

Biocore 384 - Cellular Biology Lab (2 cr.) Honors intermediate level lab course.

Canvas Course URL: <https://canvas.wisc.edu/courses/330090>

Course Description

The laboratory course gives students practical experience working with the concepts introduced in Biocore 383 lecture. This lab will help you dive deeper into research and the process of science with three opportunities to generate and test your own research questions; and introduces tools and procedures of cell and molecular genetics together with statistics and an introduction to bioinformatics all integrated into three different research units (biochemistry of enzymes, molecular genetics of heat shock proteins, and signal transduction of the yeast mating pathway). This is a writing intensive course and meets CommB requirements.

Requisites: Biocore 383 or concurrent enrollment

Class Meeting Location: All Lab and Discussion Sections meet in 341 or 334 Noland Hall

Instructional Modality: This is a face-to-face laboratory course with one weekly 3-hour lab led by Dr. Janet Batzli or Dr. Anna Kowalkowski, and one weekly 50 min discussion section (required) led by your teaching assistants.

Required Resources

1. Biocore 384 Custom Lab Manual 2023 - available on Canvas
2. Biocore Writing Manual - Janet Batzli and Michelle Harris editors. Available as the *Process of Science Companion: Science Communication* online through Pressbooks.
3. Biocore Statistics Primer- Michelle Harris, Rick Nordheim and Janet Batzli editors. Available as the *Process of Science Companion: Data Analysis, Statistics, and Experimental Design* online through Pressbooks.
4. Biocore Tools & Techniques Manual (TNT) (available on Canvas)
5. Computer resources - We will be using the Canvas course website for instructional resources and access to and handing in assignments.

Instructors

Open Door policy--- Come see us! All instructors welcome student emails and hold office hours as listed or by appointment.

Janet Batzli (Course Chair and Interim Director, Biocore)

363 Noland Hall, jcbatzli@wisc.edu, 608-263-1594, [website](#)

Make an appointment or stop by- Open Door!

Anna Kowalkowski (Course Chair)

307 Noland Hall, akowalkowski@wisc.edu

Make an appointment or stop by- Open Door!

Seth McGee (Biocore Lab Manager)

339 Noland Hall, seth.mcgee@wisc.edu, 608-262-6189, [website](#)

Make an appointment or stop by- Open Door!

TA: Ziheng Zhang zzhang576@wisc.edu

	<p>uTA: Kurt Borcharding kborcherding@wisc.edu</p>
	<p>TA: Austin Robertson ajrobertson2@wisc.edu</p>
	<p>uTA: Judith Tafur tafur@wisc.edu</p>
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	<p>uTA: Ronan Montgomery-Taylor montgomeryta@wisc.edu</p>
	<p>TA: Jax Phillips jax.phillips@wisc.edu</p>
	<p>uTA: Allison Forsythe agforsythe@wisc.edu</p>
	<p>TA: Mike Ohman msohman@wisc.edu</p>

	<p>uTA: Nayef Hamdan nmhamdan@wisc.edu</p>		
	<p>Diana Tapia Ramon (High Impact Practice Facilitator) 361 Noland Hall, dtapia2@wisc.edu</p>		
Lab	Disc Time	Lab Time	Teaching Assistants / uTAs
1	Monday 12:05	TUES AM (8:50 - 11:50)	<p>TA: Ziheng Zhang zzhang576@wisc.edu</p> <p>uTA: Kurt Borcharding kborcharding@wisc.edu</p>
2	Monday 4:35	TUES PM (1:20 - 4:20)	<p>TA: Austin Robertson ajrobertson2@wisc.edu</p> <p>uTA: Judith Tafur tafur@wisc.edu</p>
3	Tuesday 4:35	WED PM (1:20 - 4:20)	<p>TA: Elliott Magnuson ecmagnuson@wisc.edu</p> <p>uTA: Ronan Montgomery-Taylor montgomeryta@wisc.edu</p>

