

Wah Chiu

Baylor College of Medicine

National Center for Macromolecular Imaging (NCMI)
(National Center for Research Resources, NIH)

Center for Protein Folding Machinery
(Nanomedicine Development Center, NIH Roadmap)

<http://ncmi.bcm.edu>

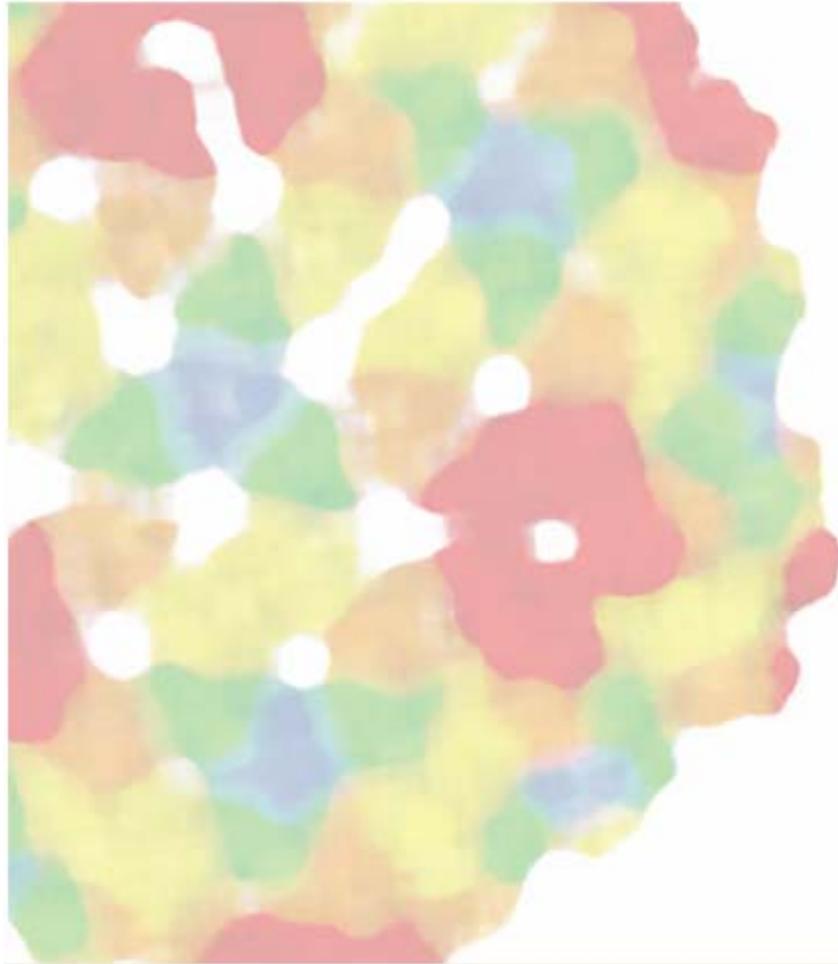


National Center for
Macromolecular Imaging

Search

[site map](#) | [contact](#)

[ABOUT](#) [PEOPLE](#) [RESEARCH](#) [COLLABORATION](#) [SOFTWARE](#) [EVENTS](#) [FACILITIES](#) [PUBLICATIONS](#) [LINKS](#)



[Download EMAN](#)

[Video Lectures](#)

[Map & Directions](#)

