Welcome to BIO 3153 – Cell Biology

Professor: Dr. Michael Jonz

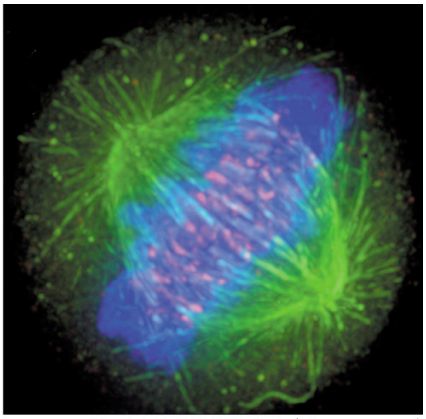

Figure 9–14. Molecular Biology of the Cell, 4th Edition.

Important Information

My office: Gendron (GNN) 260
Department of Biology

Office hours: Tuesdays 1:00-2:15 pm
TAs:
Michael Country
Wen Pan
Matthew Walker

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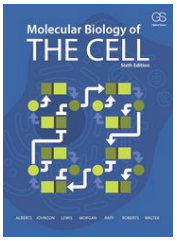
Please include “BIO 3153” in the subject line and allow at least 48 hours for a response.

Course Website

- Please consult course website for the *2015 Syllabus*
- Refer to the course website often.
- Blackboard.
- Posting of news, lecture slides and grades.
- Lecture *slides* will be posted 1 or 2 days before lecture.
- These are not meant to replace your notes.

Required Text

- Alberts et al. (2015) *Molecular Biology of the Cell*, 6th Edition.



- We will cover about 10 chapters.
- Chapter references indicated on lecture schedule.
- There are no required readings from the text.
- Use 5th ed (2008) at your own risk. I have posted a 5th-6th edition key for figures.

Evaluation

Midterm	40%
Final Exam	60%

- Midterm 20 October.
- The Final exam will cover the entire course.

Course Objectives

- Focus will be on a few topics, rather than survey a larger number.
- Material will be covered from the text, along with recent research.

Course Objectives

1. Introduction to Research Techniques: microscopy, imaging, protein structure.
2. The Cytoskeleton: filaments and molecular motors.
3. Cell Regulation: cell cycle, apoptosis
4. Protein sorting and intracellular traffic: insertion into membranes and vesicular transport.
5. Membranes and Cell Communication: membrane structure, ion channels, signalling.

BIO 3153 – CELL BIOLOGY, FALL 2015

LECTURE SCHEDULE

Lecture	Date	Topic	Slides[1]	Chapter / Article Reference[2]
1	11 Sept.	Introduction and General Features of Cells		
2	15 Sept.	Research Techniques I		8, 9, [1]
3	18 Sept.	Research Techniques II		8, 9
4	22 Sept.	Cytoskeleton I: Filament Proteins		16, [2]
5	25 Sept.	Cytoskeleton II: Regulation		16
6	29 Sept.	Cytoskeleton III: Molecular Motors		16, [3]
7	2 Oct.	Cell Cycle I: Intracellular Control		17
8	6 Oct.	Cell Cycle II: Extracellular Control		17
9	9 Oct.	Cell Cycle III: Apoptosis		18, [4]
10	13 Oct.	Mitotic Spindle		17
	16 Oct.	Midterm Review (Lectures 1-10)		
	20 Oct.	**Midterm Examination**		
	23 Oct.	TBD		
	26 - 30 Oct.	*Reading Week – No Lectures*		
11	3 Nov.	Protein Sorting I: Nucleus and Mitochondrion		12
12	6 Nov.	Protein Sorting II: Endoplasmic Reticulum		12
13	10 Nov.	Vesicular Traffic		13
14	13 Nov.	Membrane Structure		10
15	17 Nov.	Transporters and Ion Channels I		11, [5]
16	20 Nov.	Transporters and Ion Channels II		11, [6] [7]
17	24 Nov.	Cell Communication and Signalling I		11, 15
18	27 Nov.	Cell Communication and Signalling II		15
19	1 Dec.	Cell Communication and Signalling III		15, 19
	4 Dec.	Final Review (All lectures)		

Cell Biology: In General

- Structure *and* function of cells.
- From groups of cells (tissues, organs) to molecules (e.g. proteins).
- Forms basis of many other disciplines, e.g. physiology, medicine, developmental biology, biochemistry, neuroscience.
- Evolution: diversity of life and conserved characteristics.

3 Divisions of the Living World

- Bacteria
- Archaea
- Eukaryotes

} Prokaryotes

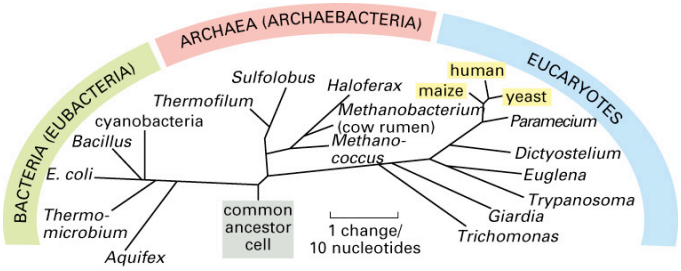


Figure 1–21. Molecular Biology of the Cell, 4th Edition.