4	Wednesday 12:05	THURS AM (8:50 - 11:50)	TA: Jax Phillips jack.phillips@wisc.edu uTA: Allison Forsythe agforsythe@wisc.edu
5	Wednesday 4:35	THURS PM (1:20 - 4:20)	TA: Mike Ohman msohman@wisc.edu uTA: Nayef Hamdan nmhamdan@wisc.edu

Credit and Instruction

Biocore 384 is a 2-credit Honors laboratory course that includes a 3-hour in-class lab time led by Drs. Anna Kowalkowski and Janet Batzli and a required 50-minute discussion section led by your graduate TA. You should plan to spend a minimum of 6 h outside of regular class hours each week to do lab readings (READ Lab Manual!), work on literature searches, project development, some data collection, data analysis, PowerPoint and poster preparation, paper writing, and peer review. Credit for this course counts towards Biological Science (which also meets the Natural Science) breadth requirements, and Honors credit that can be applied towards Honors in an array of majors. See below and the course schedule on Canvas for more information about expectations for student work.

Regular and Substantive Student-Instructor Interaction

Drs. Kowalkowski and Batzli have an open door policy to talk about the course, the Biocore program more generally, or other academic work. They will hold additional office hours during particularly busy weeks for consultation on lab projects, writing, data analysis and interpretation. Seth McGee, Biocore Lab Manager, will be available to support your development of projects and provide essential feedback as you gather materials, schedule experiments, learn techniques, and collect data. Graduate TAs will assist you during lab, facilitate discussion sections, send out timely information in weekly emails, and will grade and provide feedback on your written work. Our course instructional team also includes 4 undergraduate TAs (one for each lab section) who will provide extra support during lab and discussion time, and help you in peer review of papers and practicing oral presentations. Our large instructor team is eager to support your learning in Biocore 384!

Grading: Opportunities to Demonstrate the Learning Outcomes

You will be participating in both individual assignments and group assignments. Note that because of team assignments 32% of your final semester grade results from collaborative group efforts. Assignments, individual vs team mode, and assignment weight in percent are detailed in the table below. Papers, formal presentations and posters are graded using rubric criteria described in the Biocore Writing Manual and reported to you as a letter grade (A+, A, A-, AB, B+, B, B-, BC, C+...).

How we do things: Lab Etiquette

For use of 341 and 334 lab rooms: Access and independent use of lab rooms is a key component of our Biocore learning environment and community, but it comes with **responsibility**. You may use 341 for group or quiet study when no classes or meetings are in session. Use 334 for doing experiments and meeting with lab research teams. Non-Biocore students will be asked to leave unless they are accompanied by a Biocore student. Both 341 and 334 lab rooms have key lock boxes that you will be given access to. If there is any misuse or suspected misuse of the rooms, if the rooms are not cared for or left untidy or down right dirty, or if equipment/ books/ furniture are out of place or missing we will no longer be able to allow student access to these rooms outside of class time hours. In short, be good Biocore citizens and take care of your lab rooms!

During presentations by your peers or instructors: Your presence and participation in class is extremely important for your learning and the establishment of a positive, effective learning environment for everyone (students and instructors). With this in mind, we ask that you DO NOT use your computers, electronic devices or study for other courses during our class meeting time.

Group work & Participation: All of your in-class work this semester will be done in research teams assigned by your instructors. We expect you to discuss ideas and work through problems and analyses with your classmates, especially your teammates. However, you must write two research proposals and the final Enzyme paper on your own. Note that a team consensus Biorationale (BR) figure for both the Enzyme and the Signal Transduction units, a gel electrophoresis results and interpretation activity, and the Signal Transduction presentation are group grades (32% of your final semester grade). 5% of your final semester grade is based on team work, the quality of your check assignments, attendance, and

participation in class discussions, peer review conferences, and research team efforts. This grade is determined by input from both your instructors and from your teammates' GEA (Group Effort Analysis). The 5% class participation and team work grade is guided by the GEA rubric and often plays heavily into borderline grades at the end of the semester. Work hard on creating a positive, inclusive learning environment for your research team and for the course in general.

