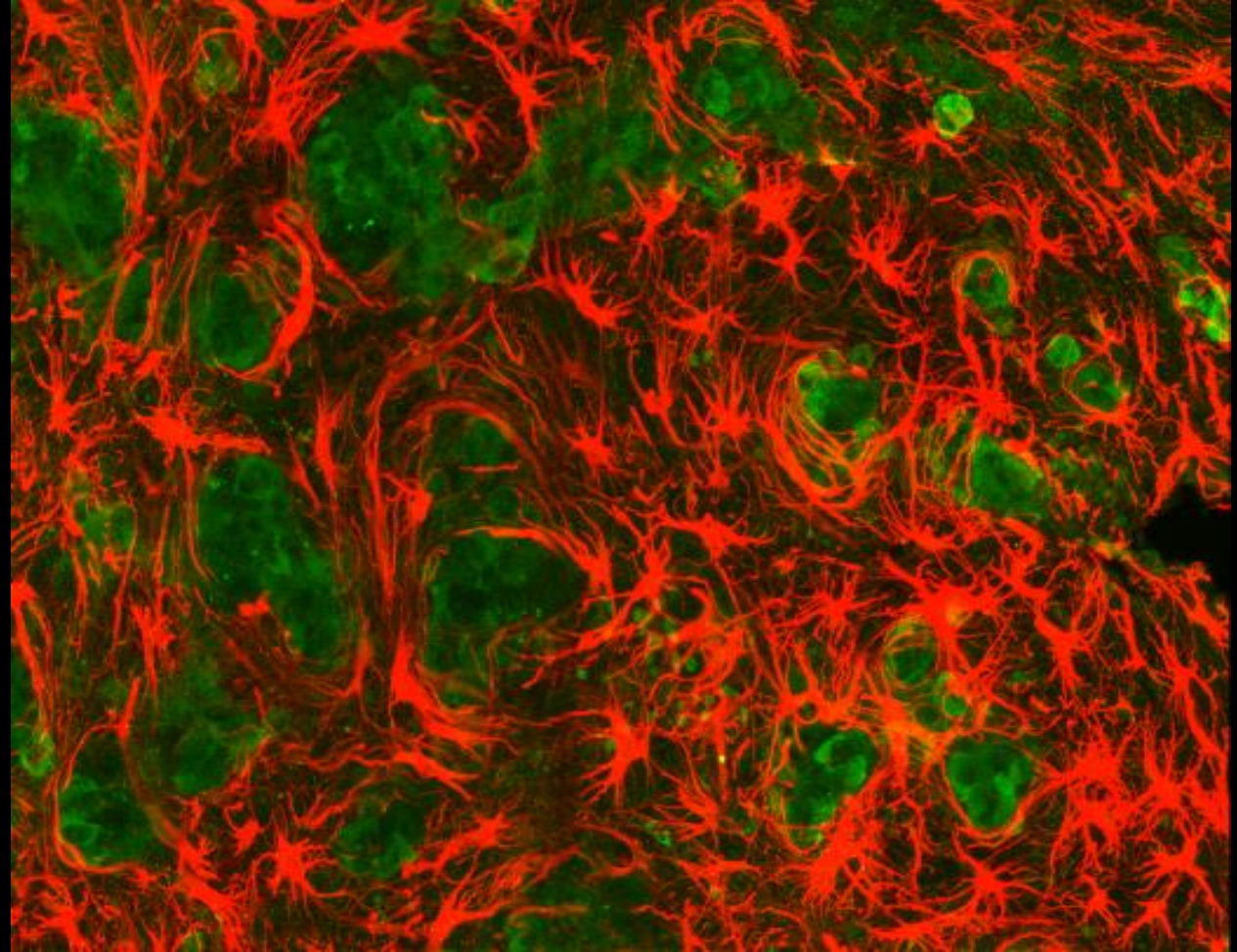


2021-2022 BCMB Program Handbook



The cover photo presented is a snapshot of inflamed/activated astrocytes surrounding breast cancer brain metastatic cells, credited to Bryan Ngo, from Dr. Lewis Cantley's lab and Chenu Jaywickreme, from Dr. Luis Parada's lab.