DIRECTOR

Wah Chiu

wah@bcm.edu

CO-DIRECTOR

Mike Schmid

mschmid@bcm.edu

CO-DIRECTOR

Steve Ludtke

sludtke@bcm.edu

ADMIN ASSISTANT

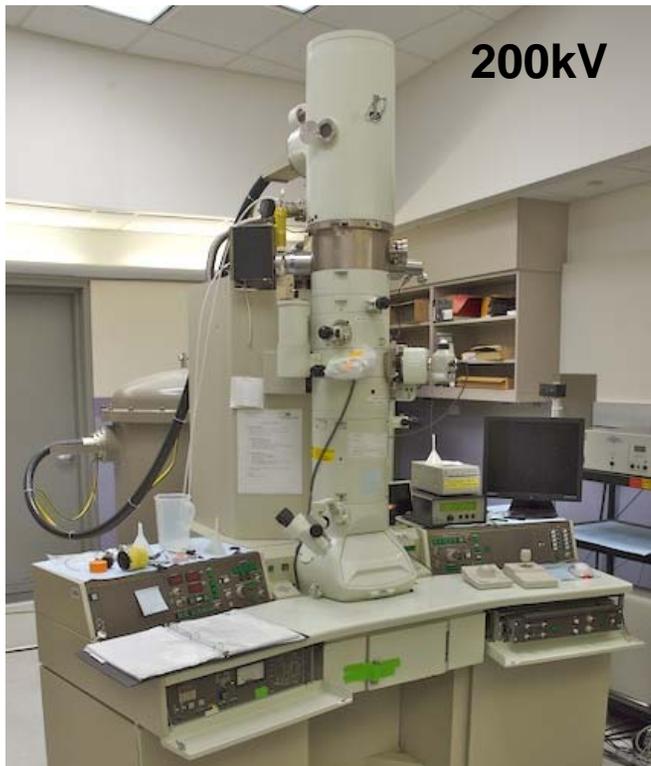
Lenora Trujillo

Research Missions at NCMI

- Develop and apply **Cryo-EM** for structure determinations of **Molecular Nano-Machines in solution states** towards atomic resolution; and of **Whole Cells** at molecular resolution
- Share our experimental and computational technology freely with the global academic community



Electron Cryo-Microscope at NCMi



NCMI Computer Clusters



Pipeline in Cryo-EM for Nano-Machine

biochemical
preparation



cryo-em sample
preparation



imaging



data collection

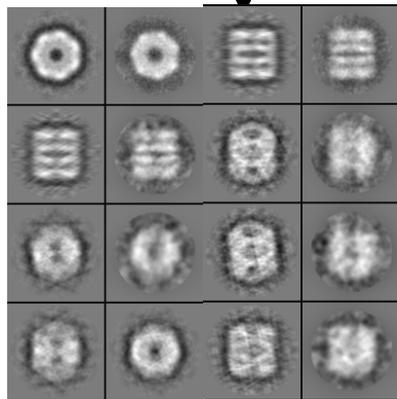
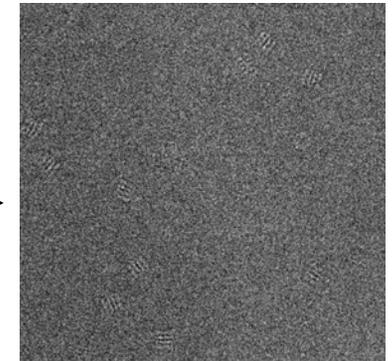


