



**Biocore 587, Biological Interactions, Spring 2023**  
**3 Credits H**

Canvas Course URL: <https://canvas.wisc.edu/courses/330115>

**Requisites**  
**Biocore 485**

**Short Course Description**

Biocore's capstone course to build on and integrate the knowledge and skills gained in previous Biocore coursework through readings and analysis of primary scientific literature. Work in small groups to analyze current and emerging topics through the lens of scientific research. Topics include microbial systems biology, neurobiology of sleep, and the genetics of cervical cancer as a viral disease.

**Meeting time and Location**

Biocore 587 lecture meets at 11:00 MWF in Room 168 Noland Hall

**Biocore 587 Instructor Team**

**Dr. Trina McMahon, Professor of Civil and Environmental Engineering & Bacteriology will teach unit 1 on The Microbial World: Diversity, Complexity, and the Foundation of Earth's Ecosystems. She is a microbial ecologist of both natural and engineered systems investigating microbial community structure and function in lakes and wastewater systems.**

**Dr. Han Wang, Assistant Professor, Integrative Biology will teach unit 2 on the Genetic Analysis of Sleep. He is a neuroscientist interested in how the brain controls behaviors and uses the model system *C. elegans* together with molecular genetic tools and *in vivo* live imaging to study sleep.**

**Dr. Anne Griep, Professor of Cell and Regenerative Biology will teach unit 3 on Cervical Cancer: A Viral Disease. She is a cellular and molecular geneticist who studies how disruptions in molecular and genetic pathways contribute to disease.**

**Graduate TAs**

- **Gonzalo Barcelo Carvajal is a PhD student in Forest and Wildlife Ecology. He is interested in applying his background in animal physiology to inform management and conservation efforts. His dissertation is focused on puma ecology.**

- **Evie Moran is a Masters Student in Water Resources Management. She is broadly interested in wetland and aquatic ecology, specifically fish and wildlife interactions with invasive species and sustainable management practices.**

#### **Undergraduate TAs**

- **Sarah Almutawa**
- **Isa Butz**

#### **Staff**

- **Carol Borcharding Biocore's Program Administrator will help with enrollment issues. Please contact Carol if you need to switch sections or have any questions regarding enrollment.**
- **Diana Tapia Ramon Biocore's High Impact Practice Facilitator who helps with course support. If you have any questions or suggestions to improve the canvas page, please let her know. Let Diana know by February 3, if you have any McBurney accommodations, exam conflicts, and/or religious holidays that conflict with a course activity.**
- **Dr. Janet Batzli, Biocore's Associate Director will help with course coordination, work with faculty, TAs and uTAs to help the course run smoothly.**

#### **Faculty**

Trina McMahon	<a href="mailto:trina.mcmahon@wisc.edu">trina.mcmahon@wisc.edu</a>	5552 Microbial Sciences Building	
Anne Griep	<a href="mailto:aegriep@wisc.edu">aegriep@wisc.edu</a>	4455 WIMR	608-262-8988
Han Wang	<a href="mailto:han.wang@wisc.edu">han.wang@wisc.edu</a>	115 iBio Research	608-262-3336

#### **Teaching Assistants**

Gonzalo Barcelo Carvajal	<a href="mailto:barcelocarva@wisc.edu">barcelocarva@wisc.edu</a>
Evie Moran	<a href="mailto:elmoran2@wisc.edu">elmoran2@wisc.edu</a>
Sarah Almutawa (uTA)	<a href="mailto:salmutawa2@wisc.edu">salmutawa2@wisc.edu</a>
Isa Butz (uTA)	<a href="mailto:ibutz@wisc.edu">ibutz@wisc.edu</a>

#### **Biocore Administration**

Janet Batzli	<a href="mailto:jcbatzli@wisc.edu">jcbatzli@wisc.edu</a>	363 Noland Hall	
Carol Borcharding	<a href="mailto:carol.borcharding@wisc.edu">carol.borcharding@wisc.edu</a>	345 Noland Hall	608-265-2870
Diana Tapia Ramon	<a href="mailto:dtapia2@wisc.edu">dtapia2@wisc.edu</a>	361 Noland Hall	

