

Chemistry of Food Proteins 16:400:506  
Spring 2011

"What is the secret of life?" I asked.

"Protein," the bartender said. "They found out something about protein."

Kurt Vonnegut, Jr., *Cat's Cradle*

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*Office Hours:* I am typically available in late afternoon and often before class on Tuesday & Thursday. Contact me to arrange a time to meet.

*Meeting Time & Place:* T & Th 5:35-6:55 pm (see attached syllabus for meeting dates as I will be out of town on some class days).

*Text:* Petsko & Ringe (2004) *Protein Structure and Function*. (Available at the Cook-Douglass Bookstore, corner of Nichol Ave. and Lipman Drive on campus.)

*Course Goal:* This course is an introduction to the chemical structure and physical properties of proteins in solution, in solids, in foods, and in biological organisms. The primary intent of the course is to develop your understanding of how protein conformation is generated by physical interactions and how changes in conformation modulate the physical, chemical, physiological and functional properties of proteins in biological organisms and in foods. A secondary intent of the course is to introduce you to the complex historical development of our understanding of protein structure and properties.

*Logistics (grading):* Your grade in this course will be determined by your grades on one in class (10%) and two take home exams (45% each).

*Sakai site:* I have set up a sakai site ([sakai.rutgers.edu](http://sakai.rutgers.edu); log in with your netID and password). This site has announcements, a calendar, and resources for the course (pdf files of research papers, for example).

*Academic Integrity:* All graduate students at Rutgers University are expected to maintain the highest possible standards of academic integrity. It is the policy of the Dept. of Food Science to enforce such standards for all of its students. Any violation of academic integrity will be handled in strict accordance with all university rules and regulations. You should note that the University considers any violation of academic integrity by a graduate student as a separable offence which may result in permanent expulsion from Rutgers University with an indication of such action placed on your academic transcript. If you have any questions about the propriety of an action that you contemplate, you should discuss it with your course instructor or your academic advisor.

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<b>Date</b>	<b>Topic</b>	<b>Reading*</b>
Jan 18	Class logistics; orientation and overview Powers of 10: dimensions	P&R 1-0
Jan 20	Amino acids: properties; pKa's Historical note: discovery of "protein"	P&R 1-1,2
Jan 25	Peptide bond: structure & properties Historical note: polypeptide theory	P&R 1-3
Jan 27	Non-covalent interactions; polymer entropy	P&R 1-4
Feb 1	Secondary structures: conformations, helices Historical note: modeling helix structure	P&R 1-5,6 Pauling et al 1951
Feb 3	Secondary structures: $\beta$ -sheets; prediction Historical note: modeling sheet structure	P&R 1-7,8 Pauling & Corey 1951
Feb 8	Folding and folded structures  <b>Exam: Amino Acid Structures &amp; Properties</b>	P&R 1-9,10,11 Dobson 2003 Protein Structure Coloring Book
Feb 10	Protein stability Historical note: intermolecular forces	P&R 1-12,13 Pauling & Delbruck 1940
Feb 15	Tertiary structures	P&R 1-14,15,16,17,18
Feb 17	Quaternary structures	P&R 1-19,20,21
Feb 22	Proteins in solution: flexibility, hydrodynamics	P&R 1-22, 2-2 Kern 2007
Feb 24	Proteins in solution: polyelectrolytes Historical note: acid and pH	Zhang & Cremer 2006
Mar 1	Denaturation Historical note: theory of denaturation	De Graaf 2000 Mirsky & Pauling 1936
Mar 3	Proteins: effect of pressure	Gross & Jaenicke 1994
<b>Mar 8</b>	<b>No Class: RDL at Conference</b>	
Mar 10	Protein bioinformatics <b>Hand out take home exam</b>	P&R 4-0,1,2,3,6
<b>Mar 15</b>	<b>Spring Break</b>	
<b>Mar 17</b>	<b>Spring Break</b>	
Mar 22	Interactions with other molecules Historical note: enzyme specificity <b>Take home exam due</b>	P&R 2-0,1,3,4
Mar 24	Structural basis of catalysis Historical note: enzyme activity and identity	P&R 2-6,7,8,9
Mar 29	Structural and functional diversity	P&R 4-5,11,12,13,14 Fink et al 2005
Mar 31	Misfolded proteins: prions, amyloid plaques, etc.	P&R 4-15 Selkoe 2003 Leibman 2005
Apr 5	Protein aggregation and gelation	Foegeding 2006 Gosal & Ross-Murphy 2000
Apr 7	Collagen, gelatin, and gelation	P&R 2-5 Bella et al 1994
Apr 12	Milk proteins	Permyakov & Berliner 2000

		Horne 2006
Apr 14	Milk protein functionality	Raikos 2010 Huppertz et al 2006
Apr 19	Protein stabilized emulsions	McClements 2004
Apr 21	Protein stabilized foams	Murray & Ettelaire 2004
Apr 26	Seed proteins Historical note: legumin molecular weight <b>Hand out final exam</b>	Adachi et al 2003 Sjogren & Svedberg 1930
Apr 28	Functionality of seed proteins	Moure et al 2006
<b>May 5</b>	<b>Take home exam due</b>	

\*P&R: sections in Petsko & Ringe (2004) *Protein Structure and Function*.