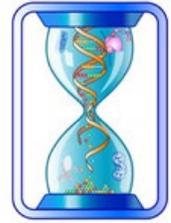


Bio 61 – Biology of Aging

Spring 2021

**Instructor:**

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When and where will we meet?

Tuesdays and Thursdays from 10:30-11:45 (block D+)
574 Boston Avenue, Room 401 and via Zoom (alternating days)

When can you talk to us outside of class?

Prof. McVey: Mondays 1-2 PM, Wednesdays 11 AM-12 noon
Zoom link: <https://tufts.zoom.us/my/mitch.mcvey>

Nick: Thursdays 2:30-3:30 PM

<https://tufts.zoom.us/j/93752016647?pwd=Vzk3bWYzeVFLdFZxYzJnWEoxNnF4QT09>

Or by appointment—just send us an e-mail

What will we be reading?

- Biology of Aging, 2nd edition, by Roger McDonald
- The Youth Pill, 2013 edition, by David Stipp
- Additional papers and resources will be posted on the Bio61 Canvas site.

What prerequisites do you need to succeed in this course? You should have already taken Bio13 and Bio14 or their equivalents at other schools. This course will draw from a wide range of topics that are introduced in the Bio13/14 course sequence.

What will we discuss in this course? The study of aging draws from a variety of biological disciplines and principles, including biogerontology, evolutionary theory, cell biology, genetics, physiology, and neurobiology. In this course, we will synthesize these multiple biological disciplines to address two BIG questions: what exactly is aging, and how can the aging process be altered?

What are our goals for this course? By the end of this semester, we would like you to:

- (1) Appreciate that aging studies are multi-disciplinary and controversy exists within each discipline.
- (2) Understand the value of using multiple approaches and model systems to study aging.
- (3) Be familiar with various topics of current aging research and their potential implications.

What will we do in this course? The aging field is dynamic and rapidly changing. We will engage in a variety of activities both in and out of class to survey the longevity landscape. Prior to each class, we will provide background information to you in the form of readings and videos. You should come to class having prepared to discuss the topic for the day. We will build upon the pre-lecture materials with in-class presentations, class discussions, and a variety of individual and group activities.

We have specifically asked that class be held in a flexible learning space to facilitate discussions. Due to COVID restrictions, you will attend some of your classes in person and some via Zoom. In both of these settings, we will ask you to engage with your colleagues in the analysis of data from the primary aging literature. Our goal is to give you practice evaluating scientific studies and using them to make informed choices regarding healthcare policy and the practice of medicine.

What are the course objectives? By the end of the semester, you should be able to:

1. Discuss the ways that biological aging is measured at the individual and population levels.
2. Define what is meant by comparative biogerontology.
3. Compare and contrast the major theories of aging.
4. Explain how a decline in various physiological processes results in diseases associated with human aging.
5. Differentiate between biomarkers of molecular, cellular, and organismal aging.
6. Describe the major characteristics of cellular and organismal aging in different organisms.
7. Give examples of how model organisms have revealed genetic determinants of longevity.
8. Define and give examples of private and public mechanisms of aging.
9. Give examples of genes and pathways that impact the aging process.
10. Analyze experimental data from the primary aging literature.
11. Give examples of anti-aging therapies and locate published studies related to these therapies.
12. Evaluate the likelihood that various therapeutic interventions will modulate the aging process in humans.
13. Appraise the sociological impacts of extending human healthspan and lifespan.
14. Recognize key scientists and research studies in the aging field.

How will your progress be evaluated?

Your final course grade will be determined based on the following point breakdown:

End-of-unit assessments	45%
Short writing assignments	20%
Group research assignment	15%
Gradescope question sets	15%
In class participation/group work	5%

End-of-unit assessments: There will be two written assessments comprised of a combination of multiple choice, matching, short answer, and short essay questions. The questions will largely be drawn from the readings, annotated lecture slides, and the in-class discussions. Your lowest grade will count for 20% of your total course grade, while your highest grade will count for 25%. You will take these assessments online, using a platform called Gradescope.

