

Topics in Microbiome Science Syllabus

[M6155] [Spring 2021]

Course Information

- **Course times and location:** F 9:30am-12:15pm, online location
- **Credit hours:** 3
- **Mode of delivery:** Distance Learning

Instructor #1

- **Name:** Matthew Sullivan
- **Email:** Sullivan.948@osu.edu
- **Office location:** 914 Riffe Building
- **Office hours:** by appointment
- **Preferred means of communication:**
 - My preferred method of communication for questions is **email**.
 - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Instructor #2

- **Name:** Virginia Rich
- **Email:** rich.270@osu.edu
- **Office location:** 934 Riffe Building
- **Office hours:** by appointment
- **Preferred means of communication:**
 - My preferred method of communication for questions is **email**.
 - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your [notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to be sure you receive these messages.



Course Prerequisites

None.

Course Description

The course will cover the ecology and evolution of microbes, at a graduate level and focused around key primary literature. We will explore a variety of essential concepts, methods, and ongoing 'unknowns' in the field. In this course, the term "microbial" is shorthand for prokaryotes + viruses, but we will briefly introduce microbial eukaryotes through guest lectures as available.

We will cover the following **overarching scientific themes**:

- Microbial ecology: What are the patterns and drivers of microbial communities? How do we grapple with scale, & statistical power? What are approaches to time series analyses, and to multi-disciplinary systems datasets (including WCGNA analyses)? What 'central dogma' considerations should inform our interpretation of multi-omic experiments? What are the defining ecological characteristics, at the microbial scale, of oceans, soils, and engineered systems?
- Microbial evolution: How is selection examined in microbes, and what is known about microbial evolutionary rates and processes? How are lineages traced, and their relationships examined?
- Microbial evolution in an ecological context: How can the above concepts be applied in unified systems frameworks, such as for understanding symbioses, or the co-evolution of viruses & microbes, or microbial metabolic hand-offs & their evolution?

Learning Outcomes

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

- Develop knowledge of foundational concepts and methods in microbial ecology and evolution.
- Explore principles of sound experimental design in these fields.
- Learn how to read, summarize, and critique primary literature in these fields.
- Improve professional communication skills as a scientist: writing & presenting, peer-evaluation of writing & presenting, and leading scientific discussions.



How This Online Course Works

Mode of delivery: This course is 100% online. There is a required synchronous (real-time) session in Zoom each week on Fridays from 9:30 a.m. - 12:15 p.m. EST. The rest of your work is found in Carmen and can be completed around your own schedule during the week.

Pace of online activities: This course is divided into **weekly modules** that are released one week ahead of time. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

Credit hours and work expectations: This is a 3 credit-hour course. According to [Ohio State bylaws on instruction](https://www.osu.edu/credit-hours) (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of C average.

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, I have the following expectations for everyone's participation:

- **Participating in online activities for attendance: at least once per week**
You are expected to log in to the course in Carmen every week. During most weeks you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with me *as soon as possible*.
- **Zoom meetings and office hours: optional**
All live, scheduled events for the course, including my office hours, are optional. I will post recordings of synchronous sessions for those who cannot attend.
- **Participating in discussion forums: two or more times per week**
As part of your participation, each week you can expect to post at least twice as part of our substantive class discussion on the week's topics.

Course Materials, Fees and Technologies

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access at go.osu.edu/student-tech-access.

Required Software

Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the [installing Office 365](http://go.osu.edu/office365help) (go.osu.edu/office365help) help article for full instructions.

CarmenCanvas Access

You will need to use [BuckeyePass](http://buckeyepass.osu.edu) (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](http://go.osu.edu/add-device) (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- [Install the Duo Mobile application](http://go.osu.edu/install-duo) (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at [614-688-4357 \(HELP\)](tel:614-688-4357) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](http://go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](http://go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)



- [Recording a slide presentation with audio narration and recording, editing and uploading video](https://go.osu.edu/video-assignment-guide) (go.osu.edu/video-assignment-guide)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat:** go.osu.edu/it
- **Phone:** [614-688-4357 \(HELP\)](tel:614-688-4357)
- **Email:** servicedesk@osu.edu



Grading and Faculty Response

Primary literature discussions are the heart of this course. To support these discussions, there may be mini-lectures by the professors, presentations by students, and at-home viewing and reading assignments, to introduce foundational concepts and methods.

We will read 1-3 papers each week, and some weeks we will view videos or short supplementary writing to support the weekly topic.

