Chemical Biology Chem 421b

Instructor: Professor Alanna Schepartz (Alanna.Schepartz@yale.edu)
KCL 120, 432-5094

Teaching Assistant: To be named.

Lectures: Tuesdays and Thursdays, 9:00 – 10:15, in SCL 19

Recitation section: Date and time TBA (1 hr)

Course description: A comprehensive introduction to the origins and emerging frontiers of chemical biology. This course develops the fundamental chemistry of molecules found in nature, a quantitative description of their interactions with themselves and each other, and subsequent effects on biological function. Topics include protein design, molecular evolution, chemical genetics, metabolic engineering, and methods in genomics and proteomics research.

Grades: Grades will be based on problem sets (40%), two exams (40%) and, in lieu of a final exam, a term paper written on a chemical biology topic not covered in class.

Problem sets: Problem sets will be distributed each Tuesday and will be due on the following Tuesday.

Texts and readings: Most readings will be from the primary literature and can be viewed and downloaded from the Yale classes server (https://classes.yale.edu). No text is required, but the following books are great sources for background material and as a reference guide. Each will be placed on reserve in Kline Science library.

Blackburn, G.M. & Gait, M.J. *Nucleic Acids in Chemistry and Biology*. Oxford (1996)
Branden, C. & Tooze, J. *Introduction to Protein Structure*. Garland (1999)
Creighton, T.E. *Proteins: Structures and Molecular Properties*. Freeman (1993)
Fersht, A. *Structure and Mechanism in Protein Science*. Freeman (1999)

Syllabus:

Date	Section		PowerPoint file	Topic	References (not a complete list, pls see classes server)
Jan. 11	What is chemical biology, and how does chemical biology differ from biochemistry or bio-organic chemistry?				
Jan. 13	Chemical methods to synthesize proteins and peptides I			Solid phase peptide synthesis	Merrifield1963.pdf Merrifield1964.pdf
Jan. 18	Chemical methods to synthesize proteins and peptides II		Inteins.ppt	Native chemical ligation methods, inteins	Casi2003.pdf Dawson2000.pdf Moots2002.pdf Moot2003.pdf Giriat2003.pdf
Jan. 20	Foldamers I		Foldamers-part-I	Foldamers with	MinterJACS2003.pdf

			Foldamers-part-II	structure	Hart2003.pdf
Jan. 25	**Case study**: The first example of a foldamer ligand for a medicinally relevant target		Foldamers-part-III	Foldamers with function	Kritzer2004.pdf Kritzer2004a.pdf
Jan. 27	Chemical methods to synthesize DNA and RNA			Solid phase oligonucleotide synthesis	Westheimer1987.pdf
Feb. 1	**Case study:** A four-base paired helix with expanded size		Non-naturalDNA.ppt		Liu2003a.pdf
Feb. 3	Evolution methods		Evolutionmeth-II.ppt		Hoess2001.pdf Keefe2001.pdf Li2002.pdf Stemmer1994.pdf Wilson2001.pdf
Feb, 8	Evolution II				Li2003.pdf Doyon2003.pdf Gartner2002.pdf
Feb. 10	No class today				
Feb. 15	DNA recognition		DNArecognition.ppt		Dervan2001.pdf Dervan2003.pdf
Feb. 17	**Case study:** Artificial transcriptional activators		Artificialactivators.ppt		Arndt2003.pdf Best2003.pdf Ansari2002.pdf
Feb. 22	Protein-protein interactions I		Protein-protein-int.ppt		Hopkins2002.pdf Chakabarti2002.pdf LoConte1999.pdf Ma2003.pdf Wells1995.pdf Ofran2003.pdf
Feb. 24	Protein-protein interactions II		Structuralplasticity.ppt		Arkin2003.pdf Atwell1997.pdf
March 1	Ligands for protein surfaces I				Berg2003.pdf Grandl2003.pdf
March 3	**Mid-term exam**				
March 22	Ligands for protein surfaces II				Chin2001.pdf Golemi-Kotra2004.pdf Rutledge2003.pdf Gemperli2004.pdf Schwarze1995.pdf
March 24	**Case study**: paralog selective ligands for Bcl-2 proteins				Chin2003.pdf Gemperli2004.pdf
March 29	Genomics and proteomics			DNA arrays	Pirrung2002.pdf
March				Protein arrays	Macbeath2000.pdf

31					Zhu2001.pdf Newman2003.pdf
April 5	**Case study:** Small molecule arrays				Macbeath1999.pdf Barnes-Seeman2003.pdf Koehler2003.pdf Knooh2003.pdf
April 12	Chemical Genetics I				Schreiber2003.pdf Shogren-Knaak2001.pdf
April 14	Chemical Genetics II				Koh2002.pdf
April 19	[open]				
April 21	**Exam**				