

Division of Medical Sciences

Ph.D. Programs at Harvard Medical School

# Quarter Courses

## Fall Term 2015-2016

**FAS Study Card Deadline:** Thursday, September 10 at 11:59pm

**Add Course Deadline:** Monday, October 19, 2015

**Drop Course Deadline:** Tuesday, October 27, 2015

**Holidays:**

Columbus Day: Monday, October 12

\*\*Classes will be held on Veteran's Day

**[Online Registration](#):** August 17 at 9:00am – August 27 at 11:59pm

*For information:* Call **617-432-4134** or email **dms\_courses@hms.harvard.edu**

**DIVISION OF MEDICAL SCIENCES  
Ph.D. Programs at Harvard Medical School  
2015-2016 Fall Term Quarter Course Offerings**

**\*BCMP 308qc. Cell Fate Decisions in Development and Disease**

Alan B. Cantor  
Enrollment: Limited to 12.

**\*Cell Biology 305qc. Intracellular Transport**

Victor Hsu

**\*Cell Biology 306qc. Teaching 100: The Theory and Science of Teaching**

Johanna L. Gutlerner  
Enrollment: Limited to 15.

**\*Cell Biology 310qc. Current Topics in Cancer Biology Research**

Alex Toker  
Enrollment: Limited to 12

**\*Cell Biology 313qc. Introduction to Quantitative Microscopy & Image Analysis**

Jennifer Waters and Hunter Elliott  
Enrollment: Limited to 16

**\*HBTM 303qc. Vision: A System and its Assessment**

Patricia D'Amore

**\*Immunology 307qc. Cancer Immunology**

Kai Wucherpfennig, Glenn Dranoff, Stephanie Dougen, and Michael Goldberg

**\*Medical Sciences 300qc. Conduct of Science**

Raju Kucherlapati

**\*Medical Sciences 301qc. PATHS courses**

David Cardozo

**\*Medical Sciences 302qc. Conduct of Science Refresher**

Raju Kucherlapati

**\*Neurobiology 305qc. Biochemistry and Biology of Neurodegenerative Diseases**

Dominic M. Walsh and Michael S. Wolfe  
Enrollment: Limited to 20.

**\*Neurobiology 306qc. Quantitative Methods for Biologists (offered August 2015)**

Michael Springer and Richard T. Born  
Enrollment: Limited to 80.

## Biological Chemistry and Molecular Pharmacology

\*BCMP 308qc. Cell Fate Decisions in Development and Disease  
*Alan B. Cantor*

2 Units. Enrollment: Limited to 12.

W., 1:30-3:30 PM

This quarter course will offer students an in-depth examination of current knowledge regarding mechanisms of cell fate decisions. In addition, 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 networks, transcription factor cross-antagonism, feedback loops, multilineage priming, pioneer factors, epigenetics, chromatin remodeling factors, “super enhancers”, stem cell bias, lineage identity maintenance, mitotic bookmarking, non-coding RNAs, cell polarity, asymmetric cell division, Notch signaling, lateral inhibition, lineage plasticity, and cellular reprogramming will be explored. These ideas will be examined in the context of a number of different tissue systems and organisms.

### **Preliminary Outline of Sessions:**

1. Overview of cell fate decisions, epigenetic states, and the instructive role of lineage-specific transcription factors (Cantor)
2. Multi-lineage priming, transcription factor cross-antagonism and gene regulatory networks (Cantor)
3. Pioneer factors, chromatin remodeling, and stem cell bias (Cantor).
4. Cell identity maintenance and mitotic bookmarking (Cantor)
5. Role of non-coding RNAs in cell fate decisions (Cantor)
6. Cell polarity and asymmetric division in cell fate decisions (Cantor)
7. Role of cell extrinsic factors and concept of lateral inhibition (Shivdasani)
8. Lineage plasticity and cellular reprogramming (Daley)
9. Dysregulated cell fate commitment in cancer (Li)

First Session, Fall 2015:

Meeting Dates: Wednesdays, September 16, 23, 30, October 7, 14, 28, November 4, 11, 18.

Time: Wednesdays, 1:30-3:30 pm

First Meeting: Wednesday, September 16, 1:30 PM

Last Meeting: Wednesday, November 18, 1:30 PM.

Location: Karp Family Research Building, 10th floor conference room.

Class Size: 12

Course Head: Alan Cantor, alan.cantor@childrens.harvard.ed

# Cell Biology

## **Cell Biology 305qc. Intracellular Transport**

Victor Hsu

2 Units

W., 3:00-5:00

This course will provide a practical guide to understanding the role of intracellular transport in physiology and disease settings. Basic mechanisms and also interdisciplinary areas that involve this fundamental cellular process will be selected for discussion.

