BBCB5080- Principles of Macromolecular Biophysics. 2024 Schedule

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Time: Wed, Thurs, **1.45-3.15pm**, 255 Anatomy-Chemistry Building

This is an introductory course on Macromolecular Biophysics. The first part of the course covers the physical fundamentals underlying the structure and behavior of macromolecules necessary for biological function. The second part of the course covers the principle biophysical methods used to study macromolecules. The third part of the course examines, through a case study approach, how novel, yet still **rigorous and reproducible** research is conducted. For each case 2 students will present a small set of papers (usually 2 to 3) representing different sides of a scientifically controversial, possibly unsolved, topic in macromolecular biophysics. Students can choose from a set of pre-selected topics, or from their own suggestions (with approval from the director). The presentations will emphasize the dynamic, often uncertain dialogue of experiment, interpretation and critique involved in rigorous and reproducible scientific discovery. The presentation will be 'contemporaneously historical', i.e. based on the state of knowledge at the time of the papers. It can use knowledge of earlier literature, but not of research that was unknown at the time. Most typically draw from papers and letters in general journals like Science or Nature. They thus are written to be understood by people outside the specific area of the articles, and without extensive background literature reading, (like BBCB508 students!)

There is no textbook that covers all of the class, as much of the material is based on current research and is too new for textbooks. However Van Holde, K. E. et al. *Principles of Physical Biochemistry*, 2nd Edition, covers much of the material. A copy to view is available from KAS.

Lecture notes and other class material, include topics/papers for the case studies will be posted as the course progresses

Grade: Homework Assignments: 40%, Exam 30%, Presentations/Participation 30%.

Date	Topic		Lecturer
	Part 1: The Physics of Macromolecules		
W aug 28	Molecular Interactions: Bonding, Nonpolar, Polar, Electrostatics		Sharp
R aug 29	Equilibria: Folding, Structure and Stability		Sharp
W sep 4	Equilibria: Binding and Allostery		Sharp
R sep 5	Kinetics: Theory		Sharp
W sep 11	Kinetics: Experimental		Kohli
R sep12	Kinetics: Enzymes, Inhibitors and more		Kohli
	Part 2: Biophysical methods for studying macromolecules		
W sep 18	Optical Spectroscopy (UV, Fluorescence, CD)		Vinogradov
R sep 19	Optical Spectroscopy (UV, Fluorescence, CD)		Vinogradov
W sep 25	Scattering: Determination of structure		Gupta
R sep 26	Super Resolution Microscopy		Lakadamyali
W oct 2	Single Molecule Biophysics		Lakadamyali
R oct 3	Fall break		
W oct 9	Cryo Electron Microscopy: Principles of EM imaging		Murakami
R oct 10	Cryo Electron Microscopy: Single Particle		Murakami
W oct 16	Cryo Electron Microscopy Tomography		Chang
R oct 17	Hydrogen Exchange		Black
W oct 23	Diffraction 1: Determination of Structure		van Duyne
R oct 24	Diffraction 2: Determination of Structure		van Duyne
W oct 30	NMR		Sgourakis
R oct 31	NMR		Sgourakis
	Part 3: Rigor and Reproducibility in Biophysical Research: Examination of Current Scientific Controversies		
W nov 6	Topics: see list in separate document handed out at first class		Pair 1, 2
R nov 7			Pair 3, 4
W nov 13			Pair 5, 6
R nov 14			Pair 7, 8
W nov 20			Pair 9, 10
R nov 21			Pair 11, 12
W nov 27	Thanksgiving- no class		Thanksgiving- no class
R nov 28	Thanksgiving- no class		Thanksgiving- no class
W dec 4	Final Exam Due		
R dec 5	BMB Retreat- No class		BMB Retreat- No class