

LSBS 524500: Membrane Biology
R6R7 (Thurs 14:10-16:00) 2020 Fall semester
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Biological membranes consist of lipids, proteins and carbohydrates to define the compartmentalization of the cells. Membranes are also very dynamics not only within the lateral and in the transverse direction of lipid bilayers, but also undergo constant motions and contacts in the intracellular cytoplasm of the cells. Recent progress in the structures/dynamics and crowdedness (or clustering) of these membrane components has allowed us to address how the molecular diversity and interactions of these essential cellular components help in exert its membrane functions through channels, transporters, enzymes, receptors and other related structural components of lipid and glycoconjugates. In order to achieve this goal, we will begin by introducing the basics of thermodynamics and membrane protein-lipid interactions, followed by the bioinformatics and structure biology of membranes. Finally, we will address how membrane transporters work with special emphasis on bioenergetics and cell signalling. Since membrane biology is a fast moving research field, updated current publications will also be discussed to guide students getting to the cutting edge of the field.

Sept 15	Introduction to membranes and thermodynamics
Sept 22	Foundation of membrane structure
Sept 29	Lipid bilayers
Oct 6	Interaction of peptides with lipid bilayers
Oct 13	Membrane protein folding and stability
Oct 20	Protein Trafficking in cells
Oct 27	Midterm Examination (Exercise I)
Nov 3	How proteins shape membranes
Nov 10	Membrane protein bioinformatics
Nov 17	Primer on biomolecular structure determination
Nov 24	Small molecule channels
Dec 1	Ion channels
Dec 8	Midterm Examination (Exercise II)
Dec 15	Primary transporters
Dec 22	Secondary transporter
Dec 29	Bioenergetics
Jan 5	Information transfer: signaling in cells
Jan 12	Final Examination (Report)

Grade: Midterm Examination (Exercise) 60%, Final Examination (Report) 20%, Class 20%

Textbook:

1. **Cell Boundaries: How Membranes and Their Proteins Work** by Stephen H White, Gunnar von Heijne & Donald M. Engelman, Garland Science; 1st Ed. 2022
2. Assigned reading and presentation on current review and articles