EEMB 145 – Terrestrial Microbiology
Fall term, 2022

Course Syllabus

Lecture: TTh, 9:30-10:45 AM
Girvetz 1112

Instructor: Ryoko Oono
Free time (aka "Office hours"): By appointment or right after classes
I am happy to meet by Zoom or in-person
Office: Noble 1116
Email: ryoko.oono@lifesci.ucsb.edu

Discussion Section Teaching Assistant: Sevan Esaian
Office Hours: By appointment
Email: sevanesaian@ucsb.edu

Discussion sections:
Time: By group consensus
Slack: **https://join.slack.com/t/terrmicroeemb145/signup**

Course Materials:

This class does not have a textbook. We will be reading and discussing pre-selected primarily literature that will be available through GauchoSpace. Please bring the assigned readings to class (e.g., printed in hand, downloaded to your laptop or tablet before class, your devices must be charged). All lectures will be delivered **in-person** unless the university cancels in-person teaching or there are extenuating circumstances (e.g., poor air quality, spiking COVID cases on campus). No lectures will be recorded or remotely available. Students are responsible for making up for missed class material with individual meetings, which can be offered

remotely. To access primary literature from journal websites (especially while you are off-campus), you may have to install a UCSB VPN.

Course Overview: This is a four-credit course, employing discussions surrounding primary literature analysis to provide students with an introduction to major topics in microbial ecology and evolution. **This course primarily centers around active class discussions of assigned primary literature.** The readings cover a broad but basic understanding of the diverse microbial systems that play profound roles in our ecosystems (and our own evolution) – focusing on terrestrial systems since there is another course specifically for marine microbiology. Many of the papers are published in the recent decade and represent cutting-edge research in their respective fields. That said, the majority of our systems are symbiotic with eukaryotic host organisms, so a more appropriate title of the course may have been *Symbiotic Microbiology*. Students will gain a deep understanding of the technical methods and interpretation of scientific results of the study. The methods and themes will focus more on ecology and evolution rather than physiology or genomics. Students, however, will be able to choose their own topic for their final paper.

This class follows a 'flipped' design where students ask questions and share answers with fellow classmates. Class presence is critical and active participation in the discussion is also essential and highly desired. **Students who do not have a valid excuse for absence after the first two weeks will be automatically dropped from the class**. Asking questions, providing answers for fellow students, providing commentary during discussions are all encouraged. The more interaction we have, the better I can hone my teaching style to your individual needs. Participation on Slack is also highly encouraged, especially if you are unable to participate in class.

Course Objectives:

- Develop familiarity with diverse microbial systems, especially in the context of interspecies relationships.
- Learn to critically evaluate the primary literature pertaining to several major areas of active investigation in contemporary microbial ecology and evolution.
- Become familiar with cutting-edge technology employed in microbiology.
- Develop and refine skills in presenting scientific findings to non-specialists.
- Integrate knowledge of microbiology to relevant cultural, social, and legal aspects of their lives.
- Become an independent life-long learner.

Evaluation:

15% *One 12-15 min Presentation - team*
5% *Participation/Attendance in Discussion section* (2.5% x 2 sections)
*An absence on the day of your team presentation or discussion section will be penalized.

15% *Quizzes **DUE BEFORE EVERY CLASS*** (1% x (18 quizzes - 3 lowest scores))
Quizzes allow 2 attempts (last attempt recorded).
45% *Comprehension worksheets **DUE AFTER EVERY CLASS*** (3% x (18 worksheets - 2 lowest scores - 1 presentation))

17% *Final paper*
3% *Peer Feedback on EliReview* (1.5% x 2 reviews)

100%

Presentation (15%). Students will be assigned to teams based on their subject interests (take "survey quiz" on GauchoSpace during first week of classes). There will be one in-person team presentation required from each student. The team will be made up of 5-6 students. Each student must show that they contributed fairly to the final team presentation. There will be confidential self-evaluations per team and each student will have specific tasks to complete that will be decided by the team during the team meeting with the TA. Student teams are encouraged to meet prior to their presentation (after their discussion section) to practice a short GoogleSlide PowerPoint presentation (**12-15 minutes)**. These presentations should be concise but elaborating on main points and relevant background information. The presentations are meant to help each member 1) prepare a deep understanding of the research, 2) practice oral presentation skills, including designing visually-appealing presentations and condensing complex concepts to help fellow students understand the materials, and 3) socialize and develop communication and collaboration skills. Presentations will be followed by a break-out session to complete the comprehension worksheets. The content and discussion points of the papers will likely help students complete the comprehension worksheets (see below), so a thorough presentation will help your peers understand and retain information for their grade. The discussions are designed to help students understand the primary literature in a critical manner. Presentation slides should be uploaded on GS for grading and sharing with fellow students.

