BBCB5080- Principles of Macromolecular Biophysics. 2025 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. Cases 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 BBCB5080 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 on canvas as the course progresses

Grade: Homework Assignments: 40%, Exam 30%, Case Study presentations/Participation 30%.

Date	Topic		Lecturer
	Part 1: The Physics of Macromolecules		
W sep 3	Molecular Interactions: Bonding, Nonpolar, Polar, Electrostatics		Sharp
R sep 4	Equilibria: Folding, Structure and Stability		Sharp
W sep 10	Equilibria: Binding and Allostery		Sharp
R sep 11	Kinetics: Theory		Sharp
W sep 17	Kinetics: Experimental		Kohli
R sep18	Kinetics: Enzymes, Inhibitors and more		Parker
	Part 2: Biophysical methods for studying macromolecules		
W sep 24	Optical Spectroscopy (UV, Fluorescence, CD)		El Khatib
R sep 25	Optical Spectroscopy (UV, Fluorescence, CD)		El Khatib
W oct 1	Scattering: Determination of structure		Gupta
R oct 2	Diffraction 1: Determination of Structure		van Duyne
W oct 8	Fall Break no class		
R oct 9	Fall break no class		
W oct 15	Diffraction 2: Determination of Structure		van Duyne
R oct 16	Cryo Electron Microscopy: Tomography		Chang
W oct 22	Cryo Electron Microscopy: Principles of EM imaging		Murakami
R oct 23	Cryo Electron Microscopy: Single Particle		Murakami
W oct 29	Hydrogen Exchange		Black
R oct 30	Super Resolution Microscopy		Hugelier
W nov 5	Single Molecule Biophysics		Hugelier
R nov 6			
W nov 12	NMR		Sgourakis
	Part 3: Rigor and Reproducibility in Biophysical Research: Examination of Current Scientific Controversies		
R nov 13	NMR		Sgourakis
W nov 19	Case Study Presentations. See list of topics in separate document handed out at first class		Pair 1, 2
R nov 20	Case Study Presentations		Pair 3,4
W nov 26	Thanksgiving- no class		Thanksgiving- no class
R nov 27	Thanksgiving- no class		Thanksgiving- no class
W dec 3	Case Study Presentations		Pair 5,6
R dec 4	Departmental Retrreat no class		
W dec 10	Case Study Presentations		Pair 7,8
R dec 11	Case Study Presentations		Pair 9, 10 (if necessary)
W dec 17	Final Exam Due		