

# MCB 64. The Cell Biology of Human Life in the World

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**Class Lectures:** Science Center Hall E, MW 1:00 – 2:30 PM. \*subject to change depending on student enrollment

**Class Sections:** Mandatory, 1.5 hr/wk (dates/times on course website). Begin February 1st.

**Preceptors:** Dr. Jessica Liu: [liu9@fas.harvard.edu](mailto:liu9@fas.harvard.edu); 617-384-9468; Northwest B135.20  
Dr. Sven Heinrich: [sheinrich@g.harvard.edu](mailto:sheinrich@g.harvard.edu); 617-495-1445; BioLabs 1090

## **Course Description:**

This course teaches fundamental concepts in cell biology in the context of several individual life histories drawn from different parts of the world. Each life case focuses on key aspects of human development, growth, aging and disease while providing a nuanced view of the interplay between the life sciences, geography and culture. For example, the Human Immunodeficiency Virus and AIDS in South Asia is used to explore mucosal immunity and the basis for estimating relative infection risk, while a comparative discussion of aging in the United States and Japan is used to explore diet, cellular metabolism, and their relationship to protein damage and turnover. Each case delves into the cell biology of major biological events across the life history of a human being from different geographical and cultural backgrounds.

Cell biology is a pervasive part of society today and affects the individual lives of every citizen around the world. This course uses the vibrant social backdrop of different countries in the world to showcase the changing impact of cell biology research on both the individual and society. An emphasis is placed on interdisciplinary issues such as how developing drug therapies for disease and aging are based on understanding cell biology and can be further influenced by genetic and environmental factors.

Assigned readings establish a biological and social context for each stage of a character's life, and the characters' life histories unfold during the course in each week's discussion topics. The characters therefore serve as compelling frameworks for bringing together different perspectives on the particular scientific topic at hand.

**Course Website:** <https://canvas.harvard.edu/courses/23845>

All course-related communication will be carried out through the course website including announcements, posting of lecture videos, reading assignments and practice problems. We expect you to check the course website regularly for any updates or course-related items.

**Course Format:**

The course is divided into 3 phases; each phase looks at a particular life stage for each of the characters. Phase 1 focuses on fetal and early childhood development with an emphasis on epigenetics, the cell biology of fetal programming, and cell structure. This will give students the opportunity to explore how environmental and cell biological factors affect early development in the context of different geographic and cultural backdrops. Phase 2 focuses on infectious disease and connects early adulthood with how different environments influence pathogen exposure, infection, and therapy. The process of science in the form of biomedical research is also addressed in intersecting narratives. In Phase 3, students follow the characters into old age and explore how events in early development now affect later health outcomes as well as unravel the mysteries of the aging process and its societal impact.

There is no textbook for the course. Assigned readings for the lectures will be mostly articles from scientific journals and will be available for download on the course website under “Readings and Resources”. Answer keys to the section handouts can be found under “Sections”.

**Course Work and Grades:**

The course grade will be based on interval content evaluations (ICEs), in-class case development sessions with supporting written reflections, final oral presentations with accompanying written work and presentation slides, in-class break outs, and section attendance and participation.

<b><u>Grades and Work Summary</u></b>	
<b>7 Interval Content Evaluations (“ICEs”; top 7 scores out of 8):</b>	<b>40%</b>
<b>4 In-Class Case Development Sessions/Reflections + 2 Posters (Phases 1&amp;2):</b>	<b>30%</b>
<b>Final Presentation + Written Summary &amp; Slides (Phase 3) + Participation:</b>	<b>25%</b>
<b>15 In-Class Break Outs (MUST register for Poll Everywhere by 01/25/2017):</b>	<b>3%</b>
<b>Section Attendance and Participation</b>	<b>2%</b>

• **Interval Content Evaluations (or “ICEs”)**

ICEs are designed to eliminate infrequent, high-stakes and high-stress midterms with more frequent, shorter, 45-minute assessments. **Students will take the ICEs online via the course website. You will have a 48-hour time frame (always 7 PM Wednesday to 7 PM Friday) within which to start and complete your 45-minute ICE. You are responsible for finding a quiet room to take your ICE individually. We are holding all students to the honor code outlined in the course’s academic integrity policy.**

If you miss an ICE, you must have a written medical excuse, and your final ICE grade will be based on your remaining ICEs. If there are any technical difficulties that prevent you from

taking the ICE within the 48-hour time frame, you must have a documented ticket with Harvard University's Information Technology (HUIT) department for us to consider your case.