Papers, Posters & Presentations (Formal & Informal): As a Writing Intensive/ CommB course, Biocore 384 provides a number of opportunities for you to improve your written and oral communication skills about science. Papers are to be written in the form of a scientific research paper and posters and are graded using the rubric criteria described in the Biocore Writing Manual. You and your research teams will prepare and present ungraded *informal feedback presentations* in the format of a research proposal when you are planning your research projects (similar to what graduate students do in their research labs). Feedback presentations will allow you to receive essential and valuable feedback from your instructors and peers prior to you doing your experiment AND prior to writing a research proposal. Although not graded, feedback presentations are where a great deal of learning happens- for both the presenters and the audience. You and your team will also give one graded *formal presentation* at the end of the semester to summarize your 'capstone' signal transduction project. This requires presenters to focus on both the scientific rigor of the project as well as how it is presented to the audience.

Check Assignments: Check (✓) assignments are scored simply adequate or inadequate. Completion of check assignments will be taken into account as part of your Team & Class Participation grade.

Peer review: You will have 2 opportunities to be a peer reviewer (as well as to have your work reviewed) this semester. You will turn in a copy of the review you received with each assignment, along with an author's response form that briefly explains major revisions as well as what advice you took and did not take from your reviewer, and why. Your peer review grades will be based on your efforts in reading/ reviewing your peer's writing and filling out *both the peer review and author response sheets*. Collectively the peer reviews are worth **6%** of your total semester grade. Even when not required, we strongly encourage you to use the peer review process before turning in papers or posters.

Late Assignment Policy: Papers & assignments must be handed in on time unless you have contacted your TA *ahead of time* to request an extension due to emergency or extenuating circumstances. Otherwise, we will deduct one grade per weekday it is late from the grade you would have received (e.g., A->AB for one day late). Note that even an F paper (one week late) counts more than 0 (not handed in at all) when we total the final grades at the end of the semester. If you know of a religious observance or other commitment this semester that will keep you from attending class, let your TA, Anna Kowalkowski, or Janet Batzli know within the first two weeks of class which dates you request relief due to a religious observance or election official responsibility. You can find more information about [UW-Madison's religious observance policy here](#).

How to Succeed in This Course

Your presence and participation in class is extremely important for your learning and the establishment of a positive, effective learning environment for everyone (students and instructors). With this in mind, we ask that you engage in listening and participate in class discussion, ask questions, take notes, and DO NOT study for other courses during our class meeting time.

Here are resource links to other campus services:

- [University Health Services](#)
- [Undergraduate Academic Advising and Career Services](#)
- [Office of the Registrar](#)
- [Office of Student Financial Aid](#)
- [Dean of Students Office](#)

Course Evaluations

Students will be provided with an opportunity to evaluate this course and your learning experience via mid-semester and final course evaluations. Student participation is an integral component of this course, and your confidential feedback is important to instructors. You are strongly encouraged to participate in the course evaluation.

Students' Rules, Rights & Responsibilities

Please use **this link** above to access information about UW-student privacy rights (FERPA).

Creating a Diverse and Inclusive Community and Classroom

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world. <https://diversity.wisc.edu/>

In Biocore, we strive for the utmost equity for all students, TAs, and faculty/staff. We are a community of students and instructors committed to and in full support of students who identify as Black, Brown, Indigenous, students of color, students with disabilities; students with racial, ethnic, gender, LGBTQ+ diverse identities. Your perspective, your learning, your interests, and your contributions matter within our engaged learning community. Our community and our science depend on engaging and embracing different perspectives and this starts with each of us understanding and recognizing our own biases. It takes a great deal of awareness and self-work to recognize bias and our own lack of awareness/ignorance on specific topics. As a program, we all need to work on this recognition and how to hold each other accountable. Accountability in this context is a willingness to accept responsibility for ourselves, our intentions, words, and actions—when it comes to mitigating discrimination, microaggressions, and bias in all of its forms.

