

# Fall 2021 Half Courses

*\*Referred to as "Full Term" in GSAS Academic Calendar\**

## ENROLLMENT DEADLINES

Check-in Opens	Aug. 2
Course Registration	Aug. 16
Check-in Deadline	Aug. 16
Course Reg. Deadline	Aug. 26
Fall Full Term Begins	Sept. 1
Add/drop no fee	Sept. 20
Last day to add/enroll	Oct. 18
Last day to drop	Nov. 1

## GSAS ACADEMIC CALENDAR



<https://registrar.fas.harvard.edu/gsas-academic-calendar>

## REMINDERS

You **cannot register** for courses until you **CHECK-IN** (or go to: <https://registrar.fas.harvard.edu/online-check-in>)

Register for **16 credits** for full-time student status and health insurance eligibility

Register by going to <https://my.harvard.edu/>

For questions, contact: [dms\\_courses@hms.harvard.edu](mailto:dms_courses@hms.harvard.edu)



**BBS 301 Embedded Teaching Practicum (for Graduate TFs)**

Jason Heustis

**BBS 330 Critical Thinking & Research Proposal Writing**

Rosalyn Adam, Matthew Harris

**BCMP 200 Principles of Molecular Biology**

Joseph Loparo, Karen Adelman, Alan Brown, Lee Churchman, Frank Slack, Ralph Scully

**BCMP 218 Molecular Medicine**

Suneet Agarwal

**BCMP 230 Principles & Practice of Drug Development**

Stan Neil Finkelstein, Peter Sorger

**BMIF 201 Concepts in Genome Analysis**

Shamil Sunyaev, Cheng-Zhong Zhang, Michael Baym, Heng Li

**GENETIC 201 Principles of Genetics**

Fred Winston, Maxwell Heiman, Thomas Bernhardt, Jenna Galloway, Stephanie Mohr, Steven McCarroll

**HBTM 235 Principles of Human Disease: Physiology & Pathology**

Connie Cepko

**IMMUN 201 Advanced Topics in Immunology**

Thorsten Mempel, Shiv Pillai

**IMMUN 301 Immunology Seminar**

Shiv Pillai, Galit Alter

**MED-SCI 250AB Human Functional Anatomy**

Lee Gehrke



**MICROBI 202 Mechanisms of Bacterial Pathogenesis & Host Immune Response**

Marcia Goldberg, Barczak, Amy, Helaine, Sophie, Higgins, Darren, Kagan, Jonathan, Ravel, Deepali, Starnbach, Michael

**MICROBI 205 Mechanisms of Microbial Pathogenesis**

Sanjat Kanjilal

**NEUROBIO 212 Mathematical Tools for Neuroscience**

Eleanor R. Batty, John Assad

**NEUROBIO 215A The Discipline of Neuroscience**

John Assad, Lisa Goodrich, Tari Tan

**NEUROBIO 230 Visual Recognition: Computational & Biophysical Perspective**

Gabriel Kreiman

**SHBT 200 Acoustics, Production & Perception of Speech**

Satrajit Ghosh, Sunil Puria, Heidi Nakajima

**SHBT 201 Biology of the Inner Ear**

Charles Liberman, Stéphane Maison

**VIROLOGY 200 Introduction to Virology**

Jonathan Abraham, Philip Kranzusch

**VIROLOGY 202 Proposal Writing**

Daniel Lingwood, Todd Allen, Samuel Rabkin, Smita Gopinath, Gaurav Gaiha



## Biological & Biomedical Sciences

### **BBS 301 Embedded Teaching Practicum (for Graduate TFs)**

Jason Heustis

4 units. Instructor consent required

Time varies by date; details of date and time to be shared by instructors

**Meeting Dates:** Aug. 10 – Dec. 15, 2021

**Meeting Location:** Shared by instructors

The Embedded Teaching Practicum serves to enhance the teaching experience for TFs and the learning experience for enrollees in the core BBS courses. While TFs serve different functions and experience teaching from different perspectives in each of our core courses, they collectively serve a vital role in helping with the delivery of a contemporary, high-quality and accessible education to HMS graduate students. The embedded teaching practicum provides practice-based training in curriculum design, developing learning objectives, assessment development and DBER; facilitating a group discussion; professionalism in the classroom; minding and supporting student wellness; and preparation for teaching throughout and beyond time in graduate school. Teaching fellows are provided training and experience in the development of an early-career teaching philosophy. Required course for TFs working in BCMP 200; other TFs may register for this course pending approval of the Course Director.

**Course Notes:** This course runs from August 10, 2021 - December 15, 2021. Time varies by date; details of date and time to be shared by instructors. Sessions scheduled in August will be held to complete essential training prior to the start of the class; these will be held virtually to ensure students can participate remotely.

TFs should contact Jason Heustis, [ronald\\_heustis@hms.harvard.edu](mailto:ronald_heustis@hms.harvard.edu). Required Course for TFs working in BCMP 200. Open to TFs serving in other BBS core classes. Registration for this class is limited to students serving as Teaching Fellows for BBS core. Class meetings will be scheduled during daytime and evening hours, and will be communicated by the instructor. TFs are required to participate in all synchronous and asynchronous components of the course in which they are serving as a TF.

**Course Head:** Jason Heustis, [ronald\\_heustis@hms.harvard.edu](mailto:ronald_heustis@hms.harvard.edu)



## **BBS 330 Critical Thinking & Research Proposal Writing**

Rosalyn Adam, Matthew Harris

4 units.

Th, 2:00pm – 3:30pm

**Meeting Dates:** Sept. 9 – Dec. 17, 2021

**Meeting Locations:** Session 1 & 2 (lectures) NRB 350

A small group tutorial systematically guiding students in the writing of original, hypothesis-driven research proposals from initial topic selection through completion of a final draft.

**Course Notes:** This course is open to second year BBS students. Others need permission of the instructors. Dates, times and locations for Sessions 3 and 4 will be determined by the faculty running the small group sessions. Students will be able to sign up for their specific group on a first-come, first-served basis until the group limit (5 students) is reached. The BBS office will coordinate this process. Group assignments will be posted on the course [website](#).

**Class Notes:** Session 1 (lecture) will be held on Sept. 9, 2:00pm - 3:30pm. Session 2 (lecture) will be held on Sept. 30, 2:00pm - 3:30pm. Small group sessions will be scheduled by faculty instructors and will occur on Zoom.

**Recommended Prep:** Check course [website](#) for downloadable material

**Course Heads:** Rosalyn Adam, [rosalyn.adam@childrens.harvard.edu](mailto:rosalyn.adam@childrens.harvard.edu), Matthew Harris, [matthew.harris@childrens.harvard.edu](mailto:matthew.harris@childrens.harvard.edu)

**Other instructors:** Caroline Burns, [caroline.burns@childrens.harvard.edu](mailto:caroline.burns@childrens.harvard.edu), Geoff Burns, [geoff.burns@childrens.harvard.edu](mailto:geoff.burns@childrens.harvard.edu), April Craft, [april.craft@childrens.harvard.edu](mailto:april.craft@childrens.harvard.edu), Christina Jacobsen [Christina.jacobsen@childrens.harvard.edu](mailto:Christina.jacobsen@childrens.harvard.edu), Hong Chen [hong.chen@childrens.harvard.edu](mailto:hong.chen@childrens.harvard.edu), Christian Dibble [ccdibble@bidmc.harvard.edu](mailto:ccdibble@bidmc.harvard.edu), Ming-Ru Wu [Ming-Ru\\_Wu@DFCI.HARVARD.EDU](mailto:Ming-Ru_Wu@DFCI.HARVARD.EDU), Sean Stowell, [srstowell@bwh.harvard.edu](mailto:srstowell@bwh.harvard.edu), Yu-Hua Tseng, [yu-hua.tseng@joslin.harvard.edu](mailto:yu-hua.tseng@joslin.harvard.edu), John (Sean) Clohessy, [jclohess@bidmc.harvard.edu](mailto:jclohess@bidmc.harvard.edu), Duane Wesemann, [dwesemann@partners.org](mailto:dwesemann@partners.org), Ralph Scully, [rscully@bidmc.harvard.edu](mailto:rscully@bidmc.harvard.edu), Mimi Bandopadhyay, [Pratiti\\_Bandopadhyay@DFCI.HARVARD.EDU](mailto:Pratiti_Bandopadhyay@DFCI.HARVARD.EDU), Natalie Artzi, [nartzi@bwh.harvard.edu](mailto:nartzi@bwh.harvard.edu)



## Biological Chemistry & Molecular Pharmacology

### **BCMP 200 Principles of Molecular Biology**

Joseph Loparo, Karen Adelman, Alan Brown, Lee Churchman, Frank Slack, Ralph Scully

4 units. Enrollment limited to 78. Instructor consent required.