#### **Course Description**

Welcome to your fourth semester of Biocore! Biological Interactions is intended to help you integrate the material you have learned in the previous three semesters of Biocore, and your other classes, and apply it to some areas of active research. We will consider three topics and will look at some of the ecology, genetics, cell biology, physiology, and biochemistry relevant to understanding these issues. The course will be focused around a series of papers from the scientific literature and will provide you with opportunities to gather information, visualize, analyze, explore, and plan strategies for the investigation of complex biological problems. The three topics are: 1) The Microbial World: Diversity, Complexity, and the Foundation of Earth's Ecosystems, led by Dr. Trina McMahon, Department of Bacteriology; 2) Genetic Analysis of Sleep, led by Dr. Han Wang, Department of Integrative Biology; 3) Cervical Cancer: A Viral Disease, led by Dr. Anne Griep, Department of Cell and Regenerative Biology. The final two weeks of the course will be devoted to a team project centered around science communication.

The schedule of the units is given on page 7.

## Overall Course Learning Goals

At the end of Biocore you should be able to:

- Work as a productive, collaborative member of a team.
- Use terminology and conventions accurately and appropriately.
- Explain why there is not always just one right answer to a question.
- Draw on experience, accumulated knowledge, and creativity to solve complex biological problems.
- Build a logical evidence-based argument.
- Describe how a whole system works from the molecular to the organismal level.
- Frame sophisticated biological questions and formulate testable hypotheses, using appropriate methods to test your hypothesis.
- Read and analyze primary scientific literature.
- Think as a biological scientist and be able to communicate your knowledge to others.

## Course Format and Scheduling

Biocore 587 is a 3 credit Honors class with 3 x 50-minute lecture sections (11:00 MWF in room 168 Noland Hall) and 50 minute discussion section on Tuesday. You should plan to spend a minimum of 6 hr/week outside of class reading the papers, study guides, and textbook and meeting with your team.

In this final semester of Biocore you will be given more responsibility for your own learning. Therefore, the class is structured to build in time for you to discuss the material in teams and less time for the faculty to lecture. The week prior to each unit, the paper(s) for the week and a study guide will be posted on the course website. In general, a topic will be introduced in lecture on Friday and the Monday lecture will provide more background material, but we will generally **not** be discussing the papers in lecture. **It is essential that everyone reads the assigned papers and background references before the lecture on Monday.** On Tuesday in the discussion there will be a quiz, focusing on vocabulary terms, background, or methods discussed in the study guide or lecture that we consider essential to understanding the topic. The remainder of discussion section will focus on more complex techniques or concepts crucial for understanding the paper(s). On Wednesday in class you will work in teams on worksheets that pose questions based on the papers for that week. The Friday class will consist of discussion of the worksheets, summary of the week's material, and the introduction of the next week's material.

## Biocore 587 Assignments, Exams, and Grades

Your grade for Biocore 587 will be based on your performance on the 9 Tuesday discussion quizzes, the 9 Wednesday team worksheets, three exams, and the final team project (which will count as two worksheet grades). The percentages of the grade are as follows: worksheets and final project 45%, quizzes 10%, exams 45%. Neither the course as a whole nor the various activities are curved. (Intermediate grades [AB and BC] **may** also be used, but this will be decided by the faculty team at the end of the semester.)

<u>Percentage</u>	<u>Letter Grade</u>
100-90%	A
89-80%	B
79-70%	C
69-60%	D

### Opportunities to demonstrate achievement of learning outcomes

Assessment	Date/ Time	Weight %
Unit 1 Exam	Tues Feb 21, 7:30-9:00pm	15
Unit 2 Exam	Tues Mar 28, 7:30-9:00pm	15
Unit 3 Exam	Tues, April 25, 7:30-9:00pm	15
Quizzes (9)	Tuesday Discussion	10
Group Worksheets (9)	Wednesday Lecture	45
Final Project (equivalent to two worksheets)	Final Exam time May 12, 12:25pm	

You cannot make up a missed Quiz or Group Worksheet. We will work with you regarding illness and personal emergencies on a case-by-case basis. If you are ill, have a family emergency, or if you have a planned absence contact your TA and Diana Tapia Ramon as soon as possible, preferably before the missed session. If you are late for a Wednesday session, please note the time of arrival on the worksheet and you will receive credit only for the portion of the time that you were present. Everyone must sign in on the worksheet on Wednesday.

Lecture notes or slides are not posted on the website. If you miss a lecture, talk with members of your group. If there is a figure that is not included in the textbook and is crucial for your understanding of the material, it is typically included in the study guide or posted at the instructor's discretion.