**No makeup ICEs will be given.**

ICEs provide multiple opportunities to demonstrate your individual facility in applying course concepts and specific topics assessed in each ICE are outlined in each lecture's Learning Goals and Objectives. There are a total of 8 ICEs: the lowest ICE score will automatically be dropped at the end of the term.

ICEs hedge against cramming and rote memorization and instead incentivize the gradual accrual of knowledge and skills as the course progresses. All ICE answers will be expected to be in your own words. Each ICE will be open course material: you may use any material on the course website and your own notes. Outside resources, including those on the internet, will not be allowed.

• **In-Class Case Development Sessions/Reflections**

At the end of each of Phases 1 and 2, there will be 2 In-Class Case Development Sessions (2 per phase or 4 total) focused on integrating the cell biological concepts of the phase with the proposed life history situations of the appropriate characters. Specific prompts will be provided before each development session to foster structured group debates that give students the freedom to apply what they know to a novel situation. In each development session, each student will participate in 2 different groups tackling different discussion prompts and respond to a closing prompt, which will provide the basis for a small poster and written reflection statement (500 words max, not including supporting references). **Posters will be turned in at the end of the second session, and a soft copy of the two reflections for each phase must be turned in on the canvas course website on the due date at the beginning of class (1 PM).**

**Late Assignment Policy:**

After the deadline, turn in posters and reflections directly to the preceptor. Late posters and reflections will be accepted past the deadline with 20% deducted **per day**.

• **Final Student Presentations**

At the end of Phase 3, each student will prepare a 10-minute presentation that describes his/her own new character, complete with geographic and life history context, and with an emphasis on a particular life event that connects with the convergence of cell biology with human health issues. **On the day of the presentation, at the beginning of class (1 PM), a slide deck of the presentation must be turned in on the canvas course website (see syllabus). The soft copy of the written summary (1000 words max, not including references) must be submitted through the canvas course website no later than May 3rd.** The written summary, in combination with the slides, should emphasize key points of the presentation. In other words, if a colleague missed the presentation, the summary should impart the ideas that are most important. Relevant literature resources must also be appropriately referenced. In the week(s) before, student presenters will prepare drafts and can receive feedback on them during section

or office hours, with an emphasis on the structure/content of presentations. When not presenting, all students are expected to come fully prepared to participate and ask questions (will count toward your final presentations participation grade).

- **In-Class Break Outs**

An In-Class Break Out is an interactive, in-class activity/discussion culminating in a multiple-choice question or other polled activity based on concepts addressed in lecture. Responses to Break Outs are submitted using either a cell phone or a laptop via a program called Poll Everywhere (see below for instructions on how to sign up for an account). Please email us if you have access to neither a laptop nor a cell phone. In-Class Break Outs will occur during the lecture throughout the entire semester. Participation in 15 Break Outs will make up 3% of the final course grade. It is your responsibility to ensure your Poll Everywhere account is saving and keeping track of your responses throughout the course.

**Registering for Poll Everywhere (by 01/25/2017)**

To start using the Poll Everywhere program for In-Class Break Outs, please follow these steps to first register as a participant for the Break Out polls and then certify your telephone number (if you are planning on texting in your responses). More detailed instructions are posted on the course website.

1. Follow this link to register: <http://www.pollerywhere.com/register?p=2dp6p-1pvd>.
2. On the "Participant Registration" page, enter your full name, email address, whatever password you like, and click on "Register my account." Please keep your email and password on securely recorded somewhere as you may need to log into this website again.

- **Section Attendance and Participation**

Section plays an important role in deepening your engagement with and understanding of the course material. For MCB 64 sections are mandatory, and your section leaders (TAs/TFs) will be taking attendance as well as noting your participation. Participation in this case is defined as contributing an insightful comment, question, or answer to the section handout in reference to the primary scientific literature discussed in section. Section attendance and participation will make up 2% of your final course grade.

