

Molecular and Cellular Biophysics I

PHY2707, Fall 2023

Instructors:

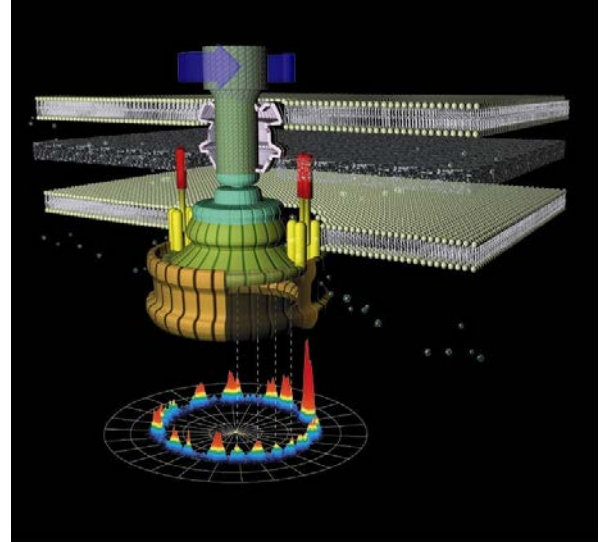
Prof. Claudiu Gradinaru
claudiu.gradinaru@utoronto.ca

Prof. Andreas Hilfinger
andreas.hilfinger@utoronto.ca

Department of Physics, U of T

Available (in-person):

Thursdays in MP 516C (appointment preferred, but not necessary)



Course Location and Times:

Weekly lectures are on Thursdays 1-3 pm in MP408 starting on Sept 14.

Textbook:

Molecular and Cellular Biophysics, Meyer B. Jackson
Cambridge University Press, 2006

Course Description:

This course investigates the physical properties of biomolecules with emphasis on principles of equilibrium and non-equilibrium thermodynamics and statistical mechanics that can be used to quantitatively describe biological structure and function. We will introduce the fundamental concepts while also making extensive use of examples from the research literature for you to gain an understanding of the general importance and broad applicability of physical laws to life sciences. Your active participation is required and includes reading and preparing papers assigned for discussion in each lecture in addition to two formal presentations during the course.

Grade Evaluation:

Article Summaries	---	10%
Assignments (4 x 15%)	---	60%
Teaching Presentation	---	15%
Research Paper Presentation	---	15%

Participation and Attendance:

Attending to class and participating is vital to your learning. We therefore strongly recommended that you regularly attend class and participate. Please come to class on time and don't hesitate to ask questions!

Article Summaries:

You will regularly be required to submit a 1-page summary of an assigned research article. The exact dates and articles will be announced on Quercus. Scientific publications are the primary means of learning about developments within the research field and this exercise is designed to get you to critically read (bio)physics papers. Your task is to summarize the main points of the paper and what you did not understand and/or did not agree with! Article summaries will be discussed at the beginning of class, so make sure to upload them at least 1-2 hours before the lecture. *If you need to miss a class, please arrange to submit your summary before it is due as late submissions will not be accepted.*

Homework Assignments:

There will be four homework assignments, which are due at specific due dates throughout the term. They will be posted on Crowdmark approximately one week before the due date. You may work together on the homework; however, you are each individually responsible for all homework assignments. So please make sure you understand how to solve the problems. *All assignments must be turned in at the beginning of class on the due date of that assignment. A 10% penalty will be deducted for each day the assignment is late up until when the solutions are posted, at which point you can no longer receive credit for the assignment.*

Oral Presentations:

You will give two presentations during the course.

- *Teaching Presentation*
In week 6 you will present a part of Chapter 6 of the textbook on Diffusion & Brownian Motion. The purpose of this presentation is for you to prepare for a lecture type setting and getting used to academic teaching. Specific details will be discussed as the date approaches.
- *Research Paper Presentation*
In week 12 you will present a scientific research paper inform the class about a particular area of modern biophysics research. The purpose of this presentation is for you to practice your oral communication skills. The exact research paper will be assigned to you by a draw two weeks in advance of the presentation date. The presentation session will be similar to what you would experience at a meeting like the Biophysical Society meeting. Your presentation will be graded on clarity and style as well as on content. Specific details will be discussed as the date approaches.

Class Schedule Fall 2023:

- 2022-09-14 Molecular Associations [CG]
- 2022-09-21 Allosteric Interactions I [CG]
- 2022-09-28 Allosteric Interactions II [CG]
- 2022-10-05 Fundamental Rate Processes [CG]
- 2022-10-12 Association Kinetics [CG]

- 2022-10-19 Student Presentations – Chapter 6 of Textbook [YOU]

- 2022-10-26 Multi-State Kinetics [AH]
- 2022-11-02 Random Walks [AH]
- 2022-11-09 Fluctuation-Dissipation Theorem [AH]
- 2022-11-16 Fluctuations in Biology I [AH]
- 2022-11-23 Fluctuations in Biology II [AH]

- 2022-11-30 Student Presentations – Selected Research Articles [YOU]