



## BC565 - Molecular Regulation of Cell Functions

### Important information on COVID-19:

Pandemic Preparedness Team announced spring semester (2022) public health requirements on [January 3, 2022](#) that includes:

- Masks required indoors (unless in a space alone), and required in residence halls unless in your own room
- vaccines and vaccine boosters are now required for all students, faculty and staff working or studying on university grounds
- Initial semester re-start saliva screening upon arrival to campus regardless of vaccine status

All students are expected and required to report to the COVID Reporter (<https://covid.colostate.edu/reporter/>) when:

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under "I believe I have been in close contact with someone who has COVID-19." This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.

As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official if you have been asked to isolate or quarantine.

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University's COVID resources and information, including FAQs about the spring semester, please visit the CSU COVID-19 site <https://covid.colostate.edu/>.

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**Instructors:** Chaoping Chen, MRB 233, 491-0726 (office), [Chaoping.Chen@colostate.edu](mailto:Chaoping.Chen@colostate.edu)  
Santiago Di Pietro, MRB 281, 491-5302 (office), [Santiago.Dipietro@colostate.edu](mailto:Santiago.Dipietro@colostate.edu)  
Steven Markus, MRB 241, 491-5979 (office), [Steven.Markus@colostate.edu](mailto:Steven.Markus@colostate.edu)  
Jennifer DeLuca, MRB 237, 491-6718 (office), [Jennifer.DeLuca@colostate.edu](mailto:Jennifer.DeLuca@colostate.edu)  
Soham Chanda, MRB 279, 491-7004 (office), [Soham.Chanda@colostate.edu](mailto:Soham.Chanda@colostate.edu)

**TA:** Randy Owen, [Randall.Owen@colostate.edu](mailto:Randall.Owen@colostate.edu)  
Office hours, 9-10 am in MRB250 on Wednesdays

**Resources/Background reading:**

*Molecular Biology of the Cell*, 6th Edition, Bruce Alberts et al, 2015 print  
*Cell Biology*, 3rd Edition, Thomas Pollard et al, 2016 print  
*Molecular Cell Biology*, 8th Edition, Harvery Lodish et al, 2016 print

**Teaching/learning style/venue:**

- This course will encompass a mixture of lectures, written assignments, and student-lead discussions of primary literatures.
- Lectures and paper discussions will be in-person at AZ E210 3:00 – 4:50 PM on MW with Echo360 streamed live in Canvas. Lecture slides and related materials will be posted to Canvas as references.

**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 contents 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** the class.

**Student learning outcome and goals:**

- Master the fundamental concepts and mechanisms involving molecular regulation of 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.***
- Become able to articulate and explain the standard and state-of-the-art approaches for 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.
- To 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 out of a total of 500 points from a total five modules for the semester with each module being worth 100 points. There is NO comprehensive final exam.
- A typical point distribution for each module is shown below:
  - Pre-module quiz : 10 pts
  - 3 paper critiques (13 pts per assignment) : 39 pts
  - In-class discussion activities (5 pts per paper discussion): 15 pts
  - 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 19 – Feb 2	Membrane dynamics and cell signaling	Chaoping Chen
Module 2	Feb 7 – Feb 23	Intracellular compartments, protein sorting and membrane traffic	Santiago Di Pietro
Module 3	Feb 28 – Mar 23	The Cytoskeleton	Steven Markus
	Mar 14-18	Spring break within Module 3	
Module 4	Mar 28 – Apr 13	The Cell Cycle	Jennifer DeLuca
Module 5	Apr 18 – May 4	Cell Biology of Neurons	Soham Chanda

### Reading/written assignments

- For the primary literature reading assignments, each student will be tasked with describing a figure(s) from each manuscript and will lead the discussion on that figure in class. **\*\*Every student needs to be prepared to present each figure.\*\*** Figures will not be preassigned (and the flow of discussing the manuscripts will not *necessarily* follow the order of the figures).
- 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.
- While preparing for paper discussion, students are highly recommended to critically read each manuscript by asking questions such as: (1) Would the experimental details be better investigated with a different technique? (2) Would the data have been better analyzed with an alternative statistical approach? (3) How would funding restrictions (or unlimited funding) have changed the experimental workflow?
- The emphasis of the discussion should be on the hypotheses tested, and the methods utilized. Please be prepared to provide additional information beyond that provided solely in the manuscript.

### 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 approximately 400-600 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, and (3) suggestions for improvement.
- 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 reviews of manuscripts under consideration and should be drafted as such (examples will be provided by the instructors).
- 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.

- 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 fails to carefully or correctly address. 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. Do not simply point out weaknesses, but rather devise alternative and/or improved methods to test the hypothesis (at least in your opinion).
- 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. In a real review your 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.**



## Module 1 - Membrane Dynamics and Cell Signaling

**Instructor:** Chaoping Chen ([Chaoping.Chen@colostate.edu](mailto:Chaoping.Chen@colostate.edu))

**Office:** 233 Molecular & Radiological Sciences Building

**Phone:** (970) 491-0726

**Office hours are immediately after each class or by appointment**

### Learning Objectives

#### Lecture 1 – membrane

- Membrane lipids
- Membrane proteins

#### Lecture 2 – protein hardware and second messengers in cell signaling

- Membrane receptors
- Kinases and phosphatases
- GTPases
- Adaptors
- Second messengers

#### Lecture 3 – signal integration

- Olfaction
- Light perception
- Insulin
- T-cell activation

### Class Schedule:

	Content	Assignments
Wed, Jan 19	Lecture 1: cancelled/CSU closure	Pre-module quiz due Jan 19 at 3 pm Pre-lecture reading of a review article on membrane diversity
Mon, Jan 24	Lecture 1: Introduction and Membrane	
Wed, Jan 26	Paper 1 discussion Lecture 2: protein hardware for signaling second messengers	Paper 1 critique due Jan 24 at 3 pm
Mon, Jan 31	Paper 2 discussion Lecture 3: signal integration	Paper 2 critique due Jan 26 at 3 pm
Wed, Feb 2	Paper 3 discussion Module assessment	Paper 3 critique due Jan 31 at 3pm