M/W/F, 11:00am – 12:00pm

**Meeting Dates:** Sept. 1 – Dec. 6, 2021

**Meeting Location:** The course will meet in the Cannon room for the first day of class. After that, the main course room will be TMEC 227. Please see course page for breakdown.

Principles of Molecular Biology is a course organized around the Central Dogma of Biology with presentations covering fundamental aspects of DNA and RNA structure, their function, and their interactions with proteins. The course opens with a discussion of the physical and chemical properties that drive the interactions of proteins with nucleic acids. This is used as a basis for understanding the material presented in the subsequent six modules, which cover DNA replication, DNA repair, gene regulation, transcription, RNA processing, and translation. Throughout this course, an emphasis will be placed on how the structure of small molecular machines (proteins) define their function in the processes and pathways that are introduced.

**Recommended Prep:** Intended primarily for graduate students familiar with basic molecular biology or with strong biology/chemistry background.

**Course Head:** Joseph Loparo, [joseph\\_loparo@hms.harvard.edu](mailto:joseph_loparo@hms.harvard.edu)

**Other Instructors:** Karen Adelman, Alan Brown, Lee Churchman, Frank Slack, Ralph Scully

**Curriculum Fellow:** Madhvi Venkatesh, [madhvi\\_venkatesh@hms.harvard.edu](mailto:madhvi_venkatesh@hms.harvard.edu)

### **BCMP 218 Molecular Medicine**

Suneet Agarwal

4 units. Enrollment limited to 25. Instructor consent required

T, 1:00pm - 3:00pm

**Meeting Dates:** Sept. 14 – Dec. 7, 2021

**Meeting Location:** TMEC 447



A seminar on various human diseases and their underlying genetic or biochemical bases. Primary scientific papers discussed. Lectures by faculty and seminars conducted by students, faculty supervision.

**Course Notes:** Faculty mentors will guide student-led discussions of the papers. Jointly offered with the Medical School as HT 140.

**Prerequisites:** College-level mastery of principles of cellular and molecular biology and genetics.

**Course Head:** Suneet Agarwal, [suneet.agarwal@childrens.harvard.edu](mailto:suneet.agarwal@childrens.harvard.edu)

## **BCMP 230 Principles & Practice of Drug Development**

Stan Neil Finkelstein, Peter Sorger

4 units.

Wed., 3:00pm - 6:00pm

**Meeting Dates:** Sept. 8 – Dec. 8, 2021

**Meeting Location:** MIT 4-237

Critical assessment of the major issues and stages of developing a pharmaceutical or biopharmaceutical. Drug discovery, preclinical development, clinical investigation, manufacturing and regulatory issues considered for small and large molecules. Economic considerations of the drug development process.

**Course Heads:** Stan Finkelstein, [finkelst@hcp.med.harvard.edu](mailto:finkelst@hcp.med.harvard.edu), Peter Sorger, [peter\\_sorger@hms.harvard.edu](mailto:peter_sorger@hms.harvard.edu)

**Other Instructors:** Nienke Moret, GK Raju

## Biomedical Informatics

### **BMIF 201 Concepts in Genome Analysis**

Shamil Sunyaev, Cheng-Zhong Zhang, Michael Baym, Heng Li

4 units.

M/W, 2:30pm - 4:00pm

**Meeting Dates:** Sept. 1 – Dec. 1, 2021

**Meeting Location:** TMEC 250 Mini Amphitheater



This course focuses on quantitative aspects of genetics and genomics, including computational and statistical methods of genomic analysis. We will introduce basic concepts and discuss recent progress in population and evolutionary genetics and cover principles of statistical genetics of Mendelian and complex traits. We will then introduce current genomic technologies

and key algorithms in computational biology and bioinformatics. We will discuss applications of these algorithms to genome annotation and analysis of epigenomics, cancer genomics and metagenomics data. Proficiency in programming and basic knowledge of genetics and statistics will be assumed.

**Course Head** Shamil Sunyaev, [ssunyaev@rics.bwh.harvard.edu](mailto:ssunyaev@rics.bwh.harvard.edu)

**Other Instructors:** Cheng-Zhong Zhang, Michael Baym, Heng Li

## Genetics

### **GENETIC 201 Principles of Genetics**

Fred Winston, Maxwell Heiman, Thomas Bernhardt, Jenna Galloway, Stephanie Mohr, Steven McCarroll

4 Units.

M/W/F, 9:00am – 10:20am

**Meeting Dates:** Lectures will be in the Cannon Room, beginning Wed., Sept. 1 through Dec. 9. There will also be eight discussion sections during the semester. All problems sets and exams will be posted on the course website during the semester.

**Meeting Location:** Cannon Room, Building C 114

An in-depth survey of genetics that covers basic principles and modern approaches. We will draw on examples from various systems, including bacteria, yeast, *Drosophila*, *C. elegans*, zebrafish, mouse, and human.

**Course Notes:** Intended for first-year graduate students.

**Course Heads:** Fred Winston, [winston@genetics.med.harvard.edu](mailto:winston@genetics.med.harvard.edu), Max Heiman, [heiman@genetics.med.harvard.edu](mailto:heiman@genetics.med.harvard.edu)



## Human Biology & Translational Medicine

### **HBTM 235 Principles of Human Disease: Physiology & Pathology**

Connie Cepko

4 units

M/W/F, 9:00am - 10:30am

Breakdown (subject to change): M/F – lectures, W – tutorials

**Meeting Dates:** Sept. 1 – Dec. 1, 2021

**Meeting Location:** Locations vary by date – please see course page

This course covers the normal physiology and pathophysiology of selected organs, through lectures, readings, tutorials based on clinical cases, and patient presentations. Human biology is emphasized, with some examples also drawn from model organisms. Recent therapeutic approaches, including RNAi, gene therapy, and genome editing will be covered

**Course Note:** Course enrollment is open to graduate students from any program as well as undergraduates.

**Prerequisites:** Knowledge of introductory biochemistry, molecular biology, and cell biology required (MCB52 and MCB54 or equivalent and one year of organic chemistry for undergraduates).

**Course Head:** Connie Cepko, [cepko@genetics.med.harvard.edu](mailto:cepko@genetics.med.harvard.edu)

## Immunology

### **IMMUN 201 Advanced Topics in Immunology**

Thorsten Mempel, Shiv Pillai

4 units. Enrollment limited to 50. Instructor consent required

T/Th, 1:30pm – 3:00pm EST

**Meeting Dates:** Sept. 2 – Dec. 2, 2021

**Meeting Location:** Modell 100A, Fred S. Rosen Lecture Hall



This course provides an intensive and in-depth examination of a selection of fundamental concepts in immunology. It takes advantage of the unique expertise of members of our

Immunology faculty to illustrate how these concepts have been established and continue to be developed based on seminal work in the field including contributions from their own laboratories.