All teams should **practice** their talk beforehand. Whether or not you have practiced will likely be apparent during the presentation. If a team member fails to arrive for the presentation, other team members should be able to cover for the team member if they have practiced. Hence, practicing is very important. The team member who cannot be present at their own presentation, but contributed to the preparation of the presentation will lose just 10% of the presentation grade (e.g. 10% of 15% = 1.5% of total grade).

Discussion section participation (5%). Presenter team members MUST participate actively in discussion section prior to their presentation. Because the discussion sections meet at unorthodox times, not every discussion section is mandatory for all students, but each student should plan on participating in at least two sections (one for their own paper and another one). Students must come prepared to discuss the paper and ask the TA for clarifying points. The quizzes are due for these discussion section participants (both presenters and non-presenters)prior to the discussion section. Participation will be graded by the TA.

Online quizzes (15%). For every primary literature assigned for reading (see schedule below), there will be a short (2-4 question) quiz on GauchoSpace. **The quizzes will close at 9:30 am before every class**. The quiz is open-notes. Two attempts are allowed but you will not be able to see which problems you got wrong on the first attempt (you will be able to see your score after the first attempt).

Comprehension worksheets (45%). After every class and paper discussion (either team-led or lecture-style), there will be a short worksheet to assess reading and analytical comprehension. If the paper is presented by a team, those team members will lead in helping answer the questions but each of the answers must be written individually by each student. Answers should be uploaded online 48 hours after class on GauchoSpace (**deadline Friday midnight for Thursday papers or Wednesday midnight for Tuesday papers**). *Presenting students* do not get graded for worksheets for their papers. **Late comprehension worksheets are accepted** by email to the TA or Ryoko for **half credit** - that's still 1.5% of your final grade!

Final Paper (17%). Each student will choose a recent article from the news media (e.g., Fox News, BBC, Washington Post, LA Times) that covers a recent scientific study (e.g., "Microbiome study could change the way doctors diagnose depression", "Link between Alzheimer's disease and gut microbiota is confirmed") and fact check the article by reading the primary literature cited in the news article. The original news media MUST mention a published study and you must read this study. The final paper should introduce the study, the societal context in which this news article made an impact (e.g., at the beginning of COVID-19 outbreak, a time when depression rates were increasing, etc.), and the conclusions of the study and article. The paper MUST involve a microbe

or microbiome. Each student must clear the paper with Ryoko because there are some restrictions (e.g., primary paper cannot be a review paper). Paper should be 2-3 pages long, single-spaced, with references to all sources.

Peer Feedback through EliReview (3%). A draft of the final papers will be peer-reviewed through EliReview. Students will learn to give constructive feedback in writing.

Extra Credit (capped at 5%) There will be extra credit sporadically offered throughout the quarter (e.g., writing a summary based on a video), so there is no need to make grand excuses when you miss one or two assignments. Just continue to stay alert about extra credit opportunities if you think you will need to miss a class/assignment. Also, don't think of these points as 'extra'. Think of them as safety nets (savings, back-ups) for when you might fall ill or have a family emergency and need to take a week off of school without having your grades drop. You want as many of these points saved up for those 'just-in-case' life events.

