Bio207: Reading Assignments

All the Reviews and papers are important for understanding the topic and should be read. However, maybe only one or two of the papers will be discussed in class. We will let you know in advance which papers will be selected for discussion.

Week 1: April 8
Judith Frydman, Biology Department, Stanford University
General introduction to protein folding in the cell

Reviews
Young JC, Agashe VR, Siegers K, Hartl FU. Pathways of chaperone-mediated protein folding in the cytosol. *Nat Rev Mol Cell Biol*.(2004) **10**:781-91.

Mayer MP, Bukau B. Hsp70 chaperones: cellular functions and molecular mechanism. *Cell Mol Life Sci*.(2005) (6):670-84

Horwich AL, Fenton WA, Chapman E, Farr GW. Two families of chaperonin: physiology and mechanism. *Annu Rev Cell Dev Biol*. (2007);23:115-45

McClellan AJ, Tam S, Kaganovich D, Frydman J. Protein quality control: chaperones culling corrupt conformations. *Nat Cell Biol*.(2005) (8):736-41.

Week 2: April 15
Jonathan King, Biology Department, MIT
Protein Folding, Misfolding and Aggregation

Reviews
B. Nall. "Protein Folding and Isomerization of cytochrome C" from *"Protein Folding: deciphering the second half of the genetic code"* L. Gierasch and J. King Eds. (1990)

Dyson HJ, Wright PE. Equilibrium NMR studies of unfolded and partially folded proteins. *Nat Struct Biol*. 1998 Jul;5 Suppl:499-503.

A. Mitraki and J. King Protein Folding intermediates and inclusion body formation, *Biotechnology,* 1999

Papers
Shoemaker KR, PS Kim, EJ York, JM Stewart, RL Baldwin Tests of the helix dipole model for stabilization of alpha–helices *Nature* (1987);**326**, 563 - 567

D Eliezer, J Yao, HJ Dyson, PE Wright Structural and dynamic characterization of partially folded states of apomyoglobin and implications for protein folding *Nature Structural Biology* (1998) **18**, 148 - 155

Week 3: April 22
Vijay Pande, Chemistry Department, Stanford University
Folding@Home: computational approaches to the folding problem

Reviews
C. D. Snow, E. J. Sorin, Y. M. Rhee, and V. S. Pande. How well can simulation predict protein folding kinetics and thermodynamics? *Annual Reviews of Biophysics* **34** 43-69 (2005)

J. England, D. Lucent, and V. S. Pande. Rattling the cage: computational models of chaperonin-mediated protein folding. *Current Opinion in Structural Biology,* **18** 163-9 (2008)

Papers
J. L. England, D. Lucent, and V. S. Pande. A Role for Confined Water in Chaperonin Function. *JACS,* **130** 11838-9 (2008)

D. Ensign, P. Kasson, and V. S. Pande. Heterogeneity Even at the Speed Limit of Folding: Large-Scale Molecular Dynamics Study of a Fast-Folding Variant of the Villin Headpiece. *Journal of Molecular Biology,* **374** 806-16 (2007)

D. Lucent, V. Vishal, and V. S. Pande. Protein folding under confinement: A new role for solvent. *Proceedings of the National Academy of Sciences, USA* **104** 10430-10434 (2007)

Week 4: April 29
Paul Adams, Lawrence Berkeley Lab
Structural Biology of Chaperonins

Reviews
Xu Z, Sigler PB. .GroEL/GroES: structure and function of a two-stroke folding machine. *J Struct Biol*. (1998) **124**(2-3):129-41

Gutsche I, Essen LO, Baumeister W. Group II chaperonins: new TRiC(k)s and turns of a protein folding machine. *J Mol Biol*. 1999 Oct 22;293(2):295-312.

Papers
Braig K, Otwinowski Z, Hegde R, Boisvert DC, Joachimiak A, Horwich AL, Sigler PB. The crystal structure of the bacterial chaperonin GroEL at 2.8 A. *Nature*. 1994 Oct 13;371(6498):578-86.

Xu Z, Horwich AL, Sigler PB. The crystal structure of the asymmetric GroEL-GroES-(ADP)7 chaperonin complex. *Nature*. 1997 Aug 21;388(6644):741-50.

Ditzel L, Löwe J, Stock D, Stetter KO, Huber H, Huber R, Steinbacher S. Crystal structure of the thermosome, the archaeal chaperonin and homolog of CCT. *Cell*. 1998 Apr 3;93(1):125-38.

