

## **Symbiotic Interactions, a.k.a. Bio 114: Fall 2009**

My expectations for what students should get out of the seminar include:

Public speaking practice:

how to give clear and organized talks

how to lead, moderate and take part in discussions

Expertise in critically reading the primary scientific literature

Experience designing and executing experiments

An up-to-date and integrated understanding of issues important for many or most symbioses

A perspective on the importance of symbiosis at different levels of biological organization

An appreciation of the kinds of experiments and systems used to study the biology of symbiosis and other systems at the molecular level

### **Overview:**

For the first half of the semester, we will meet twice weekly at the scheduled seminar times and study six symbiotic systems in depth.

1. To familiarize all of us with techniques that we will see frequently when we start to read the primary literature, we will have a “technique toolbox” meeting on *Thursday September 3<sup>rd</sup>*.
2. The second week of the semester, student teams will report on well-studied and especially important or interesting symbiotic systems – where they are found, what the symbiotic partners give and take, how the symbiosis is transmitted, the importance of the symbiosis, etc. The idea is to give sufficient background about the system so that people understand the issues and context of the interactions and the vocabulary necessary to discuss the symbiosis in more detail once we begin to read the primary literature. *Each seminar participant will do this twice, once on September 8<sup>th</sup> and once on September 10<sup>th</sup>. I expect these presentations to be about 30-35 minutes, although interruptions for questions will likely increase the time.*
3. The third, fourth and fifth weeks of the semester, teams of students will lead discussions of papers focused on “common themes”. These common themes are issues that are important for all or most symbioses, for example, nutrient exchange between partners. We will define during the first week of the semester what common themes are most important to discuss. *Usually, three people will work in a team for these presentations. Each seminar participant will do this twice during the semester. For each class meeting, we will discuss two or three papers that relate to the “theme of the day.”*

During the second half of the semester, our focus will switch mainly to research projects:

1. Each seminar member will present a proposal for a research project to the rest of the class the Tuesday before fall break. The proposal needs to address what you want to do, why it is interesting, how you will do it and the sort of results you expect. After each presentation, the proposal will be thoughtfully critiqued by all seminar participants to generate new ideas or help further focus the proposal. After we have heard all the project proposals, we will decide what projects will be done – most people will work in teams, with the composition, size and scope of the projects dependent on individual interests and the number of participants on a particular project.
2. Projects will start after fall break. During the second half of the semester, we will usually meet weekly as a class on Tuesdays to discuss laboratory project progress, present data

and help troubleshoot experiments. However, all seminar participants will keep both Tuesday and Thursday afternoon available to meet with their groups, me, or to work in the lab. Lab work will also be performed at other times during the week.

3. In addition, during the second half of the semester, each person will have the opportunity to investigate and give a brief report on a symbiosis that was not discussed previously. This will give each person the opportunity to investigate a symbiosis of their own choosing. *Each seminar participant will do this once during the semester.*

### **The mechanics of preparing for and taking part in most class meetings:**

**Being a presenter:** This is your opportunity to be the teacher you have always wanted! For your presentations, prepare a handout summarizing the main points of your presentation. It may be helpful to include some figures from the papers you read or slides from your powerpoint presentation. It should also include a complete list of properly formatted and annotated references in case someone wants to read more. Please make sure that I have any material you wish to have copied by 11:30 the day of our meeting.

**Being a discussion leader:** The papers will be chosen by the discussion leaders in consultation with me. Generally two or three papers will be assigned for each discussion. Discussion leaders need to have strategies for involving all class members in the discussion. Engaging activities that help participants synthesize the important issues are essential.

**Being a discussion participant:** For the discussions of primary literature, students must bring a typed summary of the papers assigned for that session. This summary will be critical in helping you prepare for the discussion. The summary should address the points described below. Bullet points or an outline are preferable to paragraphs of prose – it will be easier for you to refer to during the discussion than long paragraphs of text.

