

The Biology of Human Aging
HEB 1403

Instructor: Professor Noreen Tuross
tuross@fas.harvard.edu

Welcome. This class will meet live in Zoomland on Thursday from 12:45pm-2:45pm (EST). In addition, mini (and sometimes not so mini) lectures will be recorded and posted on Sunday evening. Questions based on the lecture and readings will be posted on Sunday and are due no later than Tuesday evening (8pm EST) via email (tuross@fas.harvard.edu). Class discussion leaders will meet with Professor Tuross at an agreed upon time on Wednesday to go over the class responses and plan for Thursday's class. You can anticipate being a discussant for the class readings twice during the semester (TBD).

In table form:

Sunday evening	Lecture is posted (a couple of weeks will have no recorded lecture)
Monday/Tues	Listen to lecture and make sure weekly reading is done. Write out responses to questions.
Tuesday evening (8pm EST)	Response to reading/lecture questions is due.
Wednesday	Meeting with Thursday Discussants
Thursday 12:45-2:45pm	Live Zoom Discussion

One goal of this schedule is to protect our weekends. While some of you may wish to do your reading on weekends, the schedule should allow you to complete all assignments/meetings for the class during weekdays.

There will be a final paper in this course. Detailed instructions and guidance will be provided.

Syllabus/Schedule

The book used in the course is

The Biology of Aging by Roger B. McDonald

Second edition

The book is available on Amazon (among other companies). You can purchase, rent or use the e version available through the Harvard library (note, only 3 people at a time can use the library e book).

Journal articles will be posted in Modules.

Introductory Class

Week 1: September 3

Topics:

Are you aging? If so, where, how? What age do you consider elderly? Longevity vs Lifespan.

How long does the average Harvard College Professor live (and how do we know this)?

Part 1.

The Basics of Aging and the Place of Humans in the Animal Kingdom

This section covers basic demographic information; change in population structure through time; the difference and similarities among humans and other animals; and the experimental models used to study aging (and the limitations that presents in understanding human aging and longevity)

Week 2: September 10

McDonald, 2

Individual Meetings

Week 3: September 17

McDonald, Chapters 1 and 7

(Response 1)

Part 2.

The Evolution of Aging Beyond Grandmothers

Is aging evolving? Aging Greats (Darwin, Weismann, Medawar, Williams, Hamilton); Mutation Accumulation; Antagonistic Pleiotropy; Disposable Soma Theory, Grandmother and Female Longevity.

Week 4: September 24

McDonald, Chapter 3

(Response 2)

Week 5: October 1

Flatt, Thomas, and Linda Partridge. "Horizons in the evolution of aging." *BMC biology* 16, no. 1 (2018): 1-13. (Warning. This is a dense paper. Start early and often).

(Response 3)

Week 6: October 8

Natrrass, Stuart, Darren P. Croft, Samuel Ellis, Michael A. Cant, Michael N. Weiss, Brianna M. Wright, Eva Stredulinsky et al. "Postreproductive killer whale grandmothers improve the survival of their grandoffspring." *Proceedings of the National Academy of Sciences* 116, no. 52 (2019): 26669-26673.

Engelhardt, S.C., Bergeron, P., Gagnon, A., Dillon, L. and Pelletier, F., 2019. Using geographic distance as a potential proxy for help in the assessment of the grandmother hypothesis. *Current Biology*, 29(4), pp.651-656.

Austad, Steven N., and Andrzej Bartke. "Sex differences in longevity and in responses to anti-aging interventions: a mini-review." *Gerontology* 62, no. 1 (2016): 40-46

(Response 4)

Part 3.

Is It All Just Wear and Tear? and

Cellular Aging and The Genetics of Aging

The most intensive three weeks of the semester in terms of amount of reading and variety of the content. Topics include Telomere Shortening, Rate of Living, Systems Functioning, AGE products, Oxidative Damage, mTor, IGF1, Epigenetic Changes.

Week 7: October 15

Mcdonald Chapter 8 pp 231-257 and 275-281

Pinti, M., Appay, V., Campisi, J., Frasca, D., Fülöp, T., Sauce, D., Larbi, A., Weinberger, B. and Cossarizza, A., 2016. Aging of the immune system: focus on inflammation and vaccination. *European journal of immunology*, 46(10), pp.2286-2301.

Optional

Franceschi, C., Salvioli, S., Garagnani, P., de Eguileor, M., Monti, D. and Capri, M., 2017. Immunobiography and the heterogeneity of immune responses in the elderly: a focus on inflammaging and trained immunity. *Frontiers in immunology*, 8, p.982.

(Response 5)

Week 8: October 22

(Response 6)

Week 9: October 29

Mcdonald Chapter 5, selected portions

Sen, Payel, Parisha P. Shah, Raffaella Nativio, and Shelley L. Berger. "Epigenetic mechanisms of longevity and aging." *Cell* 166, no. 4 (2016): 822-839.

Optional

Fraga, Mario F., Esteban Ballestar, Maria F. Paz, Santiago Ropero, Fernando Setien, Maria L. Ballestar, Damia Heine-Suñer et al. "Epigenetic differences arise during the lifetime of monozygotic twins." *Proceedings of the National Academy of Sciences* 102, no. 30 (2005): 10604-10609.

(Response 7)

Part 5.

Large Issues and Aging

In this section we explore three topics: Race, Climate Change and Immortality, weaving in the information from previous sections.

Week 10: November 5

Mcdonald Chapter 4 (pp. 109-131)

López-Otín, Carlos, Maria A. Blasco, Linda Partridge, Manuel Serrano, and Guido Kroemer. "The hallmarks of aging." *Cell* 153, no. 6 (2013): 1194-1217.

(Response 8)

Week 11: November 12

Alzheimers Disease and APOE

Belloy, M.E., Napolioni, V. and Greicius, M.D., 2019. A quarter century of APOE and Alzheimer's disease: progress to date and the path forward. *Neuron*, 101(5), pp.820-838.

Reas, E.T., Laughlin, G.A., Bergstrom, J., Kritz-Silverstein, D., Barrett-Connor, E. and McEvoy, L.K., 2019. Effects of APOE on cognitive aging in community-dwelling older adults. *Neuropsychology*, 33(3), p.406.

(Response 9)

Week 12: November 19

Who Wants to Live Forever?

Mcdonald, Chapter 10

Olshansky, S. Jay, and Bruce A. Carnes. "Inconvenient truths about human longevity." *The Journals of Gerontology: Series A* 74, no. Supplement_1 (2019): S7-S12. nes, 2019

Climate Change and Aging

<https://www.nytimes.com/interactive/2020/07/23/magazine/climate-migration.html?action=click&module=Top%20Stories&pgtype=Homepage>

Kenney, W. Larry, Daniel H. Craighead, and Lacy M. Alexander. "Heat waves, aging, and human cardiovascular health." *Medicine and science in sports and exercise* 46, no. 10 (2014): 1891.

Week 13: December 3

Student Presentations