Week 5: May 6
W.E. Moerner, Chemistry Department, Stanford University
Application of Single Molecule Approaches to folding and misfolding

Reviews
W. E. Moerner and D. P. Fromm, Methods of Single-Molecule Fluorescence Spectroscopy and Microscopy *Rev. Sci. Instrum.* (2003). **74**, 3597-3619

Weiss, S "Fluorescence Spectroscopy of Single Biomolecules", *Science,* (. 1999,) vol. 283, pp. 1676-1683.

Papers
So Yeon Kim, Erik J. Miller, Judith Frydman, and W. E. Moerner. Single-molecule FRET reveals substrate remodeling by the chaperonin GroEL/ES, preprint

Orte A, Birkett NR, W. Clarke RW, Devlin GL, Dobson CM , and Klenerman D
Direct characterization of amyloidogenic oligomers by single-molecule fluorescence
PNAS (2008) 105, 14424

Week 6: May 13
William Mobley, Dept of Neurology, Stanford University School of Medicine
Alzheimers Disease and other neurodegenerative diseases: Clinical aspects and cellular pathology

Reviews
Stokin GB and Goldstein LS.B. Axonal Transport and Alzheimer's Disease
Annu. Rev. Biochem. (2006).**75**:607-627.

Papers

L Rajendran, A Schneider, G Schlechtingen, Weidlich S, Ries J, Braxmeier T, Schwille P, Schulz JB, Schroeder C, Simons M, Jennings G, Knölker H-J, Simons K Efficient Inhibition of the Alzheimer's Disease β-Secretase by Membrane Targeting *Science,* (2008) 5875, pp. 520 - 523

Salehi A, Delcroix JD, Belichenko PV, Zhan K, Wu C, Valletta JS, Takimoto-Kimura R, Kleschevnikov AM, Sambamurti K, Chung PP, Xia W, Villar A, Campbell WA, Kulnane LS, Nixon RA, Lamb BT, Epstein CJ, Stokin GB, Goldstein LS, Mobley WC. Increased App expression in a mouse model of Down's syndrome disrupts NGF transport and causes cholinergic neuron degeneration. *Neuron*.(2006) **51**(1):29-42.

Cui B, Wu C, Chen L, Ramirez A, Bearer EL, Li WP, Mobley WC, Chu S. One at a time, live tracking of NGF axonal transport using quantum dots. *Proc Natl Acad Sci U S A*. (2007);**104**:13666-71

Week 7: May 20
Judith Frydman
Molecular chaperones, cancer and aging

Reviews
Mayer MP, Prodromou C, Frydman J The Hsp90 mosaic: a picture emerges. *Nat Struct Mol Biol*. (2009) Jan;16(1):2-6

Whitesell L, Lindquist SL. HSP90 and the chaperoning of cancer. *Nat Rev Cancer*. 2005 (10):761-72.

Morimoto RI. Proteotoxic stress and inducible chaperone networks in neurodegenerative disease and aging. *Genes Dev*. 2008 ;22(11):1427-38

Papers
Morley JF, Morimoto RI. Regulation of longevity in Caenorhabditis elegans by heat shock factor and molecular chaperones. *Mol Biol Cell*. 2004 Feb;15(2):657-64.

Gidalevitz T, Ben-Zvi A, Ho KH, Brignull HR, Morimoto RI Progressive disruption of cellular protein folding in models of polyglutamine diseases. *Science*. 2006 ;311(5766):1471-4.

Dai C, Whitesell L, Rogers AB, Lindquist S Heat shock factor 1 is a powerful multifaceted modifier of carcinogenesis. *Cell*. 2007130(6):1005-18.

Week 8: May 27
Isabella Graef, Dept of Pathology, Stanford University School of Medicine
Small molecules and therapeutic approaches to folding disease

Reviews
Lansbury PT, Lashuel HA. A century-old debate on protein aggregation and neurodegeneration enters the clinic. *Nature*. 2006;443(7113):774-9

Balch WE, Morimoto RI, Dillin A, Kelly JW. Adapting proteostasis for disease intervention. *Science*. 2008 319(5865):916-9.

Papers
Mu TW, Ong DS, Wang YJ, Balch WE, Yates JR 3rd, Segatori L, Kelly JW. Chemical and biological approaches synergize to ameliorate protein-folding diseases. *Cell*. 2008;134(5):769-81.

Gestwicki JE, Crabtree GR, Graef IA. Harnessing chaperones to generate small-molecule inhibitors of amyloid beta aggregation. *Science*. 2004 306(5697):865-9.