in the area of prokaryotic biology.

6. Learner expectations (advice for doing well in this course)

Intelligently and politely utilize the learning opportunities provided by lectures:

1. Attend all classes; do not arrive late or leave early
2. Prepare for the next lecture by reading assigned material *before* class
3. Handouts will be distributed prior to each class. You may write notes on them during the lecture
4. Read over assigned reading in detail after class and *before* the next class; make notes on anything that is unclear or that you are curious about and seek an answer from the lecturer, a classmate or the text
5. Keep up in your understanding and reading; if you fall behind you will not be able to follow lecture material and will rapidly fall still further behind. Do not hesitate to consult lecturers to help you keep up and catch up.
6. You should allocate at least 2 hours of study for each hour lecture throughout the course; don't be tempted to rely on cramming.

7. Recommended background/prerequisites

1. Basic biochemistry (BB450-like), bacterial physiology and/or genetics (MB310 and MB312-like)
2. Integration with MCB/MB Graduate programs: MCB554/555 and MB513 will provide basic introductions to aspects of prokaryotic biology. So ideally this class should be taken after or at least concurrent with MCB554/555 or MB13, which is offered in the Fall/Winter.

8. University and departmental policies

Statement Regarding Students with Disabilities

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.

Student conduct

The Department of Microbiology follows the university rules on civility and honesty. These can be found at <http://oregonstate.edu/instruct/cssa556/CIVHON556.htm>. Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action. Cheating or plagiarism by students is subject to the disciplinary process outline in the Student Conduct Regulations. General information about student conduct regulations is available at <http://oregonstate.edu/admin/stucon/regs.htm>.

9. Instructor info

Martin Schuster
Office Nash 422
email: martin.schuster@oregonstate.edu

Peter Bottomley
Office Nash 348
Email: peter.bottomley@oregonstate.edu

Office hours directly after class or by appointment

9. Additional information on the grant-writing component

General

The goal of this part of the class is to introduce you to grant-writing, and to better prepare you for a grant-writing component during your prelims. There will be two meetings during regular class time devoted to grant writing. You are encouraged to seek advice and discuss your progress with the instructors in one-on-one meetings. Time between meetings will be spent individually on proposal preparation and writing.

Proposal format

Each mini-proposal should contain **one** specific aim. Six to eight pages double-spaced excluding references, 1 inch margins, 12-font Times New Roman or 11-font Arial. Organization: Abstract, Specific Aim, Background and Significance, Research Design and Methods, References. Try to identify a topic centered around at least one major paper in the subject areas covered in class. If you choose a different paper not discussed in class, it should be of high relevance published in a journal with an impact factor > 3 (see examples below). There should be significant potential for future research. The topic you choose will have to be approved by the instructor.

Timeline and tasks

1. **Friday, Jan 19:** Lecture on the basics of grant writing and evaluation.
2. **Until Friday, Feb 16:** Think about potential proposal topics. Write a brief outline that includes the title, objective (hypothesis), significance, specific aim, and the experimental approach chosen (only about ½ page single-spaced). Discuss the outline with the instructor.
3. **Monday, March 5:** Hand in completed proposals in class (as one paper copy). Also send an electronic copy to the instructor via email. The instructor will distribute the proposals to two fellow students to write an evaluation of the respective proposal. You will have one week to read the assigned proposals and write an evaluation using the following criteria (about one page double-spaced per proposal): Significance, innovation, approach, overall evaluation and rating (according to the guidelines below). This document is for the benefit of your fellow student and to guide your own discussion during the study section meeting. Bring an additional paper copy to the class meeting on Friday, March 11 for the instructors.

4. **Monday, March 12 and Friday, March 16: “Study-section” meeting:** Discussion of proposals based on written evaluations. If the number of proposals is >6, we will divide the class in two and have two meetings. Each proposal reviewer should bring their written critique to the meeting and hand a copy to the proposal author at the end of the meeting.

Peer review guidelines (based on NIH and NSF)

Significance: Does this study address an important problem? If the aims of the application are achieved, how will scientific knowledge be advanced? What will be the effect of these studies on the concepts or methods that drive this field?

Innovation: Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing paradigms or develop new methodologies or technologies?

Approach: Are the conceptual framework, design, methods, and analyses adequately developed, well-integrated, and appropriate to the aims of the project? Does the applicant acknowledge potential problem areas and consider alternative tactics?

Overall evaluation: In one paragraph, briefly summarize the most important points of the critique, addressing the strengths and weaknesses of the application in terms of the three review criteria. Recommend a score reflecting the overall impact of the project on the field, weighting the review criteria, as you feel appropriate for each application. An application does not need to be strong in all categories to be judged likely to have a major scientific impact and, thus, deserve a high merit rating. For example, an investigator may propose to carry out important work that by its nature is not innovative, but is essential to move a field forward.

Score:	Excellent	Exceptionally strong with no or negligible weaknesses
	Very good	Very strong with only some minor weaknesses
	Good	Strong but with numerous minor weaknesses or at least one moderate weakness
	Fair	Some strengths but also some moderate weaknesses or at least one major weakness
	Poor	Few strengths and numerous major weaknesses

Resources

The following journals publish review articles on topics related to prokaryotic biology. Such articles are often a good starting point to explore a new area of research:

- Nature Reviews Microbiology
- Trends in Microbiology
- Current Opinion in Microbiology
- FEMS Microbiology Reviews
- Microbiology and Molecular Biology Reviews

Examples of high-quality journals publishing original research in prokaryotic biology are:

- Nature
- Science
- Cell
- Cell Host Microbe

- Proceedings of the National Academy of Sciences
- Nature Microbiology
- mBio
- Journal of Bacteriology
- Applied and Environmental Microbiology
- Molecular Microbiology
- Environmental Microbiology
- ISME Journal
- PLOS Pathogens
- PLOS One

OSU has online-access to all of these journals:

[http://search.library.oregonstate.edu/primo_library/libweb/action/dlSearch.do?vid=OSU&institution=OSU&query=facet_atoz%2cexact%2cA&indx=1&bulkSize=30&dym=false&loc=local%2cscope%3a\(AZOSU\)&fn=goAlmaAz&sortField=stitle&almaAzSearch=true&azSearch=true](http://search.library.oregonstate.edu/primo_library/libweb/action/dlSearch.do?vid=OSU&institution=OSU&query=facet_atoz%2cexact%2cA&indx=1&bulkSize=30&dym=false&loc=local%2cscope%3a(AZOSU)&fn=goAlmaAz&sortField=stitle&almaAzSearch=true&azSearch=true)