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BMB 508- Principles of Macromolecular Biophysics. 2021 Schedule

Director: Kim Sharp, sharpk@upenn.edu
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Time: Tues, Wed, **1.45-3.15pm**, 255 Anatomy-Chemistry Building (note new new UPenn compliant times)

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 BMB508 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.

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

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

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Date	Topic		Lecturer
	Part 1: The Physics of Macromolecules		
W sep 8	Molecular Interactions: Bonding, Nonpolar, Polar, Electrostatics	C&S Ch5	Sharp
T sep 14	Equilibria: Folding, Structure and Stability	C&S Ch15,17	Sharp
W sep 15	Equilibria: Binding and Allostery	C&S Ch15,17	Sharp
T sep 21	Kinetics: Experimental	C&S Ch16	Kohli
W sep 22	Kinetics: Enzymes, Inhibitors and more	C&S Ch16	Kohli
	Part 2: Biophysical methods for studying macromolecules		
T sep 28	Optical Spectroscopy (UV, Fluorescence, CD)	C&S Ch7	Vinogradov
W sep 29	Optical Spectroscopy (UV, Fluorescence, CD)	C&S Ch7	Vinogradov
T oct 5	Single Molecule techniques		Goldman
W oct 6	Single Molecule techniques		Goldman
T oct 12	Hydrogen Exchange		Black
W oct 13	Scattering: Determination of structure	C&S Ch11,12	Gupta
T oct 19	Diffraction 1: Determination of Structure	C&S Ch13	Skordalakes
W oct 20	Diffraction 2: Determination of Structure	C&S Ch13	Skordalakes
T oct 26	Cryo Electron Microscopy: Principles of EM imaging		Murakami
W oct 27	Cryo Electron Microscopy: Single Particle		Murakami
T nov 2	Cryo Electron Microscopy Tomography		Chang
W nov 3	NMR		Sgourakis
T Nov 9	NMR		Sgourakis
	Part 3: Rigor and Reproducibility in Biophysical Research: Examination of Current Scientific Controversies		
	See list in separate document handed out at first class		
W nov 10			Pair 1, 2
T nov 16			Pair 3, 4
W nov 17			Pair 5,6
T nov 23			Pair 7, 8
W nov 24	Thanksgiving- no class		
T nov 30	Final Exam (Take home)		Pair 9, 10
W dec 1			
T dec 7	Final Exam Due		