

**16:160:538 Biophysical Chemistry II
Methods in Molecular Biophysics**

Spring Semester, 2021

Instructor and Contact Information

Professor Wilma K. Olson - wilma.olson@rutgers.edu

Time and Location

Mondays and Wednesdays 10:55 AM - 12:15 PM via WEBEX

<https://rutgers.webex.com/rutgers/j.php?MTID=m0492533691545b60f1b943a30bce5251>

Meeting number (access code): 120 220 8920

Description

Introduction to biophysical techniques used in the study of biomolecular structure and function. Theoretical methods of macromolecular analysis. Methods of macromolecular engineering and design.

Course Structure

Members of the class are expected (i) to read and understand all of the course literature, (ii) to participate in class discussions, (iii) to complete a variety of written/oral assignments, (iv) to prepare a final written paper, and (v) to deliver an in-depth oral presentation on a biophysical method of his or her own choosing. Students will prepare answers to homework questions in advance of a particular class/paper, discuss the paper in class, and individually investigate supplementary issues brought up in class discussions. The supplementary items might include a brief oral/written report on relevant background material.

Literature

There is no textbook. The course will be taught using peer-reviewed literature as source material. The articles, all of which can be downloaded through the course website, are listed at the end of this document. The readings and associated homework questions must be submitted in advance of the class meeting at which the material will be discussed/presented.

Prerequisites

Biophysical chemistry I

Requirements

Homework (30%), class participation (20%), in-class oral presentation (25%), and final written report (25%)

Attendance

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to the instructor.

Class Schedule (tentative)

Week	Dates	Topics
1	Jan 20	Introduction
2	Jan 25, 27	Hu & Wang
3	Feb 1, 3	Mura et al; Pauling et al
4	Feb 8, 10	Shimanouchi & Mizushima; Ramachandran et al
5	Feb 15, 17	Scott & Scheraga; Tanaka & Scheraga; Senior et al
6	Feb 22, 24	Haugland & Stryer; Beardsley & Cantor; Murchie et al
7	Mar 1, 3	Marini et al; Strauss & Maher
8	Mar 8, 10	Smith et al; Finzi & Gelles
	Mar 15, 17	Spring break
9	Mar 22, 24	Vafabakhsh & Ha; Ngo et al
10	Mar 29, 31	Eisenberg & Felsenfeld; Plumridge et al
11	Apr 5, 7	Petrov&Williams; DaoDuc et al
12	Apr 12, 14	Honig&Nicholls; Student projects/presentations
13	Apr 19, 21	Student projects/presentations
14	Apr 26, 28	Student projects/presentations
15	May 3	Student projects/presentations