**Course Notes:** Intended for students who have had prior exposure to immunology on the undergraduate level. In the absence of such exposure, students must obtain the permission of the Course Director.

**Prerequisites:** A background in genetics and biochemistry is strongly recommended.

**Course Heads:** Thorsten Mempel, [tmempel@mgh.harvard.edu](mailto:tmempel@mgh.harvard.edu), Shiv Pillai, [pillai@helix.mgh.harvard.edu](mailto:pillai@helix.mgh.harvard.edu)

**Other Instructors:** Jonathan Kagan, Ulrich von Andrian, Frederick Alt, Nir Hacohen, Amy Wagers, Michael Carroll, Facundo Batista, Kai Wucherpfennig, Vijay Kuchroo, Arlene Sharpe, Judy Lieberman, Lydia Lynch, Stephanie Dougan, Kate Jeffrey

## IMMUN 301 Immunology Seminar

Shiv Pillai, Galit Alter

4 units. Enrollment limited to 20. Instructor consent required.

W, Speaker Meet and Greet 12:00pm - 1:00pm, Discussion Class 2:00pm - 3:30pm EST

**Meeting Dates:** Sept. 1 – Dec. 1, 2021

**Meeting Location:** Modell 100A, Fred S. Rosen Lecture Hall

Gives students exposure to research topics in immunology. Students prepare for the weekly seminar through readings, discussions, and preparing brief write-ups. These discussions are facilitated by members of the Committee on Immunology.

**Course Note:** Required for, and limited to, first-year Immunology graduate students. All others will be evaluated for enrollment on a case by case basis. Attendance is required at both the speaker Meet and Greets and the seminars. Meet and Greet timing can be found in class notes in my.harvard.

**Course Heads:** Shiv Pillai, [pillai@helix.mgh.harvard.edu](mailto:pillai@helix.mgh.harvard.edu), Galit Alter, [GALTER@mgh.harvard.edu](mailto:GALTER@mgh.harvard.edu)



## Medical Sciences

### **MED-SCI 250AB Human Functional Anatomy**

Lee Gehrke

4 units. Enrollment limited to 48. Instructor consent required.

M/W/F, 1:30pm – 6:00pm

Breakdown: Lecture: 1:30pm-2:45pm; Laboratory: 3:00pm -6:00pm

**Meeting Dates:** Sept. 8 – Dec. 10, 2021

**Meeting Location:** Armenise Amphitheater (lecture) plus TMEC Anatomy Labs

Lectures, prosections, and donor cadaver dissections provide a thorough exploration of the gross structure and function of the human body. Fundamental principles of embryology and bioengineering promote analytical approaches to understanding the body's design.

**Course Notes:** Open to qualified graduate students with research interests in organismic and evolutionary biology (OEB), with permission of the course director. The course has a minimum enrollment of 30. This course requires rental of a locker for a fee. Offered jointly with the

Medical School as HT010, which is open to M.D. candidates in the Health Sciences and Technology Program, Harvard Medical School

**Course Head:** Lee Gehrke, [lee\\_gehrke@hms.harvard.edu](mailto:lee_gehrke@hms.harvard.edu)

**Other Instructors:** Trudy van Houten Ph.D., Mohini Lutchman Ph.D., Sabine Hildebrandt, M.D.

## Microbiology & Immunobiology

### **MICROBI 202 Mechanisms of Bacterial Pathogenesis & Host Immune Response**

Marcia Goldberg, Amy Barczak, Sophie Helaine, Darren Higgins, Jonathan Kagan, Michael Starnbach, Deepali Ravel

4 units. Enrollment limited to 20. Instructor consent required.

T/ Th, 10:00am - 12:00pm

**Meeting Dates:** Sept. 2 – Dec. 2, 2021

**Meeting Location:** NRB 1031



This course focuses on molecular mechanisms of bacterial pathogenesis and the host response to infection. The class consists of lectures and group discussions emphasizing themes of pathogenesis, methods, results, and interpretations of classic and contemporary literature.

Subjects including bacterial secretion systems, mechanisms of entry into host cells, biofilm formation, and motility are viewed primarily from the pathogen's perspective, whereas topics including inflammasome activation, TLR signaling, and adaptive immune responses provide a host-centric view. Additional sessions are spent examining current methods of antibiotic discovery and vaccine development.

The course also introduces students to the wide diversity of pathogenic bacteria. Organisms discussed include pathogenic *E. coli*, *Shigella* species, *Vibrio cholerae*, *Listeria monocytogenes*, *Chlamydia trachomatis*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, as well as a discussion of the challenges presented by currently unculturable species. Where relevant, connections will also be made with pathogenesis and immune responses to viruses (particularly SARS-CoV-2), parasites, and fungi.

**Course Notes:** Designed to complement Microbiology 201; however, students who have not taken Microbiology 201 previously are welcome. Designed for graduate students in their first year or beyond, however undergraduates with specific interest in the field may also enroll.

**Course Head:** Marcia Goldberg, [marcia.goldberg@mgh.harvard.edu](mailto:marcia.goldberg@mgh.harvard.edu)

**Other Instructors:** Amy Barczak, Sophie Helaine, Darren Higgins, Jonathan Kagan, Michael Starnbach, Deepali Ravel

## **MICROBI 205 Mechanisms of Microbial Pathogenesis**

Sanjat Kanjilal

4 units. Enrollment limited to 40. Instructor consent required.

T/Th, 8:30am - 12:00pm

**Meeting Dates:** Sept. 7 – Dec. 13, 2021

**Meeting Location:** Building C 114 Cannon

Microbes occupy every niche of our environment and our bodies. They shape the way we develop, mature, and stay healthy. A subset of these organisms lead to states of infection, some of which have shaped the very foundations of our society. While the 20th century saw remarkable reductions in the burden of infectious diseases, they remain very much a part of our world, as evidenced by the COVID-19 pandemic. In HST 040, we will provide students an overview of the major microbial pathogens that students will encounter frequently in medical practice, their intrinsic microbiological properties, their epidemiology and their manifestations



of infection. Along the way, we will have interactive discussions around the decision-making processes to help the patient with infection, modern diagnostics, and the operation of the clinical microbiology laboratory in the 21st century. Students will also meet patients who will provide their lived experiences with acute and chronic infections. Finally, we will discuss a wide range of research topics scaling from host / microbiome interactions at the molecular level, to next generation viral and bacterial diagnostics, to applications of AI models for predicting antibiotic resistance, to global pandemic simulations and health disparities manifested through infectious diseases. In addition to the core clinical and research material, students will also have opportunities to gain skills in scientific communication through engagement with the wider public and their classmates.

**Course Notes:** Offered jointly with the Medical School as HT 040.

**Prerequisites:** A background course in molecular biology is strongly encouraged

**Course Head:** Sanjat Kanjilal, [SKANJILAL@BWH.HARVARD.EDU](mailto:SKANJILAL@BWH.HARVARD.EDU)

**Other Instructors:** Hysell, Kristen

## Neurobiology

### **NEUROBIO 212 Mathematical Tools for Neuroscience**

Eleanor R. Batty, John Assad

4 units. Enrollment limited to 20. Instructor consent required.

T/Th, 3:00pm - 4:30pm

**Meeting Dates:** Sept. 3 – Dec. 9, 2021

**Meeting Location:** TMEC 330

This course aims to equip graduate students with the fundamental quantitative skills necessary for neuroscience research and to serve as a solid foundation for further computational neuroscience classes. The course is aimed at first-, second- or third-year students in the Neuroscience PhD program, and is open to other graduate students in the biosciences. This course will cover the basics of linear algebra, differential equations, probability/statistics, and machine learning (focusing on areas applicable to neuroscience). You will not need any math experience beyond high school calculus. Some amount of coding in Python is necessary for this class. This course will be a flipped classroom course with prerecorded lectures and students working together on problem sets & programming exercises during class time.