Grades will be calculated as follows:

- A. 20% Weekly write-ups
- B. 35% Semester Presentation & Discussion Leadership
- C. 25% Final Presentation
- D. 15% In-class participation in discussions
- E. 5% Learning objectives write-ups

See [Course Schedule](#) for due dates.

Descriptions of Major Course Assignments

This course will have a number of different assignments as follows.

A. Weekly write-ups: to synthesize the information in the assigned paper(s), and to practice your scientific writing skills, each week that you are not presenting you will produce a short piece of writing with the following structure:

- 1 paragraph summarizing each of the paper(s) (i.e. 1 paragraph per paper). What was the key Q it was addressing and why is it important? What was their experimental design and approach? And what were there key findings?
- A short list of the “muddiest points” – what questions do you have about the paper(s).
- A short list of “axes of connection” to other research or concepts – how does this paper(s) relate to other papers or ideas covered in this course, in your own research, or in other classes, or elsewhere (including mainstream media)?

You will turn these write-ups in on Carmen, and bring 1 printed copy to class.

Weekly Write-ups rubric:

Criteria	Rating			Points (19)
Key Qs stated & concisely contextualized	3: clearly stated goals of all assigned papers and gave quick context	1: mentioned a single goal without context	0: did not describe goals of any of the papers.	/ 3
Experimental approach	3: clearly identified the essential experimental approach of the papers at a summary-level (ie not every step of protocols)	1: just lists some of methods or tools used, without overarching approach.	0: did not describe approach	/ 3
Findings	3: concisely articulated the key findings of the paper	1: states a single finding	0: did not describe findings	/ 3
Quality of writing	2: easy to read, clearly laid out	1: could follow, but there were some confusing sections.	0: poorly crafted, difficult to follow	/ 2
Spelling and grammar	2: no spelling and grammar errors	1: one error	0: more than one error	/ 2
Muddiest points	3: >2 questions identified clearly	1: a single question	0: none provided.	/ 3
Axes of connection	3: >1 axis of connection clearly defined	1: a poorly defined linkage to one other topic.	0: none provided	/ 3



B. Peer evaluation of weekly write-ups: Assessing our colleagues' work is one of the best ways of improving our own. Each week (unless you're presenting) you will assess a write-up from a different peer, using the grading rubric above, and adding at least 1 sentence per criteria justifying your score. Feel free to add additional editorial comments on the documents, but these are not required nor do they add to your grade. Peer evaluations will be done at home, and are due the following week.

C. Presentation & Discussion Leadership. You will sign up to be presenter and discussion leader one week. **Based on the # of students in the class this year, we will ask for 2 volunteers to present solo but only once (and get first dibs on which weeks they go), while everyone else will go twice in pairs.**

Phase 1: The goal of the presentation component will be to deliver a primer on background to the assigned topic to your peers (this could include key terminology, methods, background/history, concepts). These will directly feed into improved paper discussions. You are encouraged but not required to send the instructors your slides the week before your presentation to receive feedback. Your presentation should be no longer than 15-20".

Phase 2: As discussion leader, you will lead the group through discussion of the papers and will be responsible for an added level of knowledge about the assigned papers (you do *not* need to know every last detail of the coding, statistical methods, etc, or have read all the papers these papers reference, but you do need to know the essential information of the focal discussion paper(s)).

The discussion you lead could include:

1. For the paper(s) themselves:
 - a. overall experimental design
 - b. discussion of methods (which, if they are challenging or less familiar, will likely have been *introduced* by the presentation), including the applicability of those methods for the Qs asked
 - c. sequential interpretation of figures as a group
 - d. key results
 - e. whether the results support the author's stated findings
 - f. what the outstanding Qs are about unclear parts of the paper (the 'muddiest points')
 - g. what the next research steps might be
2. For the week's theme / focal Q:
 - a. which previous papers in the semester also relate, and how
 - b. how the papers address the week's theme (what are the emerging principles, key take-homes)
 - c. how the papers fits into the field (some historical context may have been provided in the presentation)
 - d. how the work relates to the various research engaged in by this class group.

While it might be necessary to show a few things on the screen, the focus of Phase 2 should be squarely on leading a discussion of the papers, a pooling of our collective understanding of them and a collective distillation of the group's concerns about their validity, or insights into their importance, credibility, larger relevance, etc.

We might go to the white/chalk board to sketch out experimental designs, or list insights, but these should arise from the group discussion not be prescribed by the leader (though you may have made your own lists of these in advance in order to steward the discussion most effectively and help ensure the group doesn't miss something essential).

