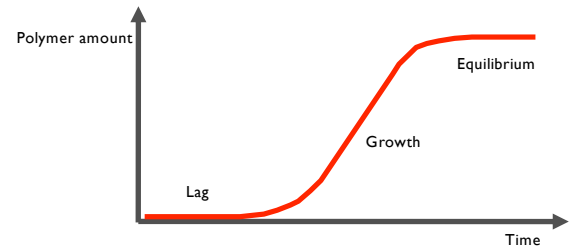



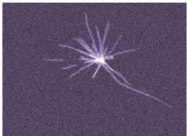
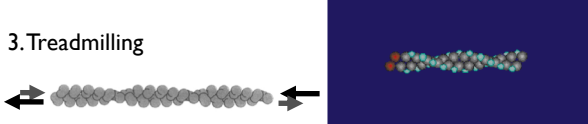
Structural changes in mechanoenzymes and macromolecular folding

Szabolcs Osváth
Semmelweis University

Polymerization



Polymerization equilibria

1. True equilibrium \rightleftharpoons 
2. Dynamic instability 
3. Treadmilling 

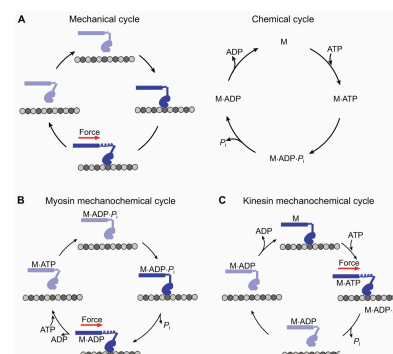
Types of motor proteins

1. Actin based
 - Myosin (They move towards the plus end.)
2. Microtubule based
 - Dynein (They move along the microtubule towards the minus end.)
 - Kinesin (They move along the microtubule towards the plus end.)
 - Dynamin (Biological role: vacuolar protein selection)

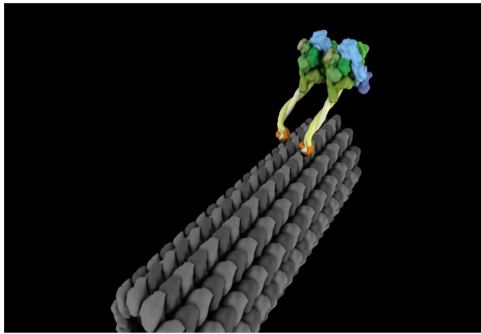
Types of motor proteins

3. DNA based mechanoenzymes
 - DNA polymerases
 - RNA polymerases
 - Viral capsid packaging engine
4. Rotating motors
 - F1F0-ATP synthase
 - Bacterial flagellar motor
5. Mechanoenzyme complexes
 - Ribosome

Cyclic operation: duty cycle

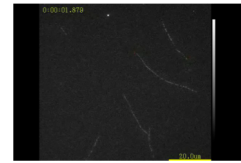


Drunken sailor mechanism of dynein movement

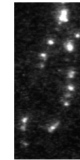


Dynein motility

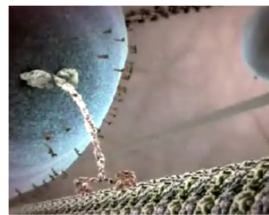
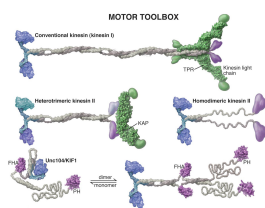
Microtubule moves
on dynein



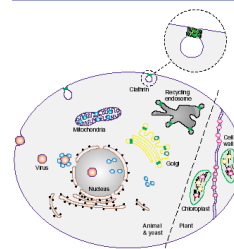
Dynein moves on microtubule



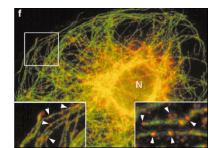
Kinesin motility



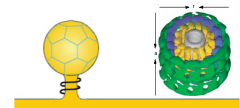
Dynamin function



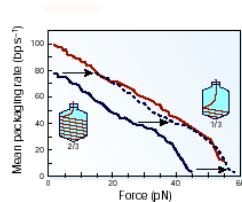
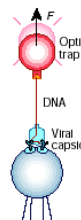
Protein	Localization	Function	Self-assess
• Cytexin	Plasma membrane (protein-coated vesicles), Golgi endosome	Vesicle formation	+
• Vps1	Golgi	Vesicle formation and transport	Unknown
• Myosin V/Myosin VI	Mitochondrial outer membrane	Mitochondrial fission and movement	Unknown
• Myosin XI/Myosin XIV	Mitochondrial inner or outer membrane, or matrix	Mitochondrial morphology	Unknown
• Phospholipids	Cell wall	Membrane morphology	+
• ADP3	Cell wall, cell elongated	Membrane elongation	Unknown
• HOX11	Cytoplasm	Anti-oxid activity	+
• Me	Cytoplasm, nucleus	Anti-oxid activity	+



Pinchase function

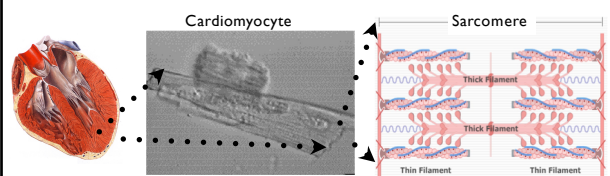


Virus portal motor



φ29 bacteriophage portal engine

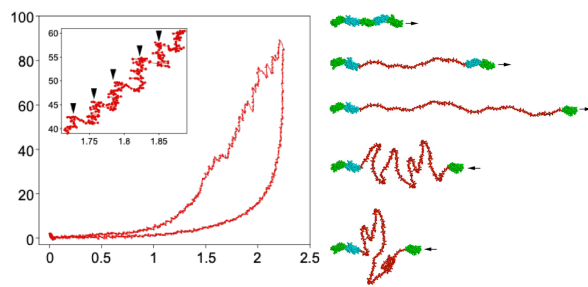
Titin



Role of titin:

- structural
- providing flexibility
- sensing force

Force-driven protein folding



The kinetics of titin refolding folding

