

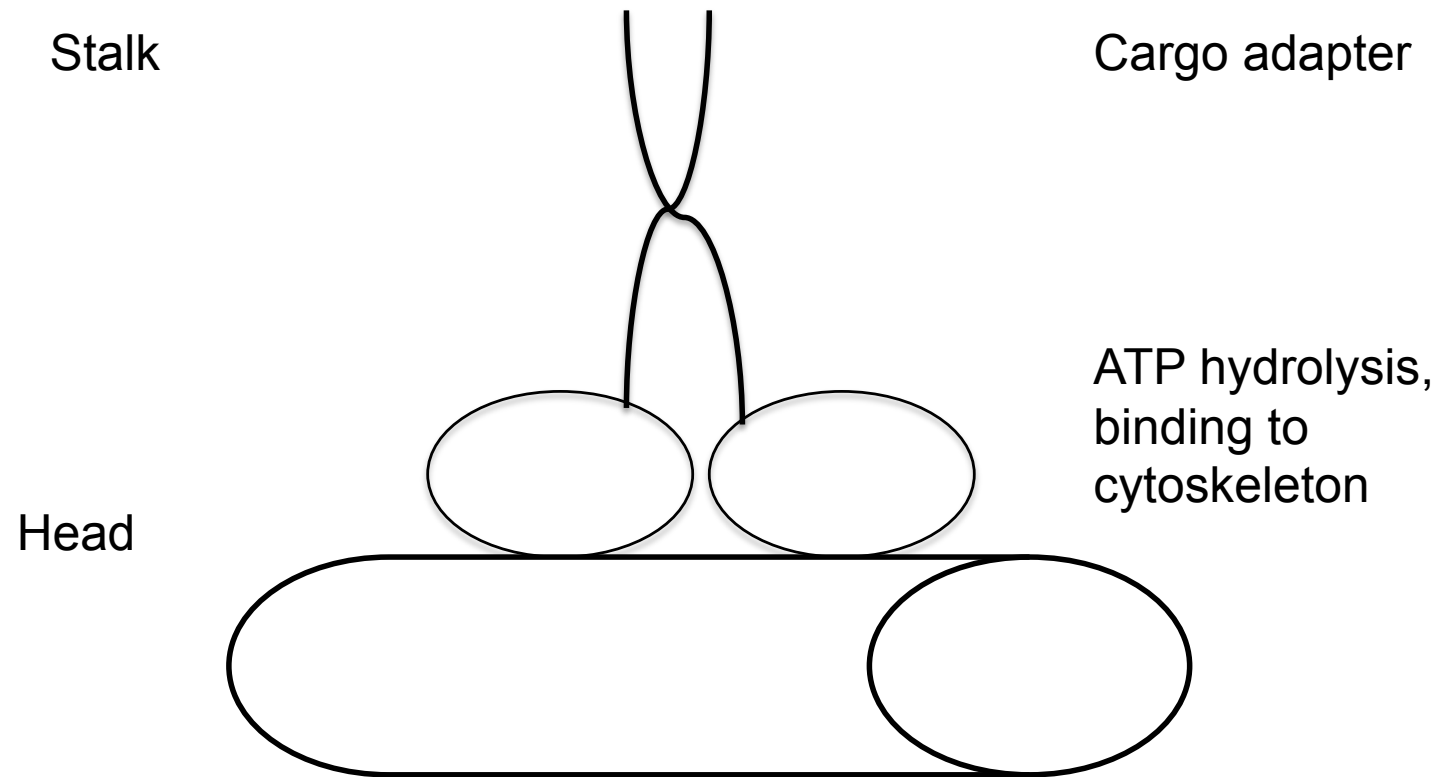
Cytoskeleton: Motors

<http://www.iiserpune.ac.in/~cathale>

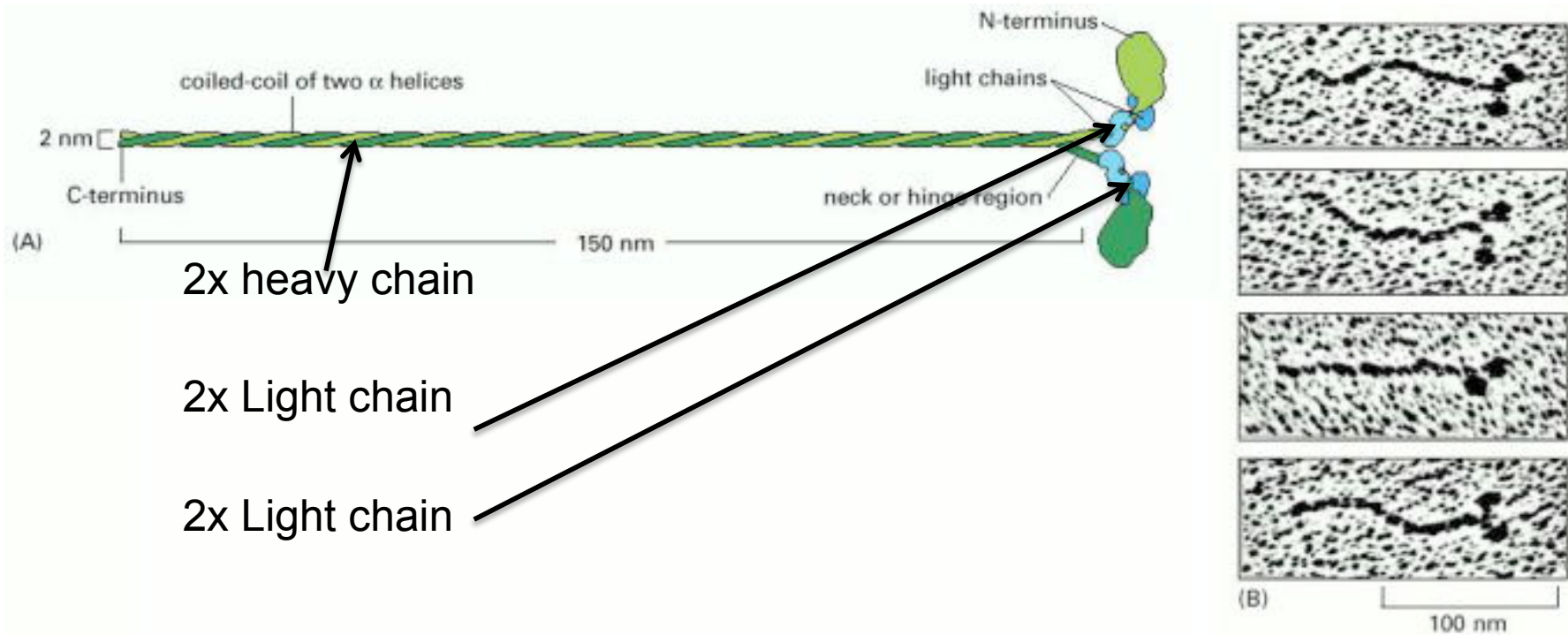
Cytoskeletal Motors

- Actin based motors
- Microtubule based motors