Weill Cornell Graduate School
of Medical Sciences



Memorial Sloan Kettering
Cancer Center

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Program Coordinators

Biochemistry & Structural Biology

The Biochemistry & Structural (BSB) program offers opportunities for advanced training in the application of biochemical, structural, biophysical and imaging methods, to address questions relating to biological processes and mechanisms.

Cell & Developmental Biology

The Cell & Developmental Biology (CDB) program comprises over 88 faculty members whose research focuses on a wide range of topics related to the control of normal and malignant cell growth, differentiation, and tissue development.

Molecular Biology

The Molecular Biology (MB) program provides unique research training to students in the molecular pathways involved in the control of nucleic acid transactions, gene expression, and cell growth and proliferation.

Becoming a Doctoral Candidate- First Year Requirements

In their first year, BCMB Allied students must complete the program's core curriculum courses, attend BCMB Student Seminar, and complete a minimum of three (3) lab rotations. Lab rotations are an important component of the students' first year in that they help him/her to decide on a research focus and select a thesis mentor, which is required by the end of the first year

Thesis Mentor

The choice of a mentor determines a student's program assignment: Biochemistry & Structural Biology, Cell & Developmental Biology, or Molecular Biology. The mentor helps the student select his/her Special Committee, consisting of the mentor and two other faculty members knowledgeable in the student's research field. The committee evaluates the student's research and progress through the rest of his/her WCGS career. Selection of the mentor and the committee typically occurs before the student starts their second year of study.

Admission to Doctoral Candidacy Examination (ACE)

In spring of the second year, the student takes the Admission to Doctoral Candidacy Examination (ACE), which includes a written component (a research proposal), and an oral examination in which the student defends the proposal and demonstrates general knowledge. Committees made up of program faculty members administer the written and oral ACE. When a student passes the ACE, she/he is a candidate for the PhD degree.

PhD Research and Degree

Within six months of passing the ACE (or before June 30 of their third year), the student must submit a two-page thesis project update to the Special Committee and meet with their committee. Thereafter, the student and the committee must meet together regularly—at least once annually—until the student's graduation. The student must submit a two-page progress report to their committee two weeks prior to each committee meeting. After passing the ACE and while working in the laboratory, the student must also complete two elective courses (two quarters), relevant to their thesis work and future goals.

The culmination of the student's successful progression through the program is the final examination (the "defense") and certification by the Special Committee that the thesis represents an official piece of research that satisfies the requirements of the WCGS for the PhD degree.

2021-2022 Rotation Dates

Summer Rotation: Jul 1st - Sep 16th

Fall Rotation: Sep 20th - Dec 10th

Winter Rotation: Jan 3rd - Mar 21st

Spring Rotation: Mar 28th - Jun 13th

Academic

TIMELINE

	Year 1	Year 2	Year 3	Year 4	Year 5
Core Curriculum	●				
Lab Rotations	●				
Join Thesis Research Lab		●			
Design full Special Committee		●			
Admission to Doctoral Candidacy Examination (ACE)		●			
Lab Research		●			
Complete Traditional and Elective Course Requirements			●	●	
BCMB Student Seminars	●	●	●	●	●
Develop PhD Thesis			●		
Annual Meetings with Special Committee			●	●	●
Continue thesis research			●	●	●
Continue thesis research and Final Defense					●

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CORE COURSES

i) First Year - ***all students must complete the core sequence of:***

BCMB Student Seminar	Quarter I - Quarter IV
Biochemistry	Quarter I
Molecular Genetics	Quarter I Quarter II
Logic and Critical Analysis	Quarters II and III
From Genes to Cells	Quarters III and IV
From Cells to Organisms and Disease	Quarters III and IV
Responsible Conduct in Research (4 live sessions)	

ii) Course in Quantitative Understanding in Biology

All students enrolled in PhD programs within the Weill Graduate School of Biomedical Sciences are required to complete a one quarter course in Biostatistics. **For BCMB students, this course will be taken during Quarter I of their second year in the program.**

iii) Elective Course Work

Before graduation, students must complete additional elective coursework prior to submission of their thesis. In addition to participation in the BCMB Student seminars, two additional quarters of electives must be fulfilled. These electives are generally taken in years 3 and 4.

