Instructor: Michele Culumber, Ph.D
Office: Tracy Hall 450H
Phone: 801-626-7795
Email: mculumber@weber.edu

Course Website: canvas.weber.edu (sign in with your Weber ID and password). Most course communication should take place in Canvas.

Office Hours:
9:30-10:30 Monday and Wednesday, and 2:30-3:30 Tuesdays and by appointment. Appointments can be made at http://culumber-microbiology.youcanbook.me, or by scanning the QR code.

Course Themes:

1. The microbiome is composed of diverse microorganisms that work in symbiotic relationships with each other and with the host. These interactions influence the health and development of the host.

2. Microorganisms are essential in the evolution of higher organisms.

3. Microbiome research is hypothesis-driven scientific research based largely on genomic analysis. Research in this field is complicated and sometimes incorrectly interpreted. We will discuss how to evaluate claims based on microbiome data.

4. A deeper understanding of the microbiome will have dramatic impacts on human and animal health and wellbeing.

“Like” us on Facebook: Weber State University Microbiology Department (Job announcements & articles)
“Follow” us on Instagram: @Weberstatemicro
This course meets the Life Science General Education requirements as listed below.

**Mission Statement for the Natural Sciences General Education Program**

The mission of the natural sciences general education program is to provide students with an understanding and appreciation of the natural world from a scientific perspective.

Science is a way of knowing. Its purpose is to describe and explain the natural world, to investigate the mechanisms that govern nature, and to identify ways in which all natural phenomena are interrelated. Science produces knowledge that is based on evidence and that knowledge is repeatedly tested against observations of nature. The strength of science is that ideas and explanations that are inconsistent with evidence are refined or discarded and replaced by those that are more consistent.

Science provides personal fulfillment that comes from understanding the natural world. In addition, experience with the process of science develops skills that are increasingly important in the modern world. These include creativity, critical thinking, problem solving, and communication of ideas. A person who is scientifically literate is able to evaluate and propose explanations appropriately. The scientifically literate individual can assess whether or not a claim is scientific, and distinguish scientific explanations from those that are not scientific.

**Foundations of the Natural Sciences Learning Objectives**

After completing the natural sciences general education requirements, students will demonstrate their understanding of general principles of science:

1. **Nature of science.** Scientific knowledge is based on evidence that is repeatedly examined, and can change with new information. Scientific explanations differ fundamentally from those that are not scientific.

2. **Integration of science.** All natural phenomena are interrelated and share basic organizational principles. Scientific explanations obtained from different disciplines should be cohesive and integrated.

3. **Science and society.** The study of science provides explanations that have significant impact on society, including technological advancements, improvement of human life, and better understanding of human and other influences on the earth’s environment.

4. **Problem solving and data analysis.** Science relies on empirical data, and such data must be analyzed, interpreted, and generalized in a rigorous manner.

**The Life Sciences Learning Objectives**

Students will demonstrate their understanding of the following characteristics of life:

1. **Levels of organization:** All life shares an organization that is based on molecules and cells and extends to organisms and ecosystems.

2. **Metabolism and homeostasis:** Living things obtain and use energy, and maintain homeostasis via organized chemical reactions known as metabolism.

3. **Genetics and evolution:** Shared genetic processes and evolution by natural selection are universal features of all life.

4. **Ecological interactions:** All organisms, including humans, interact with their environment and other living organisms.

**BIG QUESTION**

Why is Your Microbiome Important to YOU?
Textbook and Resources

Textbooks:


Required: *Microbiology.* OpenStax Microbiology, Microbiology. 2016. By Parker, N., Schneegurt, M., Tu, A., Forster, B., and Lister, P. (OpenStax CNX. May 28, 2018 http://cnx.org/contents/e42bd376-624b-4c0f-972f-e0c57998e765@5.3.)

- This is a free online textbook of Microbiology. It is available as an iBook or for Kindle, or can be accessed from the website (search for Openstax Microbiology)
- This text can also be purchased as a hard cover textbook for approximately $50 from Amazon.

Other Resources:

Website: We will use Canvas as the course website, http://canvas.weber.edu. You are required to check this site often. It will contain module outlines, supplemental information, discussions, and assignments. The discussion board and chat features will be made available for your use. Help using Canvas can be obtained by calling 801-626-7777.

Course schedule of topics, assignments, and exams will be posted on the Canvas course website and calendar.

Recommended Laboratory Materials:

1. A bound lab notebook containing lined pages. This will be used to record your lab results. An example of the type to be purchased will be shown during the first class. You must have this by Tuesday, August 28. (These may be purchased anywhere)
2. A thin permanent marker, e.g. as made by Sharpie®, should be brought to lab each time. These are not available in the lab.
3. Lab coat (optional – coats can be provided)
4. Eye protection. (Provided if needed)

Policies and Procedures

Information for Students with Disabilities:

Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in Room 181 of the Student Service Center. SSD can also arrange to provide course materials (including this syllabus) in an alternative format if necessary. Any student who has already arranged for accommodations should make an appointment with the professor to discuss these arrangements as soon as possible.