**Course Notes:** There will be some programming exercises in Python so some coding experience will be necessary (email instructor for advice on how to prepare).



**Course Heads:** Eleanor R. Batty, [Eleanor\\_Batty@hms.harvard.edu](mailto:Eleanor_Batty@hms.harvard.edu), John Assad, [john\\_assad@hms.harvard.edu](mailto:john_assad@hms.harvard.edu)

## **NEUROBIO 215A The Discipline of Neuroscience**

John Assad, Lisa Goodrich, Tari Tan

4 units. Instructor consent required.

T/Th, 9:00am – 12:00pm

**Meeting Dates:** Sept. 7 – Dec. 16, 2021

**Meeting Location:** Warren Alpert (WAB) 236

This course will endow students with the broad conceptual fluency in the discipline of neuroscience required to relate genes to circuit function, metabolism to neurological disease, and cell biology to neural computations. Through a combination of asynchronous, recorded

lectures and synchronous in-class activities, students will learn to design, quantitatively analyze, and interpret experiments that address a variety of questions spanning molecular to systems neuroscience. During the first semester, students will think critically about the fundamental units of the nervous system within the context of cellular function, electrical conduction, and chemical signaling. The second half of the course builds upon this foundation to focus on broadly defined “networks of neural function”; as related to coordinated neural activity, the concerted execution of genetic programs, and anatomically defined structural networks. The course culminates with students writing a grant proposal in the style of the NIH NRSA. Part one of a two-part series. The curriculum for this course builds throughout the academic year. Students are strongly encouraged to enroll in both the fall and spring course within the same academic year.

**Course Notes:** Please note that Program in Neuroscience (PiN) students must take both semesters to fulfill the requirement. Non-PiN students may enroll in just the fall semester with instructor approval.

**Course Heads:** John Assad, [john\\_assad@hms.harvard.edu](mailto:john_assad@hms.harvard.edu), Lisa Goodrich, [lisa\\_goodrich@hms.harvard.edu](mailto:lisa_goodrich@hms.harvard.edu), Tari Tan, [taralyn\\_tan@hms.harvard.edu](mailto:taralyn_tan@hms.harvard.edu)

**Other Instructors:** Bruce Bean, David Corey, Michael Do, Pascal Kaeser, Joshua Kaplan, Wade Regehr, Bernardo Sabatini, Thomas Schwarz, Gary Yellen



## **NEUROBIO 230 Visual Recognition: Computational & Biophysical Perspective**

Gabriel Kreiman

4 Units. Enrollment limited to 50. Instructor consent required  
M, 3:00pm – 5:00pm

**Meeting Dates:** Sept. 1 – Dec. 14, 2021

**Meeting Location:** BioLabs 2062

How does cerebral cortex store information, compute and learn? How can we build prosthetic devices to fix or augment brain function? How can we build biologically inspired artificial intelligence? This course will examine these questions in the context of visual cognition. Topics: architecture of visual cortex, neurophysiology, visual consciousness, computational neuroscience, models of pattern recognition and computer vision, artificial intelligence, brain-machine interfaces.

**Course Notes:** Jointly offered with Faculty of Arts & Sciences as NEURO 130. NEUROBIO 230 cannot be taken if NEURO 130 has been taken. NEUROBIO 230 cannot be taken concurrently with NEURO 130.

**Course Website:**

[http://klab.tch.harvard.edu/academia/classes/hms\\_neuro300\\_vision/Harvard\\_Biological\\_and\\_Computer\\_Vision.html](http://klab.tch.harvard.edu/academia/classes/hms_neuro300_vision/Harvard_Biological_and_Computer_Vision.html)

**Prerequisites:** Life Sciences 1a (or Life & Physical Sciences A) and Life Sciences 1b (or equivalent)

**Recommended Prep:** Math (Maa/Mab, Math 1A, 1B, Math 19 a/or equivalent). Physical Sciences 1. MCB 80.

**Course Head:** Gabriel Kreiman, [gabriel.kreiman@childrens.harvard.edu](mailto:gabriel.kreiman@childrens.harvard.edu), (617) 919-2530

## **Speech & Hearing Bioscience and Technology**

### **SGBT 200 Introduction to Sound, Speech, and Hearing**

Satrajit Ghosh, Sunil Puria, Heidi Nakajima

4 units. Instructor consent required

T/W/TH

**W**, 11:00am - Noon (recitations), **T/TH**, 3:00pm – 4:30pm (lectures)

**Meeting Dates:** Sept. 8 – Dec. 9, 2021

**Meeting Location:** MIT, 46-5056



Speech and hearing are fundamental to our ability to communicate, yet in the US alone millions of people suffer from some form of speech or hearing impairment. As engineers and scientists, it is important to understand the underlying principles of speech and hearing. The goals of this course are to introduce students to the acoustics, anatomy, physiology, and mechanics related to speech and hearing and to build a foundational understanding of one of the most complex, interdisciplinary, and fascinating areas of bioengineering. Particular attention will be paid to how humans generate and perceive speech. Topics include acoustic theory of speech production, basic digital speech processing, control mechanisms of speech production and basic elements of speech and voice perception. These fundamental topics will be explored through applications and challenges involving acoustics, speech recognition, and speech disorders, which are especially relevant given the ubiquity of recording and playback devices such as smartphones and home assistants. On the hearing side, topics include acoustics and mechanics of the outer ear, middle ear, and cochlea, how pathologies affect their function, and methods for clinical diagnosis. Surgical treatments and medical devices such as hearing aids, bone conduction devices, and implants will also be covered.

**Course Note:** This course is taught as course in consort with HST.714J at the Massachusetts Institute of Technology.

**Prerequisites:** Mathematical methods in science (Applied Mathematics 21a or Mathematics 21a) or equivalent. Calculus and introductory physics. Rigid body mechanics (Physics 11A), or Electrical circuits (Engineering Science 154) or permission of the instructor.

**Course Heads:** Satrajit Ghosh, [satra@mit.edu](mailto:satra@mit.edu), Sunil Puria, [sunil\\_puria@meei.harvard.edu](mailto:sunil_puria@meei.harvard.edu), Heidi Nakajima, [heidi\\_nakajima@meei.harvard.edu](mailto:heidi_nakajima@meei.harvard.edu)

## **SHBT 201 Biology of the Inner Ear**

Charles Liberman, Stéphane Maison

4 Units. Enrollment limited to 12. Instructor consent required.

**M**, 1:00pm - 2:30pm, **T/ Th**, 9:00am - 10:15am

**Meeting Dates:** Sept. 2 – Dec. 2, 2021

**Meeting Location:** TBD

Normal biology, biophysics, physiology and morphology of the inner ear, its sensory innervation and efferent control systems, and the mechanisms underlying sensorineural hearing loss and balance disorders. Material is presented through lectures, laboratory exercises and discussions of the primary literature.

**Course Notes:** Lecture notes will be available online.



**Prerequisite:** Introductory neurobiology recommended.

**Course Heads:** Charles Liberman, [charles\\_liberman@meei.harvard.edu](mailto:charles_liberman@meei.harvard.edu), Stéphane Maison, [stephane\\_maison@meei.harvard.edu](mailto:stephane_maison@meei.harvard.edu)

## Virology

### **VIROLOGY 200 Introduction to Virology**

Jonathan Abraham, Philip Kranzusch

4 units. Enrollment limited to 20. Instructor consent required.