If you experience or notice discriminatory behavior or language

We, as Biocore program faculty and staff, encourage you to speak up in the moment if it is safe to do so and to let us, Biocore faculty and staff, know. We promise to hold ourselves accountable in the event of any such offenses. If the incident reoccurs despite intervention or you continue to experience bias, do not hesitate to bring this to your instructor's attention and/or report the case through UW Madison's [Bias Incident Reporting system](#)Links to an external site.

Accountability: What to do when you do or say something that offended

Apologize, say 'I'm sorry' and take ownership when you have offended someone, even if it was unintentional. Saying nothing to remedy the situation perpetuates inequality. Taking responsibility for your words, actions, and behaviors is how you can be accountable to our community and our inclusive classroom goal. It takes everyone to create an accountable, supportive, and productive learning environment. Biocore thrives when all individuals feel supported, especially those who are historically underrepresented at the university. As a learning community, we hope to support all students and staff to the fullest extent. This relies on instilling a trustful, accepting, and accountable environment for all.

[See strategies and suggestions for navigating difficulties in the classroom](#)[Links to an external site.](#) (adapted from “Promoting Inclusive Classroom Dynamics in Higher Education” by Kathryn C. Oleson).

Accommodations for Students with Disabilities Statement

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy ([UW-855](#)) require the university to provide reasonable accommodations to students with disabilities to access and participate in its academic programs and educational services. Faculty and students share responsibility in the accommodation process. Students are expected to inform faculty [me] of their need for instructional accommodations during the beginning of the semester, or as soon as possible after being approved for accommodations. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to provide reasonable instructional and course-related accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: [McBurney Disability Resource Center](#))

Academic Calendar & Religious Observances

Use [this link](#) to find information about the current and future academic calendars, and [this link to find the UW-Madison's religious observance policy](#).

Group work, participation, and inclusive mindsets

Learning to work as an *inclusive, productive, and collaborative* member of a team is an essential skill for all professionals and is an important learning goal for Biocore 384. Learning to have an inclusive mindset includes being aware / proactively engaging with diverse perspectives among individuals in our learning community, and aims to decrease the barriers to hear and exchange diverse perspectives- especially for those who are traditionally marginalized. Inclusive behaviors include inviting and valuing other's ideas, listening and learning before making judgements, taking personal responsibility and being accountable, and creating a welcoming, connective, and affirming attitude towards others.

Collaborative, inclusive team work increases the number of perspectives focused on a complex problem, and it increases creativity and capacity for productive work! Unfortunately, group work can sometimes be challenging and unproductive

if team members do not value or invest in the team or shared goal or if one or two students dominate over others. We consider collaboration a skill that needs practice, patience, and intention to become competent. Throughout the semester you will be working with different personalities and diverse perspectives. Part of your work as a good team member is your *independent accountability* for the knowledge you gain & the work you do while respecting and encouraging the work of others.

Biocore Honor Code

You were asked to sign a statement upon entering the Biocore program during the first week of class in Biocore 381. In order to participate in the Biocore Program you agreed to the following principles:

1. I will report laboratory data honestly and accurately. Under no circumstances will I fabricate data or change data to fit what I think it should be.
2. All work that I submit under my name will be my own. I will not copy or paraphrase from another student presently or previously enrolled in this course.
3. For projects where collaboration is explicitly permitted, I will list the names of students with whom I worked.
4. I will not allow another student to copy or "borrow" my laboratory reports or other assignments.
5. I will not forge or falsify academic documents including graded assignments and examinations
6. I will strive to make Biocore a community that is based on honesty and integrity.