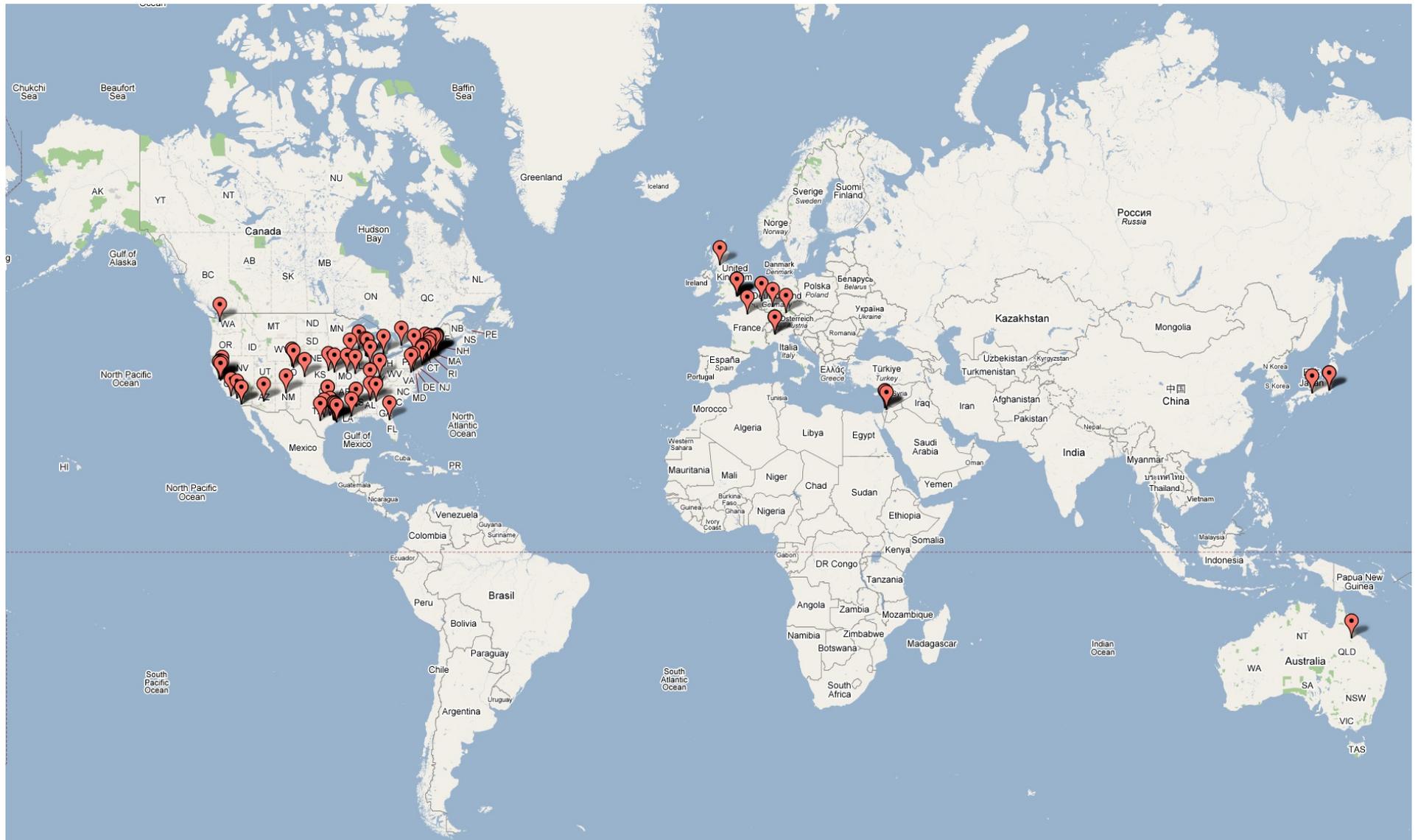
image processing

reconstruction

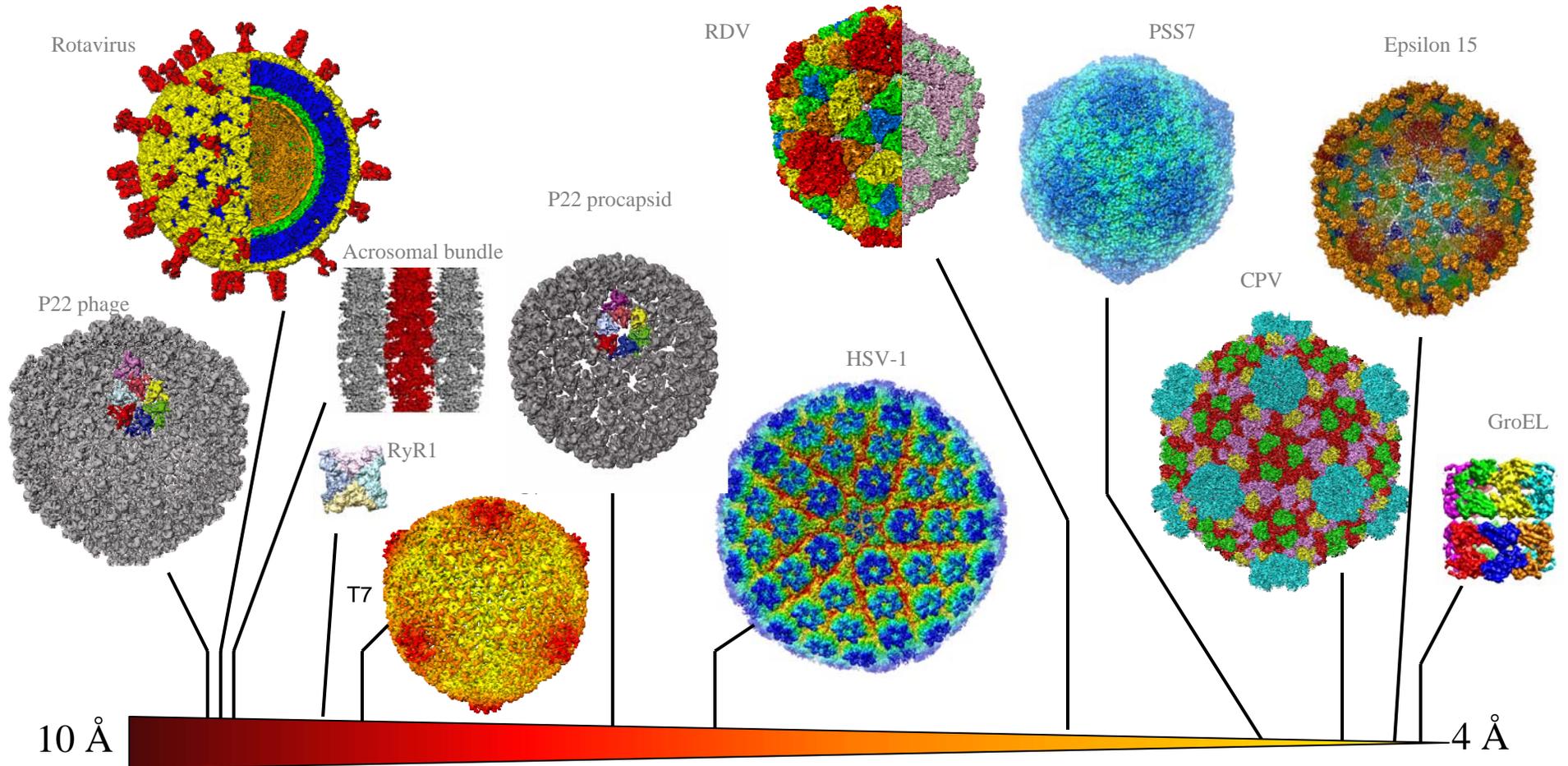
structural analysis

model

NCMI Collaborators and Users



Subnanometer Resolution Cryo-EM Structures Determined at NCMI



Cryo-EM: A tool for Nano-Objects

Nanotubes

Lon Wilson, Rice U

Nanowire

Rick Smalley, Rice U

DPPC-Au Hollow Sphere

Zasadzinski, UCSB

Membrane-copolymer

Ka Yee Lee U Chicago

Nanoshell

Naomi Halas, Rice U

Virus-like Particle and Au Core

