Quarter Courses
Fall Term 2018-2019

Classes Start: Tuesday September 4, 2018

Online Check-In (formerly known as registration): TBD
Please visit the Harvard University Knowledge Center website for more information

Deadlines and Holidays: Please visit the GSAS Calendar to view deadlines and holidays for the 18-19 academic year

For information: Call 617-432-4134 or email dms_courses@hms.harvard.edu
BCMP 308qc. Cell Fate Decisions in Development and Disease
Alan B. Cantor
Enrollment: Limited to 15

BMIF 313qc. Computing Skills for Biomedical Sciences
Nils Gehlenborg and Ted Feldman

BMIF 315qc. Computational Statistics for Biomedical Sciences
Peter Park

Cell Biology 306qc. Teaching 100: The Theory and Science of Teaching
Johanna L. Gutlerner and Bradley Coleman
Enrollment: Limited to 25

HBTM 302qc. Imaging and Microscopy Methods in Biology and Medicine
Lev Perelman

Immunology 307qc. Cancer Immunology
Kai Wucherpfennig, Catherine Wu, Stephanie Dougan and Philip Kranzusch
Enrollment: Limited to 15

Immunology 315qc. Design and Discovery of Human Antibody Drugs
Wayne Marasco, Stephanie Dougan and Quan Zhu

Medical Sciences 300qc. Conduct of Science
Kristin White

Medical Sciences 316qc. Ph.D Pathfinder
Joseph Arboleda

Medical Sciences 302qc. Conduct of Science Refresher
Kristin White

Medical Sciences 312qc. Graduate Training in the Biomedical Sciences
Bradley Coleman and Taralyn Tan

Neurobiology 301qc. Nervous System Disorders: Advances in Diagnostics and Emerging Therapies
Bakhos Tannous

Neurobiology 306qc. Quantitative Methods for Biologists (offered August 2018)
Michael Springer and Richard T. Born
Enrollment: Limited to 80
Neurobiology 308qc. Thinking about Data: Statistics for the life sciences
Richard Born
Enrollment: Limited to 40

Neurobiology 315qc. Human Neuroanatomy and Neuropathology
Matthew Frosch and Jean Augustinack
Curriculum Fellow: Taralyn Tan

Neurobiology 319qc. Neurobiology of Psychiatric Disease: From Bench to Bedside
Bill Carlezon and Kerry Ressler
*BCMP 308qc. Cell Fate Decisions in Development and Disease*

Alan B. Cantor

2 Units. Enrollment: Limited to 15.

W., 1:30PM-3:30 PM

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, 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.

**Fall 2018**

**Meeting Dates:** Wednesday, September 12, 2018 through Wednesday, November 14, 2018

**Location:** TMEC 130

**Course Head:** Alan Cantor, alan.cantor@childrens.harvard.edu
Biomedical Informatics

**BMIF 313qc, Computing Skills for Biomedical Sciences**  
Nils Gehlenborg and Ted Feldman

2 Units. Enrollment: Limited to 15. Instructor consent required.

T., Th 9:45am – 11:15am

This course will prepare students for advanced graduate level classes that require practical programming and data analysis skills. The main focus of this course is to familiarize students with the R programming language, the command line on Linux-based systems, high performance computing environments, and fundamental data analysis approaches. The skills taught in this course will enable students to design and implement programs for reproducible data analysis, manage file-based data sets, apply basic statistical, algorithmic, and visual approaches for data interpretation, assemble basic analysis workflows, and execute analyses on a compute cluster. Students will be working with Jupyter Notebooks, RStudio, git, and bash.

Notes: BMIF 313qc is graded SAT/UNSAT. If a letter grade is preferred, students can cross-register through my.harvard for BMI 713.