1. The point of this paper – what question was the paper asking (2 or 3 sentence summary). What general principles or big ideas are illustrated or addressed in this paper?
2. Briefly summarize each figure. The figures tell the story, and usually the experiments build on one another. For each figure, state the question that is being asked by the experiment (why did the authors do this experiment, how does it follow from the previous experiment). If applicable, describe/label the techniques used and the controls. Summarize the conclusion or main point from the figure including any more controls you would want to see, criticisms you have, etc. You will likely want to write notes on the paper as well (labeling lanes of gels, photos, etc.).
3. Do the data presented support the author(s)'s statements? Why or why not? What one or two figures are most important? You need to make a judgment about what is central and key and what is more peripheral.
4. Describe two points that you would like to discuss. These could be questions about their models or predictions, or how the data were interpreted or about something that was confusing to you. You could summarize and defend what you thought was especially cool or terrible about the paper. You could read another paper and be ready to integrate that into the discussion (this gives you the opportunity to investigate an aspect of the symbiosis or system that you are most interested in). Bring up these points during the discussion in class.

The summaries will be collected at the beginning of class. Bring 2 copies, one to hand in to me, and one for your use during the discussion. If you read an additional paper, make sure you have its complete citation (all authors, full title and source) in your summary.

*The seminar will be more enjoyable and stimulating if all participants feel free to ask questions of the presenter and discussion leaders. If someone says something that is contrary to your understanding, or does not 'make sense' to you, it is critical that you ask for clarification, or raise your concern. It is important to realize that I do not have all the answers, I do not expect anyone in the class to have all the answers, and that I will not think less highly of a student who does not know the answer to a question posed in class. Speakers and discussion leaders may have an opportunity to investigate the answers to important unresolved questions and report back to the seminar at the next meeting.*

**Assessment:**

You will receive two grades for the seminar: one for seminar and one for lab.

My evaluation of your work will be based on:

**Seminar**

Your preparation and engagement in discussions and as an active class participant as evidenced by your written summaries (20), your participation (20) and your reviews of yourself and classmates (10);

Your presentations – the organization and content of your presentations (25) and your ability to engage the class in an organized and focused discussion (25).

**Lab**

Your laboratory project proposal (10), your planning and execution of experiments, including end of the semester clean-up (25), the organization and completeness of your laboratory notebook (20), your preparation and presentations at weekly meetings (20), the evaluation of your teammates about your contribution (TBD) and your final paper in the form of a journal article (25).

<i>date</i>	<i>Presentation/Preview</i>	<i>treats</i>
9/1 T	Overview of the semester, scope of the course and definitions of symbiosis ID of common themes	Liz
9/3 R	Tool box presentations (ALL) Revisions and additions to list of common themes	Liz
9/8 T	<b>Cnidarians and Symbiodinium (dinoflagellates)</b> <i>(the biology of this system is the basis for coral reef ecosystems)</i> <b>Squid and Vibrio (bacteria)</b> <i>(the study of this system led to the discovery of quorum sensing - sensing by bacteria of their own population numbers; additionally interesting because the uptake of bacteria results in structural changes in the tissues which are home to the bacteria)</i> <b>Plants and Arbuscular mycorrhizal fungi</b> <i>(ecologically critical for the uptake of nitrogen, phosphate and water)</i>	
9/10 R	<b>Insects and gut bacteria</b> <i>(bacteria are essential for insects with specialized diet, including aphids, termites, and tsetse flies – the cause of sleeping sickness)</i> <b>Vertebrates and gut bacteria</b> <i>(bacteria play a key role in gut development as well as influencing the availability of nutrients from food)</i> <b>Legumes and rhizobia bacteria</b> <i>(essential for the conversion of nitrogen from the atmosphere to a biologically useable form)</i>	
9/15 T	<b>Theme I</b>	
9/17 R	<b>Theme II</b>	
9/22 T	<b>Theme III</b>	
9/24 R	<b>Theme IV</b>	
9/29 T	<b>Theme V</b>	
10/1 R	<b>Theme VI</b>	
10/6 T	<b>PROJECT PROPOSAL PRESENTATIONS</b>	Liz
10/8 R	<b>DISCUSSIONS and DECISIONS</b>	Liz
10/13 and 10/15 FALL BREAK		
10/20 T	Lab progress	
10/27 T	Lab progress; Other systems	
11/3 T	Lab progress; Other systems	
11/12 R	<b>Note: Thursday meeting</b> Lab progress; Other systems	
11/17 T	Lab progress; Other systems	
11/24 T	Lab progress; Other systems	
12/1 T	Lab progress; Other systems	
12/8 T	Lab progress	
12/15 T	End of semester gala; final lab papers due by 1:15 on Thursday December 17th	Liz