If you know in advance that you will miss an assessment, please notify me at least one week ahead of time so that we can make alternate arrangements. If you miss an assessment due to a documented health or family-related emergency, we will work together to reschedule. Requests for re-grades must be made on Gradescope within one week after the exam is returned.

Unit 1 assessment	Tuesday, March 9 th
Unit 2 assessment	Tuesday, April 13 th

Writing assignments: There will be two short writing assignments during the semester. The purpose of these assignments is to delve further into topics that we will discuss in class and to become familiar with the longevity/aging literature and resources. These assignments should be submitted via Canvas on the due date before class begins (10:30 AM). Points will be deducted for tardiness.

Writing assignment #1:	Thursday, March 4 th
Writing assignment #2:	Thursday, April 8 th

Group aging intervention project: There have been many drugs, supplements, and interventions which people have claimed can extend healthspan and/or lifespan. We will discuss a number of these during the last third of the course. Your final assignment will involve identifying an anti-aging intervention, gathering information about it from reputable, primary sources, and preparing a research proposal in which you argue for further testing of this intervention. This assignment will be completed in groups. Your group will present your proposal to the class at our lab meeting (**Monday, May 10th, 3:30-5:30 PM**).

Important dates for the group assignment:

April 6	Individuals submit their areas of interest
April 15	Research groups announced
April 22	Groups submit their resource lists
April 29	Peer review of research proposals
May 10	Final proposal and contribution analysis due by 12 noon

Poll Everywhere in-class questions: We will be using the Poll Everywhere student response system in class. To participate, you will need to bring a web-enabled device (smartphone, tablet, or laptop) to class every day.

Question sets: Each week, we will post a set of questions designed to help you review the previous week's material and to preview the coming week's readings. You should make sure to submit your answers for each question set by 10:30 AM on the assigned due date, using the Gradescope platform. You are encouraged to consult with your colleagues on these question sets. Your lowest question set grade will be dropped.

Class participation: Your class participation grade will be determined by your attendance record, level of involvement during in-class activities (including Poll Everywhere questions), and by the quality of your contributions during class discussions and while working with your small groups.

What resources are available to you to help you succeed in this course?

The Bio61 Canvas web site: Lecture slides, additional readings, links to websites, assignments, and additional resources will be posted on the course web site (<http://canvas.tufts.edu/>).

Lecture Slides: Lecture slides will be posted on Canvas 1-2 days prior to the lecture. These will serve as a guide to what you should focus on in the assigned readings. We will annotate these slides during lecture. Because we frequently provide outlines, additional notes, and in-class activities during lectures, the on-line slides by themselves will not adequately prepare you for exams.

Lecture Videos: We will occasionally post short lecture videos that we will ask you to view before coming to class. This will allow us to spend more time in class discussing primary research studies and talking with each other.

Office hours and e-mail: Please take advantage of our office hours. We're happy to talk with you about course material or about aging research in general. Also, feel free to contact us concerning any problems you are experiencing in the course. You don't need to wait until you receive a poor grade before asking for our assistance. When you e-mail us, we will do our best to respond to your inquiry within 24 hours. If your question cannot be easily answered via e-mail, we may request that you talk to us in person.

Use of TurnItIn

As part of this course, I will utilize TurnItIn in the Trunk learning management system to help determine the originality of your work. TurnItIn is an automated system which instructors can use to quickly and easily compare each student's assignment with billions of websites, as well as an enormous database of student papers that grows with each submission. When papers are submitted to TurnItIn, the service will retain a copy of the submitted work in the TurnItIn database for the sole purpose of detecting plagiarism in future submitted works. Students retain copyright on their original course work. For more information, see Turnitin.com or review Tufts' Academic Integrity policies.

How do we ensure that everyone has an equal opportunity to succeed in the class?