M/W, 1:30pm - 3:45pm

**Meeting Dates:** Sept 8 - Dec 13

**Meeting Location:** TMEC 447

Introduction to virology. The lecture component reviews the basic principles of virology and introduces the major groups of human viruses. Weekly discussion groups critically analyze selected papers from the literature.

**Course Notes:** There will be mid-term and final projects consisting of proposals based on laboratory rotations.

**Course Website:** <http://www.courses.fas.harvard.edu/6075>

**Prerequisites:** Current Virology PhD student, or upon special consent

**Course Heads:** Jonathan Abraham, [abraham@crystal.harvard.edu](mailto:abraham@crystal.harvard.edu), Philip Kranzusch, [philip\\_kranzusch@dfci.harvard.edu](mailto:philip_kranzusch@dfci.harvard.edu)

### **VIROLOGY 202 Proposal Writing**

Daniel Lingwood, Todd Allen, Samuel Rabkin, Smita Gopinath, Gaurav Gaiha

4 units. Enrollment limited to 12. Instructor consent required.

W, 1:45pm – 4:00pm

**Meeting Dates:** Sept. 8 – Nov. 3, 2021

**Meeting Locations:** Location varies by date.



**General classroom meetings:**

**Group 1 meetings:** Conference room 852 at the Ragon institute, 400 Technology Square, Cambridge (Sept 15; Sept 22; Sept 29; Oct 6; Oct 13; Oct 20).

**Group 2 meetings:** Conference room 750 at the Ragon institute, 400 Technology Square, Cambridge (Sept 15; Sept 22; Sept 29; Oct 6; Oct 13; Oct 20).

**Group 3 meetings:** Rm 3820, Simches Research Bldg, MGH, 185 Cambridge St. Boston (Sept 15; Sept 22; Sept 29; Oct 6; Oct 13; Oct 20).

Students will write, present, and evaluate research proposals in the areas of virus replication, viral pathogenesis and treatment and prevention of viral infections.

**Prerequisites:** General background in biochemistry and virology.

**Course Head:** Daniel Lingwood, [dlingwood@gm.harvard.edu](mailto:dlingwood@gm.harvard.edu)

**Other Instructors:** Todd Allen [TALLEN2@mgh.harvard.edu](mailto:TALLEN2@mgh.harvard.edu), Samuel Rabkin [Rabkin@mgh.harvard.edu](mailto:Rabkin@mgh.harvard.edu), Smita Gopinath [sgopinath@hsph.harvard.edu](mailto:sgopinath@hsph.harvard.edu), Gaurav Gaiha [GGAIHA@mgh.harvard.edu](mailto:GGAIHA@mgh.harvard.edu)



# Fall 2021 Quarter Courses (QC)

*\*Referred to as "Half Term" in GSAS Academic Calendar\**

*Fall Session 1 (Half-Term QC's): 9/1/21 – 10/15/21*

*Fall Session 2 (Half-Term QC's): 10/18/21 – 12/2/21*

## ENROLLMENT DEADLINES

Check-in Opens	Aug. 2
Course Registration	Aug. 16
Check-in DDline	Aug. 16
Fall 1 Course Reg. Deadline	Aug. 26
Fall 1 Begins	Sept. 1
Fall 1 Add/Drop Deadline	Sept. 9
Fall 2 Begins	Oct. 18
Fall 2 Course Reg. Deadline	Oct. 22
Fall 2 Add/Drop Deadline	Nov. 4

## GSAS ACADEMIC CALENDAR



<https://registrar.fas.harvard.edu/gsas-academic-calendar>

## REMINDERS

You **cannot register** for courses until you **CHECK-IN** (or go to: <https://registrar.fas.harvard.edu/online-check-in>)

Register for **16 credits** for full-time student status and health insurance eligibility

Register by going to <https://my.harvard.edu/>

For questions, contact: [dms\\_courses@hms.harvard.edu](mailto:dms_courses@hms.harvard.edu)



**BCMP 308QC Cell Fate Decisions in Development & Disease**

Alan B. Cantor

**CELLBIO 306QC Teaching 100: The Theory & Science of Teaching**

Bradley Coleman

**HBTM 302QC Imaging and Microscopy Methods in Biology & Medicine**

Lev Perelman

**IMMUN 307QC Cancer Immunology**

Kai Wucherpfennig, Stephanie Dougan, Philip Kranzusch, Judith Agudo

**IMMUN 319QC Immunopathology and therapeutics of inflammation and resolution**

Timothy Hla, Charles Serhan

**IMMUN 320QC Innate immunity and viral infection of the lung. Coronaviruses, flu and lung superinfections**

Ivan Zanoni

**MED-SCI 300QC Conduct of Science**

Kristin White

**MED-SCI 302QC Conduct of Science Refresher**

Kristin White

**MED-SCI 312QC Graduate Training in the Biomedical Sciences**

Bradley Coleman

**MED-SCI 316QC PhD Pathfinder**

Joseph Arboleda, Jane Riccardi

**NEUROBIO 306QC Quantitative Methods for Biologists (AUGUST BOOTCAMP)**

Michael Springer, Richard T. Born

**NEUROBIO 308QC Thinking about Data: Statistics for the Life Sciences**

Richard T. Born, Brian Healy



**NEUROBIO 309QC The Molecular Pathology & Current Therapies for Retinal Diseases**

Dong Feng Chen, Petr Baranov, Corinna Bauer, Kinsang Cho, Shelley Fried, Daniel Sun, Mengyu Wang

**NEUROBIO 311QC Eye, Brain & Vision: Classics in Visual Neuroscience**

Richard Born, Jan Drugowitsch, Talia Konkle, Mark Andermann, Michael Do, Margaret Livingstone, Joshua Sanes, Chinfei Chen

**NEUROBIO 315QC Human Neuroanatomy & Neuropathology**

Matthew Frosch, Jean Augustinack

**NEUROBIO 322QC Advances in synaptic, cellular and circuit neuroscience**

Pascal Kaeser, Wade Regehr

**SHBT 301QC Introduction to Speech & Hearing Laboratories**

Bertrand Delgutte



## Biological Chemistry & Molecular Pharmacology

### **BCMP 308QC Cell Fate Decisions in Development & Disease**

Alan B. Cantor

2 units. Enrollment limited to 15. Instructor consent required.

W, 1:30pm - 3:30pm

**Meeting Dates:** Sept. 8 – Nov. 3, 2021

**Meeting Location:** Karp Family Research Building, Boston Children's Hospital, 7th Floor Conference Room

This quarter course will offer students an in-depth examination of current knowledge regarding mechanisms of cell fate decisions. It will examine these processes in the context of developmental cell plasticity, cellular reprogramming, and cancer. This will primarily be a literature-based course with examination and discussion of key studies in the field. Concepts involving the instructive role of lineage-specific transcription factors, transcription factor cross-antagonism, gene regulatory networks, multilineage priming, progenitor cell heterogeneity, pioneer factors, epigenetics, chromatin accessibility, chromatin remodeling factors, "super-enhancers," stem cell bias, lineage identity maintenance, mitotic bookmarking, non-coding RNAs, cell polarity, asymmetric cell division, lateral inhibition, lineage plasticity, and cellular reprogramming will be explored. These ideas will be examined in the context of several different tissue systems and organisms.

