Welcome to Microbial Ecology BI 410/510

About the Course

Instructor: Brendan Bohannan
Office: 309 Pacific Hall
Phone: 346-4883
Email: bohannan@uoregon.edu
Class hours and room: TTh 10:00 – 11:20PM, Condon 106.
Office Hours: Thursdays 11:30-12:30PM and by appointment.

Prerequisites: BI 212/213/214 or BI 283. BI 370 Ecology and BI 330/331 Microbiology are recommended.

Web Site: Our web site is accessible via the UO Canvas server. Login requires your UO Information Services (Computing Center) email address and the corresponding password.

How I will contact you: All of my communication to you outside of class will take place via email. Specifically, I will use the email registered to you by the University of Oregon. If you use another ISP for your email, make sure you arrange to have your UO email forwarded to it, or arrange to change your registered email address with UO.

Required readings and assignments: There isn't a required textbook for this course. I will be assigning reading from a variety of sources. By 5:00PM Friday, I will have posted the next week's readings and writing assignment on the class website. Most of the readings will be available for download as pdf files. To read these you will need Adobe Acrobat Reader, free software that is installed on UO computers and can be downloaded from the following website: http://www.adobe.com/products/acrobat/readstep2.html

About Microbial Ecology

Microbial ecology is the study of the causes and consequences of the distribution and abundance of microorganisms. Microbial ecologists are interested in why particular microorganisms are found in a particular place, what roles they play ecologically, and how they interact with their living and non-living environment.

Historically, microbial ecology has been considered a subdiscipline of microbiology, with roots in the study of microbial physiology. More recently, scientists have attempted to integrate microbial ecology into the general study of ecology, and microbial ecology has started to develop as a subdiscipline of ecology as well.

This class will focus on this integration. We will explore how microbes are ecologically similar to plant and animals, and how they differ. While doing this, we will also explore how information about the ecology of microorganisms can be applied to questions of conservation, environmental management and human health.

About Me

I joined the University of Oregon faculty in September of 2006, after 8 years on the faculty at Stanford University. My research group studies the community ecology of microorganisms (viruses,

bacteria, archaea, and microeukarya), using a combination of laboratory microcosm experiments and field studies using molecular techniques. I am particularly fascinated with the diversity of microbial life and much of my research is focused on the causes and consequences of microbial biodiversity.

Course Goals

I have two goals for this course.

Help you learn some of the central ideas in microbial ecology—This course is not a panoramic overview of microbial ecology. Microbial ecology is a very broad and integrative science. In a 10 week course an overview could only be cursory. I feel strongly that as upper division and graduate students you will learn more if we take the time to explore in detail some of the major controversies and hot topics in microbial ecology.

Help you continue your transition from student to *scholar* —A scholar is someone who can think critically, argue logically, write clearly, and read effectively. Most importantly, a scholar understands how to organize and use knowledge, and takes responsibility for their own learning. My goal is to provide you with opportunities to practice all of these skills.

Critical thinking involves using a variety of forms of information, synthesized logically, to solve a problem. Critical thinking is a key tool for any educated citizen of the planet, and is essential for a practicing scientist. It will be my job to give you a structured opportunity to practice critical thinking by interacting with the literature, your colleagues, and me. This means giving you readings and assignments that allow you to stretch your mental muscles a bit.

A great way to practice critical thinking is to write out your argument--an idea that sounds great in your head may be less wonderful when down on paper. In this class, you will write short paragraphs and longer essays that ask you to synthesize and apply what you have learned.

The primary literature remains the first front in the advance of science. The quantity of the literature is growing exponentially. Reading it *effectively* is a skill that can be learned and practiced.

Strategy for Achieving these Goals

By now, 95% of your education has likely been structured around lectures. Lectures are good tools for downloading information. They require a particular dynamic. This dynamic, bluntly stated, is "professor professes, student writes it down". Lectures, however, are pretty lousy ways to learn how to engage the literature and to learn how to read and think like a scientist. Instead, we will use the following tools to work on these skills.

Readings and the case method—We will use the case method to dissect the readings. Through this analysis, we get to know the material by working with it, not by memorizing it. Thus for a typical class, you will be given a background reading, one or two readings from the scientific literature, plus some study questions. During the class period we will work our way through the readings in order to better understand the context of the research, its major findings, its

flaws and strengths. We may do in-class exercises that will help us explore the ideas in the readings. These exercises may take the form of debates, small group discussion of a scientific question, a computer simulation or other exercise.

Essay Paragraphs—Each week, you will be asked to write short essays on a study question or questions key to understanding that week's topics. These essays are an opportunity to think critically and to engage with the material.

Take-home exam — There will be a midterm exam in this class. This exam will be a "take-home" exam and will consist primarily of questions you will have already encountered as study questions, or as questions posed in class. This is an opportunity for you to think more deeply about the course topics and to demonstrate your progress in understanding the material.

Group project — You will have an opportunity to work with ideas from microbial ecology by writing a research proposal. I will give you a handout describing this assignment in more detail later. In brief, you will write a proposal in small groups (2 - 3 students). You will begin by deciding (in consultation with each other and with me) on a topic for your proposal. You will then write a short literature review (1 – 2 pages) on your research topic, and craft a 5 page research proposal (including information from your review). Near the end of the term the class will be divided into two groups, and each group will read the other groups' research proposals, write reviews of each, and choose the best proposal for "funding". You will be given the reviews of your proposal and will have the opportunity to revise it before it is given a final grade. Your grade for the proposal assignment will be based on your literature review, your initial proposal, your participation in the review process (including the reviews you write) and your revised proposal.

Grading — Your final grade will depend on your performance on the weekly essay questions (40%), the midterm (20%), and the group project (40%). In-class participation is very important in a discussion-centered course such as this one. You will not be graded down if you choose not to participate, but I may increase your grade by up to half a grade for exemplary participation.

Tentative Deadlines

(by 10AM on day indicated)

Groups assigned: January 12.

Proposal topic due: January 26.

Literature review due: February 4.

Midterm handed out: February 4.

Midterm due: February 11.

Proposal due: February 25.

Proposal reviews due: March 3.

Final proposal due: March 16.

Tentative course schedule

	Foundations
January 5	Introduction: microbes, the hidden majority.
January 7	Life at small scales: the physics and biology of being tiny.
January 12	Promiscuous and altruistic? Unique aspects of microbial evolution.
	Populations
January 14	The power of numbers: microbial demography and evolutionary ecology.
January 19	Variation is the spice of life: microbial life history strategies.
January 21	Finding food: metabolic diversity, foraging, and resource acquisition.
	Interactions
January 26	Fighting over food: resource competition among microbes.
January 28	Chemical warfare: interference competition among microbes.
February 2	Bugs for breakfast: predation and parasitism in the microbial world.
February 4	United we stand: mutualistic and cooperative interactions among microbes.
	Biodiversity
February 9	Squeezed from above and below: multiple interactions in the microbial world.
February 11	There goes the neighborhood: community assembly and succession.
February 16	The hidden majority revealed: the study of microbial biodiversity.
February 18	A place in space: microbial spatial ecology and biogeography.
	Ecosystems
February 23	Global physiology: the microbial ecology of nutrient cycles.
February 25	*open*
March 1	The value of diversity: microbial biodiversity and ecosystem function.
March 3	Proposal review.
	Applications
March 8	Application: microbial ecology and human health.
March 10	Application: microbial ecology and environmental management.