Academic Integrity Statement

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for

additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/

Biocore Statement of Academic Integrity

We trust you to do your own, best work on all individual assignments, and that all team members will equivalently contribute to all group assignments. Remember, you formally agreed to this when you signed the Biocore Honor Code last fall (the six principles of the Biocore Honor Code are below). If you have exceptional circumstances that prohibit you from doing your own, best work, please see us to talk about it.

What is academic integrity and why are we promoting it? Academic integrity means being honest about your intellectual work which is fundamental to the pursuit of knowledge. We ask you to sign this honor code as a pact between you and the Biocore Program faculty/staff to abide by the academic rules of conduct laid out by the University. Without these rules of conduct our institution would be severely limited in its capacity to function as community of higher learning.

As a UW-Madison student, it is your responsibility to be informed about what constitutes academic misconduct, how to avoid it and what happens if you decide to engage in it. For more information, see <https://conduct.students.wisc.edu/academic-integrity/>

These guidelines protect both you and the university if an infraction has occurred. Ignorance of these regulations is not a defense in cases of infringement. So.. Just DON'T Do It!

Definition of Academic Dishonesty

Misconduct includes the following, but is not limited to this list:

- Seeks to claim credit for the work or efforts of another without authorization or citation (plagiarism)
- Uses unauthorized materials or fabricated data in any academic exercise (using notes for a closed-book online exam)
- Forges or falsifies academic documents or records (having a friend sign you in for attendance when you're absent)
- Intentionally impedes or damages the academic work of others (tampering with another student's experiment)
- Engages in conduct aimed at making false representation of a student's academic performance (altering test answers and submitting the test for regrading)
- Assists other students in any of these acts

Examples include but are not limited to: cutting and pasting text from the web without quotation marks or proper citation; paraphrasing from the web without crediting the source; using notes or a programmable calculator in an exam when such use is not allowed; using another person's ideas, words, or research and presenting it as one's own by not properly crediting the originator; stealing examinations or course materials; changing or creating data in a lab experiment; altering a transcript; signing another person's name to an attendance sheet; hiding a book knowing that another student needs it to prepare an assignment; collaboration that is contrary to the stated rules of the course, or tampering with a lab experiment or computer program of another student."

Consequences for Academic Dishonesty

To determine whether academic dishonesty has occurred, the instructor and Biocore administrators will meet with the student. In Biocore, students who commit acts of academic misconduct will write a letter describing what they did and, if appropriate, apologize to individuals who were involved in the incident. In alignment with the penalties listed in the University's UWS14, Student Academic Disciplinary Procedures we recognize three levels of consequences (1) An oral reprimand; and (depending on the severity of the case) written reprimand presented only to the student; or an appropriate assignment to be evaluated by the instructor or Biocore administrative staff, (2) a lower or failing grade on the assignment, exam, or course; removal of the student from the course or program; and a written reprimand included in the student's university disciplinary file, (3) recommendation for disciplinary probation for up to 2 years, suspension, or expulsion from the University.

How you earn your final grade

We use an absolute grading scale in 384 (no curves!). Assignments, due dates, and assignment weight in percent are detailed in the schedule above. Pre-lab assignments are graded on a point percentage basis. Papers and posters are graded using rubric criteria described in the *Biocore Writing Manual* and reported to you as a letter grade (A+, A, AB, B+, B, B-, BC, C...). Letter grades are converted to numeric values when final grades are tallied at the end of semester (e.g. AB=89, B+=87). Check (✓) assignments are scored simply adequate or inadequate. Grades will be reported through Canvas.

Your final grade will be determined from the sum of your letter grade assignments and pre-lab assignments, after each assignment is weighted as stated in the syllabus above and converted to a percentage score. Your final percentage score is converted to a final letter grade as follows:

<u>Final %</u>	<u>Letter Grade</u>
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90-100	A
80-89.9	B
70-79.9	C
60-69.9	D
Score <60	F

*For those few individuals that are on the borderline at the end of the semester, we will assign intermediate grades (AB and BC) based on our evaluation of your participation (in both lab AND discussion), teamwork and your effort.