**Course Head:** Alan Cantor, [alan.cantor@childrens.harvard.edu](mailto:alan.cantor@childrens.harvard.edu)

**Other instructors:** Jason Buenrostro, Ramesh Shivdasani, Thorsten Schlaeger, Zhe Li

## Cell Biology

### **CELLBIO 306QC: Teaching 100: The Theory & Science of Teaching**

Bradley Coleman

2 Units. Enrollment limited to 20. Instructor consent required.

TH

**Remote section:** 8:30am - 10:30am

**In person section:** 2:00pm -4:00pm



**Meeting Dates:** Sept. 16 – Nov. 18, 2021

**Meeting Location:** In person section: TMEC 128 Learning Studio (Castle)

For many graduate students and medical educators, teaching will be part of their career, whether as mentoring, formal classroom teaching, or teaching in the hospital. In addition, the theory and research evidence accumulating in the disciplines of cognitive psychology, neuroscience, and from STEM classrooms, has turned the question of “How do we best teach science and medicine?” into its own scientific discipline. The Theory and Science of Teaching focuses on understanding why certain teaching methods are effective by examining the scientific research and theoretical frameworks that support these methods. We will read and discuss foundational educational and cognitive psychology texts and primary literature, and then develop course materials that allow us to put these ideas into practice.

**Class Note:** Class will meet for 2 hours of synchronous discussion and learning activities each week. The in-person section will meet Thursdays from 2:00-4:00 in Longwood and is intended for PhD students who must take their classes in-person. The remote section will meet 8:30-10:30 over Zoom and is reserved for master’s students. The content of the sections will be the same and both will share identical asynchronous learning components. This will include watching videos, reading a variety of materials, participating in discussion boards, creating sample materials, and writing learning reflections. The synchronous and asynchronous components combine to meet the course objectives and are equally important to students’ learning.

Class begins September 16th with the release of the first asynchronous module. The first synchronous class meeting is September 30th.

**Course Note:** The course has been designed as a companion to Genetics 302QC: Teaching 101, but neither course is a prerequisite of the other.

**Recommended Prep:** Make It Stick, by Brown, Roediger and McDaniel is required pre-reading and should be completed before the first day of class on September 30th. A required asynchronous ‘module 0’ will be released on Canvas, September 16th.

**Course Head:** Bradley Coleman, [Bradley\\_Coleman@hms.harvard.edu](mailto:Bradley_Coleman@hms.harvard.edu)

## Human Biology & Translational Medicine

### **HBTM 302QC Imaging and Microscopy Methods in Biology & Medicine**

Lev Perelman

2 units. Enrollment limited to 15. Instructor consent required.

TH, 3:00pm - 5:00pm



**Meeting Dates:** Sept. 16 – Dec. 2, 2021

**Meeting Location:** TMEC 304 Classroom (Hinton)

This quarter course will introduce students to modern imaging modalities used in biology and medicine, with emphasis on modalities most frequently employed in cellular and molecular biology. The course will offer an overview of the basic principles of light and electron microscopy and explain their resolution limits and sources of contrast. We will discuss modality-specific functionally relevant fluorescence molecular probes which can be used for live cell imaging. The course will provide a detailed review and theory of operation of modern advanced light microscopy techniques such as confocal, line-scanning, light sheet, STED, light scattering, multi-photon and superresolution microscopy. We will then discuss Raman and light scattering spectroscopy methods for monitoring induced pluripotent stem cell differentiation, genetic targeting in microscopy and CRISPR-based photoactivatable transcription systems and basic concepts of optogenetics. We will review specific optogenetic actuators and sensors, modern light delivery techniques and various applications from investigating brain functions to cardiac optogenetics. We will also offer an overview of medical imaging techniques, such as ultrasound, X-ray CT, MRI, PET/SPECT, and ultrasound imaging, along with emerging optical imaging and spectroscopy methods. Lectures will be supplemented by visual demonstrations of the microscopy systems and hands-on laboratory work and discussions of the operation principles of those systems.

**Course Head:** Lev Perelman, [lperelman@fas.harvard.edu](mailto:lperelman@fas.harvard.edu)

## Immunology

### **IMMUN 307QC Cancer Immunology**

Kai Wucherpennig, Stephanie Dougan, Philip Kranzusch, Judith Agudo

2 units. Enrollment limited to 20. Instructor consent required.

M, 4:00pm - 6:00pm

**Meeting Dates:** Nov. 1 – Dec. 13, 2021

**Location:** Modell Center, 100A

There have been many exciting recent developments in the cancer immunology field, and multiple therapeutic approaches have shown efficacy against diverse types of cancer. This course will emphasize new mechanistic insights, specifically on the following topics: mechanisms of spontaneous protective anti-tumor immunity; key effector cell populations of



anti-tumor immunity; innate immune pathways in tumor immunity; inflammation and tumor microenvironment; immunosuppressive mechanisms in tumor immunity; targeting of inhibitory receptors; cancer vaccines.

**Course Note:** Must be PhD student at Harvard or postdoctoral fellow

**Course Head:** Kai Wucherpfennig, [kai\\_wucherpfennig@dfci.harvard.edu](mailto:kai_wucherpfennig@dfci.harvard.edu)

**Other Instructors:** Dougan, Stephanie, Kranzusch, Philip, Agudo, Judith

### **IMMUN 319QC Mechanisms and therapeutics of inflammation and resolution**

Timothy Hla, Charles Serhan

2 units.

TH, 10:00am – 12:00pm

**Meeting Dates:** Oct. 7 – Dec. 2, 2021

**Meeting Location:** Modell Center 2nd floor conference room, Rm 258

Even though physiological inflammation undergoes active resolution processes to return to normal homeostasis, abnormalities in specific mechanistic processes involving immune, vascular and parenchymal cells lead to many diseases ranging from asthma, fibrosis, cancer, autoimmunity to cardiovascular diseases. This course will focus on multicellular interaction networks, lipid mediators and signaling mechanisms in inflammatory and resolute pathobiology. Topics such as pathogenetic mechanisms, mediators, Omics strategies and cellular heterogeneity will be covered. Discrete mediator networks, namely, eicosanoids, SPMs, S1P, and LPA that are therapeutically tractable and used to treat diseases will be highlighted. In addition, development of novel therapeutics to control inflammatory and resolution pathology will be discussed.

**Course Head:** Timothy Hla, [Timothy.Hla@childrens.harvard.edu](mailto:Timothy.Hla@childrens.harvard.edu)

**Other Instructors:** Charles Serhan

### **IMMUN 320QC Innate immunity and viral infection of the lung. Coronaviruses, flu and lung superinfections**

Ivan Zanoni

2 units.

T, 10:30am – 12:30pm



**Meeting Dates:** Nov. 9 – Nov. 30, 2021

**Meeting Location:** Modell 100A Fred S. Rosen Lecture Hall

The course will focus on the innate immune response elicited in the lung in response to viral infections. Particular focus will be given to RNA viral infections such as coronaviruses and influenza viruses. The role of innate immune cells, interferons, and other immune mediators in resolving and/or aggravating the viral infection will be discussed. Also, how an initial response against the virus facilitates the development of secondary bacterial superinfections will be analyzed.

**Course Notes:** Basic knowledge of immunology is expected in order to follow the content of this course.

**Course Head:** Ivan Zanoni, [Ivan.Zanoni@childrens.harvard.edu](mailto:Ivan.Zanoni@childrens.harvard.edu)

## Medical Sciences

### **MED-SCI 300QC Conduct of Science (REQUIRED for G2 students)**

Kristin White

2 Units.

**Section Meeting Dates and Locations:** To be determined by specific section leaders

**Lecture Dates and Locations:**

Research Integrity: It's a Matter of Public Trust

Tuesday, September 28, 2021, at 3:00-4:30 p.m. EDT

Conflict Resolution Skills for the Researcher

Tuesday, October 12, 2021, at 3:00-4:30 p.m. EDT

Inclusive Excellence in Research: Creation of a Vibrant, Scientific Global Community

Tuesday, October 26, 2021, at 5:00-6:30 p.m. EDT

This course is a required course for all DMS students and all who receive support from NIH training grants. The goal of this course is to inform students about the appropriate conduct of research and the many ethical and social problems that they may encounter during their research career in graduate school. The course consists of three lectures for the entire class and several highly interactive sessions with a small group of fellow students moderated by a faculty



member. Some of the issues that will be discussed in this course include appropriate methods of collecting laboratory data, issues dealing with research misconduct, interactions with members of the laboratory and the mentor, and the ethical role of the scientist in society.