- **Accommodations for Students with Disabilities:**

We are aware some students may require additional accommodations for ICEs and the phase sessions. If this applies to you, please first contact the Harvard Accessible Education Office (AEO) to discuss the specific accommodations you might need (instructions: <http://aeo.fas.harvard.edu/register.html>). Once you have this letter, bring it to the preceptor no later than February 6, 2017, so that we have time to make arrangements before the first ICE.

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### Syllabus - Spring 2017

Date	Meeting	Subject	Notes
M Jan 23	L1	Opening Narratives: the Biological Contexts of China, India, and the US plus a Case Study	
W Jan 25	L2	The Impact of HIV Denialism Fetal Programming	1st In-Class Break Out
M Jan 30	L3	Prenatal Effects of the Environment	
W Feb 1	L4	Molecular Basis of Epigenetics	<b>S1:</b> Guide to reading scientific papers and approaching ICEs: BPA/disruption oogenesis
M Feb 6	L5	Mitochondria: Symbiotic Partners Mitochondrial Inheritance and Disease	
W Feb 8	L6	Complete L5 Cytoskeleton and Cellular Structure	<b>S2:</b> Epigenetic Programming by Maternal Behavior
W-F Feb 8-10		<b>ICE 1 (covers L1-L2)</b>	
M Feb 13	L7	Complete L6 Muscular Dystrophy	
W Feb 15	L8 P1a	HIV and AIDS in the World <b>Phase 1a In-Class Case Development</b>	<b>S3:</b> Mitochondrial Disease and Purifying Selection
W-F Feb 15-17		<b>ICE 2 (covers L3-L5, S2)</b>	
M Feb 20	-	No class – President's Day	
W Feb 22	P1b	<b>Phase 1b In-Class Case Development</b>	<b>Phase 1 posters due</b> <b>S4:</b> Genome Editing in Mouse Model of DMD and Gene-Editing Policies
W-F Feb 22-24		<b>ICE 3 (covers end of L5-L7, S3)</b>	
M Feb 27	L9	The Beginning of AIDS and the Discovery of HIV	
W Mar 1	L10	HIV Infection and the Immune System	<b>Phase 1 reflections due</b> <b>S5:</b> HIV, Dendritic Cells, and DC-SIGN
M Mar 6	L11	HIV Transmission	
W Mar 8	L12	Sexual Transmission of HIV: Patterns and Prevention	<b>S6:</b> Blocking Mucosal Transmission of HIV

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W-F Mar 8-10		<b>ICE 4 (covers end of L7-L9, S4-S5)</b>	
M Mar 13	-	No Class– Spring Break	
W Mar 15	-	No Class – Spring Break	
M Mar 20	L13	Complete L12 Evolutionary Theories of Aging	
W Mar 22	L14a P2a	The Physiology of Aging I <b>Phase 2a In-Class Case Development</b>	<b>S7:</b> Human Mortality Improvement in Evolutionary Context
W-F Mar 22-24		<b>ICE 5 (covers L10-L12, S6)</b>	
M Mar 27	P2b	<b>Phase 2b In-Class Case Development</b>	<b>Phase 2 posters due</b>
W Mar 29	L14b	The Physiology of Aging II	<b>S8:</b> Mitochondrial Superoxide Triggers Longevity in <i>C. elegans</i>
M Apr 3	L15	Cellular Aging	<b>Phase 2 reflections due</b>
W Apr 5	L16	Aging and Neurodegeneration	<b>S9:</b> Section leaders: avatar example
W-F Apr 5-7		<b>ICE 6 (covers L13-14a/b, S7)</b>	
M Apr 10	L17	The Societal and Public Health Implications of Aging I	
W Apr 12	L18	The Societal and Public Health Implications of Aging II	<b>S10:</b> Transmission of amyloid- $\beta$ pathology
W-F Apr 12-14		<b>ICE 7 (covers L15-L16, S8)</b>	
M Apr 17	P3	<b>Student Presentations (class time)</b>	
W Apr 19		Wrap up character narratives	
W-F Apr 19-21		<b>ICE 8 (covers L17-L18, S10)</b>	
M Apr 24	P3	<b>Student Presentations (class time)</b>	
W Apr 26	P3	<b>Student Presentations (class time)</b>	Last day of classes
M May 1	P3	<b>Student Presentations (class time)</b>	Reading period
W May 3	P3	<b>Student Presentations (class time)</b>	<b>Final written summary due</b> Reading period