It is OK as leader to call on your peers (or instructors) during the discussion especially when looking for insights from their particular areas of knowledge.

Note that "Phase 1" and "Phase 2" may end up intermingling and that is OK.

Presentation rubric:

Criteria					Points (60)	
Content	A	B	C/D	F	35	
Organization	Organization clear from the start, & followed	Organization presented and mostly adhered to	Organization inconsistent	Disorganized	/ 8	
Concept conveyance	Concepts are clearly conveyed, with succinct explanations, appropriate examples, and informative visual aids	Concepts presented but some are unclear	Concepts periodically murky; key concepts missing	No key concepts covered	/ 8	
Accuracy	The information presented is correct	The information is mostly correct with only minor inaccuracies	One appreciable inaccuracy	Rampant inaccuracies	/ 8	
Referencing	Literature & knowledge sources referenced	Knowledge mostly referenced	Some important key ideas stated as 'known facts' without attribution	No referencing	/ 4	
Timeliness	Talk fit within allotted timeframe	Talk was <2" over	Talk <5" over	Talk >5" over	/ 2	
Q & A	Qs addressed with thought, some known answers, and engaged group brainstorming when answers not known	Qs addressed thoughtfully	Poor handling of Qs without known As	Qs addressed blankly	/ 5	
Slides					15	
Style	Slides uncluttered, easy to follow	Slides mostly clear	Difficult to follow, e.g. from excessive text, variable fonts, use of illegible tables	Slides impossible to follow	/ 10	
Source attribution	Graphics consistently attributed to their source	Graphics almost always sourced.	Some graphics sourced.	No sources	/ 5	
Speaking style					10	
Physically	Professional bearing, no nail-biting, swaying, etc	A few fidgety moments	Periodic fidgets but generally stable	Excessive fidgety movement	/ 3	
Verbally	(after the first 5"😊) Minimal 'ums', cogent verbiage, content matches slide content	Generally smooth delivery, a few rough spots	Periodically distracted; reads from notes	Frequently loses place; verbiage does not match slides	/ 5	
Rapport	Maintains eye contact, "presence" in the space, facial expressions, use of laser pointer to help guide audience	Generally engaged with audience	Spends long periods with back to audience looking at slides; spends long periods looking down or out of window, or with eyes closed	No eye contact	/ 2	

Discussion leadership rubric:

Criteria	Rating			Points (10)
Guidance rather than lecturing	3: Prompted discussion with leading questions, kept 'top-down' description of material to essential background	1: Provided their own interpretations for the majority of the 'discussion' period, showed limited engagement of group	0: used a lecturing approach to cover the material	/ 3
Thoroughness of scope	3: Covered the key ideas of material (but note, it's OK if sometimes the discussion of a single paper is so engaged that you have less time for the other(s))	1: Skipped over key concepts of a paper (without being time constrained), or didn't give peers a chance to discuss their 'muddiest points'	0: Did not cover essentials of paper(s)	/ 3
Knowledge of material	3: Clear knowledge of essential details of paper(s)	1: Notable gaps in understanding of elements of paper(s)	0: Lack of understanding of paper(s)	/ 3
Style: Verbal & physical bearing and rapport with group	1: Minimal 'ums', encouraging tone and facial expressions to help promote discussion		0: No eye contact, flat tone of voice, many 'ums', etc.	/ 1

D. Final Presentation. In lieu of final exams, on April 24th (unless there's a conflict) everyone will present on a topic and associated paper of their choosing within the overarching theme of Microbial Ecology and Evolution. The rubric will be the same as that above for Presentations. Each person will go solo.

E. Peer evaluations of presentations. You will evaluate your peers' presentations using an in-class evaluation sheet based on the above rubric, and with time to write down comments about their performance. Full completion of the evaluation sheet, with comments, will earn full credit; partial completion partial credit; no completion will get zero credit.

F. Participation. Show up on time and prepared, and participate in class. Because these are discussions, **it is OK if you dislike speaking up with answers, or feel you know less than the rest of the class - you can still participate, by bringing your pithy questions to the group.**

	A	B	C/D	F
Preparation	Arrives on time fully prepared at every class session	Arrives mostly, if not fully, prepared (ongoing)	Inconsistent preparation	Rarely or never prepared
Participation	Plays an active role in discussions (ongoing)	Participates constructively in discussions (ongoing)	When prepared, participates constructively in discussions	Comments vague if given; frequently demonstrates lack of interest
Contribution to Class	Comments advance level and depth of dialogue (consistently)	Makes relevant comments based on assigned material (ongoing)	When prepared, relevant comments are based on assignments	Demonstrates a noticeable lack of interest

Courtesy of Jesse Kwiek; Adapted from The Teaching Professor, March 2005.