BCMB Student Seminars. Learning how to effectively communicate one's science is an important skill to acquire during PhD training. BCMB student seminars involve two 30-minute research-in-progress presentations from BCMB graduate students, to be scheduled at the beginning of each academic year. These will typically occur on Friday afternoons from 1:30-2:30 pm. BCMB students **are required** to attend in years 1-5 and **are required** to present seminars in years 3-5. All other BCMB students are encouraged to attend, and opportunities to present are available to all students on a volunteer basis. Required attendance can be excused only by written permission from a course director or program co-director. BCMB Student Seminars can also be taken for one-quarter elective credit by BCMB students with special permission from the program co-directors.

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Traditional Courses: To fulfill the remaining 2 quarter elective requirement, students may substitute a traditional course on a subject relevant to their thesis project. Possible courses offered at Weill Cornell include Methods in Biophysics, Principles of Developmental Biology, and Cryoelectron Microscopy of Macromolecular Assemblies (@NYSBC). Alternative courses offered at other institutions can also be used to fulfill this requirement but require prior approval by the program directors and the registrar. Upon review of the course syllabus, the course directors will determine if elective courses will be awarded either 1 or 2 quarter of credits.

Students are required to complete the core curriculum during the first year and are advised to spread out the elective course requirements between their second to fourth years. All core courses must be completed with a grade of high pass or better to remain in good academic standing (see "Good Standing Within the BCMB Program" below). All of the core courses cover material that is not usually taught at the undergraduate level and is crucial for success in science. "Logic and Critical Analysis", "From Genes to Cells" and "From Cells to Organisms and Disease" rely heavily on primary literature and classroom discussions. Active participation is expected and required to receive a passing grade in these courses. Failure to participate fully and obtain a High Pass or better will result in the review of a student's status by the program co-directors.

The Curriculum Committee may exempt a student from elective courses if the Committee determines that an equivalent course has been taken at other undergraduate or graduate institutions. If a student wants to obtain a course exemption, one of the program directors must be notified and a written petition must be submitted to the Curriculum Committee. Courses taken prior to matriculating in the BCMB Program may not be used to substitute for any of the course requirements.

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LABORATORY ROTATIONS

All students are required to complete three laboratory rotations that are acceptable to the Faculty.

Rotation periods are:

Summer Rotation: Jul 1st - Sep 16th

Fall Rotation: Sep 20th - Dec 10th

Winter Rotation: Jan 3rd - Mar 21st

Spring Rotation: Mar 28th - Jun 13th

Laboratory Rotation Policies:

Lab rotations are an important aspect of your first-year curriculum. It is a chance for you to learn new techniques, to demonstrate your curiosity for scientific research and reasoning, and to determine whether that particular lab is a good match for you. It is also a time for the rotation mentor to evaluate your ability to do bench research and your understanding of the technical and theoretical aspects of the project and the broader set of questions being addressed in the lab.

You must inform the first year advisors of the lab that will host your rotation by September 23, January 11, and April 5 for the first, second and third rotation, respectively. At the end of each lab rotation, it is your responsibility to prepare a brief lab report. Your rotation report should summarize your work in a maximum of two pages of text, excluding figures and references. Please attach a front page with your name and the signatures of your rotation mentor and first-year advisor to indicate their approval of your report. Reports should be completed and approved by the rotation mentor by the end of the rotation. These reports should be submitted to the first year advisors. Once approved by the first year advisor, reports are then submitted to Vanessa Dodson's office, Cornell A-131. You must also forward an electronic version to Vanessa Dodson. The rotation mentor will submit a written evaluation as well. You should schedule a meeting with your rotation mentor at the conclusion of the rotation to discuss your progress and for a critique of your performance. Submission of all three rotation reports is required to remain in good academic standing and to progress to the elective courses and the ACE exam I.