**Fall 2018**  
**Meeting Dates:** September 4, 2018 through October 18, 2018  
**Location:** Countway 403  
**Course Head:** Nils Gehlenborg, nils@hms.harvard.edu

**BMIF 315qc, Computational Statistics for Biomedical Sciences**  
Peter Park

2 Units. Enrollment: Limited to 26. Instructor consent required.

T. Th 10:00 – 11:30

This course will provide a practical introduction to statistical analysis of biological and biomedical data. Basic techniques will be covered, including descriptive statistics, elements of probability, hypothesis testing, nonparametric methods, correlation analysis, and linear regression. Emphasis will be on how to choose appropriate statistical tests, how to assess statistical significance, and how to avoid common mistakes in analysis of large datasets. This course is geared toward graduate students in the biological sciences, but others are welcomed as auditors if space permits. No previous knowledge in statistics is required, but some proficiency in R will be assumed.

Notes: Cross listed with HMS as BMI715

**Fall 2018**  
**Meeting Dates:** October 23, 2018 through December 13, 2018  
**Location:** Countway 403  
**Course Head:** Peter Park, peter_park@hms.harvard.edu
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?” 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. Make It Stick, by Brown, Roediger and McDaniel is required pre-reading and should be completed before the first day of class.

Note: The course has been designed as a companion to Genetics 302qc: Teaching 101, but neither course is a prerequisite of the other.
Human Biology and Translational Medicine

HBTM 302QC Imaging and Microscopy Methods in Biology and Medicine
Lev Perelman

2 units. Instructor consent required

T., 3:00PM – 5:00PM

Introduce modern imaging modalities with emphasis on modalities frequently employed in cellular and molecular biology and medicine. Will discuss basic principles of operation of modern advanced microscopy techniques, such as confocal, two-photon fluorescence, CLAAS, super-resolution and STED microscopy. Overview noninvasive medical imaging techniques used in scientific research: X-ray CT, MRI, ultrasound, PET/SPECT, diffuse optical tomography (DOT), optical coherence tomography (OCT), and photoacoustic tomography (PAT). Lectures will be supplemented by visual and hands-on demonstrations of imaging systems and discussions of the operation principles of these systems

Fall 2018
Meeting Dates: October 9, 2018 through December 4, 2018
First Meeting Location: TMEC 448
Course Head: Lev Perelman, lperelman@fas.harvard.edu
**IMMUNOLOGY**

*Immunology 307qc. Cancer Immunology*
Kai Wucherpfennig, Catherine Wu, Stephanie Dougan and Philip Kranzusch

2 Units. Enrollment: Limited to 15

M., 4:00PM – 6:00PM.

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, in particular on the following topics: Mechanisms of spontaneous protective anti-tumor immunity; Key effector cell populations of anti-tumor immunity; Inflammation and tumor microenvironment; Immunosuppressive mechanisms in tumor immunity; Targeting of inhibitory receptors; Cancer vaccines; new approaches for delivery of immunotherapies into tumors.

Note: Must be PhD student at Harvard or postdoctoral fellow

**Fall 2018**
**Meeting Dates:** October 29, 2018 through December 10, 2018
**Location:** Modell Center, Room 100
**Course Head:** Kai Wucherpfennig, Kai_Wucherpfennig@dfci.harvard.edu
Immunology 315qc. Design and Discovery of Human Antibody Drugs
Wayne Marasco, Stephanie Dougan and Quan Zhu

2 Units. Enrollment: Limited to 15

T., 10:00AM – 12:00PM

This quarter course will focus on all aspects of therapeutic antibody (Ab) engineering from bench to bedside with an emphasis on translational research. Short lectures will introduce the topics of the day, reviews and seminal papers will be provided. Ab discovery will include readings on in vitro microbial discovery platforms such as Ab-phagemid and Ab yeast display as well as single B cell cloning strategies. Current state of the art of human Ig locus transgenic mice will be discussed. Engineering strategies will include chimeric, humanized and human Abs, and different formats including single chain Abs (scFvs), domain Abs, BITES and Bi-specific Abs. Human Fc engineering to increase or decrease immune-mediated clearance will be discussed including glycan engineering. Manipulating engineered Ab in vivo clearance through size and FcRn interactions will be discussed. We will also discuss nanobodies, antibody drug conjugates and immunotoxins and chimeric antigen receptors.

