

QBIO 502: Molecular Biology for Quantitative Scientists

Instructors: Rory Spence, PhD, Remo Rohs, PhD

Office hours: by appt, rspence@usc.edu

Time and Place

Mondays and Wednesdays, 2:00 to 3:50 PM, zoom

TEXT: Optional: Molecular Biology, Craig et al, 2nd edition

I will provide supplemental reading and visual information for you on Blackboard.

I. Learning outcomes

1. Gain a better understanding of the fundamentals of molecular biology for students who have had little to no previous exposure.
2. Develop an appreciation for appropriate experimental design in answering questions in molecular biology for students who have had little to no previous exposure.
3. Understand how “big data” is generated in the field of molecular biology for students who have had little to no previous exposure.
4. Improve ones ability to critically read primary scientific literature.
5. Improve ones skills for communicating ideas, both orally and in writing.

II. Course Description

Few fields in biology are developing more rapidly on more fronts and with more excitement than molecular biology. This class serves as an introduction to classical and modern molecular biology techniques for quantitative science students. We will cover the molecular biology methods with emphasis on those that are able generate “big data.” We gladly welcome all graduate students who have any interest in the techniques and fundamentals of molecular biology. Classes will be a combination of lectures, discussions/presentations of original research articles and exams. An emphasis is placed on developing skills related to independent exploration of the subject. Of course, respect and support for your classmates (and your professors) during discussions is expected. We will also read and analyze original research articles. While the book does an excellent job of giving us the basics of molecular biology, papers will provide us with cutting edge hypothesis and results. Class presentations and discussions based on these papers will improve your critical and creative thinking.

III. Grading

Assignment	Points	% of grade
Midterm exam	100	25
Final exam	100	25
Paper presentations	140	35
Active participation	60	15
TOTAL	400	100

IV. Description of Assessment of Assignments

There will be 2 exams for the class, one midterm and one final. Each exam will be worth 25% of your grade. The exams will **not** be memorization of facts, instead they will test your ability to think critically and creatively about topics we have covered in class. Exam dates are firm. The evaluation of your effort in the course will depend to a significant degree on active participation (15%) in discussions in addition to paper presentations. 'Active participation' means not only regular attendance at lectures, but demonstrated intellectual engagement in discussions (e.g. reading the assigned pages prior to class, asking informed questions, raising provocative issues, contributing interesting observations, and helping to answer questions posed by others). Paper presentations will be group assigned (35%). Groups of students will be responsible for presenting the paper to the class on the assigned day. It is not expected that you fully understand the paper in its entirety, however, it is expected that you present the basic concepts/figures/questions of the paper so that our class discussions may be fruitful. We are always available to answer any questions you might have via email or office hours prior to assigned presentation. We will be sure to post the paper on blackboard quite a bit ahead of time. I will also present the first paper of the semester myself to establish a guideline for you. We will post your grades for all assignments on blackboard throughout the semester as quickly as we can so you know your standing in the class. If you ever are unsure of your grade or have any questions please feel free to reach out to us in person or via email. We are willing to regrade all exams. However, you must return the exam to me within one week of when we return it to you with a written response of what you believe should be regraded. We reserve the right to regrade the entire assignment.

V. Schedule

1 Introduction to Molecular Biology, DNA - The Genetic Material

2 Chargaff 1952, Watson Crick 1953

3 PAGE, Sanger Sequencing

4 Sanger et al, PNAS, 1977

5 DNA Replication

6 Messlson and Stahl 1958 paper

<https://magazine.caltech.edu/post/the-most-beautiful-experiment>

7 Cloning

8 Classic Cloning Paper

9 Polymerase Chain Reaction, RT-PCR

10 PCR Paper 1988, RT-PCR Paper...

11 GFP, Reporters

12 Tsein Paper

Week 7: Midterm (Review and Exam)

13 Transgenics

14 Cre-lox Paper or Crispr

15 Virus

16 Covid Strain Paper

17 Imaging

18 Clarity Paper

19 Mass Spec, Proteomics, Translation

20 Paper

21 DNA Sequencing

22 Paper

23 RNA Sequencing -Transcription

24 Paper

Week 15: Review and Final/Screening Exam

VI. Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776

osas.usc.edu

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu

chan.usc.edu/otfp

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.