

WELCOME TO MICROBIOLOGY LABORATORY. HERE WE'LL BE USING TECHNIQUES IN MICROBIAL PHYSIOLOGY, MICROBIAL GENOMICS, MICROBIAL EVOLUTION, AND MICROBIAL ECOLOGY TO EXPLORE THE ROLE OF MICROBES IN HEALTH, INDUSTRY, AND THE ENVIRONMENT. INQUIRY-BASED EXPERIMENTS WILL COVER THE FUNDAMENTALS OF BOTH WORKING WITH LIVE MICROSCOPIC ORGANISMS AT THE BENCH AND BIOINFORMATICALLY ANALYZING THEIR GENOMES AT THE COMPUTER.

LECTURE, YORK 3010, T+H 9:30-10:50
LAB, TATA 2101+2102, T+H, 11-2:50

INSTRUCTOR DR. KATHERINE PETRIE



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OFFICE: MUIR BIO 2202

OFFICE HOURS: M 9:30-10:30

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DID YOU KNOW UCSD HAS CORE SKILLS FOR ALL STUDENTS TO MASTER? HERE ARE SOME OF THEM.

WHAT THIS COURSE WILL ENABLE YOU TO DO:

LEARNING OUTCOMES AKA LO'S

BY THE END OF THE COURSE YOU'LL BE ABLE TO:

1. APPRECIATE THE STRUCTURE, PHYSIOLOGY, AND DIVERSITY OF MICROORGANISMS.
2. APPRECIATE INTERACTIONS OF MICROBES WITH OTHER ORGANISMS.
3. APPRECIATE INTERACTIONS OF MICROBES WITH THEIR ENVIRONMENT.
4. DETECT AND INTERPRET EVIDENCE OF MICROBIAL EVOLUTION.
5. ISOLATE, IDENTIFY, GROW, AND QUANTITATE MICROORGANISMS.
6. EXECUTE LABORATORY TASKS USING ASEPTIC TECHNIQUE.
7. PLAN AN EXPERIMENT FROM A GENERAL OUTLINE OF RESEARCH OBJECTIVES.
8. ANALYZE AND INTERPRET EXPERIMENTAL DATA TO DRAW ACCURATE AND STATISTICALLY SOUND CONCLUSIONS.
9. COMMUNICATE SCIENTIFIC RESEARCH - ITS JUSTIFICATION, METHODS, AND FINDINGS - EFFECTIVELY.
10. RECOGNIZE UNKNOWN'S IN MICROBIOLOGY
11. VALUE THE RELEVANCE OF MICROBIOLOGY TODAY

GOALS FOR
BIO MAJORS

GOALS FOR
ALL STUDENTS

UNDERSTAND
BIOTIC AND PHYSICAL
INTERACTIONS

UNDERSTAND EVOLUTION
AND DIVERSITY

USE CONTEMPORARY
BIOLOGICAL RESEARCH
TECHNIQUES AND QUANTITATIVE
APPROACHES TO ANALYZE
RESULTS

QUANTITATIVE
REASONING

CRITICAL THINKING

CONSTRUCT
REASONABLE
HYPOTHESES
TO EXPLAIN
BIOLOGICAL
PHENOMENA

WRITTEN + ORAL
COMMUNICATION

RECOGNIZE THE
INTERACTIONS
BETWEEN
BIOLOGY AND
SOCIETY

INFORMATION LITERACY

HOW WILL YOU
DEMONSTRATE THAT
YOU ACCOMPLISHED
THE 11 LO'S?

ASSESSMENTS AND BASIS FOR FINAL GRADE:

ASSESSMENT	WEIGHT
IN-LECTURE CLICKER QUESTIONS	10 %
PACKBACK PARTICIPATION	10%
NOTEBOOK CHECKS	6 %
PRACTICAL	2 %
EFFECTIVE PARAPHRASING HOMEWORK	2 %
MICROBIAL ZOO	5%
MICROBES + HEALTH LAB REPORTS	20 %
MICROBES + INDUSTRY LAB REPORT	10 %
MICROBES + ENVIRONMENT PRESENTATION	5 %
MIDTERM EXAM	10 %
FINAL EXAM	20 %

NO BELL CURVE:
YOU WON'T BE
COMPETING
AGAINST
EACH OTHER!