Notes: There is a wide range of clinical applications in the therapeutic antibody engineering space including chronic inflammatory diseases, cancer, neurologic diseases and conditions, cardiovascular diseases and infectious diseases. We can get the pulse of the class and see what directions we want to choose and some of the course readings can be tailored to this interest.

Course Pre-requisites: Immunology 201. Background in genetics and biochemistry strongly recommended. Must be a PhD student at Harvard or postdoctoral fellow otherwise course director permission will be needed to enroll

Fall 2018
Meeting Dates: September 18, 2018 through November 13, 2018
Location: Modell 100
Course Head: Wayne Marasco, wayne_marasco@dfci.harvard.edu
*Medical Sciences 300qc. Conduct of Science*
Kristin White

2 Units.

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 five 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, interactions with members of the laboratory and the mentor and issues dealing with research misconduct.

Note: All current G2 students must register for this course on their Fall Semester 2018 study cards. Specific enrollment instructions will be sent to current G2s and other eligible students in the upcoming weeks. Please contact Tatevik Holmgren (Tatevik_Holmgren@hms.harvard.edu) for enrollment inquiries.

Note: Restricted to GSAS graduate students on the Longwood campus.

**Fall 2018**
**Meeting Dates:** September 20, 2018 through November 15, 2018  
**Course Directors:** Kristin White  
**Course Administrator:** Tatevik Holmgren, Tatevik_Holmgren@hms.harvard.edu  
**Location:** Armenise 125 (D) Amphitheater

*(All lectures will begin promptly at 3:30 p.m. and end at 5 p.m. Mandatory registration for students will begin at 3 p.m.)*

**Lecture One:** Research Integrity: It's a Matter of Public Trust, Gretchen Brodnicki, J.D., HMS Dean for Faculty and Research Integrity  
**Date/Time:** Thursday, September 20, 2018, at 3:30-5:00 p.m.  
**Location:** Armenise 125 (D) Amphitheater

**Lecture Two:** Our Social Responsibility: Tools for Acting with Integrity, American Cancer Society Professor Emeritus of Microbiology and Immunobiology Jonathan Beckwith, and Dr. Morgan Thompson, Assistant Director of Teacher Education, The Mindfulness Center at Brown University  
**Date/Time:** Thursday, October 25, 2018, at 3:30-5:00 p.m.  
**Location:** TMEC 246, Walter Amphitheater

**Lecture Three:** Conflict Resolution Skills for the Researcher, Melissa Brodrick, Ombudsperson, Harvard Medical School  
**Date/Time:** Thursday, November 8, 2018, at 3:30-5:00 p.m.  
**Location:** Armenise 125 (D) Amphitheater
**Medical Sciences 302qc. Conduct of Science Refresher**
Kristin White

2 Units.

This course is a required course for all DMS students and all who receive support from NIH training grants. This is a refresher course for advanced graduate students. 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 four 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, interactions with members of the laboratory and the mentor and issues dealing with research misconduct.

Note: All current G5 students must register for this course on their Fall Semester 2018 study cards. **G5 students are required to attend at least two out of the three didactic sessions. Specific enrollment instructions will be sent to current G5s and other eligible students in the upcoming weeks.** Please contact Tatevik Holmgren (Tatevik_Holmgren@hms.harvard.edu) for enrollment inquiries.

Note: Restricted to GSAS graduate students on the Longwood campus.

**Fall 2018**
Meeting Dates: September 20, 2018 through November 15, 2018  
Course Directors: Kristin White  
Course Administrator: Tatevik Holmgren, Tatevik_Holmgren@hms.harvard.edu  
Location: Armenise 125 (D) Amphitheater

*(All lectures will begin promptly at 3:30 p.m. and end at 5 p.m. Mandatory registration for students will begin at 3 p.m.)*

**Lecture One:** Research Integrity: It's a Matter of Public Trust, Gretchen Brodnicki, J.D., HMS Dean for Faculty and Research Integrity  
Date/Time: Thursday, September 20, 2018, at 3:30-5:00 p.m.  
Location: Armenise 125 (D) Amphitheater