You are encouraged to work with your colleagues to do the Canvas question sets and to discuss the class readings—after all, science is a collaborative affair. However, your writing assignments and end-of-unit assessments should be your intellectual property only (or that of your group, if it is a group assignment). When you use information from articles, papers, or other sources, be sure to properly cite your sources. Any type of plagiarism or cheating will be dealt with harshly, including a grade of 'zero' on the assignment and possible other penalties as detailed in Tufts' written policies. If you ever have a question about the expectations concerning a particular assignment or project, be sure to ask us for clarification.

A student who is academically dishonest is claiming an advantage not available to other students. As your instructors, we are responsible for ensuring that all students compete on a level playing field. You are expected to be familiar with Tufts' Academic Integrity guidelines (<http://ase.tufts.edu/biology/bgguide/classes/tahonesty.htm>). Faculty members are required to report suspected cases of academic integrity violations to the Dean of Student Affairs Office. If we suspect that you have cheated or plagiarized in this class, we must report the situation to the Dean.

As part of this course, we will utilize TurnItIn to help determine the originality of your work. TurnItIn is an automated system which instructors can use to quickly and easily compare each student's assignment with billions of websites, as well as an enormous database of student papers that grows with each submission. When papers are submitted to TurnItIn, the service will retain a copy of the submitted work in the TurnItIn database for the sole purpose of detecting plagiarism in future submitted works. Students retain copyright on their original course work. In this class, you will be given the opportunity to see the TurnItIn originality report for your papers submitted through Canvas.

Diversity Statement: We want to create a learning environment in our class that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including age, race, gender, class, sexuality, religion, and ability, among others). Throughout the semester, we will be discussing potentially controversial topics. We request that you always treat your classmates with respect during these discussions. Listen carefully to what your colleagues are saying and respond courteously, even when you don't agree with their opinions.

In-Person Classroom Health and Safety Policy: As you're aware, due to the COVID-19 pandemic, the academic experience will be different for all of us. When physically in person for this course, you'll be responsible for wearing a mask that covers your mouth and nose, practicing physical distancing of 6 feet with other individuals, and keeping your desk and chair on the designated spots on the ground. You will also be responsible for wiping down your own desk, chair, and other frequently touched surfaces with alcohol wipes or other approved disinfectant (provided) upon arrival and departure from the classroom (or lab, studio, etc.). It is imperative that we work together as a community to uphold these standards to help mitigate the risk of spreading the virus. Failure to do so may result in a referral to the Dean of Student Affairs Office. For more information about expectations for the Spring semester, the COVID public health policies outlined in the Fall Guide are still in effect. Please review the Fall Guide [here](#).

Mental Health Support: As a student, there may be times when personal stressors or emotional difficulties interfere with your academic performance or well-being. The Counseling and Mental Health Service (CMHS) provides confidential consultation, brief counseling, and urgent care at no cost for all Tufts undergraduates as well as for graduate students who have paid the student health fee. To make an appointment, call 617-627-3360. Please visit the CMHS website: <http://go.tufts.edu/Counseling> to learn more about their services and resources.

Academic Support at the StAAR Center: The StAAR Center (formerly the Academic Resource Center and Student Accessibility Services) offers a variety of resources to all students (both undergraduate and graduate) in the Schools of Arts and Science, Engineering, the SMFA and Fletcher; services are free to all enrolled students. Students may make an appointment to work on any writing-related project or assignment, attend subject tutoring in a variety of disciplines, or meet with an academic coach to hone fundamental academic skills like time management or overcoming procrastination. Students can make an appointment for any of these services by visiting go.tufts.edu/StAARCenter

Accommodations for Students with Disabilities: Tufts University values the diversity of our students, staff, and faculty and recognizes the important contribution each student makes to our unique community. Tufts is committed to providing equal access and support to all qualified students through the provision of reasonable accommodations so that each student may fully participate in the Tufts experience. If you have a disability that requires reasonable accommodations, please contact the StAAR Center (formerly Student Accessibility Services) at StaarCenter@tufts.edu or 617-627-4539 to make an appointment with an accessibility representative to determine appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