Lia Stanciu, Purdue University

Cryo-Electron Tomography of Platelet

Jose Lopez
U Washington



NIH Nanomedicine Development Center

<http://proteinfoldingcenter.org>

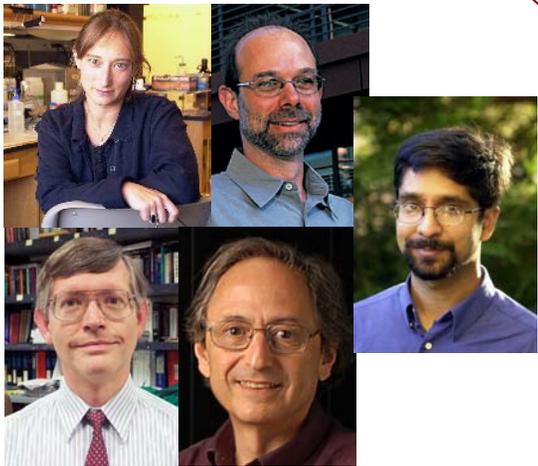
PI: Wah Chiu

Protein Folding Machinery Center Investigators

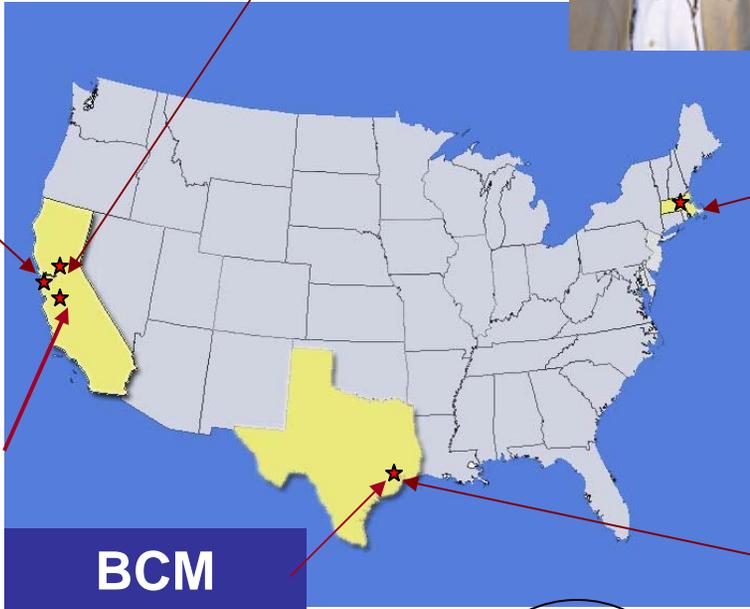


UCSF

Lawrence Berkeley
Nat'l Laboratory

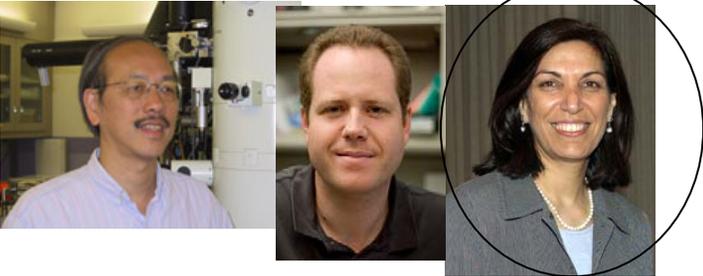


Stanford
University



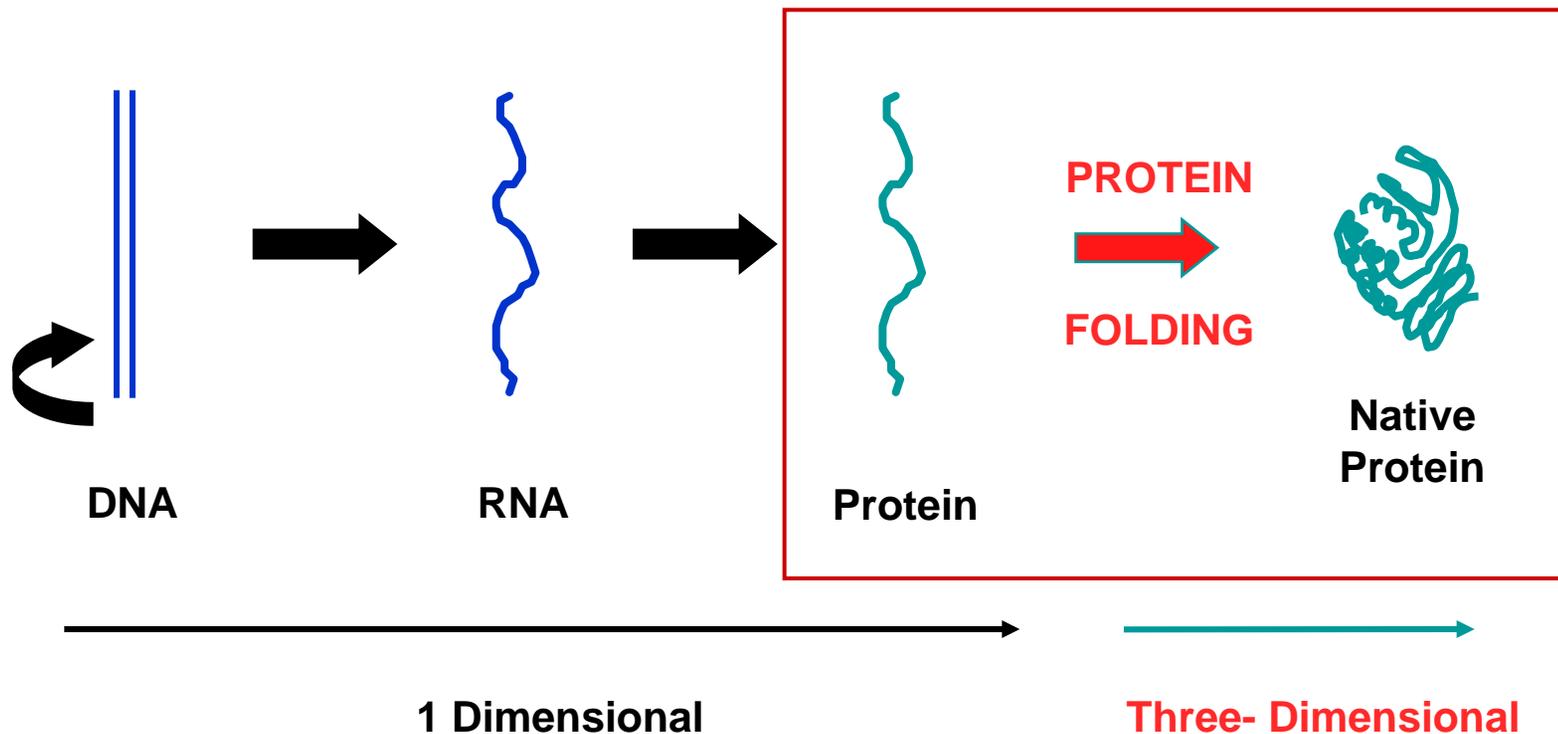