i) It is expected that students will have chosen a thesis mentor by July 1st. The choice of mentor determines the student's Program assignment, (Biochemistry & Structural Biology, Cell and Developmental Biology or Molecular Biology). Students must inform Vanessa Dodson's office, Cornell A-131, once they have chosen a thesis mentor.

ii) Only for students who start in the Summer: the period July - September counts as one rotation. You are expected to choose a second rotation to begin in September, You may choose a thesis mentor in March at the end of the second standard rotation period (which will be your third rotation). However, there is no guarantee that the particular lab of interest will be accepting students at that time. This

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scenario could arise if the lab is still in the process of evaluating rotation students in their third standard rotation (April - June). Unless you have an existing commitment to join a lab by March 29, you should make arrangements to start a 4th rotation to commence on April 1.

iii) Each lab is eligible to take a maximum of 2 students per year from within the Allied Program.

FIRST YEAR REVIEW

The progress of all 1st year students is reviewed by the program directors at the end of the first year and reported to the curriculum committee. If a student has encountered difficulties during the 1st year curriculum, leading to the student being placed on academic probation, the student's case will be reviewed by the full curriculum committee. The main purpose of this review is to identify the strengths and weaknesses of each student, so that, if possible, the student and faculty can work together to remedy any deficiency in training. At the end of the review, the committee will make a decision regarding the resolution of the student's probation status, which can range from prescribing a course of action to remediate any evident weaknesses (examples include requiring the student to re-take courses or attend specific focus groups, or recommending that the student be dismissed from the program). The student will receive a formal letter describing the committee's decision, which will be placed in his/her graduate school file.

PROGRAM DIRECTORS AND FIRST YEAR ADVISORS

The BCMB Program co-directors also serve as first-year advisors for the incoming students. They are Dr. Mary Baylies (m-baylies@ski.mskcc.org) and Dr. Jessica Tyler (jet2021@med.cornell.edu). Elena Piskounova (elp2025@med.cornell.edu), Kirk Deitsch (kwd2001@med.cornell.edu) and Bjorn Kafsack (bjk2007@med.cornell.edu) also serve as first year advisors. They are available to assist you and help make your first year go as smoothly as possible. You will be assigned to a first year advisor but feel free to contact any of them for curriculum planning, information, problems etc.”

CURRICULUM COMMITTEE

Co-chaired by the Program Directors, Drs. Mary Baylies, Jessica Tyler and consisting of approximately 15 faculty members, this committee oversees all educational aspects of the Programs. They are responsible for assembling the curriculum, setting course requirements, adjudicating student applications for exemption from course requirements, administering the evaluation of students at the end of their first year, and establishing the format of the Admission to Candidacy Examination (ACE).



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GOOD STANDING WITHIN THE BCMB PROGRAM

To remain in good academic standing in the Programs, students must achieve a grade of B or better (High Pass) in each required course and maintain a High Pass average in all course work. A grade of Low Pass or Fail is unacceptable and may result in the student being placed on academic probation status. Completed rotation reports are also required to remain in good standing. Students in the 2nd year or above are also required to have a thesis mentor to remain in good standing. Students in the 3rd year or above are required to present annually at a scientific meeting (see item J below) and to complete an annual Special Committee meeting by June 30th each year to remain in good standing. If a student at any point fails to meet the requirements for good standing, they may be placed on academic probation and either the Curriculum Committee or another appropriate committee empowered by the Curriculum Committee will meet to discuss the case and can make one of three recommendations to the Dean: i) that the student be prescribed a course of action for returning to good standing, ii) that the student be allowed to continue to pursue a Ph.D., iii) that the student be asked to leave the Program. If a student is allowed to attempt to return to good standing, the student will remain on probation until fulfilling all of the specified requirements to the satisfaction of the Curriculum Committee.