**Lecture Two:** Our Social Responsibility: Tools for Acting with Integrity, American Cancer Society Professor Emeritus of Microbiology and Immunobiology Jonathan Beckwith, and Dr. Morgan Thompson, Assistant Director of Teacher Education, The Mindfulness Center at Brown University  
Date/Time: Thursday, October 25, 2018, at 3:30-5:00 p.m.  
Location: TMEC 246, Walter Amphitheater

**Lecture Three:** Conflict Resolution Skills for the Researcher, Melissa Brodrick, Ombudsperson, Harvard Medical School  
Date/Time: Thursday, November 8, 2018, at 3:30-5:00 p.m.  
Location: Armenise 125 (D) Amphitheater
Medical Sciences 312qc. Graduate Training in the Biomedical Sciences
Bradley Coleman and Taralyn Tan

2 Units Enrollment: Limited to 50, instructor consent required

Instructs graduate student teaching assistants in the pedagogy and course management skills required to be an effective TA. The course begins with three two-hour class sessions that focus on the basics of how to use evidence-based teaching approaches to be more prepared for class, strategies to maximize what your students learn, and advice about common situations and problems. As the semester progresses, students use their work as TAs as the basis for continued instruction and reflection on teaching best practices. Instruction is matched to individual TA responsibilities, but includes goal-setting, evaluation of approaches, teaching observations, and structured feedback.

Recommended Prep: Open to any graduate student currently serving as a Teaching Assistant, pending approval of a Curriculum Fellow overseeing the appropriate longitudinal component. If your course is already has a curriculum fellow, please contact them prior to registering. If you are TAing a course that is not served by a Curriculum Fellow you must contact Bradley Coleman prior to enrolling to discuss your ability to receive continued instruction and practice throughout the semester.

Fall 2018
First Meeting: August 28, 2018
Final Meeting: December 5, 2018
Location: contact instructor
Course Director: Bradley Coleman, Bradley_Coleman@hms.harvard.edu
Medical Sciences 316QC PhD Pathfinder
Joseph Arboleda and Jane Riccardi

2 Units Enrollment: Limited to 50, instructor consent required

Monday* - Friday, 5:00- 7:00 (with an hour after for networking session)
*Monday’s session will run from 4PM-7PM

In this course, Ph.D. 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.

A Ph.D. 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 Ph.D. students interested in learning about the range of career options available to biomedical Ph.Ds. 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.

The last session of this course will be the launch for the new DMS Paths Certificate Program. DMS students who have successfully completed the pilot program will present their Capstone presentations.

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

Fall 2018
First Meeting: October 22, 2018
Final Meeting: October 26, 2018
Location: Modell 100A
Course Co-Directors: Joseph Arboleda, Joseph_Arboleda@MEEHARVARD.EDU
Course Manager: Jane Riccardi, jane_riccardi@hms.harvard.edu
Neurobiology

**Neurobiology 301qc. Nervous System Disorders: Advances in Diagnostics and Emerging Therapies**
Bakhos Tannous, Xandra Breakefield and Christian Badr

2 Units

T., 3:00PM – 5:00PM

This course will discuss current trends in diagnostic and therapeutic applications, including gene/cell therapy and CRISPR technology, for different nervous system disorders ranging from neurodegeneration, eye/ear diseases and brain tumors. We will also examine bench-to-bedside translation, ongoing clinical trials as well as imaging/biomarkers for diagnostics and therapeutic monitoring.

**Fall 2018**
Meeting Dates: September 4, 2018 through November 6, 2018
Location: TMEC L-007
Course Head: Bakhos Tannous, bakhos_tannous@hms.harvard.edu

**Neurobiology 306qc. Quantitative Methods for Biologists (offered in August 2018)**
Michael Springer and Richard T. Born

2 Units. Enrollment: Limited to 80.

M., W., F., 10:00AM – 4:00PM; T., Th., 1:00PM – 5:00PM

The goals of this course are to introduce students to programming in the MATLAB environment and to begin using this tool for analyzing data and for gaining intuition about the behavior of complex systems through the use of numerical simulations.