BCM

M. I. T.

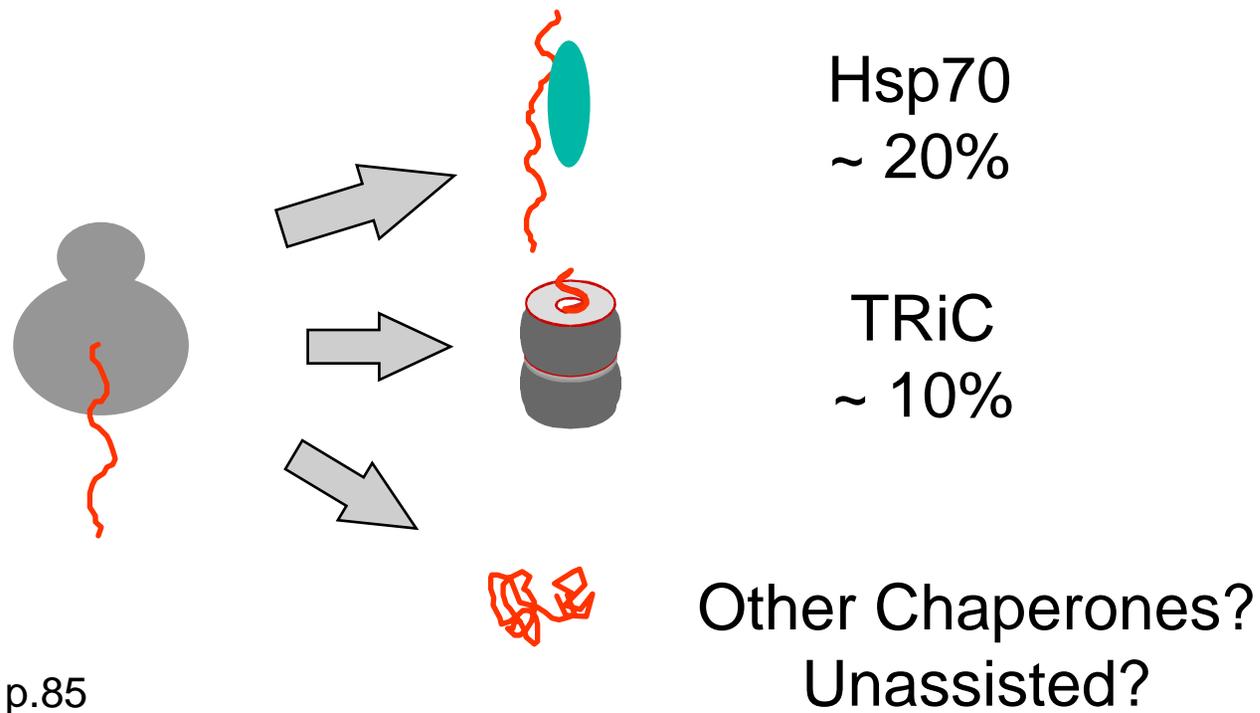


MD Anderson Cancer
Center

Protein Folding is a Key Step in Gene Expression



Chaperone-mediated Folding in the Cell



EMBO J (1999)18, p.85

**A Large Fraction of Cellular Proteins Transits
Through Chaperones During their Biogenesis**

Defects in Protein Folding lead to Human Disease

Amyloid Deposits: Prions, Alzheimers

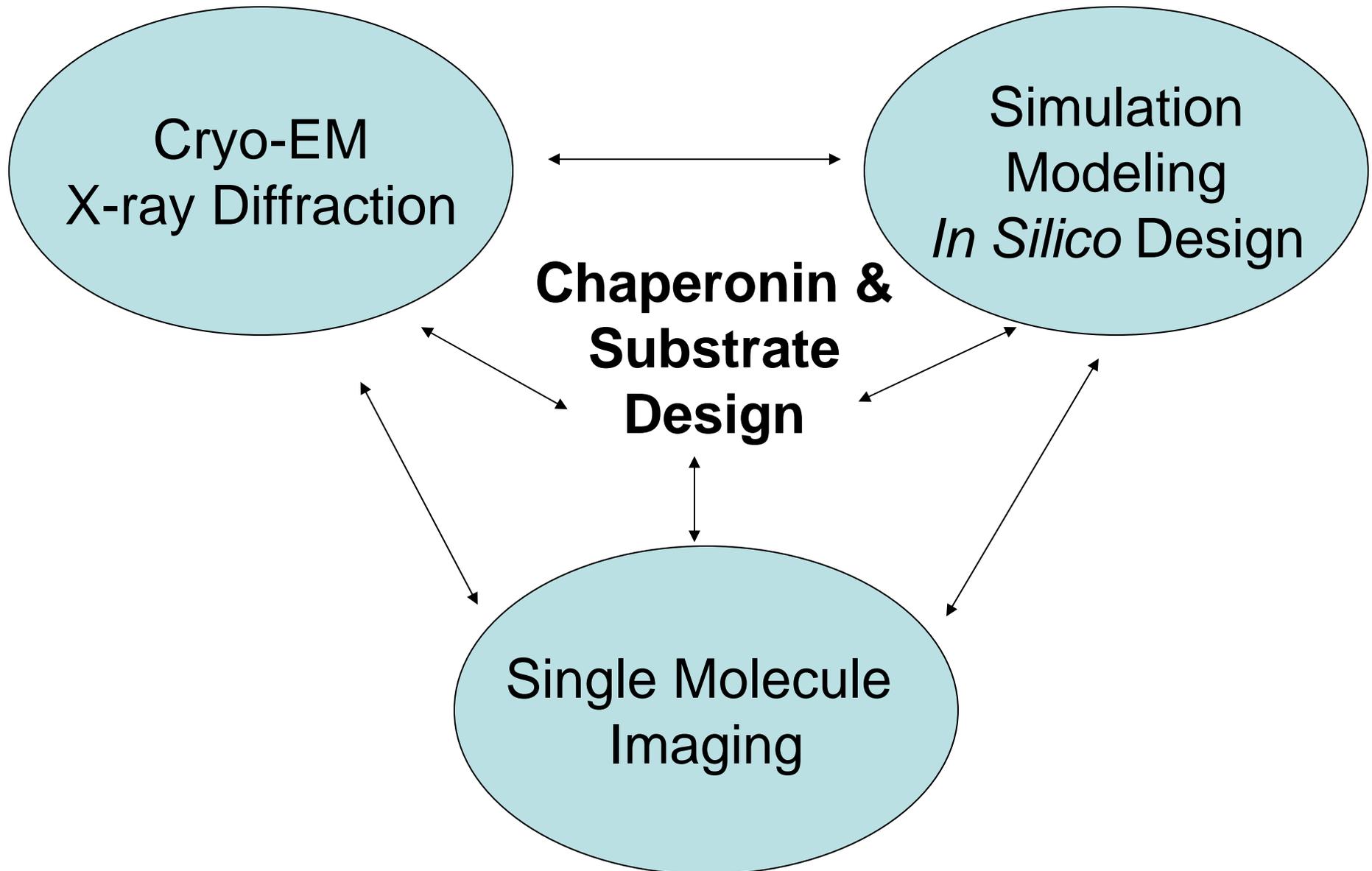
Mutations: Cancer, Metabolic Diseases

Denaturing Stress: Ischemia, Stroke

Our Nanomedicine Center Goals

- Engineer chaperonin variants optimized to fold proteins of biomedical importance *in vitro*.
- Engineer chaperonin variants that promote folding/unfolding of specific proteins *in vivo*.
- Engineer an “adaptor” molecule to turn “on” or “off” substrate targeted to the chaperonin
- Design a versatile nano-cage based on the chaperonin platform to encapsulate and release ligands of choice.
- Develop and disseminate a pipeline of measurement and simulation tools for characterizations of nanomachines.
- Develop an educational curriculum on nanomedicine

Multi-Disciplinary Approach to Design New Chaperonin and Substrate



Protein Folding Machinery Center

- Continuously seeking for clinical partners for exploring our unique capability for treating diseases related to protein misfolds
- Actively engaging in bridging translational and biophysical/computational research