CABM SEMINAR SERIES 2020-2021

Course Literature

- Hu M, Wang S (2021) "Chromatin tracing: imaging 3D genome and nucleome" Trends Cell Biol 31(1) 5-8.
November 4th
Anna Buscary, MA/PhD
TBD
- Mura C, McCrimmon CM, Vertrees J, Sawaya MR (2010) "An introduction to biomolecular graphics" PLoS Comput Biol 6(8) e1000918.
November 2nd
Columbia University
- Pauling L, Corey RB, Branson HR (1951) "The structure of proteins: two hydrogen-bonded helical configurations of the polypeptide chain" Proc Natl Acad Sci USA 37(4):205-211.
December 2nd
Manfred Rechthaus, PhD
- Pauling L, Corey RB (1951) "Atomic coordinates and structure factors for two helical configurations of polypeptide chains" Proc Natl Acad Sci USA 37(5):235-240.
December 2nd
Manfred Rechthaus, PhD
- Shimanouchi T, Mizushima S (1955) "On the helical configuration of a polymer chain" J Chem Phys 23(4):707-711
November 13th
Philipps University Marburg
- Ramachandran GN, Ramakrishnan C, Sasisekharan V (1963) "Stereochemistry of polypeptide chain configurations" J Mol Biol 7(7):95-99
January 13th
Valentina Fossati, PhD
- Scott RA, Scheraga HA (1966) "Conformational analysis of macromolecules. III. Helical structures of polyglycine and poly-L-alanine" J Chem Phys 45(6):2091-2101
February 2nd
TBD
- Tanaka S, Scheraga HA (1976) "Medium- and long-range interaction parameters between amino acids for predicting three-dimensional structures of proteins" Macromol 9(6):945-950
February 2nd
The New York Stem Cell Foundation
- Senior AW, Evans R, Jumper J, Kirkpatrick J, Sifre L, Green T, Qin C, Židek A, Nelson AWR, Bridgland A, Penedones H, Petersen S, Simonyan K, Crossan S, Kohli P, Jones DT, Silver D, Kavukcuoglu K, Hassabis D. (2020) "Improved protein structure prediction using potentials from deep learning" Nature 577(7792):706-710
February 2nd
"A SARS-CoV-2 Protein Interaction Map Reveals Targets for Drug Repurposing"
University of California, San Francisco
- Haugland RP, Stryer L (1967) "Energy transfer: a spectroscopic ruler" Proc Natl Acad Sci USA 58(2):719-726
February 2nd
University of California, San Francisco
- Beardsley K, Cantor CR (1970) "Studies of transfer RNA tertiary structure by singlet-singlet energy transfer" Proc Natl Acad Sci USA 65(1):39-46
March 3rd
Nan Yang, PhD
- Murchie AI, Clegg RM, von Kitzing E, Duckett DR, Diekmann S, Lilley DM (1989) "Fluorescence energy transfer shows that the four-way DNA junction is a right-handed cross of antiparallel molecules" Nature 341(6244):763-766
March 3rd
TBD
Icahn School of Medicine at Mount Sinai
- Marini JC et al (1982) "Bent helical structure in kinetoplast DNA" Proc Natl Acad Sci USA 79(24):7664-7668
April 7th
Hiroaki Mitsuya, MD/PhD
- Strauss JK & Maher LJ 3rd (1994) "DNA bending by asymmetric phosphate neutralization" 266(5192), 1829-1834
April 7th
TBD
- Smith SB, Cui Y, Bustamante C (1996) "Overstretching B-DNA: the elastic response of individual double-stranded and single-stranded DNA molecules" Science 271(5250):795-799
April 7th
TBD
- Finzi L & Gelles J (1995) "Measurement of lactose repressor-mediated loop formation and breakdown in single DNA molecules" Science 267(5196):378-380
April 7th
National Cancer Institute
- Vafabakhsh R & Ha T (2012) "Extreme bendability of DNA less than 100 base pairs long revealed by single-molecule cyclization" Science 337(6098):1097-1101
May 5th
Suzanne Deberardinis
- Ngo TT et al (2015) "Asymmetric unwrapping of nucleosomes under tension directed by DNA local flexibility" Cell 160(6):1135-1144
May 5th
"TBD"
UT Southwestern
- Eisenberg H, Felsenfeld G (1967) "Studies of the temperature-dependent conformation and phase separation of polyriboadenylic acid solutions at neutral pH" J Mol Biol 30(1):17-37
May 5th
TBD
- Plumridge A, Andresen K, Pollack L (2020) "Visualizing disordered single-stranded RNA: connecting sequence, structure, and electrostatics" J Am Chem Soc 142(1):109-119
May 5th
TBD
- Petrov AS, Bernier CR, Hershkovits E, Xue Y, J C, Stepanov VG, Gaucher EA, Grover MA, Harvey SC, Hud NV, Wartell RM, Fox GE,  "Secondary structure and domain architecture of the 23S and 5S rRNAs" Nucleic Acids Res 41(10):7322-33
May 5th
TBD
- Dao Duc K, Batra SS, Bhattacharya N, Cate JHD, Song YS. (2019) "Differences in the path to exit the ribosome across the three domains of life" Nucleic Acids Research 47(8):4198-4210
May 5th
TBD
- Honig B, Nicholls A (1995) "Classical electrostatics in biology and chemistry" Science 268(5214):1144-1149
May 5th
TBD