Extenuating circumstances:

Unforeseen problems can arise during a semester. Serious illnesses for yourself or a family member, for example, can be a tremendous distraction to your studies. If you encounter extenuating circumstances that are affecting your ability to attend class, study, or to otherwise perform your best, you should seek assistance from Student Counseling Center (http://www.weber.edu/CounselingCenter/) or other University resources. I will always be available to help you find assistance. Students who are called up to active military duty need to contact the Veterans’ Administration on campus to discuss your options.
Academic Honesty:
Cheating, as defined by the Student Code (documents.weber.edu/ppm/6-22.htm), will be reported to the administration and will result in a failing grade. Exams will be administered on ChiTester and I expect that you will follow the testing center rules regarding behavior during exams. Only materials explicitly mentioned in the exam are allowed during testing.

Classroom Conduct:
Students are expected to adhere to the student code (documents.weber.edu/ppm/6-22.htm). Distracting or disrespectful behavior will result in removal from the class.

Attendance Policy:
1. This is an Honors course. I expect that students will attend class and participate in discussions, labs, and activities.
2. Attendance will be taken and reported on Canvas and Starfish.
3. Incomplete grades will not be offered without documented extenuating circumstances that meet the requirements outlined in the PPM.
   https://www.weber.edu/Records/Grading_System.html

Classroom Technology:
You are encouraged to bring an internet (WiFi preferable) enabled tablet, laptop, or smartphone, to class so you can participate with a classroom response system or to obtain information. However, devices are to be used to participate in class only. The classroom response system we use will be free for students and will be used to monitor participation and as a formative assessment tool. Further information will be given in class.

Influenza and Other Disasters:
If you become sick with influenza (cough with a fever) please stay home until you no longer have a fever. If you are coughing in class, I reserve the right to have you wear a mask. See the exam policy for missed exams. Labs cannot be made up. If I cannot attend due to influenza, arrangements will be made to have another instructor cover the course.

Flu vaccines are free for students and available at the Student Health Center (https://www.weber.edu/healthcenter/) in late September or early October.

In the event that campus is closed due to a geological, biological, meteorological, or other emergency, please check the course website for instructions. Sign up for Code Purple for campus emergency instructions and announcements.

Starfish Advising
We Care About Your Success! Weber State University uses Starfish® to help identify students who may need additional support in order to achieve academic success. Throughout the term, you may receive emails from Starfish® regarding your course grades or academic performance. Please pay attention to these emails and consider taking the recommended actions. If you receive one of these alerts, please keep in mind they are meant to help you achieve success—they do not affect your grade, or carry any punitive action. Students may also raise flags in Starfish® that signal to the instructor and academic advisor that they need additional help. Advisors are available to connect students with a variety of campus resources and answer questions. You may find the Starfish program at your eWeber portal.
Assessments
Your progress in this course will be assessed with a combination of exams, discussions, projects and the signature assignment. Information about all of the assessments will be posted on Canvas.

Grades

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Total % of Grade (weight)</th>
<th>Number</th>
<th>Approximate Points Each</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM Chapter Reflections</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Exam 1</td>
<td>15</td>
<td>1</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Exam 2</td>
<td>15</td>
<td>1</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Exam 3</td>
<td>15</td>
<td>1</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Project Belly Button Microbiome</td>
<td>5</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Project Evaluate a Probiotic</td>
<td>5</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Case Study Worksheets</td>
<td>10</td>
<td>5</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Signature Assignment</td>
<td>15</td>
<td>1</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Book Discussion Group Project</td>
<td>15</td>
<td>1</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

Lecture Exams, 45% (total): There are three exams. These exams will assess your mastery of the course content based upon the objectives. Material covered will be from lecture and from the text. These exams will be given on ChiTester, but may also have a take-home component.

The last exam must be completed by the end of the day on Dec, 13th (scheduled final exam day for this class).

All exams will be available at all of the WSU testing centers, including satellite campuses. It is your responsibility to know the testing center hours and policies. This information can be found at http://www.weber.edu/TestingCenter/default.html.