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ADVANCE TO CANDIDACY EXAM

A student must be in good academic standing to take the ACE. The ACE is administered in two sections: a written exam and an oral exam. For the written exam, the student prepares a research proposal on a topic selected by the student and approved by the ACE Committee. The ACE Committee consists of several faculty members whose membership on the committee rotates. The current chair of the ACE committee is Dirk Schnappinger. The written proposal is reviewed by the ACE Committee and returned to the student with a written critique. The oral exam tests the student's ability to respond to comments in the critique, as well as the student's general knowledge. The Examining Committee for the oral consists of five faculty members: the Special Committee (i.e. the research mentor and two additional faculty members), a chairperson, and one additional member. At least one of the five members is also a member of the ACE Committee. Before taking the ACE, students must have completed the core sequence of courses; however, they need not have completed their elective courses. The ACE is taken during the Spring of the second year. The official description of the requirements and procedures for the ACE is contained in a separate document that will be provided to students upon completion of their first-year requirements.

Between six months after completion of the ACE and no later than June 30th of their third year, each student is required to convene her/his first Special Committee meeting (see below for composition of the Special Committee). In addition, the student is required to prepare a written document outlining their thesis progress to date. This document should be no longer than 2 pages, excluding illustrations and references. It must be submitted to the Special Committee members at least 2 week in advance of this meeting. At the meeting, the student should be prepared to discuss in depth the background (general and specific) of the project, approaches that will be taken, and what has already been accomplished. This meeting will serve as a mechanism to ensure that the student's thesis work is progressing. It will also serve to update the Committee with the student's project and to allow the committee to provide constructive comments. The 2 page document must be approved by the committee. A brief report will be completed by one of the committee members (not the thesis mentor) in LEARN for forwarding to the Program Directors. Completion of the post-ACE first Special Committee meeting is required to remain in good academic standing.

ACE TOPIC CHOICE

The topic is up to the student, with the following advisory considerations: It is the student's privilege to have flexibility and latitude in choice of the ACE topic. However, it is the student's responsibility to convincingly demonstrate independence of thought. The closer the ACE topic is to research projects previously conceived by the student's mentor or already being conducted in the host laboratory, the more difficult it may be to establish the independence of the student's thinking. However, it is often the case that the ACE is taken at a point when the thesis topic is not defined or the thesis topic that was initially chosen does not pan out. An independently-conceived ACE topic may give shape to or even become a thesis topic; this is welcomed.



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The only restriction on topic choice is that all portions of the document must be written entirely independently from the student's mentor. While the student is encouraged to build on work previously conducted in the host laboratory, direct incorporation of specific aims, hypotheses or conclusions from a previously written grant application from the mentor (or anyone else) is not allowed. The mentor must certify that the specific aims were developed and written independently, and that the content of the ACE proposal was not "lifted" from a pre-existing research plan. The student will be held responsible for all ideas expressed in the proposal, and will be expected to explain, justify and defend all concepts described in the written document.

A suitable topic is one that incorporates experimentally testable models or hypotheses, is amenable to rational experimental design, and results in more than one predictable outcome for the experiments. Research topics that are seen as "fishing expeditions" or are not hypothesis-driven will generally not be approved.

As noted above, the lab head will be given the proposed aims and the completed written exam. For the student to proceed, the lab head must attest that the aims were prepared independently and that they reflect the original work of the student.

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SPECIAL COMMITTEE

Once a thesis mentor has been agreed upon (which should occur by July 1), the student, in consultation with the mentor, forms a Special Committee composed of the thesis mentor and two additional faculty members. This committee acts to evaluate a student's research and should also serve as an informational resource to the student. Special Committee forms are available from the graduate office (Cornell A -131) or on the Graduate School Website.

A Program Director must sign these forms, which are then returned to Vanessa Dodson, who files them with the Dean's office. Any subsequent changes must be approved by a student's mentor and the appropriate Program Director, and be indicated on the form on file in the Dean's office.

The Special Committee must meet at least once per year from year 2 through graduation by July 1. Annual Special committee meetings are a requirement for remaining in good academic standing. For each Special Committee meeting (following the one that occurs within 6 months of completing the ACE), the student should prepare a 1-2 page written outline of progress and future goals. This must be submitted to all committee members prior to the meeting.