- Force generation by ATP-coupling
- Kinetics
- Intracellular transport
- Regulation
- Specific examples- muscles, cilia, flagella

Motors- using the head

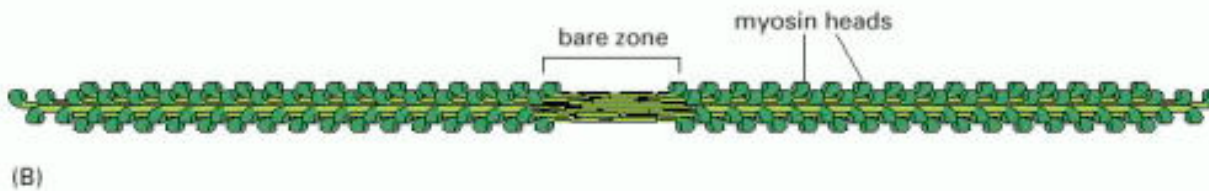
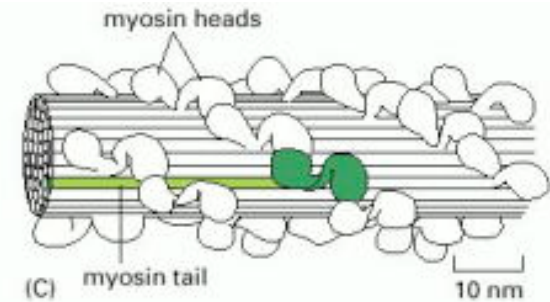