GRADING SCALE

97-100	A+	(4.0)
93-97	A	(4.0)
90-93	A-	(3.7)
87-90	B+	(3.3)
83-87	B	(3.0)
80-83	B-	(2.7)
77-80	C+	(2.3)
73-77	C	(2.0)
70-73	C-	(1.7)
60-70	D	(1.0)
<60	F	(0)

FOR REPORT
GUIDELINES + RUBRICS,
STAY TUNED TO
TRITON ED!

MATERIALS NEEDED TO SUCCEED:

A CLICKER: FOR LECTURE, YOU ARE REQUIRED TO HAVE AND BRING AN i>clicker THAT IS REGISTERED VIA CANVAS.

LAB MANUAL: PHYSICAL COPY, AVAILABLE FROM THE BOOKSTORE (\$28), ISBN: 9781533901750

PACKBACK ACCESS CODE: WE'LL BE USING THIS AI-MODERATED FORUM TO DIVE DEEPER INTO THE TOPICS WE COVER IN CLASS. YOU'LL NEED TO PURCHASE AN ACCESS CODE, (\$28), AVAILABLE FROM THE BOOKSTORE WEBSITE (LOOK UP BIMM 121 UNDER 'TEXTBOOKS').

PPE: A LAB COAT THAT YOU ONLY USE FOR THIS CLASS THAT EXTENDS TO YOUR KNEES, SAFETY GLASSES (REGULAR PRESCRIPTION GLASSES AREN'T SUFFICIENT).

LAB NOTEBOOK: BOUND STYLE, WITH CARBONS

CANVAS: GRADES, AND OTHER COURSE INFORMATION WILL BE POSTED ON CANVAS, SO MAKE SURE YOU CAN ACCESS IT VIA COURSEFINDER.UCSD.EDU.

SOMETHING TO TAKE NOTES WITH DURING LECTURE: LECTURES WILL BE PODCAST, BUT RESEARCH SHOWS THAT PEN + PAPER NOTE-TAKING IS BEST.

HOW TO SUCCEED IN THIS CLASS:

DAILY CLICKER QUESTIONS (10% OF GRADE):

LECTURES WILL START WITH A BRIEF CLICKER 'QUIZ' ON THE BASIC DETAILS FOR THE UPCOMING LAB. IF YOU'VE READ THE LAB MANUAL PAGES FOR THE NEXT LAB SESSION, YOU SHOULD BE ABLE TO ANSWER THESE QUESTIONS. AFTER THAT, THERE WILL BE CLICKER QUESTIONS THROUGHOUT THE LECTURE THAT WILL CHALLENGE YOU TO APPLY WHAT YOU'VE JUST LEARNED. FOR THIS SECOND TYPE, YOU WILL USUALLY HAVE THE OPPORTUNITY TO COLLABORATE WITH YOUR NEIGHBORS.

EVERY DAY YOU WILL HAVE THE OPPORTUNITY TO EARN:

- 2 PARTICIPATION POINTS (SUBMIT ANSWER TO 75% OF ALL QUESTIONS FOR 2 PTS, ELSE GET 0/2)
- 3 PERFORMANCE POINTS (GET 1 PT FOR EVERY CORRECTLY ANSWERED QUESTION)

THERE ARE USUALLY MORE THAN 3 CLICKER QUESTIONS PER CLASS, SO EVEN IF YOU GET SOME WRONG YOU MAY STILL GET FULL POINTS.

IF YOU MISS LECTURE....

IF YOU MISS LECTURE, OR IF YOUR CLICKER IS HAVING TECHNICAL DIFFICULTIES, YOU MAY NOT MAKE UP THE QUESTIONS. HOWEVER WE'LL DROP YOUR LOWEST 4 CLICKER DAYS.