Teaching & Learning Data Transparency Statement

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully evaluates and vets all campus-supported digital tools used to support teaching and learning, to help support success through [learning analytics](#), and to enable proctoring capabilities. View the university's full [teaching and learning data transparency statement](#).

Privacy of Student Records & the Use of Audio Recorded Lectures Statement

See more information about [privacy of student records and the usage of audio-recorded lectures](#).

Course materials and recordings for this course are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a class meeting is not already recorded, you are not authorized to record class meetings without Janet Batzli's or Anna Kowalkowski's permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have course materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted course materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Instructional Policies Related to COVID-19

Depending on the continuing global pandemic and campus Covid19 policy, we should be prepared to mask up and physically distance, if required. Wearing a mask and physical distancing are currently not required in indoor or outdoor campus spaces. However, there are reasons why some of us will be wearing masks including risk of disease (Covid and other communicable diseases) for self and others we care for. Therefore, just like any aspect of our work together-- let's communicate, be respectful, pay attention, be intentional and inclusive.

Biocore Lab Courses Are All About The Process Of Science

You may be familiar with the model for scientific investigations known as the "Scientific Method." The model presents a logical sequence of steps leading from an initial observation to an experiment and interpretation of data. However, few scientists actually carry out investigations according to the rigidly defined linear sequence of steps. What they do is to engage in the following activities:

1. **Making observations and generating testable questions:** *Making Observations* takes a careful, keen eye and experience in differentiating subtleties and slight differences in whatever you are sensing (visually— or smell, touch, taste too!). Through careful observation, we notice variations and patterns that provide the basis for developing questions and predictions that can be tested or measured in an empirical way.
2. **Formulating hypotheses supported by a rationale:** Forming hypotheses requires stating tentative explanations or answers to your testable question based on background knowledge about the system you are investigating. A hypothesis is not simply an 'educated guess'. It must be supported by a substantive rationale (what we will refer to as a *biological rationale*), have explanatory power, and make a prediction that can be tested.
3. **Designing and conducting an investigation:** This process includes planning the methods and procedures for gathering data to answer a question, evaluate a hypothesis, or challenge a theory. You test hypotheses by designing *manipulative experiments* or making careful *systematic observations* that evaluate the actual outcome against the predicted outcome. The type and design of your investigations is based on the questions you ask as an investigator, your knowledge of

the study system, AND the general “knowledge” available in the scientific literature. In short, you need to understand the complexity of the system before measuring it.

4. **Analyzing and interpreting data:** Investigators attempt to find patterns and provide meaning in a group of data in a particular context. When working with data in this class, we will emphasize the need to explore *sources of variation* within and between comparison groups, and will help you make connections between your data, the concepts and context underlying the project, and the assumptions you are making in your experiment. Interpretation of data should bring you back to your hypothesis, which you can either support or reject. The analysis and interpretation of data will form the basis for inferring explanations about the natural world.

5. **Constructing new knowledge:** If you reject your hypothesis based on the interpretation of your data, you may conclude that the assumptions you made about the system are not valid or that the way you are thinking about your system is incorrect. *Important Note:* You have not failed or made a mistake if your experiment leads you to reject your hypothesis. Nor have you “proven” your hypothesis true if your data supports your prediction. You have simply supported or accepted your hypothesis—under this specific situation. With more precise measurement, different statistical tests, or repeated experimentation in different environmental conditions with different organisms etc... your data may force you to reject your hypothesis. This should lead you to a new, more sophisticated hypothesis as you increase your knowledge about the system. You might even find that the patterns that you see run counter to what you read in the scientific literature, in your textbooks, or even are in opposition to what your instructors think (gasp!). If that’s the case, you have just learned or discovered something new! Now that is exciting and....that is the process of science.