Grading – Course grades will be curved at the end of the course depending on the breakdown of scores. The percentages will go as such: A 93-100, A- 90-92; B+ 87-89, B 83-86, B- 80-82; C+ 75-79, C 70-74, C- 65-69, D 50-64; F < 50

Day	Assigned literature	Reminders and assignments	General topics
9/22 Thurs	**Introduction to course objectives and syllabus**	• Rank papers for presentation	History of microbiology and symbiosis, sequence technology
9/27 Tues	**Overview of Viruses, Bacteria, Archaea, Protists, Fungi (lichens), fungal ecology & evolution:** Microbial Biogeography: Patterns in Microbial Diversity across Space and Time. Fierer 2008	• First team presenting on lichens (Miller et al. 2021) on 10/6 should *plan a meeting with TA* between 9/29 - 10/4	Plant-microbe interactions (Viruses, Fungi, Plants), endophytes, three-way symbioses, host-symbiont vs. microbiome
9/29 Thurs	**Class discussion:** A virus, a fungus, in a plant: a three-way symbiosis required for thermal tolerance. Marquez et al. 2007		

10/4 Tues	**Sample Presentation by Ryoko:** Basidiomycete yeasts in the cortex of ascomycete macrolichens. Spribille et al. 2016	• Second team presenting on legume-rhizobia mutualism (Wood et al. 2018) on 10/13 should *plan a meeting with TA* between 10/6-10/11	Plant-microbe interactions (Lichens, mutualisms, green algae, cyanobacteria, fungi, mycorrhizae, rhizosphere)
10/6 Thurs	**Team presentation (#1):** Epiphytic macrolichen communities take decades to recover after high-severity wildfire in chaparral shrublands. Miller et al. 2021		
10/11 Tues	**Class discussion:** Soil fungal community composition and functional similarity shift across distinct climatic conditions. Bui et al. 2020	• Third team presenting on leaf miners (Kaiser et al. 2010) on 10/20 should *plan a meeting* with TA between 10/13-10/18	Plant-microbe interactions (Legume-rhizobia), parasitism, trade-offs, nutritional mutualism vs defense mutualism, insect-microbe interactions
10/13 Thurs	**Team presentation (#2):** Genetic conflict with a parasitic nematode disrupts the legume–rhizobia mutualism. Wood et al. 2018		
10/18 Tues	**Class discussion:** Defense contracts: molecular protection in insect-microbe symbioses. Van Arnam et al. 2017 [Review] + **Lecture on Bacteria**	• Fourth team presenting on fungus-growing ants (Cafaro et al. 2010) on 10/27 should *plan a meeting* with TA 10/18 -10/25	Insect-microbe interactions, antibiotic resistance, three-way symbioses
10/20 Thurs	**Team presentation (#3):** Plant green-island phenotype induced by leaf-miners is mediated by bacterial symbionts. Kaiser et al. 2010		
10/25 Tues	**Class discussion:** Mixed mode transmission promotes persistence of an emerging tick-borne disease. Sambado et al. 2020	• Fifth team presenting on slime molds (Brock et al. 2016) on 11/3 should *plan a meeting* with TA 10/27 -11/1	Social amoeba (Protista), multi-level selection, Bet-hedging
10/27 Thurs	**Team presentation (#4):** Specificity in the symbiotic association between fungus-growing ants and protective *Pseudonocardia* bacteria. Cafaro et al. 2010		
11/1 Tues	**Class discussion:** Primitive agriculture in a social amoeba. Brock et al. 2011 + **Lecture on Protista**	• Sixth team presenting on pike gut microbiome on 11/10 should *plan*	Phylosymbiosis, host speciation

11/3 Thurs	**Team presentation (#5):** Sentinel cells, symbiotic bacteria and toxin resistance in the social amoeba *Dictyostelium discoideum*. Brock et al. 2016	*a meeting with TA* between 11/3 - 11/8 ● Send Prof. Oono links for the news media and proposed paper to analyze for your final paper. Proposed paper MUST be ok'd by Prof. Oono. **Please message on Slack.**	
11/8 Tues	**Class discussion:** The hologenomic basis of speciation: gut bacteria cause hybrid lethality in the genus *Nasonia.* Brucker & Bordenstein 2013.	● Seventh team presenting on gut microbes and brain on 11/17 should *plan a meeting* with TA 11/10 -11/15 ● Students should be proactively requesting feedback on their final paper. **Please message us on Slack.**	Human microbiome
11/10 Thurs	**Team presentation (#6)** Gut microbial communities of American pikas (*Ochotona princeps*): Evidence for phylosymbiosis and adaptations to novel diets. Kohl et al. 2017		
11/15 Tues	**Class discussion:** Gut-brain axis: how the microbiome influences anxiety and depression. Foster & Neufeld 2013 [Review] **Lecture on Archaea**	● **Drafts of your final paper are due on EliReview for peer-review on 11/20 (Sunday night)**	
11/17 Thurs	**Team presentation (#7)** Gut microbiome remodeling induces depressive-like behaviors through a pathway mediated by the host's metabolism. Zheng et al. 2016 Molecular Psychiatry		
11/22 Tues	**No in-person class on Tuesday.** **Complete two EliReviews.**	● No class Thursday due to Thanksgiving. ● Final (eighth) team on 12/1 should *plan a meeting* with TA between 11/22 -1129	● Scientific literacy