IF YOU MISS THE MIDTERM, YOUR FINAL WILL BE WORTH A BIGGER % OF YOUR GRADE TO COMPENSATE. IF YOU MISS THE FINAL, YOU MAY BE ELIGIBLE FOR AN INCOMPLETE.

USE THESE DROPS WISELY: IT'S BETTER TO SAVE THEM FOR THE UNEXPECTED.

IF YOU MISS LAB...

YOU MUST LET DR. PETRIE, YOUR IA, + YOUR GROUP KNOW AHEAD OF TIME. YOU WILL STILL BE RESPONSIBLE FOR WHAT YOU MISSED. IN THE CASE OF REPEATED ABSENCES, YOU MAY BE ASKED TO PROVIDE DOCUMENTATION. ABSENCES DUE TO SCHEDULING CONFLICTS (OTHER COURSEWORK, VACATIONS, LIZZO CONCERTS, ETC) WILL NOT BE EXCUSED AND EACH WILL RESULT IN A PENALTY (1 % OFF OVERALL GRADE).

NOTEBOOK CHECKS (6% OF GRADE)

THERE WILL BE WEEKLY IN-LAB CHECKS OF YOUR LAB NOTEBOOK. THE GUIDELINES FOR HOW TO KEEP YOUR NOTEBOOKS ARE IN THE LAB MANUAL. ONE THING THAT WILL HELP YOU ENSURE YOU GET FULL CREDIT IS TO ANSWER ALL QUESTIONS LISTED IN THE MANUAL

PACKBACK (10% OF GRADE)

THIS AI-MODERATED DISCUSSION FORUM IS A KEY LEARNING TOOL FOR THE CLASS. IT IS DRIVEN BY YOUR CURIOSITY AND WILL HELP YOU MAKE CONNECTIONS BETWEEN WHAT WE LEARN IN CLASS AND THE REAL WORLD.

EVERY WEEK, YOU ARE REQUIRED TO:
MAKE 2 POSTS, AT LEAST 1 OF WHICH MUST BE A RESPONSE

TO EARN CREDIT, YOUR POSTS MUST MEET CERTAIN GUIDELINES. PACKBACK WILL ASSIGN A CURIOSITY SCORE TO EACH POST BASED ON ITS DEPTH, CREDIBILITY, AND PRESENTATION. CONSISTENTLY HIGH CURIOSITY SCORES ARE AN OPPORTUNITY TO EARN EXTRA CREDIT. YOU CAN MISS 2 PACKBACK WEEKS.

IF HEALTH OR FAMILY EMERGENCIES MAKE YOU MISS TOO MUCH, SEEDR. PETRIE TO DISCUSS THE POSSIBILITY OF AN "INCOMPLETE". PER UCSD POLICY, YOUR GRADE MUST BE IN GOOD STANDING TO BE ELIGIBLE.

INCLUSIVITY:

EVERYONE WILL COME TO THIS COURSE WITH DIFFERENT BACKGROUNDS, KNOWLEDGE, AND PERSPECTIVES. WE WANT TO CREATE A CLASSROOM CULTURE THAT RESPECTS AND REVELS IN THIS HUMAN DIVERSITY. IF YOU HAVE ANY CONCERNS RELATED TO INCLUSIVITY OR FEEL YOUR IDENTITIES (RACE, GENDER, SEXUALITY, RELIGION, ABILITY, ETC) ARE NOT BEING HONORED, PLEASE LET US KNOW! ACCOMMODATIONS CAN BE MADE FOR STUDENTS WITH A LETTER FROM THE OSD. FOR MORE INFORMATION ON CAMPUS + COMMUNITY RESOURCES, CHECK CANVAS.

