



# BIOLOGY 864

## MICROBIOLOGY OF EXTREME ENVIRONMENTS: *ADAPTATIONS TO LIFE IN EXTREME ENVIRONMENTS*

### FALL 2010

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**Office Hours:** Tuesdays 11AM-12noon; Wednesdays 1-2PM; Hensill Hall 668A

**Schedule** Wednesdays, 10:10 – 12:00  
**Location** Hensill Hall 116 on the SFSU Main Campus

#### Course Description:

Over the past few decades, we have come to appreciate that microbial organisms account for a substantial proportion of the Earth's biomass. Indeed, few places on the surface of our planet can be considered devoid of life and microbial communities have even been found to thrive in environments previously deemed too extreme to support life. Evidence suggests that microbial communities in these environments may contribute significantly to the global biosphere and play pivotal roles in regulating biogeochemical nutrients cycles. In this course, we will be examining how life adapts to these extreme environments and what experimental tools we may use to better understand these communities. We will draw directly from primary research articles and develop focused mini-proposals to address compelling questions in the field.

#### Enrollment:

This graduate-level course is primarily intended for Microbiology graduate students interested in exploring the adaptation and physiology of microorganisms living in extreme environments. Under exceptional circumstances, advanced undergraduate students will be allowed to enroll. Enrollment will be limited to 10-15 students. ***In all cases, consent of the instructor is required for continued enrollment.***

#### Learning Objectives

By the end of this course, students will be able to:

- Read, understand and critique papers published in the scientific literature.
- Search the primary research literature to identify interesting articles of relevance to the topics discussed in class.
- Develop and present a one-hour lecture based on the selected research article.
- Describe the general methods utilized in microbial ecology and physiology.
- Write a short 4-page research proposal in NIH or NSF format on an original research question developed by the student based on the topics discussed during the course.

#### Format:

- In the first week of class, we will jointly develop a list of topics to be explored by the class through presentations of primary research articles. These topics can be taken from the list provided by the instructor (see below), or may develop from discussions in class.
- Individual students will assign themselves to specific topics and, working with the instructor, will select a recently published primary research article of significant interest to the topic.
- Students will lead a critical discussion of the selected topic using the selected research article as a launching point. Presenting students are encouraged to request help from the instructor and/or classmates on how to organize their presentation and prepare visual aids.

- The selected research article must be provided to the rest of the class at least one week prior to the presentation. All students are required to write a brief summary of the article, which is due before class on the day of the presentation. This summary should **BRIEFLY** address the following points:
  - *What is the general topic of the paper that is being presented?*
  - *Why is this general topic significant?*
  - *What is the significance of this particular paper? What “gap in our knowledge” is being addressed by this paper?*
  - *Include **three questions** that you have about this paper.*
- Each student will lead 1-2 discussions over the course of the semester, depending on the number of students enrolled in the class.
- Presentations will be evaluated by the entire class according to the following criteria:
  - *Preparation and organization of presentation.*
  - *Whether the presenter was persuasive and demonstrated an understanding of the material.*
  - *How well the speaker communicated (clarity, tone, audibility).*
  - *Usefulness of additional information and the degree to which the presenter relied on the projected images.*
  - *How well the presentation engages the audience*
  - *Overall performance of presenter.*
- Based on their interests and the material presented in the course, students will develop a mini-proposal. We will dedicate time throughout the course to discuss these ideas as a group in order to provide feedback and constructive criticism. Finalized versions of the proposals will be presented to the class and written up to turn in as final projects.

### Potential Topics:

Possible topics to explore over the course of the semester include:

- *Physiological/metabolic/genetic adaptations to extreme environmental parameters such as:*
  - *Heat*
  - *Cold*
  - *High/low pH*
  - *Salinity*
  - *Anoxia*
  - *Pressure*
- *Population structures/dynamics of microbial communities in extreme environments*
- *Metagenomics of microbial communities in extreme environments*
- *Experimental approaches to studying microorganisms in/from extreme environments*
- *Relationship between extreme environments and the Origin of Life*
- *Biogeochemical cycles in extreme environments*

### Grading:

<i>Participation in class discussions</i>	<i>20%</i>
<i>Reading summaries</i>	<i>10%</i>
<i>Presentation evaluations</i>	<i>10%</i>
<i>Research article presentation(s)</i>	<i>20%</i>
<i>Proposal presentation</i>	<i>20%</i>
<i>Written mini-grant proposal</i>	<i>20%</i>
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<i>Total</i>	<i>100%</i>

### Attendance:

As we will only meet 15 times over the course of the semester, attendance is mandatory. Class participation is a significant portion of the final grade. Students will be permitted only one absence over the semester and must inform the instructor in advance of any planned absences.

