BIOCHEMISTRY AND MOLECULAR BIOLOGY
COLORADO STATE UNIVERSITY

2023 Spring BC565

BC565 - Molecular Regulation of Cell Functions

CSU COVID Guidance

All students are directed to report any COVID-19 symptoms to the university immediately, as well as exposures or positive test results from a medical provider or home test.

- If you suspect you have symptoms, or if you know you have been exposed to a positive person or have tested positive for COVID (even with a home test), you are directed to fill out the COVID-19 Reporter.
- If you know or believe you have been exposed, including living with someone known to be COVID positive, or are symptomatic, it is important for the health of yourself and others that you complete the online COVID Reporter. Do not ask your instructor to report for you.
- If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.
- You may also report concerns in your academic or living spaces regarding COVID exposures through the COVID Reporter. You will not be penalized in any way for reporting.
- When you complete the COVID Reporter for any reason, the CSU Public Health Office is notified. Students who report symptoms or a positive antigen test through the COVID Reporter may be directed to get a PCR test through the CSU Health Network's medical services for students.

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Instructors: Santiago Di Pietro — MRB 281, 491-5302 (office) — Santiago.Dipietro@colostate.edu
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Jennifer DeLuca — MRB 237, 491-6718 (office) — Jennifer.DeLuca@colostate.edu
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TA: Tyler Guthrie, T.Guthrie@colostate.edu
Time and place TBD

Resources / Background reading:
Molecular Biology of the Cell, 7th Edition, Bruce Alberts et al, 2022 print
Molecular Biology of the Cell, 6th Edition, Bruce Alberts et al, 2015 print
Cell Biology, 3rd Edition, Thomas Pollard et al, 2016 print (4th Edition will be released in March 2023)
Molecular Cell Biology, 9th Edition, Harvery Lodish et al, 2021 print

Teaching / Learning style / Venue:
- This course will encompass a mixture of lectures, written assignments, and student-led discussions of primary literature.
- Lectures and paper discussions will be in-person in AZ E210 3:00 – 4:50 PM on MW. Lecture slides and related materials will be posted to Canvas prior to class meetings.

Prerequisites and Expectations:

- Previous coursework in Molecular Cell Biology (equivalent to BC465)
- CSU Graduate School anticipates that 3 additional hours of outside classwork will be needed per credit hour each week. BC565 students should thus expect to spend ~8-12 hours on assignments and reading material each week.
- This course is designed for students who have been exposed to working in a wet lab, and who are actively participating in research projects. Those with no "real" lab experience will find the material rather abstract. Please consult the recommended reference textbooks (Resources / Background reading) if you need a refresher on the topics/concepts that will be discussed ***prior to*** coming to class.

Student learning outcome and goals:

- Master the fundamental concepts regarding the molecular mechanisms underlying various cell functions. ***The material presented in this class is not meant to be a refresher of undergraduate coursework and assumes that you have already mastered the general concepts.***
- Be able to articulate and explain standard and state-of-the-art approaches used in the study of molecular and cellular biology. Learn how to design experiments to address scientific questions, and how to interpret experimental results. The primary goal is to improve your ability to access, integrate, and evaluate the literature, not to have an encyclopedic knowledge of the field.
- Be able to critically analyze/evaluate experimental data in order to draw a conclusion based on your own, independent assessment.
- Develop and establish communication (both oral and written) skills for effective and productive scientific discussions.

Grades:

- Grades will be determined from a total of 500 possible points from five distinct modules taught throughout the semester, with each module being worth 100 possible points. There is NO comprehensive final exam.
- A typical point distribution for each module is shown below:
  - o Pre-module quiz: 10 pts
  - o 3 paper critiques (13 pts per assignment): 39 pts
  - o In-class discussion activities (5 pts per paper discussion): 15 pts
  - o Module assessment: 36 pts

- Letter grades will be determined at the end of the semester. We reserve the right to ascribe “+” or “-” to any letter grade.