YOU WILL POSITIVELY AFFECT YOUR PARTICIPATION GRADE BY:

1. Becoming more active and/or making more effective comments that raise overall level of discussion.
2. Asking thoughtful questions that will enhance discussion and engage peers.
3. Listening carefully to, supporting, and engaging your peers in discussion.

YOU WILL NEGATIVELY AFFECT YOUR PARTICIPATION GRADE BY:

1. Not attending class (unexcused), or **arriving to class late**.
2. Using electronic devices (e.g. cell phone, iPad, computer, etc.) for personal, non-class related reasons.
3. Dominating class discussions, thereby restricting others' participation.
4. Making offensive, and/or disrespectful comments during discussions.

G. Learning objectives write-ups. At the beginning and end of the course you will be required to complete short writing assignments (no more than 1 page single-spaced) self-evaluating your strengths and weaknesses in each of the areas covered by the 4 course learning objectives, based on the 3 overarching themes. At the start of the course you will evaluate your knowledge coming in, describe how these knowledge and training areas fit into your longer term research and career goals, and the areas you are most excited to learn about, and identify your strategy/ies for succeeding in the course. We will read a summary of learning styles to help frame this. At the end of the course, you will reflect on which areas you advanced your knowledge and in what ways, and what learning strategies worked for you.

Learning objectives write-ups (written for entry exercise; exit rubric will be simplified)

Criteria	Rating			Points (19)
Strengths & weaknesses	8: for each of the 4 learning objectives,	4: only identified strengths or weaknesses, or only	0: did not self-assess.	/ 8

	articulated a clear self-assessment	addressed a subset of objectives		
Longer-term context	3: identified how the course material fits into your overall training and professional goals	1: mentioned a goal but without contextualizing course material.	0: did not describe context	/ 3
Strategy	4: clearly articulated strategies you will use to achieve your learning goals in this course	2: identified a single strategy but did not link it to this course	0: did not describe strategy	/ 4
Quality of writing	2: easy to read, clearly laid out	1: could follow, but there were some confusing sections.	0: poorly crafted, difficult to follow	/ 2
Spelling and grammar	2: no spelling and grammar errors	1: one error	0: more than one error	/ 2

Late Assignments

Please refer to Carmen for due dates. Due dates are set to help you stay on pace and to allow timely feedback that will help you complete subsequent assignments. Due to the collaborative nature of class discussions, we are not able to grade posts submitted after the final weekly deadline for this assignment type.

Instructor Feedback and Response Time

We are providing the following list to give you an idea of our intended availability throughout the course. Remember that you can call [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact us first through our Ohio State email address. We will reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** We will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Discussion board:** We will check and reply to messages in the discussion boards once mid-week and once at the end of the week.
- **Grading and feedback:** For assignments submitted before the due date, we will try to provide feedback and grades within **seven days**. Assignments submitted after the due date may have reduced feedback, and grades may take longer to be posted if they will be considered at all.

Grading Scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-

77–79.9: C+
 73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E

Other Course Policies

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. We will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. See citation specifics below.
- **Synchronous sessions:** During our Zoom sessions I ask you to use your real name and a clear photo of your face in your Carmen profile. During our full-group lecture time, you may turn your camera off if you choose. When in breakout rooms or other small-group discussions, having cameras and mics on as often as possible will help you get the most out of activities. You are always welcome to use the [free, Ohio State-themed virtual backgrounds](https://go.osu.edu/zoom-backgrounds) (go.osu.edu/zoom-backgrounds). Remember that Zoom and the Zoom chat are our classroom space where respectful interactions are expected.
- **To make the most of this course, our writing and citation suggestions are:**
 - A. *Tips for reading a scientific data paper:*
 - What was the goal of the study?
 - What was the general approach?
 - What was the actual experimental design – can you draw a flow chart of it?
 - What specific methods did they use, both experimental and analytical?
 - What does each of their figures mean? Each should tell you a central “piece” of the paper’s story. I often read figures through twice: once before reading the results – or sometimes even the paper! – and then a second time when I get to the places in the text where they’re referenced.
 - What are the key results?
 - Do these results support, or contradict, previous work?
 - What are their take-home messages?