ACADEMIC INTEGRITY:

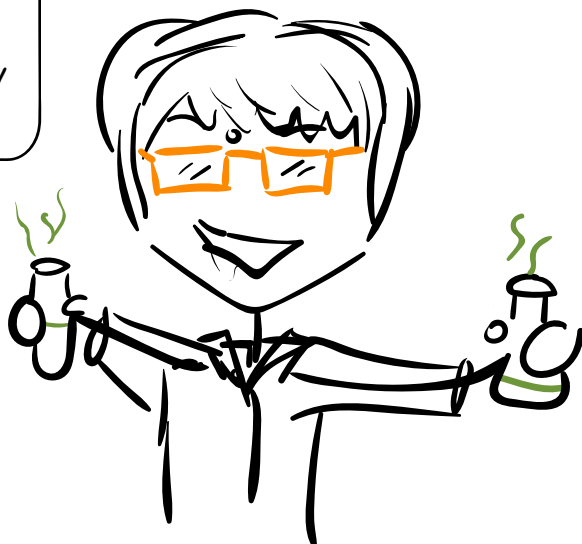
AN INCLUSIVE ENVIRONMENT IS ONE WHERE EVERYONE HAS AN EQUAL OPPORTUNITY TO SUCCEED. ACADEMIC DISHONESTY (INCLUDING, BUT NOT LIMITED TO: CHEATING, PLAGIARIZING, ANSWERING WITH SOMEONE ELSE'S CLICKER) FRACTURES THE PLAYING FIELD, BY GIVING SOME STUDENTS AN UNFAIR ADVANTAGE. ASSIGNMENTS WILL BE MONITORED VIA TURN-IT-IN, AND STUDENTS FOUND TO HAVE COMMITTED ACADEMIC DISHONESTY WILL BE REFERRED TO THE UCSD ACADEMIC INTEGRITY OFFICE AND MAY RECEIVE A FAILING GRADE FOR THE COURSE.

REGRADE REQUESTS:

WE ALL MAKE MISTAKES. IF YOU THINK YOUR HOMEWORK, WORKSHEET, REPORT, OR EXAM WAS GRADED IN ERROR, SUBMIT A REQUEST **BY EMAIL** TO DR. PETRIE WITHIN 7 DAYS OF RECEIVING YOUR GRADE. INCLUDE A WRITTEN DESCRIPTION OF THE ERROR, INCLUDING WHICH QUESTION YOU ARE CONCERNED ABOUT AND WHY YOU THINK THE GRADE IS MISTAKEN. **NO IN-PERSON REQUESTS WILL BE CONSIDERED.** THE REGRADE OPTION IS TO SAFEGUARD YOU FROM GENUINE MISTAKES IN GRADING; THERE IS NO GUARANTEE YOU SCORE WILL GO UP.

WE'RE WORKING TO IMPROVE YOUR EDUCATIONAL EXPERIENCE:

DID YOU KNOW THAT YOU CAN BE PART OF A RESEARCH STUDY IN THIS CLASS?



NO! NOT LIKE THAT! INSTEAD, DURING THIS CLASS, I'LL BE WORKING TO FIGURE OUT THE MOST EFFECTIVE TEACHING METHODS FOR YOUR LEARNING. THIS MEANS YOU MIGHT DO SURVEYS AND PROVIDE FEEDBACK. FOR MORE INFORMATION, PLEASE READ THE OPT-OUT FORM HANDED OUT IN CLASS OR ON CANVAS.

UCSD MICROBIOLOGY LABORATORY COURSE SCHEDULE (TENTATIVE):

MICROBES AND HEALTH

MICROBES AND INDUSTRY

MICROBES AND THE ENVIRONMENT

FALL
19

WEEK 1.

T LECT. (1/7): INTRO TO COURSE
T LAB. (1/7): LAB 1
H LECT. (1/9): CULTURES, COLONIES,
+ MICROSCOPY
H LAB. (1/9): LAB 2

PLEASE REMEMBER THAT YOUR WORK IN
LECTURE (CLICKERS) WILL BE GRADED, SO
BE SURE TO SHOW UP!

PARAPHRASING HW
DUE 1/14!

WEEK 2.

T LECT. (1/14): BIOFILMS + DILU-
TIONS 1
T LAB. (1/14): LAB 3
H LECT. (1/16): CELL APPEARANCE +
DILUTIONS 2
H LAB. (1/16): LAB 4

PARAPHRASING HW
REVISIONS DUE 1/21!