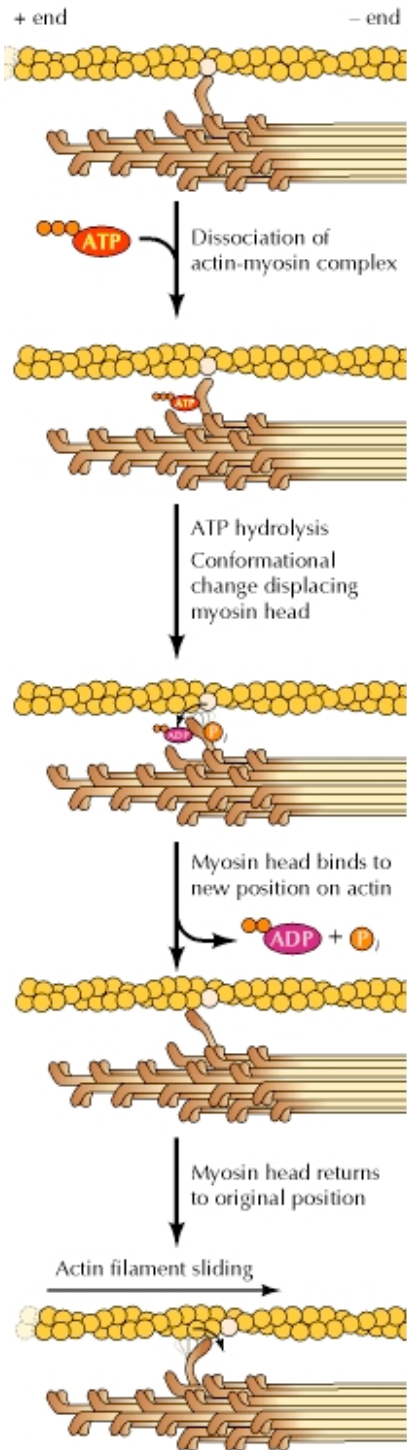
Actin-dependent: Myosin



Myosin II

Organization of Myosin





Mode of action of Myosin

1. ATP binding
2. ATP hydrolysis
3. Myosin conformational change
4. New position binding
5. ADP released
6. Myosin returns to original position