6. **Communicating your science:** As you question your analysis/ interpretation, or when you talk about or write about your understanding, you expose your ideas to discussion and debate. This is sometimes uncomfortable but is an essential form of feedback, and it helps to clarify fuzziness in our thinking. Communicating and receiving feedback on your science, and reviewing scientific work of your peers

provides essential quality control and expands the knowledge we have collectively as a scientific community. In practice, above and beyond meeting expectations for a grade-- communicating your science clearly and effectively provides a vehicle for sharing and constructing new knowledge with others, and allows the next generation of scientists (AKA next year's Biocore students) to "stand on the shoulders of giants" (Sir Issac Newton).

Course Learning Outcomes: How this Applies to Biocore 384

As instructors, we are here to help you and to facilitate your learning of biology and your development as a scientist in an active way, but ultimately you bear the responsibility for learning the material, developing skills and taking ownership of your education. We will challenge you to go beyond simple memorization of details, to interconnect concepts, applications and problems; to ask meaningful questions; to test well-developed hypotheses; and to communicate your findings to your instructors and peers within the realm of science. These are lofty goals! We set high standards for you because we expect that you can reach them!

By the end of Biocore 384, students will be able to

1. Build on, apply, and integrate concepts & skills learned in Biocore 383 and other Biocore courses in an applied setting.
2. Make careful, systematic observations, and ask testable, relevant, creative scientific questions
3. Search, sort, and gather relevant background information from texts and primary literature.
4. Make predictions and formulate clear, testable hypotheses supported by biological rationale at an intermediate level.
5. Evaluate assumptions associated with experimental design and the biological system.
6. Develop protocols and work with tools and procedures to test hypotheses in cellular and molecular biology.
7. Communicate effectively about science through writing and oral presentations.
8. Give and receive constructive feedback using professional communication and effective interpersonal skills.
9. Utilize quantitative and scientific reasoning skills to analyze, evaluate, and interpret data to make logical conclusions based on evidence.
10. Work as a member of a productive, collaborative research team
11. Contribute to a safe, sustainable, socially, and ethically responsible learning environment.

The Big Picture: Learning Outcomes for all three Biocore Lab Courses

*Note that the goals above are the same goals as Biocore 382 now applied to cell biology. They are also the same goals for third semester Biocore 486- Principles of Physiology Lab. These are higher-level cognitive skills that take time to develop (multiple semesters!). *Students are only required to take two of the three Biocore labs. Many choose to take all three!*

Four Strategies for doing well in Biocore Labs

Be prepared. Do Pre-lab assignments and read the relevant section of the lab manual carefully ahead of your laboratory meeting time and be sure you understand the question(s) the project is attempting to answer and the approach you will be taking to answer these questions. Careful preparation will save you a great deal of time both during lab and in writing assignments. Pre-lab assignments are designed to help in this process.

Make the most of the time you have in lab. Collect the necessary data and make detailed notes in your lab notebook. In many cases we have allowed time in class for you to begin analyzing and discussing your data, preparing presentations and getting feedback from peers and instructors. Take advantage of this opportunity. This is where the most learning takes place.

Start writing your lab papers well before the deadline and pay attention to the many hints in the lab manual, TA weekly announcements, handouts, and *Biocore Writing Manual*. We emphasize writing in this course not only because communicating your ideas is part of the scientific process, but also because writing about a subject helps you understand more clearly and at greater depth. This takes time. Many times during the semester you will have the opportunity to have your paper reviewed by a peer before turning it in for a grade. This is an excellent opportunity to remedy problems before turning in a final copy. If your peers cannot understand what you have written it is unlikely that the instructor will understand.

Cultivate a relationship with your Biocore peers. **Your peers are an incredible resource and have much to offer you in the way of support and advice in this course. These are the people you can depend on for the next three semesters!**