Offered in alternate years.

**Meeting Dates:** November 11, 2015 through December 23, 2015

**First Meeting:** Wednesday, November 11, 2015

**Final Meeting:** Wednesday, December 23, 2015

**Location:** Dana-Farber, Smith Building, Room 546

**Course Head:** Victor Hsu

**\*Cell Biology 306qc. Teaching 100: The Theory and Science of Teaching**

Johanna L. Gutlerner

2 Units. Enrollment: Limited to 15.

Th., 1–3:30.

For many graduate students, teaching will be part of their career, whether as mentoring, formal classroom teaching, or outreach. 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 an annotated lesson plans that allows us to put these ideas into practice.

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

**Fall 2015**

**Meeting Dates:** October 1, 2015 through November 19, 2015

**First Meeting:** Thursday, October 1, 2015

**Final Meeting:** Thursday, November 19, 2015

**Location:** TMEC 423

**Course Head:** Johanna Gutlerner, Johanna\_gutlerner@hms.harvard.edu

**\*Cell Biology 310qc. Current Topics in Cancer Biology Research**

Alex Toker

2 Units. Enrollment: Limited to 12

Th. 9:00 – 10:30 a.m.

This course is designed for early- to mid-year graduate students that are interested in exploring current topics related to the Hallmarks of Cancer. Leading and cutting edge technologies in Cancer Biology Research are explored in-depth using recent papers of high profile in a round-table discussion format. Course sessions consist of a short lecture led by a postdoctoral discussion leader to review background information, followed by discussion of the literature selected for that session. Topics include: Metastasis and EMT, Tumor Microenvironment and Metabolism, Cancer Genomics, Cancer and microRNAs, and Cancer Stem Cells.

Note: Expected to be given in 2015–16.

**Fall 2015**

**Meeting Dates:** September 24, 2015 through November 12, 2015

**First Meeting:** Thursday, September 24, 2015

**Final Meeting:** Thursday, November 12, 2015

**Location:** TMEC 430

**Course Head:** Alex Toker, atoker@bidmc.harvard.edu

**Curriculum Fellow:** Megan Mittelstadt, [megan\\_mittelstadt@hms.harvard.edu](mailto:megan_mittelstadt@hms.harvard.edu)

## **Cell Biology 313qc. Introduction to Quantitative Microscopy & Image Analysis**

Jennifer Waters and Hunter Elliott

2 units. Enrollment: Limited to 16

W., 10 a.m. - 12 p.m.

When used properly, quantitative optical microscopy and computational image analysis are powerful tools for exploratory and mechanistic investigations of molecular and cellular processes. This quarter course is an introduction to experimental design and best practices for using optical microscopy techniques (fluorescence, confocal, TIRF, super-resolution, light sheet microscopy) and computational methods (image segmentation, filtering, object detection, tracking, image-derived data analysis, etc.) in cell biology research. An emphasis is placed on making accurate and precise quantitative measurements from optical microscopy images.

### **Schedule**

1. Quantitative Microscopy Basics: Resolution, signal-to-noise ratio, sampling
2. Fluorescence Microscopy: Fluorophores, filters, objective lenses - Setting up your microscope to maximize resolution and signal-to-noise ratio
3. Digital Imaging: CCD and sCMOS cameras – How they work, and how to use them effectively in a quantitative imaging experiment
4. Image Analysis: Resolution, signal-to-noise ratio and diffraction-limited objects
5. Image Analysis: Image segmentation, binary operations and tracking
6. Advanced Fluorescence Microscopy Methods: Confocal, TIRF, super-resolution, light sheet microscopy - how they work, and when you should use them
7. Quantifying Fluorescence: Image arithmetic, image corrections and deconvolution
8. The State of the Art: Up and coming imaging and analysis methods

Course policies: Attendance at all sessions is required and necessary for success in the course. This course is graded SAT/UNSAT, based on class attendance and participation.

### **Fall 2015**

**Meeting Dates:** Sept 2 (Wed), 9 (Wed), **14 (Mon)**, 16 (Wed), 23 (Wed), **28 (Mon)**, 30 (Wed), Oct 7 (Wed)

Meeting Time: Wednesdays, 10am-12pm, **except as noted.**

**First Meeting:** Wednesday, September 2, 10:00 a.m.

**Last Meeting:** Wednesday, October 7, 10:00 a.m.

**Location:** Countway 403

**Class Size:** 16

**Course Head:** Jennifer Waters, [jennifer\\_waters@hms.harvard.edu](mailto:jennifer_waters@hms.harvard.edu)

# Human Biology and Translational Medicine

## **\*HBTM 303qc. Vision: A System and its Assessment**

Patricia D'Amore and Russell Woods

2 Units

W., 3:00 – 5:00 p.m.