Signature Assignment 15%
Toward the middle of the semester you will be assigned a “signature assignment” to address and assess the larger learning outcomes related to the objective “Impacts of Microbes on Human Society.” This project will involve developing a presentation that addresses the question “What is the future impact of microbiome research on health and medicine?”
Grades will be assigned on the following percentage basis after weighting:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100% to 93%</td>
</tr>
<tr>
<td>A-</td>
<td>&lt; 92% to 90%</td>
</tr>
<tr>
<td>B+</td>
<td>&lt; 89% to 87%</td>
</tr>
<tr>
<td>B</td>
<td>&lt; 86% to 83%</td>
</tr>
<tr>
<td>B-</td>
<td>&lt; 82% to 80%</td>
</tr>
<tr>
<td>C+</td>
<td>&lt; 79% to 77%</td>
</tr>
<tr>
<td>C</td>
<td>&lt; 76% to 73%</td>
</tr>
<tr>
<td>C-</td>
<td>&lt; 72% to 70%</td>
</tr>
<tr>
<td>D+</td>
<td>&lt; 69% to 67%</td>
</tr>
<tr>
<td>D</td>
<td>&lt; 66% to 63%</td>
</tr>
<tr>
<td>D-</td>
<td>&lt; 62% to 60%</td>
</tr>
<tr>
<td>E</td>
<td>&lt; 59% to 0.0%</td>
</tr>
</tbody>
</table>

The professor reserves the right to lower the grading parameters if it becomes necessary. The official policy will be strictly adhered to concerning incomplete grades (consult the WSU catalog)

Other Important Dates: The last day to cancel (CL) is Sept. 17. The last day to withdraw (W grade) is Nov. 6. The last day of the semester is Dec. 7. Your final exam must be completed by the end of the day December 14th. No work can be submitted after December 7th, the last day of classes.

HNRS 1570 Your Microbial You

This outline will give you an idea of the order of topics covered in this class and the assigned reading. The order of topics may change. All reading assignments and supplemental materials will be posted on Canvas.

1. The Microbial World – 3 weeks.
   *I Contain Multitudes* Ch 1, 2, & 3
   a. What are microorganisms? What is a microbiome
      Reading Microbiology
      i. Cell structure, size, types
         *Microbiology* Chapter 3
      ii. Ways we describe microorganisms, ways we visualize microorganisms
         Chapter 2.2-2.3
      iii. Viruses
         Chapter 6.1-6.2
      iv. **Lab: tooth scraping and microscopy**
         Chapter 2.2-2.3
   b. Microbial diversity & Evolution
      i. Levels of microbial diversity: Domains, phyla, genus, species
         Chapter 1.3
      ii. Symbiotic relationships
         Chapter 4.1, 4.6
      iii. Microbial evolution phylogenetic trees
         Chapter 1.2
   c. How Microbes Grow and Metabolic Diversity
      i. Basics of metabolism
         Chapter 8.1-8.3; 8.6; 8.7
      ii. How microbial cells grow
         Chapter 9.1
      iii. Metabolic diversity and growth requirements
         Chapter 9.2-2.5

2. How we study microbiomes – 2 weeks
   *I Contain Multitudes* 4 & 5
   a. Genomics
      i. What is a genome? Understanding the relationship between DNA, RNA, and Proteins
         Chapter 10.1-10.4; 11.1-11.5
      ii. Horizontal gene transfer
         Chapter 11.6
      iii. DNA and whole genome a sequencing
         Chapter 12
      iv. Advantages and disadvantages
      v. **Lab/Case Study: look at microbiome data examples**
   b. Experiments & Data
      i. History
      ii. Microbiome data – levels of diversity
      iii. Animal studies (lean vs. obese mice)
iv. Human studies  
v. Advantages and disadvantages  
c. Model organisms and what we learn:  
   i. Mice  
   ii. Bobtail squid  
   iii. Other examples  
3. Host Microbe interactions - 3 weeks.  
   * I Contain Multitudes 6 & 7  
   a. Symbiosis and Coevolution  
   b. The Immune System  
      * Chapters 17 & 18  
         i. Evolution of the interactions between MB and Immune system – Immune 
            system as a gardener  
         c. Positive interactions – How the MB helps  
         d. Dysbiosis – What happens when the MB goes wrong – **Bean microbiome**  
            activity  
         e. Viruses  
4. Humans (or animals) as microbial habitats -3 weeks.  
   * I Contain Multitudes Ch 8 &9  
   a. System by system survey  
      * Chapter 21.1; 22.1; 23.1; 24.1; 26.1  
         i. **Lab Belly button microbiome (culture and mock data)**  
         ii. Different systems, skin, oral, GI, urogenital, etc. – Jig saw activity  
            1. Environmental conditions (nutrients, pH, oxygen, etc)  
         iii. **Gut brain axis**  
   b. Impact of the environment  
      i. Uncontacted American’s study  
      ii. Baby’s first microbiome  
      iii. MB development from birth Æ adult  
5. The future of MB research in Medicine - 3 weeks.  
   * I Contain Multitudes Ch 10  
   a. Identifying Risk Factors for Dysbiosis, The role of the MB in autoimmune diseases  
      i. Diseases/conditions that might be mediated or fixed by the MB  
   b. Bugs as Drugs: Repairing the microbiome, probiotics, prebiotics, and fecal 
      transplants  
   c. Preventing disease through host/microbe modifications: e.g. malaria 
      eradication