Tips for reading a scientific review paper:

- What is the topic being conveyed, and why is it worthy of a review?
- How long has the topic being reviewed been known about?
- Is it clear who the author(s) is – are they a leader in the topic?
- What are the key experiments, discoveries, or methods described for moving the topic forward?

- Does the review contribute any new analyses or offer any novel perspectives (either of which it will make clear are new and not just from other work; a common contribution is a new “synthesis” figure bringing together concepts within the topic they’re reviewing)?
- What is the point of each figure? Each should tell you a central “piece” of the paper’s story. I often read figures through twice: once before reading the results – or sometimes even the paper! – and then a second time when I get to the places in the text where they’re referenced.
- Does the reviewed topic fit in or contradict the previous conceptual framework?
- What are their take-home messages?

Tips for coherent writing:

- Make an outline first. It gets your ideas down and organized. Not starting with one can lead to a jumbled mix of concepts without clear logical flow.
- *Topic sentences* (e.g. see <http://www.writingcentre.uottawa.ca/hypergrammar/partopic.html>) are **key** to good writing.
- Use concise, direct language. Avoid run-on sentences.
- Always check your spelling and grammar.
- If you are unclear of what constitutes plagiarism, it is your responsibility to educate yourself; OSU has a resource for you, see the Code of Student Conduct <http://studentaffairs.osu.edu/csc/>

Citing your sources:

When information you provide in your writing is sufficiently novel and not your own, then sources must be cited in the text and a complete and correct bibliography (see example below) must follow. Your sources of information might include: (i) focal papers, (ii) textbook chapters (including section #) that provided any critical background information, (iii) web pages or additional sources of information.

To cite sources, you can numerically or “author year” provide the reference(s) when supporting your statements. For the example reference below, you might say and cite something in your essay like, “caves harbor phylogenetically distinct microbial lineages (Holmes et al 2001).” You clearly did not demonstrate this phylogenetic distinctness in cave microbes yourself, but the 2001 study did and that is where you gained the information.

Bibliographic citation example; feel free to use the citation format of any major journal.

Holmes, A.J., N.A. Tujula, M. Holley, A. Contos, J.M. James, P. Rogers, and M.R. Gillings. 2001. Phylogenetic structure of unusual aquatic microbial formations in Nullarbor caves, Australia. *Environmental Microbiology*. 3:256-264.

Academic Integrity Policy

See [Descriptions of Major Course Assignments](#) for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State’s Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university’s [Code of Student Conduct](http://studentconduct.osu.edu) (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university’s *Code of Student Conduct* and this syllabus may constitute “Academic Misconduct.”

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also

have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, [on-demand mental health resources](https://go.osu.edu/ccsondemand) (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:6142925766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](https://www.nationalsuicideline.org) (suicidepreventionlifeline.org) or by calling [1-800-273-8255\(TALK\)](tel:18002738255). [The Ohio State Wellness app](https://go.osu.edu/wellnessapp) (go.osu.edu/wellnessapp) is also a great resource.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with [Student Life Disability Services \(SLDS\)](#). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services.

Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)

Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates.