THE LAB PRACTICAL IS A GRADED OB-
SERVATION OF YOUR LAB SKILLS. MAKE
SURE YOU GET IN LOTS OF PRACTICE
BY SHARING THE WORK WITH YOUR
PARTNER IN WEEKS 1 + 2. WHILE YOU'RE
WAITING YOUR TURN, YOU CAN WORK ON
YOUR MICROBIAL ZOO.

WEEK 3.

T LECT. (1/21): MICROBIAL GENOMES
T LAB. (1/21): LAB 5
H LECT. (1/23): ILLUMINA SEQUENC-
ING
H LAB. (1/23): LAB 6, LAB PRACTI-
CAL

PRACTICAL! 1/23

MICROBES AND HEALTH**MICROBES AND INDUSTRY****MICROBES AND
THE ENVIRONMENT****WEEK 4.**

T LECT. (1/28): (MORE) ILLUMINA SE-
QUENCING

T LAB. (1/28): LAB 7

H LECT. (1/30): MIDTERM!!!!

H LAB. (1/30): LAB 8

**MIDTERM
1/30!**

SEE CLASS
WEBSITE FOR
LAB REPORT
GUIDLINES!

WEEK 5.

**BIOFILM LAB PART 1 DUE
TUE 2/4 11:59 PM**

T LECT. (2/4): FERMENTATION +
DIFFERENTIAL ID 1

T LAB. (2/4): LAB 9

H LECT. (2/6): PCR

H LAB. (2/6): LAB 10

WEEK 6.

T LECT. (2/11): DISCUSS DNA
LIBRARY POOL

T LAB. (2/11): POOL +SUBMIT ILLU-
MINA SEQUENCING (PLANNED)

T LECT. (2/11): NATURAL CRISPR

T LAB. (2/11): LAB 11

H LECT. (2/13): KNOWN CRISPER
LOCI IN L.A.B., DIFFERENTIAL ID 2

H LAB. (2/13): LAB 12

MICROBES AND
THE ENVIRONMENT

MICROBES AND HEALTH

MICROBES AND INDUSTRY



MICROBIAL ZOO
DUE TUE 2/18 11:59 PM

T LECT. (2/18): SANGER SEQUENC-
ING

T LAB. (2/18): LAB 13

H LAB. (2/20): LAB 14

T LAB. (2/25): LAB 15

H LECT. (2/27): BLAST, CRISPRS
AND THE MICROBIOME

H LAB. (2/27): LAB 16

T LECT. (2/25): PHOTOSYNTHESIS
AND TOLERANCE TO CHANGE

T LAB. (2/25): LAB 15

H LAB. (2/27): LAB 16

T LECT. (3/3): ANALYZING ILLUMINA
SEQUENCE DATA

T LAB. (3/3): LAB 17

H LECT. (3/5): FINAL REVIEW

H LAB. (3/5): LAB 18



YOGURT LAB REPORT DUE
FRI 3/6 11:59 PM

T LAB. (3/3): LAB 17

H LAB. (3/5): LAB 18

WEEK 7.

WEEK 8.

WEEK 9.

MICROBES AND HEALTH

MICROBES AND INDUSTRY

MICROBES AND
THE ENVIRONMENT

WEEK 10.

T LAB. (3/10): LAB 19

H LECT. (3/12): FINAL!!

H LAB. (3/12): LAB 20

FINAL!

H LECT. (3/12): FINAL!!

FINAL!

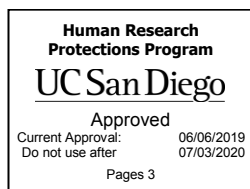
T LECT. (3/10): PRESENTATIONS!!

H LECT. (3/12): FINAL!!

FINAL!

BIOFILM LAB PART 2 DUE
THES 3/17 11:59 PM

THAT'S DURING
FINALS WEEK!



University of California, San Diego
Consent to Act as a Research Subject

Investigating the Impact of Pedagogical Choices on University Student Learning and Engagement

Who is conducting the study, why you have been asked to participate, how you were selected, and what is the approximate number of participants in the study?