Course organization:

Module #	Duration	Topic	Instructor
Module 1	Jan 18 – Feb 1	Intracellular compartments, protein sorting and membrane traffic	Santiago Di Pietro
Module 2	Feb 6 – Feb 22	Cell Biology of Neurons	Soham Chanda
Module 3	Feb 27 – Mar 22	The Cytoskeleton	Steven Markus
	Mar 13-17	Spring break within Module 3	
Module 4	Mar 27 – Apr 12	The Cell Cycle	Jennifer DeLuca
Module 5	Apr 17 – May 3	Nuclear Organization	Sarah Swygert

Reading / written assignments

- For the primary literature reading assignments, individual students will be tasked with describing a figure from each paper and will lead the discussion of that figure in class. Figures will not be preassigned to students. ***Therefore, every student needs to be prepared to present each figure of the article***. Typically, the flow of the discussion will follow the order of the figures, but occasionally the order may be changed or a particular figure may be skipped if superfluous.
- Each student must also be prepared to discuss the background and/or perspective for the manuscript; there is little point in discussing the experimental details of a manuscript without knowing the context of why the science under study is important.
- **The emphasis of the discussion should be on the hypotheses tested, experimental results and conclusions**. Please be prepared to provide additional information beyond what is provided in the manuscript.
- While preparing for paper discussion, students are highly recommended to critically read each manuscript and fully understand the methods and approaches. Additionally, students are encouraged to consider questions such as: (1) Are appropriate controls included? (2) Would the experimental details be better investigated with a different technique?

Guidelines for primary literature critiques (13 pts per critique; 39% of your total grade)

- A critique of the papers to be discussed in class will be due on Canvas **at 3pm of the class day** and will be graded. ***Please target the overall length of your critiques to be between 400 and 600 words. Use Arial 12-point font with 1-inch margins.*** These writing assignments will allow you to practice critically evaluating manuscripts. Each critique should answer the central question: **"Are the experimental rigor, novelty, presentation, and topic of the manuscript in question of sufficiently high quality to warrant its publication?"** Also, the review should highlight (1) strengths/weaknesses of the paper, (2) the rationale for the recommendation chosen (*e.g.*, whether the manuscript should be accepted or rejected for publication; see below), and (3) suggestions for improvement, or follow-up studies.
- The written review must be your own thoughts, and it must be written using complete sentences (no bullets, abbreviations, or jargon may be used; however, a bulleted or numbered list of items may follow the summary paragraphs; see below). Your reviews should mimic peer reviews of manuscripts under consideration for publication and should be drafted as such (examples will be provided by the instructors). The overall goal of the critique is to evaluate the quality and importance of the work. Criticisms of the writing style, the format, or even suggestions for future experiments are okay, but do not substitute for a balanced scientific critique of the work that is presented in the manuscript.
- The review should contain the following key elements:
- *1. Summary paragraphs*: The first paragraph (5-6 sentences) should start by describing the field and the manner in which the manuscript might impact the field. You must communicate to the authors and editors that you are knowledgeable about the field, that you understand the knowledge gaps of the field, and that you understand the main techniques employed. Something akin to "*Proper gene regulation is necessary to permit cell differentiation, but the mechanisms underlying regulation at the level of transcription/translation/genome architecture/etc/etc are not completely understood. The current manuscript addresses a significant gap in the field, particularly x, y, or z*". Conclude the first paragraph with a statement that declares whether you as a reviewer would recommend accepting the paper as is, accepting it with revisions (major and/or minor), or rejecting the paper.
- 2. The *second paragraph* typically makes broad statements to justify your recommendation (*i.e.*, to accept or reject) and is the core of your critique/review, and generally pinpoints the most significant advances or deficiencies in the work. Use the second paragraph to explain your detailed assessment of the work. If there are significant flaws, state the flaw(s) and back up your criticism with specific points. You should comment on specific techniques, analyses and interpretations that you feel the manuscript may fail to carefully or correctly address. If there are weaknesses, do not simply point them out but rather devise alternative and/or improved methods to test the hypothesis (at least in your opinion).

- 3. In a typical manuscript review the summary paragraph(s) as described above would be followed with a specific list of items that support and clarify your position on the paper (this could be a bulleted or numbered list). In this list you should include both **major points** pertaining to the overall evaluation (usually first) and any **minor points** you wish to raise about format, writing, etc.
- Critiques will be evaluated on scientific content, ***and*** spelling and grammar. **Late critiques will not be accepted.**
- Critiques are graded on a four-tier scale: 13 pts for excellent, 10 points for good, 7 points for fair, and 0 points for incomplete or poor work.