

BIOL4480: Directed Studies in Biology

Project Description

Phase separation is a process that occurs within cells, where proteins and other biological macromolecules self-organize into condensates capable of carrying out or triggering important biological processes (Boeynaems 2018; Leslie 2021). These biological processes range from the stress response to the control of signal transduction, and even the regulation of gene expression (Boeynaems 2018). Biologists are hopeful that phase separation could answer how cells arrange their molecules so that they are in the right places at the right times. Knowing the answer to a fundamental biological question like this could pave the way for new and exciting discoveries, including insights into age-related diseases, such as neurodegenerative diseases. In this library-based project, I will be looking at biomolecular condensates and their role in neurodegenerative diseases. Specifically, how the misregulation of biomolecular condensate formation, maintenance, or clearance, could provide an avenue for pathological aggregation.

Learning Objectives

- Continue to improve upon scientific reading abilities
- Continue to improve scientific writing skills
- Continue to gain knowledge regarding biomolecular condensation and liquid-liquid phase shifts
- Learn how to complete an extensive literature review, and incorporate the information into a final written report

Meeting Schedule

- On Wednesdays at 12:30 pm, Dr. Don Nelson, a small group of students, and I will meet in order to discuss current literature and ideas, and to pose questions. Additionally, on Fridays from 3:30 pm to 5:30 pm, Dr. Don Nelson, a small group of students, and I will meet for reading presentations relevant to the Directed Studies.

Timeline

- September 2022
 - Attend biweekly meetings
 - Choose a specific topic
 - Refine library research skills and begin extensive literature review
- October 2022
 - Attend biweekly meetings
 - Finish extensive literature review
 - Plan final written report
 - Begin writing final written report
- November 2022
 - Attend biweekly meetings
 - Finish writing final written report
 - Prepare a public presentation

Evaluation

- Final written report (~60%)
- Public presentation (~25%)
- Library research skills (~15%)

Literature Cited

Boeynaems S, Alberti S, Fawzi NL, Mittag T, Polymenidou M, Rousseau F, Schymkowitz J, Shorter J, Wolozin B, Van Den Bosch L, et al. 2018. Protein Phase Separation: A New Phase in Cell Biology. *Trends in Cell Biology*. 28(6):420–435. doi:10.1016/j.tcb.2018.02.004.

Leslie M. 2021. Separation anxiety. *Science*. 371(6527):336–338. doi:10.1126/science.371.6527.336. <https://science.sciencemag.org/content/371/6527/336.summary>.