Actin filament slides

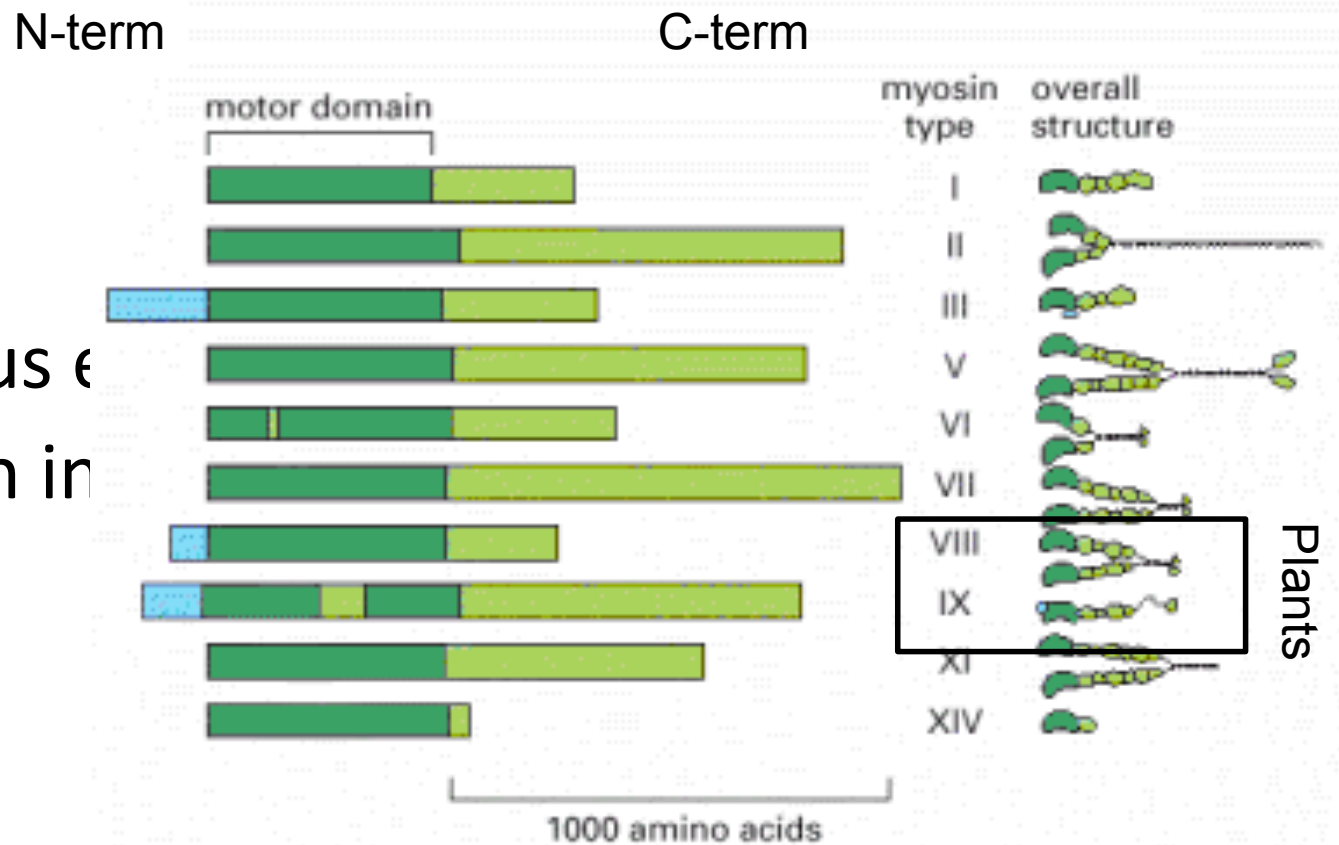


Myosin Family

- Myosin I (monomeric)- freshwater amoeba *Acanthamoeba*

- I, IX, XIV: Monomeric

- Myosin VI: minus ϵ directed- insertion in head