Policy on sharing. This course is designed for everyone to feel comfortable participating in discussion, asking questions, learning, and facilitating the learning of others. For that atmosphere to be maintained, the recordings of our conversations will only be shared with the enrolled students in the class (not posted publicly) and it is prohibited for any of us who have access to the video to share it outside the course. Similarly, I have specifically designed the syllabus, exams, handouts, and lectures for the people who are enrolled in the course this term and those may not be shared outside this course. It is against Tufts policy for anyone to share any content made available in this course including course syllabi, reading materials, problems sets, videos, handouts, and exams, with anyone outside of the course without the express permission of the instructor. This especially includes any posting or sharing of videos or other recordings on publicly accessible websites or forums. Any such sharing or posting could violate copyright law or law that protects the privacy of student educational records.

Tentative Schedule of Topics for Biology of Aging, Spring 2021

Date	Topic	Biology of Aging	Other readings	Assignment due
Theme 1 What is aging and what are current theories of aging?				
T Feb 2 Th Feb 4	What is aging? How aging is measured	Ch.1, pp. 1-19 Ch.2	Mosaic article	
T Feb 9 Th Feb 11	Human longevity and biodemography Changes during human aging	Ch.7 Ch.8	TYP Ch. 6	QS1 (2/9 10:30AM)
T Feb 16 Th Feb 18	No class – Tufts Monday Last day to add classes Age-related diseases in humans	Ch.9, pp. 312-340		QS2 (2/18)
T Feb 23 Th Feb 25	Age-related diseases in humans Evolutionary theories of aging	Ch.9, pp. 289-312 Ch.3	TYP Ch. 1	QS3 (2/23)
T Mar 2 Th Mar 4	Other theories of aging Comparative biogerontology	None Ch.1, pp. 19-24	AFAR guide TYP Ch. 3, Hughes article	QS4 (3/2) Writing #1 (3/4)
M Mar 8 T Mar 9	Last day to drop classes (no record) Unit 1 assessment			
Theme 2 What cellular and molecular mechanisms are relevant to aging?				
Th Mar 11	Cellular senescence	Ch. 4, 93-113, 125-130	Canvas articles	
T Mar 16 Th Mar 18	Cellular aging – oxidative stress I Cellular aging – oxidative stress II	Ch. 4, pp. 113-125 None	TYP Ch. 2	QS5 (3/16)
T Mar 23 Th Mar 25	Cellular aging – genomes and epigenetics Longevity studies in microorganisms	Ch. 5, pp. 133-158 Ch. 5, pp. 159-164	Canvas articles TYP pp. 172-184	QS6 (3/23) F spring break
T Mar 30 Th April 1	Longevity studies in worms and flies Longevity studies in rodents and primates	Ch. 5, pp. 164-174 Ch. 5, pp. 174-181	TYP Ch. 4 TYP Ch. 5	QS7 (3/30)
T April 6 Th April 8	Premature aging diseases in humans Hot topics in aging	Ch. 1, p. 19 None	Canvas articles Canvas articles	QS8 (4/6) Writing #2 (4/8)
M April 12 T April 13	Last day to drop classes (with a 'W') Unit 2 assessment			

Theme 3 How can longevity be modulated?				
Date	Topic	Biology of Aging	Other readings	Assignment due
Th April 15	Anti-aging remedies	Ch. 10, pp. 356-363	Canvas articles	
T April 20 Th April 22	Caloric restriction <u>Sirtuins</u> and resveratrol	Ch. 10, pp. 348-356 Ch. 5, pp.162-163	TYP pp. 139-172 TYP Ch. 9 & 11, articles	QS9 (4/20)
T April 27 Th April 29	TOR and rapamycin Peer review of research proposals	Ch. 5, pp.163-164	TYP Ch. 10, articles	QS10 (4/27)
T May 4	Implications for society	Ch. 11	TYP Ch. 12	QS11 (5/4)
M May 10 3:30- 5:30 PM	Final class meeting – group presentations			