		• **Two peer-reviews on EliReviews are DUE Sunday 11/27**	
11/29 Tues	**Class discussion:** Airborne transmission of respiratory viruses. Wang et al. 2021 **Lecture on Viruses**	**Your final paper is due 12/9 midnight.**	Scientific literacy, coronavirus
12/1 Thurs	**Team presentation (#8):** TBD Something timely **Supplementary reading:**		

COVID-19 and Our Classroom

In order to act in the best interests of our shared classroom community, please be sure to abide by policies established by the University of California and UC Santa Barbara. As a reminder, all members of our campus community are required to follow the University of California Covid 19 Vaccination policy.

- If you are feeling ill, please stay home. If you feel fine but may be contagious, please wear a mask. Let me and/or your TA know, and we will make arrangements for you.

This class is designed for in-person. If the situation changes and public health guidelines recommendations change, or if I need to self-isolate, I will let you know and we will modify our course format, using Zoom, GauchoSpace, and other platforms to continue our work together. I will communicate with you via Slack and email using the address that you use to log into GauchoSpace. **Please be sure to use your @ucsb email for that purpose and be sure to check your email at least once daily.**

General Compliance

- Student non-compliance with COVID-19 health and safety requirements or with related directions from the instructor is a violation of the UCSB Student Code of Conduct and will be adjudicated accordingly.

- All students of this course, as a condition of physical presence in this classroom (including for exams or tests in this classroom or any other location on the UCSB campus), must be compliant with the UC SARS-CoV-2 (COVID-19) Vaccination Program at all times.

Student Support Services

(1) Disabled Students Program: accommodations for exams

Students with disabilities may request academic accommodations for exams online through the UCSB **Disabled Students Program** at http://dsp.sa.ucsb.edu/. Please make your requests for exam accommodations through the online system as early in the quarter as possible to ensure **proper** arrangement.

(2) Managing stress / Supporting Distressed Students

Personal concerns such as stress, anxiety, relationships, depression, cultural differences, can interfere with the ability of students to succeed and thrive. For helpful resources, please contact UCSB **Counseling & Psychological Services (CAPS)** at 805-893-4411 or visit http://counseling.sa.ucsb.edu/ .

If you encounter a student in distress, please contact 805-893-3030 immediately and/or consult the **Responding to Distressed Student Protocol** at http://www.sa.ucsb.edu/distressedstudentsguide or phone 893-3030.

(3) Building academic skills

For general **academic support**, students are encouraged to visit **Campus Learning Assistance Services (CLAS)** early and often. CLAS offers instructional groups, drop-in tutoring, writing and ESL services, skills workshops and one-on-one consultations. CLAS is located on the third floor of the Student Resource Building, or visit http://clas.sa.ucsb.edu

(4) Responsible scholarship

Honesty and integrity in all academic work is essential for a valuable educational experience. **The Office of Judicial Affairs** has policies, tips, and resources for proper citation use, recognizing actions considered to be cheating or other forms of academic theft, and students' responsibilities, available on their website at: http://judicialaffairs.sa.ucsb.edu. Students are responsible for educating themselves on the policies and to abide by them.

(5) Responding to Hate Incidents

Hateful actions based on race, ethnicity, religion, gender, sexual orientation, gender identity, citizenship status, age, or disability are not acceptable. In the event that a hate crime or incident does occur, please report it. Reports may be made anonymously. http://judicialaffairs.sa.ucsb.edu/hate.aspx

(6) Reporting Sexual Harassment

Please visit http://sexualviolence.universityofcalifornia.edu/ for:

- campus-specific options for reporting sexual violence, sexual assault, sexual harassment, dating/domestic violence, and stalking
- campus-specific support & services, including confidential resources
- information about rights and responsibilities
- University policies and procedures