Microtubule-Dependent Motors

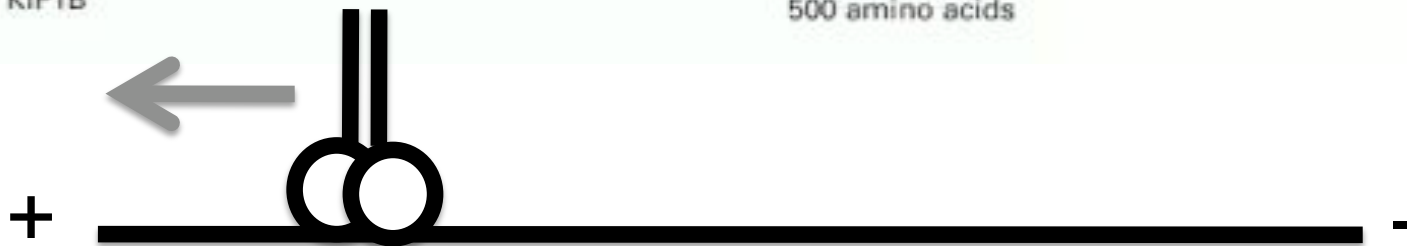
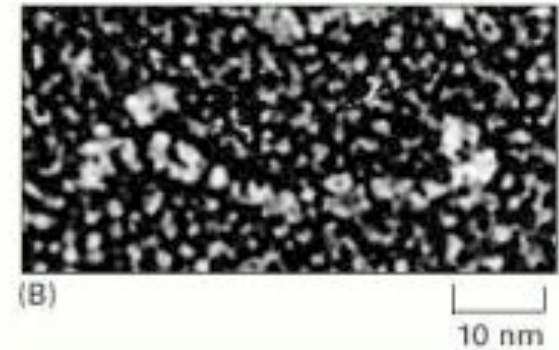
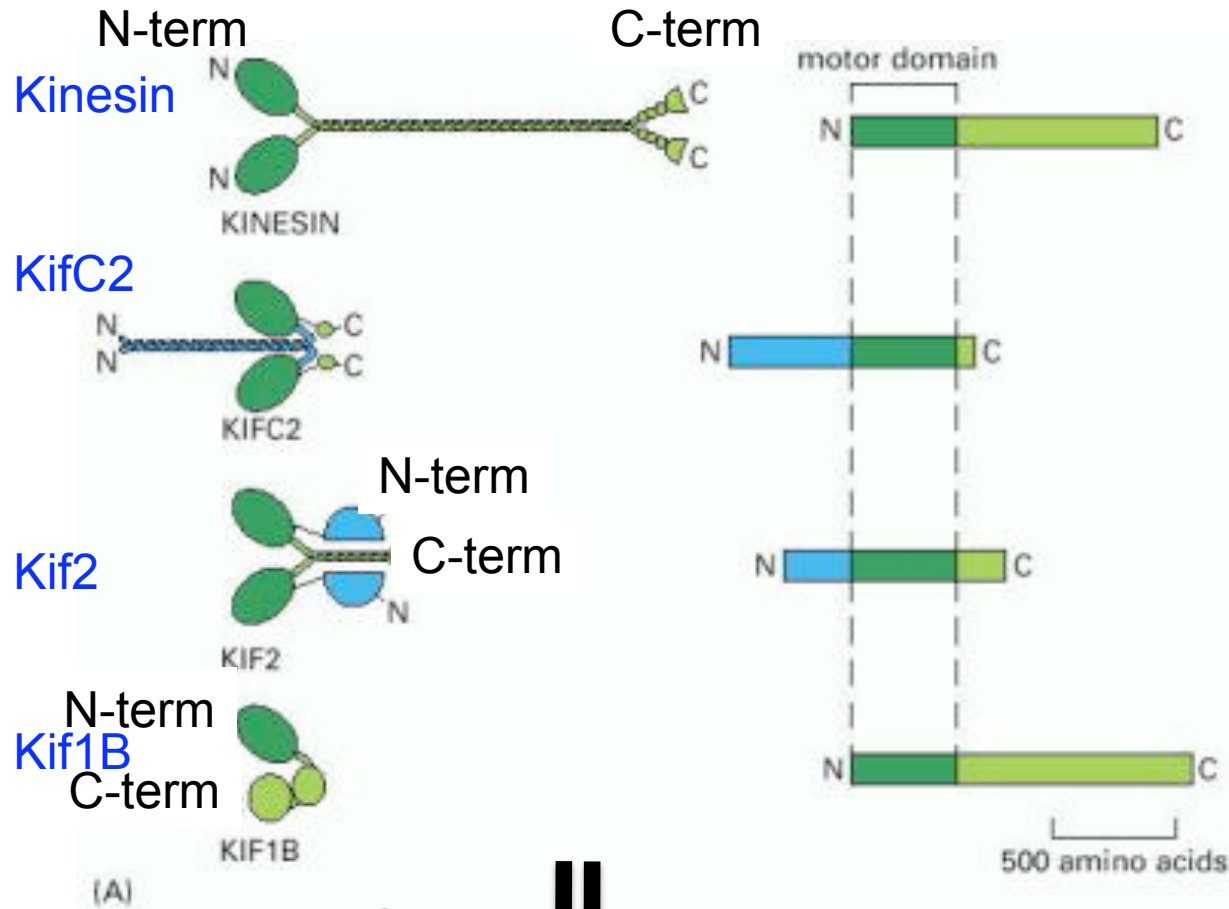
- Kinesins