Note: This boot camp course will meet in August. Please contact Jennie Epp, Jennie_Epp@hms.harvard.edu for enquiries.

**Fall 2018**
Meeting Dates: August 13, 2018 through August 24, 2018
Location: Maxwell Dworkin G115 for MWF and TMEC 227 for T/TH
Course Instructor: Michael Springer, Michael_Springer@hms.harvard.edu
** Please put this course on your fall term study card if you wish to receive credit for it.

** Neurobiology 308qc. Thinking about Data: statistics for Life sciences
Richard T. Born and Brian Healy

2 units. Enrollment limited to 40

W., 6:00PM – 8:00PM

Probability & 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 MATLAB coding exercises to practice different approaches to analyzing real data sets, with an emphasis on resampling methods.

Prerequisite: Should have taken Neurobiology 306qc

** Fall 2018
Meeting Dates: September 5, 2018 through October 24, 2018
Location: TMEC 128
Course Head: Richard Born, richard_born@hms.harvard.edu
Curriculum Fellow: Taralyn Tan
Neurobiology 309qc.
Dong Feng Chen, Petr Baranov, Corinna Bauer, Kinsang Cho, Tatjana Jakobs, Lotfi Merabet and Daniel Sun

2 Units. Enrollment limited 20

M. 3:00PM – 5PM

Retinal diseases are major causes of irreversible blindness. The retina, as a window to the brain, also presents an excellent model system to the study 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 retinal diseases, molecular pathology, and therapy, with an emphasis on recent breakthroughs and discussion of key studies 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. As the retina has long served a standard model for studying the CNS, the class will foster discussion on the implications of these studies in other disease mechanisms and therapy

Notes: Offered in alternate years

Fall 2018
Meeting Dates: September 10, 2018 through December 3, 2018
Meeting Location: Second Floor Conference Room, Schepens Eye Research Institute, 20 Staniford Street, Boston, MA 02114
Course Head: Dong Feng Chen, dongfeng_chen@meei.harvard.edu
Neurobiology 315QC Human Neuroanatomy and Neuropathology
Matthew Frosch and Jean Augustinack

4 units. Enrollment limited to 20

M., W., F., 8:30AM – 12:00PM

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 Note: All lectures on Friday end by 10:30 am.

Fall 2017
Meeting Dates: September 24, 2018 through November 2, 2018
Location: TMEC 250
Course Head: Matthew Frosch, MFROSCH@mgh.harvard.edu and Jean Augustinack (jean@nmr.mgh.harvard.edu)
Curriculum Fellow: Taralyn Tan
Neurobiology 319QC Neurobiology of Psychiatric Disease: From Bench to Bedside
Bill Carlezon, Kerry Ressler, Diego Pizzagalli, Elena Chartoff, Marissa Silveri, Laura Germine, Joe Coyle and Dost Ongur

2 units.

T., 1:00PM – 4:00PM

To provide clinical insight and critical analysis of basic and translational science approaches necessary for students to approach psychiatric disorders as scientific problems, and thus contribute future research work with clinical relevance. Each pair of lectures presents 1) basic neuroscience approaches to the neural circuitry, cell and molecular biology underlying disease, followed by 2) clinical neuroscience, genetics, neuroimaging, etc., including case studies of the disorders.

The lectures will focus on a range of psychiatric disorders, neural systems underlying behavior, and translational approaches to novel interventions, while providing insight on disease characteristics, current, novel and translationally-informed treatments, gene vs. environmental risk factors, animal models, and gaps in knowledge across the field. There will also be laboratory-based sessions (organized visits to McLean Hospital) to demonstrate examples of basic and human laboratory approaches to the study and treatment of psychiatric illness.

Course Notes: Papers will be provided in advance of each class. Draft course agenda attached.

Recommended Prep: Review papers in advance.

Fall 2018
Meeting Dates: September 11, 2018 through October 16, 2018
Location: Goldenson 229
Course Head: Bill Carlezon, (bcarlezon@mclean.harvard.edu) and Kerry Ressler (kressler@mclean.harvard.edu)