### Class Website & E-mail Policy

Course material, including handouts and assignments, will be made available online through the iLearn system (<http://iLearn.sfsu.edu/>). If you encounter any problems downloading or printing these files, please contact the instructor immediately.

Students are encouraged to e-mail questions to the instructor. Whenever e-mailing questions, please include "**BIOL 865**" in the subject line and identify yourself by signing the message with your **full name** and **SFSU ID number**. If appropriate, responses will be posted on iLearn or discussed in class—without identifying the student. ***Be advised that, in general, e-mails will receive responses within a day or two.***

### Changes to the Syllabus or Lecture Schedule

The syllabus and lab schedule are subject to change. Changes to the syllabus or lab schedule will be announced in class and/or posted on iLearn.

### Holidays and Furloughs

There will be no class on the following days:

**November 24, 2010**

**Thanksgiving Break**

### Statement on plagiarism and cheating

Students are expected to maintain a high level of academic integrity in all work pursued at SFSU.

**Cheating or plagiarism will not be tolerated under any circumstances in this class.** Cheating on an examination will result in an automatic zero points for that exam. Plagiarism, defined as either direct copying or loose paraphrasing of text from any published work (including online) without appropriate referencing, or use of another person's work or ideas without appropriate attribution, will result in an automatic zero points for that entire assignment. There will be no second chances. Furthermore, any incidence of cheating or plagiarism will be reported to the Chair of the Biology Department, the Dean of the College of Science and Engineering, and the Office of Student Affairs for possible disciplinary action. Consequences can include penalties up to expulsion from the University.

### Cell phones & pagers

Please silence cell phones and pagers before arriving in class.

### American with Disabilities (ADA) Accommodation

The University is committed to providing reasonable academic accommodation to students with disabilities. Students with disabilities who need accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by e-mail ([dprc@sfsu.edu](mailto:dprc@sfsu.edu)).

### Important Deadlines for Add/Drop/Withdrawal:

#### **September 7, 2010**

Deadline to drop courses using GATOR REG.

#### **September 21, 2010**

Deadline to add courses with instructor-issued permit number.

#### **September 8 – November 16, 2010**

Withdrawal period -- no documentation required.

Withdrawals will result in a "W" grade on transcript records.

#### **November 17 – December 13, 2010**

Withdrawal is permissible only for **serious and compelling reasons**. Students must file a petition to be reviewed by the Instructor and the Department Chair. Approved withdrawals will result in a "W" grade on transcript records.

***"Withdrawals are not normally permitted during the final three weeks except in verified cases of accident or serious illness where the cause of withdrawal is due to circumstances clearly beyond the student's control and where the assignment of an incomplete is not practical. Ordinarily, withdrawals in this category will involve total withdrawal from the University."*** (SFSU Bulletin)

### Schedule of Topics

Week	Date	Proposed Topics ( <i>tentative!!!</i> )
1	Aug 25	Introduction to Class & Selection of Topics Lecture (Dr. Talia Jewell): <a href="#">Introduction to Extreme Environments</a>
2	Sept 1	Lecture (Prof. de la Torre): <a href="#">Microbial Ecology &amp; Environ. Genomics</a>
3	Sept 8	
4	Sept 15	
5	Sept 22	
6	Sept 29	
7	Oct 6	
8	Oct 13	
9	Oct 20	
10	Oct 27	
11	Nov 3	Lecture (Prof. de la Torre): <a href="#">How to write a research proposal</a>
12	Nov 10	Class discussion: Preliminary proposal ideas
13	Nov 17	
14	Nov 24	<b>NO CLASSES – THANKSGIVING BREAK</b>
15	Dec 1	
16	Dec 8	<b>IN-CLASS PROPOSALS PRESENTATIONS</b>
17	Dec 15	<b>FINAL PROPOSALS ARE DUE</b>