REQUIREMENTS FOR FORMAL PRESENTATIONS OF SCIENTIFIC DATA

The ability to accurately and effectively present scientific data in a formal setting is vital to a productive scientific career. To encourage students to gain such experience, all students upon completion of their ACE must annually present original data at a formal scientific venue. This requirement can be fulfilled by presenting a Talk or Poster at the annual Vincent Du Vigneaud Memorial Symposium hosted by the Weill Cornell Graduate School, the annual BCMB Program Retreat held every Fall, various Departmental Seminar Series or at any National or International Scientific meeting. Fulfillment of this requirement must be verified at the student's annual special committee meeting. The student is required to submit to the special committee the abstract of the presentation.

ACADEMIC REQUIREMENTS FOR MD/PHD STUDENTS

MD/PhD students enter the Graduate Program following completion of:

- the Frontiers in Biomedical Science courses, which they take in the first two years of medical school,
- three lab rotations, during the summers preceding the first and second years of medical school and the summer after the second year of medical school.
- the first two years of the Medical School curriculum. MD/PhD students select their thesis laboratories and initiate their thesis research in the fall of their third year. During this year they also take four additional quarters of graduate courses, which they can take at either the Weill or the Rockefeller graduate schools. The ACE is administered to MD/PhD students in the Spring/summer of their third year. MD/PhD students must submit their Rockefeller Thesis Proposal (RTP) to both the MD/PhD office and the program coordinator at the Graduate School. All Weill Graduate School MD-PhD students must have a faculty member from the Rockefeller Graduate School on their special committee.

BCMB PROGRAM FACULTY LIST

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BIOCHEMISTRY COURSE - FALL 2021

Lectures: MWF 9:30 AM -11:00 AM

Discussions: 5:30 PM - 7:00 PM

Director: Baran Ersoy - bersoy@med.cornell.edu; (415) 215 1555; Belfer Research Building Rm 628

TAs: 2nd Year: Rachel Glenn (lead) - rag4005@med.cornell.edu; Richard Garner - rig4005@med.cornell.edu;

1st Year: Kevan Chu - kec4008@med.cornell.edu; Abraham Shim - acs4002@med.cornell.edu; Josefine Striepen - jus4013@med.cornell.edu.

Lecture #	Date	Day	Topic	Faculty	TA1	TA2	Discussion
1	30-Aug	M	Physical principles that govern chemical reactions	Tim Ryan	Abraham Shim	Josefine Striepen	
2	1-Sep	W	Enzymes: Why do they work?	Christopher Lima	Abraham Shim	Kevan Chu	
Discussion	2-Sep	R	PYMOL workshop		Abraham Shim	Kevan Chu	PYMOL
3	3-Sep	F	Reaction mechanisms: PYMOL exercise	Christopher Lima	Abraham Shim	Kevan Chu	
4	8-Sep	W	X-Ray crystallography	Steven Long	Abraham Shim	Josefine Striepen	
Discussion	9-Sep	R	Review of essential math		Abraham Shim	Kevan Chu	Math review
5	10-Sep	F	Statistical mechanics of biomolecules I	John Chodera	Abraham Shim	Kevan Chu	
6	13-Sep	M	Statistical mechanics of biomolecules II	John Chodera	Abraham Shim	Kevan Chu	
Discussion	14-Sep	T	Practice question(s)		Abe & Kevan		4-6
7	15-Sep	W	Cryo-EM	Richard Hite	Abraham Shim	Kevan Chu	
8	17-Sep	F	Protein folding. Non-covalent forces	David Eliezer	Rachel Glenn	Richard Garner	
9	20-Sep	M	Ligand Binding	Kenneth Marans	Josefine Striepen	Richard Garner	
10	22-Sep	W	Protein-protein interactions	Jonathan Goldberg	Josefine Striepen	Richard Garner	
Discussion	22-Sep	W	Practice question(s)		Abe, Josefine, Richard & Rachel		7-10

Midterm (Handed on Sep 24, due back by Oct 8)