Gabriele Wienhausen, Director of the Teaching and Learning Commons, together with her education research colleagues is conducting a research study to find out more about how pedagogical choices affect student learning and experience in the classroom. You have been asked to participate in this study because you are a student in a class that is being studied or used as a control. There will be approximately 500,000 participants in this study.

Why is this study being done?

The purpose of this study is to create knowledge that has the potential to improve the learning and educational experience of students at UC San Diego and beyond.

What will happen to you in this study and which procedures are standard of care and which are experimental?

If you agree to be in this study, the following will happen:

- Your data from this class including grades, homework and exam submissions, and survey responses will be included in the analysis to determine the effectiveness of the pedagogical techniques used in this course compared to other similar courses.

How much time will each study procedure take, what is your total time commitment, and how long will the study last?

Your participation involves only agreeing to let us use your data in our analysis. It will require no time on your part above the time you put into this course without agreeing to the study.

What risks are associated with this study?

Participation in this study may involve some added risks or discomforts. These include the following:

1. A potential for the loss of confidentiality. We will not share your personally identifying data with people outside our research team. Data will only be kept in anonymized form for research purposes. Course data will not be used for this research study until after final grades have been posted and will be rendered confidential by removing any identifiers before analysis. Your instructor will not know whether or not you are participating in this study until after final grades have been posted. Data from students who opt out of the study will be removed prior to data analysis. Research records will be kept confidential to the extent allowed by law. Research records may be reviewed by the UCSD Institutional Review Board.

Since this is an investigational study, there may be some unknown risks that are currently unforeseeable. You will be informed of any significant new findings.

What are the alternatives to participating in this study?

The alternatives to participation in this study are not to participate. If you choose to opt-out of participating in this research study, we will exclude your data from analysis. Whether you participate will have no impact on your experience or grade in the associated class as the professor will not know who is or is not participating in the study until after final grades are assigned.

What benefits can be reasonably expected?

There is no direct benefit to you for participating in the study. The investigator, however, may learn more about how to improve student learning, and society may benefit from this knowledge.

Can you choose to not participate or withdraw from the study without penalty or loss of benefits?

Participation in research is entirely voluntary. You may refuse to participate or withdraw or refuse to answer specific questions in an interview or on a questionnaire at any time without penalty or loss of benefits to which you are entitled. If you decide that you no longer wish to continue in this study before the end of the quarter, simply respond to the online opt-out form here: <https://goo.gl/forms/JSBRjEmkES6W6xYc2>. If you decide to opt out after the quarter has ended, you must contact Laurel Nelson (laureln@ucsd.edu) and give the quarter and the course from which you would like your data withdrawn.

You will be told if any important new information is found during the course of this study that may affect your wanting to continue.

Can you be withdrawn from the study without your consent?

The PI may remove you from the study without your consent if the PI feels it is in your best interest or the best interest of the study. You may also be withdrawn from the study if you do not follow the instructions given you by the study personnel.

Will you be compensated for participating in this study?

You will not be compensated for participating in this study.

Are there any costs associated with participating in this study?

There will be no cost to you for participating in this study.

Who can you call if you have questions?

Gabriele Wienhausen and/or her colleague has explained this study to you and answered your questions. If you have other questions or research-related problems, you may reach Gabriele Wienhausen at gwienhausen@ucsd.edu or (858) 534-3958.

You may call the Human Research Protections Program Office at 858-246-HRPP (858-246-4777) to inquire about your rights as a research subject or to report research-related problems.

Your Consent

If you consent to participate in this study, no action is needed. If you DO NOT consent to participate in this study, or you choose to opt-out at any time during the quarter, please submit this form online at https://docs.google.com/forms/d/e/1FAIpQLScs0Cznypp4SxQJOsFMgP9nFDjJ0zzYPISBWsiP3_wiWkdjaA/viewform. Your instructor will not have access to the list of students who opted out until after grades are posted. Note that you must separately opt-out of the study for each course involved in this study.

[] I am not 18 years or older or I do not consent to anonymized research use of my data from the course specified below.

Course name: _____

Course section number: _____

Term: _____

Name: _____

PID: _____