**Course Notes:** All current G2 students must register for this course on their Fall Semester study cards. Specific enrollment instructions will be sent to current G2s and other eligible students prior to the first day of class. Please contact [Bethany\\_Krevat@hms.harvard.edu](mailto:Bethany_Krevat@hms.harvard.edu), for enrollment inquiries. **Restricted to HILS graduate students within programs on the Longwood campus.**

**Course Head:** Kristin White, [Kristin.White@mgh.harvard.edu](mailto:Kristin.White@mgh.harvard.edu)

**Course Administrator:** [Bethany\\_Krevat@hms.harvard.edu](mailto:Bethany_Krevat@hms.harvard.edu)

## **MED-SCI 302QC Conduct of Science Refresher (REQUIRED for G6 students)**

Kristin White

2 Units.

**Section Meeting Dates and Locations:** To be determined by specific section leaders

**Lecture Dates and Locations:**

Research Integrity: It's a Matter of Public Trust

Tuesday, September 28, 2021, at 3:00-4:30 p.m. EDT

Conflict Resolution Skills for the Researcher

Tuesday, October 12, 2021, at 3:00-4:30 p.m. EDT

Inclusive Excellence in Research: Creation of a Vibrant, Scientific Global Community

Tuesday, October 26, 2021, at 5:00-6:30 p.m. EDT

This course is a required course for all DMS students and all who receive support from NIH training grants. The goal of this course is to inform students about the appropriate conduct of research and the many ethical and social problems that they may encounter during their research career in graduate school. The course consists of three lectures for the entire class and several highly interactive sessions with a small group of fellow students moderated by a faculty member. Some of the issues that will be discussed in this course include appropriate methods of collecting laboratory data, issues dealing with research misconduct, interactions with members of the laboratory and the mentor, and the ethical role of the scientist in society.

**Course Notes:** All current G6 students must register for this course on their Fall Semester study cards. Specific enrollment instructions will be sent to current G6s and other eligible students



prior to the first day of class. Please contact [Bethany\\_Krevat@hms.harvard.edu](mailto:Bethany_Krevat@hms.harvard.edu), for enrollment inquiries. **Restricted to HILS graduate students within programs on the Longwood campus.**

**Course Head:** Kristin White, [Kristin.White@mgh.harvard.edu](mailto:Kristin.White@mgh.harvard.edu)

**Course Administrator:** [Bethany\\_Krevat@hms.harvard.edu](mailto:Bethany_Krevat@hms.harvard.edu)

## **MED-SCI 312QC Graduate TF Training in the Biomedical Sciences**

Bradley Coleman

2 units. Enrollment limited to 50. Instructor consent required.

**Initial Course Meetings:** 3:00pm - 5:00pm on TH, Aug 26; T, August 31; TH, Sept 2

**Meeting Location:** Contact instructor

Registration for Nanocourse: <https://curriculumfellows.hms.harvard.edu/classes/graduate-tf-training-biomedical-sciences-0>

MED-SCI 312QC is designed to be an 'on the ground' training for Longwood-based teaching fellows. The course instructs graduate student teaching fellows in the pedagogy and course management skills required to be an effective TF. The course begins with three two-hour class sessions that focus on the basics of evidence-based teaching practice and practical strategies for working with students. As the semester progresses, students use their work as TFs as the basis for continued instruction and reflection on teaching best practices and the challenges of their application in real-world settings.

**Course Notes:** Open to any HILS graduate student serving as a Teaching Fellow in the fall semester, pending approval of the Curriculum Fellow working in their course (or by special arrangement approved by the Director of the Curriculum Fellows Program).

**All** students interested in registering for MED-SCI 312QC should **also** register for the *Graduate TF Training in the Biomedical Sciences* nanocourse. Any interested student may attend the first three sessions of MED-SCI 312QC and receive nanocourse credit, regardless of whether they are a current TF.

[Register for the nanocourse here.](#)

**Course Director:** Bradley Coleman, [bradley\\_coleman@hms.harvard.edu](mailto:bradley_coleman@hms.harvard.edu)



## **MED-SCI 316QC PhD Pathfinder**

Joseph Arboleda, Jane Riccardi

2 Units. Enrollment limited to 50. Instructor consent required.

M - F, 5:00pm - 7:00pm (with an additional hour afterwards for networking)

**Meeting Dates:** Oct. 18- Oct. 22, 2021 (*these dates are tentative and are subject to change*)

**Meeting Location:** 10/18 – 10/21 Cannon Room, 10/22 TBD

In this course, *PhD Pathfinder*, students will learn about the many career paths available to people with advanced degrees in biomedical research including academia, biotech, patent law, science writing/publishing, consulting/business, education, and science policy/regulation. Students will also learn how to find opportunities on and off campus to take the next step in their career plans.

A PhD education provides students with fundamental knowledge about the principles and practice of the scientific method and promotes development of problem-solving skills in ways that are quite useful for many different professions. Students will have the opportunity to learn from experienced professionals representing each of these paths, to learn about strategies for career development, curriculum enrichment, and networking opportunities that will make them competitive for their career of choice.

The course is open to all PhD students interested in learning about the range of career options available to biomedical PhDs. The course includes talks, didactic sessions, workshops and networking events to promote interactions between students and invited speakers. There will be a special emphasis on helping students with their own skill self-assessment to assist in career and professional development. After each session there will be a small networking reception for both the students and lecturers.

**Course Note:** Students are required to attend all five sessions for course credit.

**Course Director:** Joseph Arboleda, [joseph\\_arboleda@meei.harvard.edu](mailto:joseph_arboleda@meei.harvard.edu)

**Course Manager:** Jane Riccardi, [jane\\_riccardi@hms.harvard.edu](mailto:jane_riccardi@hms.harvard.edu)

## Neurobiology



## NEUROBIO 306QC Quantitative Methods for Biologists (August bootcamp)

Michael Springer, Richard T. Born

2 Units. Enrollment limited to 80. Instructor consent required.  
M/W/F, 10:00am-4:00pm (one-hour break from 2pm-3pm) EST  
T/Th, 2:00pm-4:00pm (drop-in/homework) EST

**Meeting Dates:** Aug. 9 – Aug. 20, 2021

**Meeting Locations:**

M/W/F in Cambridge, MA in Maxwell-Dworkin G115  
T/TH in Longwood (Boston), MA in TMEC 227 or on zoom

The goal of this virtual camp is to introduce you to programming in the MATLAB environment and to show you the power this provides for analyzing data and for gaining intuition about the behavior of complex systems through the use of numerical simulations. Some of you, upon encountering in the previous sentence words like “programming” and “numerical simulations,” will feel the cold hand of fear grip your stomach, because you have never done any programming and, in fact, have tried to avoid math as much as possible. If so, YOU ARE PRECISELY THE PERSON WE HAD IN MIND as we were planning the course. We are aiming to help you break through this barrier of darkness and fear into the radiant sunshine of quantitative enlightenment. The true beauty of MATLAB, as we will personally demonstrate, is that it allows people who are not mathematically adept (e.g. some of the instructors of this course) to use powerful numerical methods and visualization tools to gain an understanding of concepts that are very difficult to grasp analytically.

**Course Notes:** The camp is primarily designed for those of you with *no prior programming experience*. If you fit this description, you should definitely plan to take the course. It is critical to be familiar with a scientific programming language with which to improve your quantitative literacy throughout graduate school. We also suggest that you start working through the MOOC that Mike created as an adjunct to the boot camp. It covers much of the same material as we will cover in class during the first week, but, as you all know, repetition is essential when learning a new language.