11	27-Sep	M	Protein purification I	Stewart Shuman	Richard Garner	Rachel Glenn	
12	29-Sep	W	Protein purification II (to be confirmed)	Stewart Shuman	Richard Garner	Rachel Glenn	
13	1-Oct	F	Post-translational modification-mediated signaling	Andrew Koff	Richard Garner	Rachel Glenn	
14	4-Oct	M	Mass spectrometry of polypeptides	Noah Dephoure	Richard Garner	Rachel Glenn	
Discussion	5-Oct	T	Practice question(s)		Richard & Rachel		11-14
15	6-Oct	M	Biochemistry of lipids and membranes	Marilyn Resh	Kevan Chu	Rachel Glenn	
16	8-Oct	F	Metabolomics and metabolite profiling	Steven Gross	Josephine Striepen	Rachel Glenn	
17	11-Oct	M	Lipid metabolism	Baran Ersoy	Josephine Striepen	Rachel Glenn	
18	13-Oct	W	Glucose metabolism and cancer	Andrew Intlekofer	Josephine Striepen	Rachel Glenn	
Discussion	14-Oct	R	Practice question(s)		Josefine & Rachel		15-18
19	15-Oct	F	Genomic tools and data analysis	Iestyn Whitehouse	Kevan Chu	Josefine Striepen	
20	18-Oct	M	Proteins and nucleic acids	Elena Piskounova	Kevan Chu	Richard Garner	
21	20-Oct	W	Fluorescence-based technologies	Morgan Huse	Josefine Striepen	Abraham Shim	
Discussion	22-Oct	F	Practice question(s)		Kevan, Josefine and Richie		19-22

Final (Handed on Oct 22, due back by Nov 3)

Molecular Genetics Fall 2021

Lectures Tue/Thurs 10-11:30AM

TA discussion sessions

Wednesday 5:30-6:30pm and then 6:30-7:30pm. Sign up for each session.

Review sessions

Course Directors:

[Richard White \(MSKCC\)](#)

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Lecture number

Lecture number	Date	Topic	Faculty	Discussion Sections	TA
1	8/26/21	Genome modification & Genetic concepts	Danwei Huangfu		
2	8/31/21	Genome modification & DNA repair	Marina Jasin	#1 lecture 1 & 2 on 9/1	Bjoern
3	9/2/21	Drosophila-1	Jen Zallen		
4	9/7/21	Drosophila-2	Mary Baylies	#2 lecture 3&4 on 9/8	Aristotle
5	9/9/21	RNAi	Eric Lai		
6	9/14/21	Meiotic recombination	Scott Keeney	#3 lecture 5&6 on 9/15	Coco
7	9/16/21	C. elegans genetics	Zhirong Bao		
8	9/21/21	Advanced Genetic Approaches-1	Xiaolan Zhao	#4 lecture 7&8 on 9/22	Aristotle
9	9/28/21	Advanced Genetic Approaches-1	Xiaolan Zhao		
10	9/30/21	Mouse genetics-1	Kat Hadjantonakis	#5 lecture 9&10 on 9/29	Uk Jin
11	10/5/21	Mouse genetics-2	Alex Joyner		
12	10/7/21	Mouse genetics-3	Alex Joyner	#6 lecture 11&12 on 10/6	Uk Jin
13	10/12/21	Cancer genetics	Andrea Ventura		
14	10/14/21	Human genetics	Ken Offit	#7 lecture 13&14 on 10/13	Coco
15	10/19/21	Epigenetics	Effie Apostolou		
16	10/21/21	Zebrafish genetics	Richard White	#8 lecture 15&16 on 10/22	Bjoern
	10/26/21	Review Session #1	TAs and Course Directors		
	10/28/21	Review Session #2	TAs and Course Directors		

Exam handout

10/29/2021

Exam due

11/8/2021

Lab Rotation Research Progress Report

BCMB Allied Graduate Program

Rotation Period: Summer Fall Winter Spring

Project Title:

Student's Name: _____

Lab Rotation Mentor: _____

Signature: _____

1st Year Advisor: _____

Signature: _____