### Focus on Cooperative Learning

A course like this requires more planning by the faculty and more effort by you to understand the material. Why are we doing this? There are two reasons. First, our teaching goals are to help you integrate your knowledge of biological principles into a consistent internal framework and to develop skills that will allow you to work through any type of complex biological problem in the future. These skills are more important than the specific content of this course. Research on teaching and learning has shown that giving students the opportunity to work with peers to solve complex problems is the most effective way to meet these goals. Second, we want to help you develop your professional communication and teamwork skills; these will be essential in your future career.

### Team Member Roles

You will be assigned to a team for the semester; your assignment will be given to you in the first

week. Please sit with your team during the Wednesday class meetings when you will work together on worksheets. Within each team there are four “roles”. Each week we ask that you rotate to a different role. It will be up to you and your teammates to keep track of who has what role each week. Although some people may be more comfortable in a particular role, the point of trading roles is to help you expand your skill set by trying out different roles, so please do rotate the roles. The roles are:

**Facilitator:** Makes sure everyone understands each worksheet question before discussing it, encourages everyone to participate, encourages cooperative behavior, helps the group to reach consensus.

**Monitor:** Keeps everyone on task, monitors time, moves the group along to assure that the tasks get done.

**Recorder:** Records the group's consensus answers to the worksheet questions, submits the worksheet at the end of class Wednesday.

**Challenger:** Actively participates in the discussion, questions the reasoning behind the answer (be a devil's advocate), questions the other group members to be sure the reasoning makes sense.

All members of the team are responsible for being sensitive to the feelings and level of understanding of the others, promoting interactions, and being prepared for team meetings. This includes knowing what biological question is being addressed by the research paper and the scientific methods used to attempt to answer the question. If one member of the team misses class, designate a team member to contact them and find out if there is a problem. It is imperative that you meet with your team members for a minimum of an hour before the class on Wednesday to discuss the papers and go over the study guides. Pay attention to the questions in the study guides! We have data to show that teams that meet productively together before Wednesday consistently do better in the course than those that do not. These meetings work best when everyone comes prepared and there is a plan on how best to use the time. Some teams have tried virtual meetings, but report that they are a poor substitute for a face-to-face meetings.

## Worksheets

Rather than doing the worksheets on paper, we will be doing them on your computer. You can access the worksheet as a downloadable Word document from Canvas. One completed worksheet per group will need to be uploaded at the end of the class. This will require that each team have one fully charged laptop in class on Wednesday. If you do not have a charged laptop, let Diana Tapia Ramon know and we can supply a computer if given advance warning. We will provide one paper copy of the worksheets for you to read the questions and to be used if we have computer or internet issues. We will post a PDF of the worksheet on the class website after class on Wednesday so that you can print it out, do it yourself, and bring it to class on Friday to take notes as we discuss some of the questions.

## Board of Directors

We solicit student representatives who would like to represent Biocore 587 in the weekly staff meeting (Monday's immediately after lecture). These students will be the voice of all students to let the faculty know of issues and concerns regarding the course. One representative each week will write up “minutes” summarizing the meeting that will be included in the weekly

announcements. This is a good opportunity to contribute to course improvement and student advocacy. In addition, as a BOD member, you can get to know the course instructors better.

### **Texts and Reading Materials**

We will make use of your previous Biocore textbooks as reference materials: Hardin, J., Lodolce, J., *The World of the Cell*, 10<sup>th</sup> ed. (2022) from 383 and the textbooks from 381, these are all available on canvas.

The papers and study guides that will serve as the main texts for the course will be posted on Canvas (<https://canvas.wisc.edu/courses/330115>). You are required to have copies of all the papers and the study guides. We have prepared the study guides to help you in reading the papers. Based on studies that demonstrate that reading on paper leads to better retention than reading on a screen, we recommend that you print out the papers and study guides each week. The study guides will list the **learning objectives, vocabulary, and techniques** for each week, draw your attention to which parts of the paper are most important to understand, and provide supporting material not available in your texts. In addition, we will sometimes expand in lecture on material in the study guide and the illustrations will be helpful. The materials for each week will be available online usually by Wednesday of the previous week. **Bring your copies of the papers and the study guides to class every day!** If you need assistance with accessing the materials, contact your TA or Diana Tapia Ramon.

