

**Protein Life History (BIOSC 2145)
Fall Term, 2014**

Jeffrey L. Brodsky, Ph.D.
jbrodsky@pitt.edu
A320 Langley Hall

Wednesday, 9 AM - 10:50 AM
A202 Langley Hall
2-credits

The goal of this course is to understand the mechanisms underlying the synthesis, folding, post-translational modifications, and fates of proteins that are synthesized in various cell types, including bacteria, yeast, and humans. Emphasis will be placed on readings from the primary literature, and students will be expected to present and discuss assigned papers. Paradigm-shifting concepts and new technologies that have altered our definitions of the routes taken by proteins as they are created and mature will also be presented.

CLASS MEETINGS

Pre-Assigned Reading: "From RNA to Protein", Alberts et al. Molecular Biology of the Cell, 5th Ed., pp. 366-396

August 27 Each student will orally present 5 main points from the assigned reading (~2 minutes/point)

Five questions based on the reading will be proposed and turned-in as a written assignment.

September 3 **Ribosome profiling**
READING: Science 324: 218

Written answers to assigned questions will be turned-in.

10 **Unexpected forms of translation: Ribosome "hops"**
READING: Science 239: 1005

Find a paper in the literature in which ribosome profiling was used to investigate a new hypothesis. Write and turn-in a 1-page paper outlining how the technology was applied and what new discoveries emerged. Please present to the class (~2-3 min) theme of your selected paper.

- 17 Protecting the nascent chain: Trigger Factor**
READING: Nature 400: 693 & Science 344: 597
- 24 Unfolded proteins in the cytoplasm and ageing**
READING: Proc Natl Acad Sci USA 106: 14914
- October 1 Protein aggregation and the ubiquitin-proteasome pathway**
READING: Science 292: 1552
- Find a paper in the literature that describes another disease that arises from protein misfolding in the cytoplasm. In 1-page, describe what causes the disease and what effect this has on the cell. Is there a cure for this disease? Also, please present (~2-3 min) the theme of your selected paper.*
- October 1-3 Attend a few talks at the "Science 2014" conference**
- 15 Selecting the good from the bad proteins at the ribosome**
READING: Nature 467: 470
- Based on attendance at Science 2014, write and turn-in a 2-page synopsis of a talk you heard that is related to protein biogenesis, structure, and/or function. Include some background (with references) and write about the results and conclusions of the talk. Also, please present (~2-3 min) the topic of the presentation you wrote about.*
- 22 How do proteins know where to go? (ER targeting)**
READING: Nature 297: 647 & Alberts et al., Molecular Biology of the Cell, 5th Ed., pp. 723-731
- 29 How do proteins know where to go? (Mitochondrial targeting)**
READING: Cell 44: 801 & Alberts et al., Molecular Biology of the Cell, 5th Ed., pp. 713-719
- Some proteins are not targeted to the ER via the SRP dependent pathway, but use other routes for delivery. Find a paper that describes one of these other routes and in 1-page write about this pathway and what was discovered in the paper. Also, please present (~2-3 min) the topic of the paper you wrote about.*
- November 5 How does a protein cross a biological membranes?**
READING: Cell 71: 489

12 What happens to aberrant soluble proteins in the ER?

READING: J Cell Biol 132: 291

19 The unfolded protein response

READING: Cell 73: 1197

Find a paper in the literature that describes a disease-related membrane protein. In 1-page, describe why the mutation alters the ability of the protein to fold and/or function properly. Also, please present (~2-3 min) the topic of the paper you wrote about.

26 No class meeting

December 3 Autophagy: Getting rid of difficult proteins

READING: Human Mol. Gen. 11:1107

10 *Analyze a scientific research paper of your choice in the field of protein biogenesis, modification, and/or turnover (the paper must be from 2014 and should be no longer than 3 pages double-spaced pages).*

Grading

Written Assignments: 80% (8 graded assignments)
Class participation: 20%