This course provides an introduction to the visual system and its assessment. In general, we will consider vision as a system rather than its low-level components. Each two-hour session consists of two lectures provided by faculty with expertise in that area. Topics will include basic science and clinical topics, normal vision and abnormal vision, methods of assessment of animals and humans, clinical and laboratory measures.

**Meeting Dates:** September 9, **15, 24**, 30, October 14, 21, 28, November 4, 18, 2015.

**Meeting Time:** Wednesdays, 3:00 - 5:00pm, **except as noted.**

**Location:** 2nd floor conference room, Schepens Eye Research Institute, 20 Staniford Street, Boston 02114

**Course Heads:** Patricia A. D'Amore, [patricia\\_damore@meei.harvard.edu](mailto:patricia_damore@meei.harvard.edu), 617-912-2559 and Russell L Woods, [russell\\_woods@meei.harvard.edu](mailto:russell_woods@meei.harvard.edu), 617-912-2589



# Immunology

## **\*Immunology 307qc. Cancer Immunology**

Kai Wucherpfennig, Catherine Wu, Stephanie Dougan and Michael Goldberg

2 Units. Enrollment: Limited to 20

M., 4–6.

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.

### **Fall 2015**

**Meeting Dates:** November 2, 2015 through December 21, 2015

**First Meeting:** November 2, 2015

**Final Meeting:** December 21, 2015

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

**Course Instructor:** Kai Wucherpfennig, Kai\_Wucherpfennig@dfci.harvard.edu

## Medical Sciences

### **\*Medical Sciences 300qc. Conduct of Science**

Raju Kucherlapati

2 Units. Time to be arranged

Note: All current G2 students must register for this course on their Fall Semester 2015 study cards. Specific enrollment instructions will be sent to current G2s and other eligible students in the upcoming weeks. Please contact Megan Eruzione ([megan\\_eruzione@hms.harvard.edu](mailto:megan_eruzione@hms.harvard.edu)) for enrollment inquiries.

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

**Course Director:** Raju Kucherlapati

### **\*Medical Sciences 301qc. PATHS**

David Cardozo

Enrollment: Limited to the Division of Medical Sciences students. Not for academic credit towards the PhD degree.

2 Units. Time to be arranged

A series of career development PATH courses and discussion seminars. Different topics are covered each term.

### **\*Medical Sciences 302qc. Conduct of Science Refresher**

Raju Kucherlapati

Enrollment: Restricted to DMS graduate students.

2 Units. Time to be arranged.

Note: All current G5 students must register for this course on their Fall Semester 2015 study cards. Specific enrollment instructions will be sent to current G5s and other eligible students in the upcoming weeks. Please contact Megan Eruzione ([megan\\_eruzione@hms.harvard.edu](mailto:megan_eruzione@hms.harvard.edu)) for enrollment inquiries.

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

**Course Director:** Raju Kucherlapati

# Neurobiology

## **\*Neurobiology 305qc. Biochemistry and Biology of Neurodegenerative Diseases**

Michael S. Wolfe and Dominic M. Walsh

2 Units. Enrollment: Limited to 20.

M., 2-4.

Biochemistry and biology are integrated to provide a broad perspective on major human neurodegenerative diseases. The biochemistry, enzymology, structural biology and pathology of disease-associated proteins and approaches to developing therapeutics will be examined.

### **Fall 2015**

**Meeting Dates:** September 14, 2015 through October 26, 2015

**First Meeting:** Monday, September 14, 2015

**Final Meeting:** Monday, October 26, 2015

**Location:** NRB 354

**Course Instructor:** Michael Wolfe, [mwolfe@rics.bwh.harvard.edu](mailto:mwolfe@rics.bwh.harvard.edu); Dominic Walsh, [dwalsh3@partners.org](mailto:dwalsh3@partners.org)

**\*\*Neurobiology 306qc. Quantitative Methods for Biologists (offered in August 2015)**

Michael Springer and Richard T. Born

2 Units. Enrollment: Limited to 80.

M., W., F., 9-5.

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 bootcamp course will meet in August.

**August 2015**

**Meeting Dates:** 8/10, 8/12, 8/14, 8/17, 8/19, 8/21

**First Meeting:** Monday, August 10, 2015

**Final Meeting:** Friday, August 21, 2015

**Location:** Maxwell Dworkin G115

**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.**