### **Strategies for Success**

This is a challenging course, and it will take you several hours to get through each of the assigned papers and the associated reference material, so plan accordingly. The study guide will list the papers for the week, topics to review, vocabulary to learn, and techniques you will be expected to become familiar with. **Plan to have the papers read BEFORE class on Monday.** Before you read the papers, review the listed materials in your texts, look up the vocabulary words, and review the techniques. The best approach is to use your study guide as you read the papers. The questions in the study guide are intended to alert you to issues we want you to think about; pay attention to those questions!

Some of the experiments described in these papers may be hard to understand, because the techniques may be unfamiliar and because the authors often assume you can follow their logic without explaining it. We point out in the study guide or in discussion section what aspects of the experiments we expect you to understand. We provide support in the study guides, introductory lectures, and discussion sessions, but the best way to use these is to discuss them with your fellow team members. Plan your weekly meeting before Wednesday but **after** you have read the paper and reference materials. Discuss each other's questions and then go over each of the figures (except those that the study guide tells you to omit) and the questions in the study guide. You should do this before the Wednesday class period to be able to complete the worksheet in the allotted time. We have structured this course around teams because a large part of learning is translating what you read and hear into your own language. You do that by talking or writing about it. Explaining a concept to a peer helps both of you deepen your understanding. Find out how well you really understand the material before the quiz and worksheet by talking about it with your teammates.

If you need help with the material, discuss it with your teammates, contact your TA during their office hours, or contact the faculty member in charge of the unit (we prefer email or talk to us before or after class, if more time is needed, we can set up a meeting). Be as specific as you can about what you do not understand. This makes it easier to help you. We anticipate that the

process of understanding the papers will get easier as you become more experienced at this. However, it will continue to take time. Our goal for you by the end of this semester is to be able to critically read and understand scientific papers with limited (or no) help from us. This does not mean that you will understand everything the first time you read a paper, but rather that you will be able to identify the relevant background information that you need, recognize gaps in your knowledge, have strategies for acquiring the information you need, then study the paper, and decide whether you are convinced by the authors' conclusions. We strongly believe you will find this experience worth the effort.

**Biocore 587: Biological Interactions  
Class Schedule**

**Spring 2023**

<b>Week</b>	<b>Dates</b>	<b>Instructor</b>	<b>Topic</b>
1	1/24-1/27	McMahon	Course Introduction and Introduction to Unit 1
<b>Unit 1: The Microbial World: Diversity, Complexity, and the Foundation of Earth's Ecosystems</b>			
2	1/30 – 2/3	McMahon	The Unseen Majority
3	2/6 – 2/10	McMahon	The nitrogen cycle and how we harness microbes to remove nitrogen from sewage
4	2/13 – 2/17	McMahon	Spookmicrobes: the missing lithotroph that oxidizes ammonia anaerobically
5	2/20-2/24	McMahon/Wang	Review, Unit 1 exam, and start of Unit 2
Unit 1 Exam 2/21 7:30 pm			
<b>Unit 2: Genetic Analysis of Sleep</b>			
6	2/27-3/3	Wang	Use forward genetics screen to identify sleep regulatory genes
7	3/6-3/10	Wang	Use suppressor screen to study molecular pathways for sleep regulation
3/11-3/19 SPRING BREAK			
8	3/20-3/24	Wang	Combine human genetics and animal model to understand sleep
9	3/27-3/31	Wang/Griep	Unit 2 Review, Unit 2 Exam, and start of Unit 3
Unit 2 Exam 3/28 7:30 pm			
<b>Unit 3: Cervical Cancer: A Viral Disease</b>			
10	4/3-4/7	Griep	Investigating how the HPV oncoproteins may lead to cancer: Interaction between HPV oncoproteins and tumor suppressor proteins
11	4/10-4/14	Griep	Investigating the role of the Papillomavirus oncogenes in carcinogenesis in animal models
12	4/17-4/21	Griep	Current and future directions in the prevention and treatment of cervical cancer: Vaccine development
13	4/24-4/28	Griep/Team	Unit 3 Review, Unit 3 Exam, and start of project
Unit 3 Exam 4/25 7:30 pm			
14	5/1-5/5	Team	Biocore Graduation on Friday 5/5 at 11:00am Project completion due date will be announced during class
<b>Final Project Presentation Friday May 12, 12:25pm</b>			