3 Divisions of the Living World

- Distance between branches based on nucleotide sequences.
- Vast variability; Focus on animals

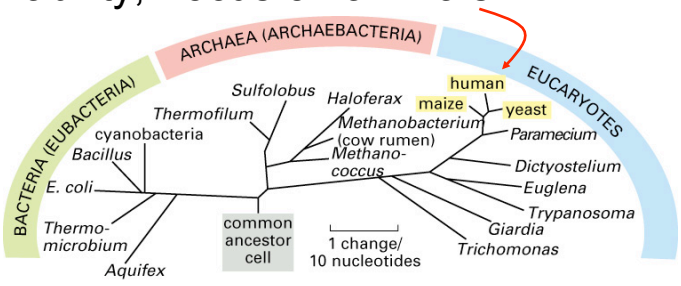


Figure 1–21. Molecular Biology of the Cell, 4th Edition.

Characteristics of Eukaryotes

- Nucleus
- 1000x larger by volume
- “Cytoskeleton”
- Internal membranes

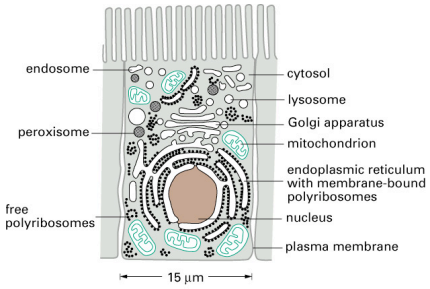


Figure 12–1. Molecular Biology of the Cell, 4th Edition.

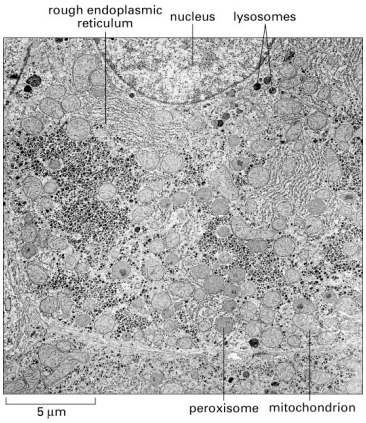


Figure 12–2. Molecular Biology of the Cell, 4th Edition.

Other Features

- Size: ~ 10-100 μm (1×10^{-6} m).
- Separated from outside by a membrane.
- Cells communicate with other cells.
- High degree of organization and compartmentalization.
- 70% H_2O.
- ATP required for *many* reactions.
- Chemical composition: *sugars, fatty acids, amino acids, nucleotides*.

Molecular Biology of the Cell, 4th Edition

Importance of Water

- *Covalent bonds* within H_2O molecule.
- Weak *hydrogen bonds* between H atoms of different H_2O molecules.
- Transient interactions between waters allow for liquid state.
- Medium permits a vast amount of chemical reactions.
- Hydrophobic effect in water and the cell membrane.

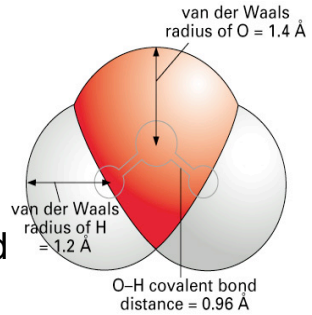


Fig. 2-12. Molecular Biology of the Cell, 4th Edition

The Plasma Membrane

- Membrane formed from *amphipathic* molecules (hydrophobic / -philic).
- Phospholipids are appropriately arranged in oil and water.
- When immersed, spontaneously aggregate to form “membranes”.

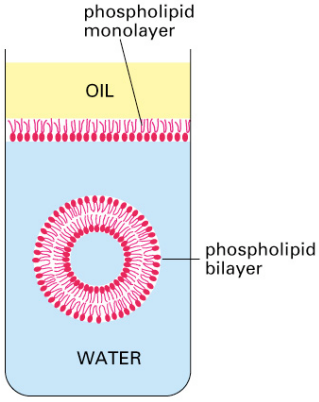


Fig. 1-12. Molecular Biology of the Cell, 4th Edition

The Plasma Membrane

- The cell membrane must be *permeable*.
- Insertion of *membrane proteins* (e.g. ion channels, transporters) allows passage or exchange of important ions or molecules.
- Highly conserved among cellular organisms.

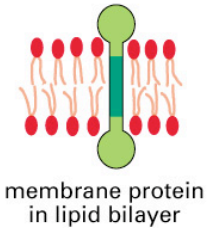


Fig. 10-24. Molecular Biology of the Cell, 4th Edition