Sign up [here](#). Please put this course on your fall term study card if you wish to receive credit for it. Email [jennie\\_epp@hms.harvard.edu](mailto:jennie_epp@hms.harvard.edu), with enquiries.

**Course Instructors:** Michael Springer, [Michael\\_Springer@hms.harvard.edu](mailto:Michael_Springer@hms.harvard.edu) and Rick Born, [richard\\_born@hms.harvard.edu](mailto:richard_born@hms.harvard.edu)



## **NEUROBIO 308QC Thinking about Data: Probability & Statistics for the Life Sciences**

Richard T. Born, Brian Healy

2 units. Enrollment limited to 40. Instructor consent required.

W, 5:00pm - 7:00pm

**Meeting Dates:** Sept. 1 – Oct. 20, 2021

**Meeting Location:** TMEC 447

Probability and statistics taught with an emphasis on using simulations and re-sampling methods to both analyze data and understand core statistical concepts. Prior to class, students will view online lectures from Dr. Brian Healy's biostatistics course. In class, we will focus on coding exercises to practice different approaches to analyzing real data sets, with an emphasis on resampling methods. Coding exercises may be carried out using either Python or MATLAB.

**Course Notes:** This course will use a flipped design in which students will view video lectures from Dr. Brian Healy's Biostatistics Certificate Course (offered through Catalyst) prior to in-class programming.

**Prerequisite:** Students are required to have some experience in programming in either Python or MATLAB. Neurobiology 306QC can fulfill this requirement.

**Course Head:** Richard Born, [richard\\_born@hms.harvard.edu](mailto:richard_born@hms.harvard.edu)

**Other Instructor:** Brian Healy

**Curriculum Fellow:** Taralyn Tan, [taralyn\\_tan@hms.harvard.edu](mailto:taralyn_tan@hms.harvard.edu)

## **NEUROBIO 309QC The Molecular Pathology & Current Therapies for Eye Diseases**

Dong Feng Chen, Petr Baranov, Corinna Bauer, Kin-Sang Cho, Shelley Fried, Daniel Sun, Mengyu Wang

2 units. Enrollment limited to 20. Instructor consent required.

M, 3:00pm - 5:00pm

**Meeting Dates:** Sept. 6 – Dec. 6, 2021

**Meeting Location:** Schepens Eye Research Institute, 2<sup>nd</sup>-Floor Conference Rm, 20 Staniford St.

The eye, as a window to the brain, presents an excellent model system to the study, diagnosis and evaluation of treatment strategies for neurodegenerative disorders in the central nervous system. A surge of progress resulting from studies in the disease mechanisms and the



development of new imaging technology have led to a huge step forward in the therapies for diagnosing and treating retinal diseases and preventing blindness. This course will offer students an in-depth examination of current knowledge regarding ocular imaging, diagnosis, molecular pathology, and therapy, with an emphasis on recent breakthroughs and discussion of key literature in the field. The class consists of lectures and group discussions that focus on seminal papers selected from both the basic science and clinical ophthalmology, which will serve as a basis for teaching students basic concepts of ophthalmology and becoming familiar with advanced imaging tools and animal models of retinal diseases. Each session will review the landmark publications on a particular topic or disease. The class will foster discussion on the implications of studies in eye and other disease mechanisms and therapies.

**Course Notes:** Offered in alternate years

**Recommended Prep:** Basic understanding for the anatomy of the eye

**Course Head:** Dong Feng Chen, [dongfeng\\_chen@meei.harvard.edu](mailto:dongfeng_chen@meei.harvard.edu)

**Other Instructors:** Petr Baranov, Corinna Bauer, Kin-Sang Cho, Shelley Fried, Daniel Sun, Mengyu Wang

### **NEUROBIO 311QC Eye, Brain & Vision: Classics in Visual Neuroscience**

Richard Born, Jan Drugowitsch, Talia Konkle, Mark Andermann, Michael Do, Margaret Livingstone, Joshua Sanes, Chinfai Chen

2 units.

W, 5:00pm - 7:00pm

**Meeting Dates:** Oct. 27 – Dec. 15, 2021

**Meeting Location:** Goldenson 229

This course is designed to meet two needs in the visual neuroscience community at Harvard. The first is a necessary didactic component to our training grant from the National Eye Institute (“Research Training in Visual Neuroscience”); the second is for our students to read primary literature that is of foundational importance for our current understanding of the visual system. The course will consist of weekly two-hour meetings during which students lead discussions, with guidance from training grant faculty, of papers that are “classics” in their respective fields paired with a modern counterpart; frequently this entails a direct comparison of original studies focused on nonhuman primates with more recent approaches in rodents.

**Course Head:** Richard Born, [richard\\_born@hms.harvard.edu](mailto:richard_born@hms.harvard.edu)



## **NEUROBIO 315QC Human Neuroanatomy & Neuropathology**

Matthew Frosch, Jean Augustinack

2 units. Enrollment limited to 20. Instructor consent required.

M/W/F, 8:30am – 12:00pm

**Meeting Dates:** Sept. 27 – Oct. 29, 2021

**Meeting Location:** TMEC 209

This course will cover human neuroanatomy in depth, with an emphasis on the functional implications of structure and medical implications of lesions. Teaching occurs through lectures, small group sessions, brain dissection and homework assignments.

**Course Notes:** Restricted to Graduate Students only. This course is offered as part of HT130. Students may not co-register for both courses.

**Course Heads:** Matthew Frosch, [mfrosch@mgh.harvard.edu](mailto:mfrosch@mgh.harvard.edu), Jean Augustinack, [jaugustinack@mgh.harvard.edu](mailto:jaugustinack@mgh.harvard.edu)

## **NEUROBIO 322QC Advances in synaptic, cellular and circuit neuroscience**

Pascal Kaeser, Wade Regehr

2 units. Enrollment limited to 10. Instructor consent required.

T, 9:00am – 10:45am

**Meeting Dates:** Sept. 14 – Nov. 16, 2021

**Meeting Location:** Goldenson 318

In this literature analysis course, students will read, analyze, present and discuss primary research literature on synaptic, cellular and circuit neuroscience. The principal goals are to (a) enhance the students' understanding of the current state of knowledge of neuroscience, and (b) to provide experience in reviewing, critiquing and presenting primary research articles. The course is integrated with an existing journal club that was initiated in the Kaeser and Regehr laboratories and that attracts additional members of the broader neurobiology research community. In addition to the participation in the journal club, the course participants will obtain a brief conceptual introduction to each paper by a teaching assistant before the journal club, and they will participate in an extended Q&A and discussion session after each journal club, such that the discussed paper can be embedded with related current concepts on each topic.

**Course Notes:** The course consists of an introduction (9.00-9.15), a journal club with additional participants (9.15-10.15), and a Q&A session with a teaching assistant and/or instructor (10.15-10.45)



**Recommended Prep:** Students should have completed NB215 or a similar foundational neuroscience course.

**Course Heads:** Pascal Kaeser, [kaeser@hms.harvard.edu](mailto:kaeser@hms.harvard.edu), Wade Regehr, [wade\\_regehr@hms.harvard.edu](mailto:wade_regehr@hms.harvard.edu)

## Speech & Hearing Bioscience Technology

### **SHBT 301QC Introduction to Speech & Hearing Laboratories**

Bertrand Delgutte

2 units.

**Meeting Dates:** Contact instructor

**Meeting Location:** Contact instructor

Short research presentations by faculty in the Speech and Hearing Bioscience and Technology to help students select a laboratory for research rotations. Some meetings include an on-site laboratory visit.

**Course Head:** Bertrand Delgutte, [bertrand\\_delgutte@meei.harvard.edu](mailto:bertrand_delgutte@meei.harvard.edu)