Week	Date	Lead	Focus Q and relevant topics	Readings (tentative, see Carmen for updates)
1	Jan 15	VIR	Why are we here (in this class)? (introductions, class format, syllabus & scheduling; how to read a paper; some big ecological Qs)	1. Antwis et al. 2017. Fifty important research questions in microbial ecology . <i>FEMS Microbial Ecology</i> . 5: fix044. 2. Lennon & Locey. 2017. Macroecology for microbiology . <i>Env. Microbiol. Reports</i> .
2	Jan 22	MBS	What should we count? (OTU/populations, species concepts, diversity)	1. OX Cordero, MF Polz. 2014 Explaining microbial genomic diversity in light of evolutionary ecology . <i>Nature Reviews in Microbiology</i> . 12: 263–273 2. Louca et al. 2018. Function and functional redundancy in microbial systems . <i>Nature Ecology & Evolution</i> . 2: 936-943. [need a diversity primer? Consider ' Counting the uncountable ' or ' Species divergence and the measurement of microbial diversity ' or ' Diversity is the question, not the answer ' or online tutorial (here)]
3	Jan 29	MBS	How does taxonomy map to phylogeny? (phylogeny, taxonomy, Tree of Life)	1. LA Hug et al. 2016. A new view of the tree of life . <i>Nature Microbiology</i> 1: 16048. 2. Parks et al. 2018. A standardized bacterial taxonomy based on genome phylogeny substantially revises the tree of life . <i>Nature Biotech.</i> 36: 996-1004. [need phylogeny primer? Book (Phylogenetic Trees Made Easy) or tutorial (here)]
4	Feb 5	MBS	What does rare versus abundant mean? (diversity, rank abundance, cataloguing)	1. Thompson et al. 2017. A communal catalogue reveals Earth's multiscale microbial diversity . <i>Nature</i> . 551: 7681. 2. Banerjee et al. 2018. Keystone taxa as drivers of microbiome structure and functioning . <i>Nature Reviews Microbiology</i> 16: 567-576.
5	Feb 12	MBS	How do microbes change over space? (Patterns and drivers of microbial community structure)	1. Sunagawa et al. 2015. Structure and function of the global ocean microbiome . <i>Science</i> . 348:1261359. (*=co-first authors) 2. O'Brien et al. 2016. Spatial scale drives patterns in soil bacterial diversity . <i>Environ Microbiol.</i> 18:2039-51. [Need an ecological statistics primer? Consider ' Multivariate analyses in microbial ecology ' or ' The role of ecological theory in microbiology ']
6	Feb 19	VIR	How do microbes change over time? (scaling, networks, time series / chronosequences, MAGs)	1. Needham et al. 2017. Ecological dynamics and co-occurrence among marine phytoplankton, bacteria and myoviruses shows microdiversity matters . <i>ISMEJ</i> . 11: 1614-29. 2. Ottesen et al. 2014. Multispecies diel transcriptional oscillations in open ocean heterotrophic bacterial assemblages . <i>Science</i> . 345: 207-212.
7	Feb 26	MBS	What level of variation matters in nature? (population genetics applied to communities)	1. Schloissnig et al. 2013. Genomic variation landscape of the human gut microbiome . <i>Nature</i> . 493: 45-50. 2. Rocha. 2018. Neutral theory, Microbial practice: Challenges in bacterial population genetics . <i>Mol. Biol. Evol.</i> 35: 1338-47.
8	Mar 5	VIR	How do microbes impact ecosystems? (ecological models, activity measurements)	1. Guidi et al. 2016. Plankton networks driving carbon export in the oligotrophic ocean . <i>Nature</i> . 532:465-470. 2. Wieder et al. 2013. Global soil carbon projections are improved by modelling microbial processes . <i>Nature Climate Change</i> . 3: 909–912. 3. Starr et al. 2018. Stable isotope informed genome-resolved metagenomics reveals that Saccharibacteria utilize microbially-processed plant-derived carbon . <i>Microbiome</i> . 6:122.
9	Mar 12	VIR	How do microbes evolve in captivity? (experimental evolution)	1. Good et al. 2017. The dynamics of molecular evolution over 60,000 generations . <i>Nature</i> 551: 45-50. 2. Zhang et al. 2018. Fungal networks shape dynamics of bacterial dispersal and community assembly in cheese rind microbiomes . <i>Nature Communications</i> . 9:336
10	Mar 19	VIR	Is metabolic interconnectedness the rule? (metabolic handoffs, MAGs)	1. Hug & Co. 2018. It Takes a Village: Microbial Communities Thrive through Interactions and Metabolic Handoffs . <i>mSystems</i> . 2. Anantharaman et al. 2016. Thousands of microbial genomes shed light on interconnected biogeochemical processes in an aquifer system . <i>Nat. Comm.</i> 3. Woodcroft et al. 2018. Genome-centric view of carbon processing in thawing permafrost . <i>Nature</i> . 560: 49-54.
11	Mar 26	MBS	How do viruses fit in? (viral ecogenomics, microdiversity, biogeography)	1. Roux et al. 2016. Ecogenomics and potential biogeochemical impacts of globally abundant ocean viruses . <i>Nature</i> . 537: 689-693 2. T.B.D.
12	Apr 2	MBS	How do we model microbial communities? (Metabolic modeling & trait-based modeling)	T.B.D.
13	Apr 9	VIR	How do hosts + symbionts/parasites co-evolve? (holobionts, co-evolution)	T.B.D.
14	Apr 16	VIR & MBS	Final presentation Q&A and prep	
15	Apr 23	VIR & MBS	Final presentation in lieu of final exam	Each person presents for 15" + 5" Qs.