Plus-end directed

- Dyneins

Minus-end directed

Kinesins

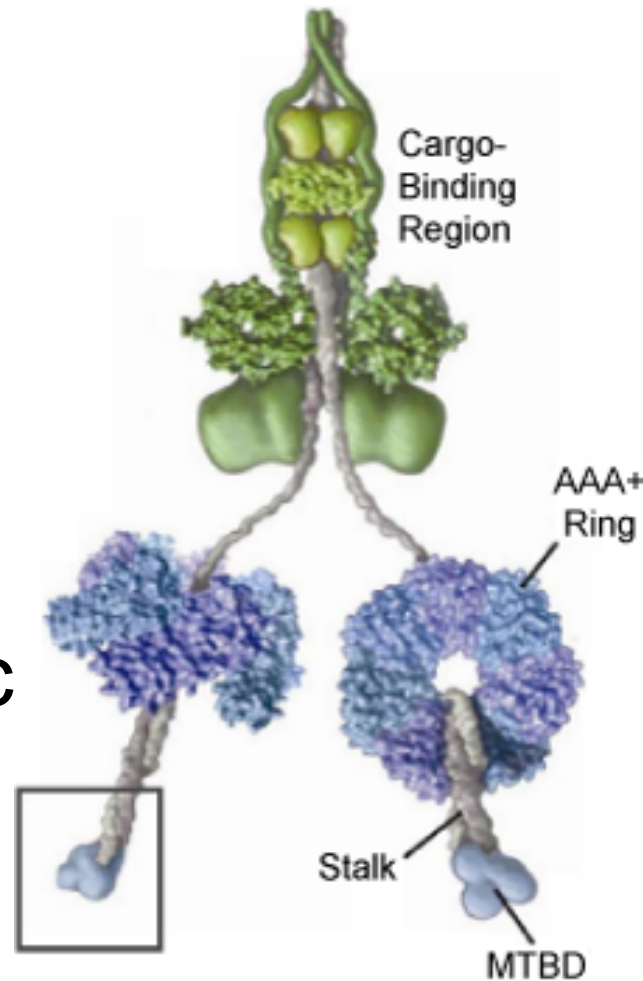


Dyneins

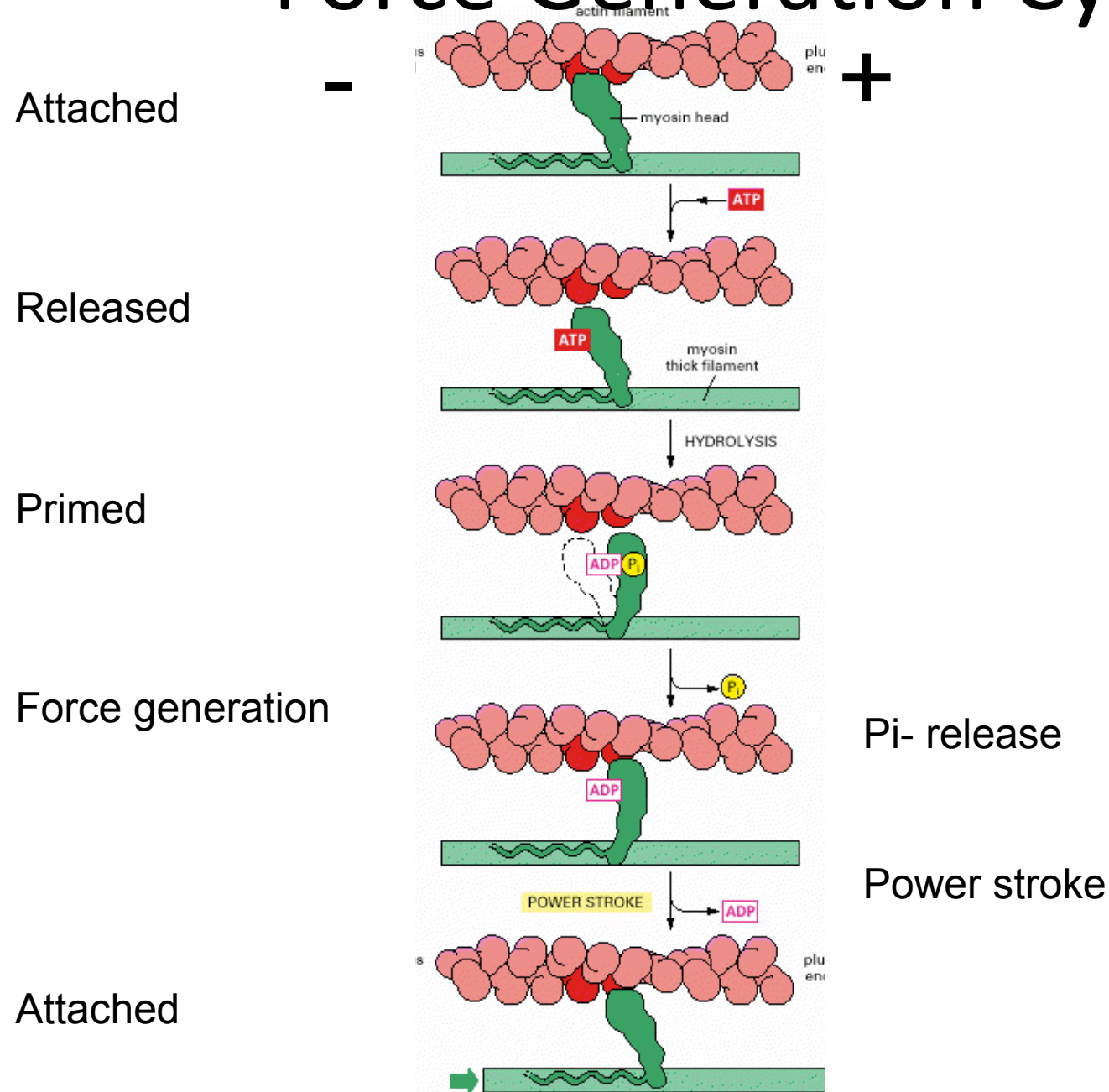
2-3 heavy
chains

Variable light
chains

1. Cytoplasmic
2. Axonemal

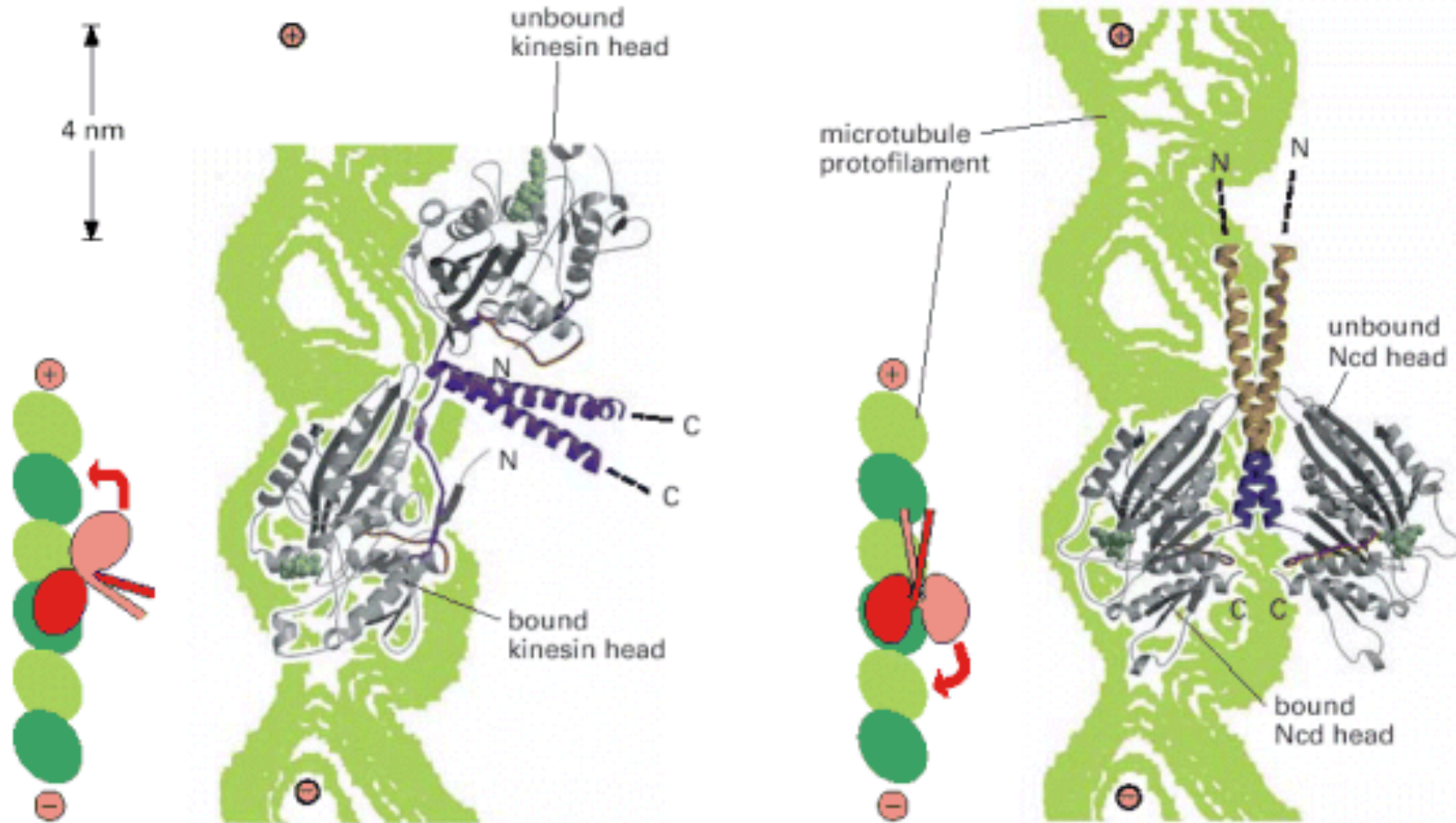


Force Generation Cycle



Rayment et al.(1993)

Kinesin Orientation



Plus end directed

Minus-end directed

kinesin: plus end-directed motor

Ncd: minus end-directed motor



Processivity vs. Speed

- Kinesin- processive: 100-cycles without unbinding

0.02-2 $\mu\text{m/s}$

- Myosin-fast: Multiple myosins, 20-steps per cycle

0.2-60 $\mu\text{m/s}$