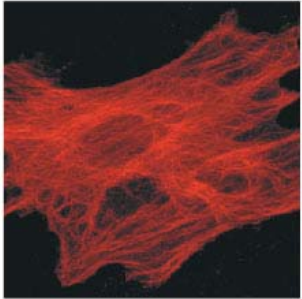
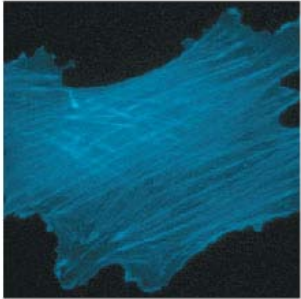
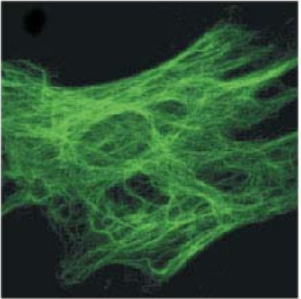
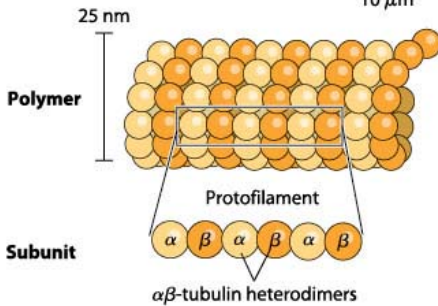
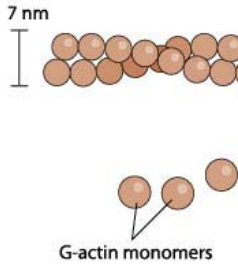
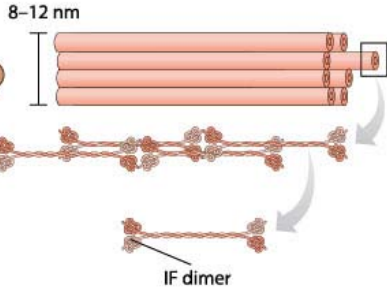
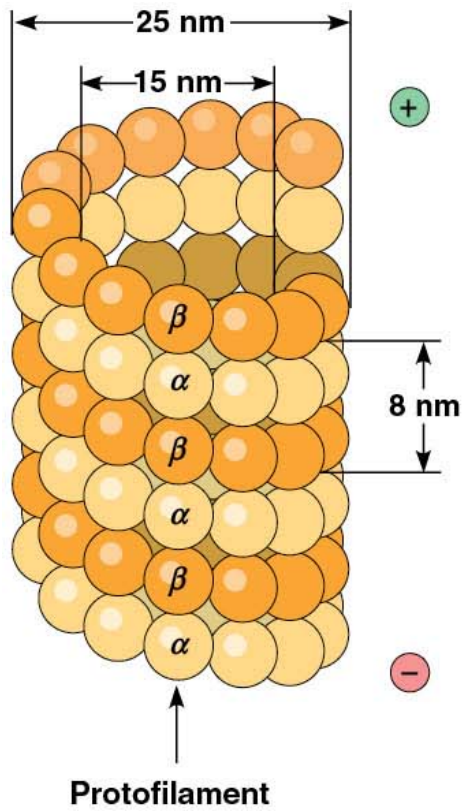
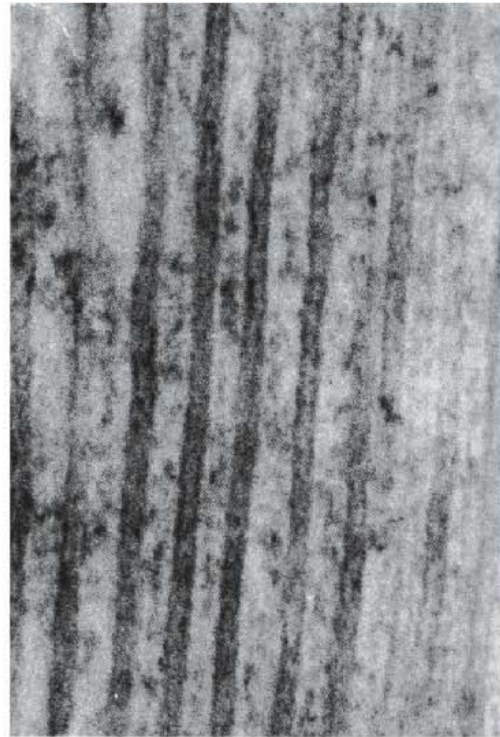


Table 13-1 Properties of Microtubules, Microfilaments, and Intermediate Filaments

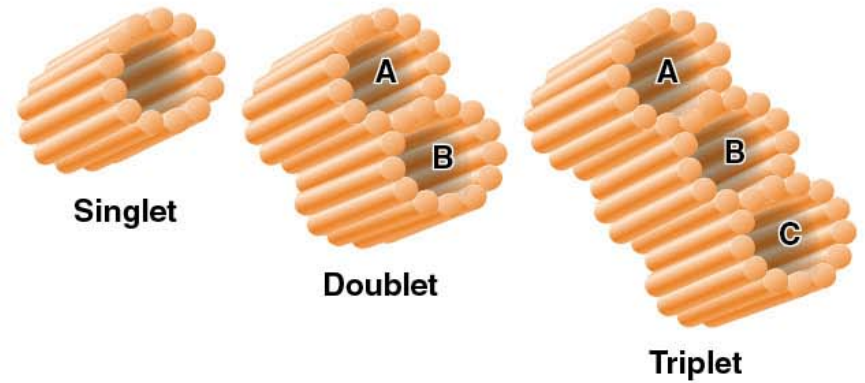
	Microtubules	Microfilaments	Intermediate Filaments
Polymer Subunit			
			
Structure	Hollow tube with a wall consisting of typically 13 protofilaments	Two intertwined chains of F-actin	Eight protofilaments joined end to end with staggered overlaps
Diameter	25 nm	7 nm	8–12 nm
Monomers	α -tubulin, β -tubulin	G-actin	Six classes of proteins; see Table 13-4, page 373
Polarity	Plus, minus ends	Plus, minus ends	No known polarity
Nucleotide substrate	GTP	ATP	None
Functions	Cytosolic MTs: Organization and maintenance of animal cell shape and polarity Chromosome movements Intracellular transport/trafficking, and movement of organelles Axonemal MTs: Cell motility	Muscle contraction Cell locomotion Cytoplasmic streaming Cytokinesis Maintenance of animal cell shape Intracellular transport/trafficking	Structural support Maintenance of animal cell shape Formation of nuclear lamina and scaffolding Strengthening of nerve cell axons (neurofilament protein) Keeping myofibrils in register (desmin)



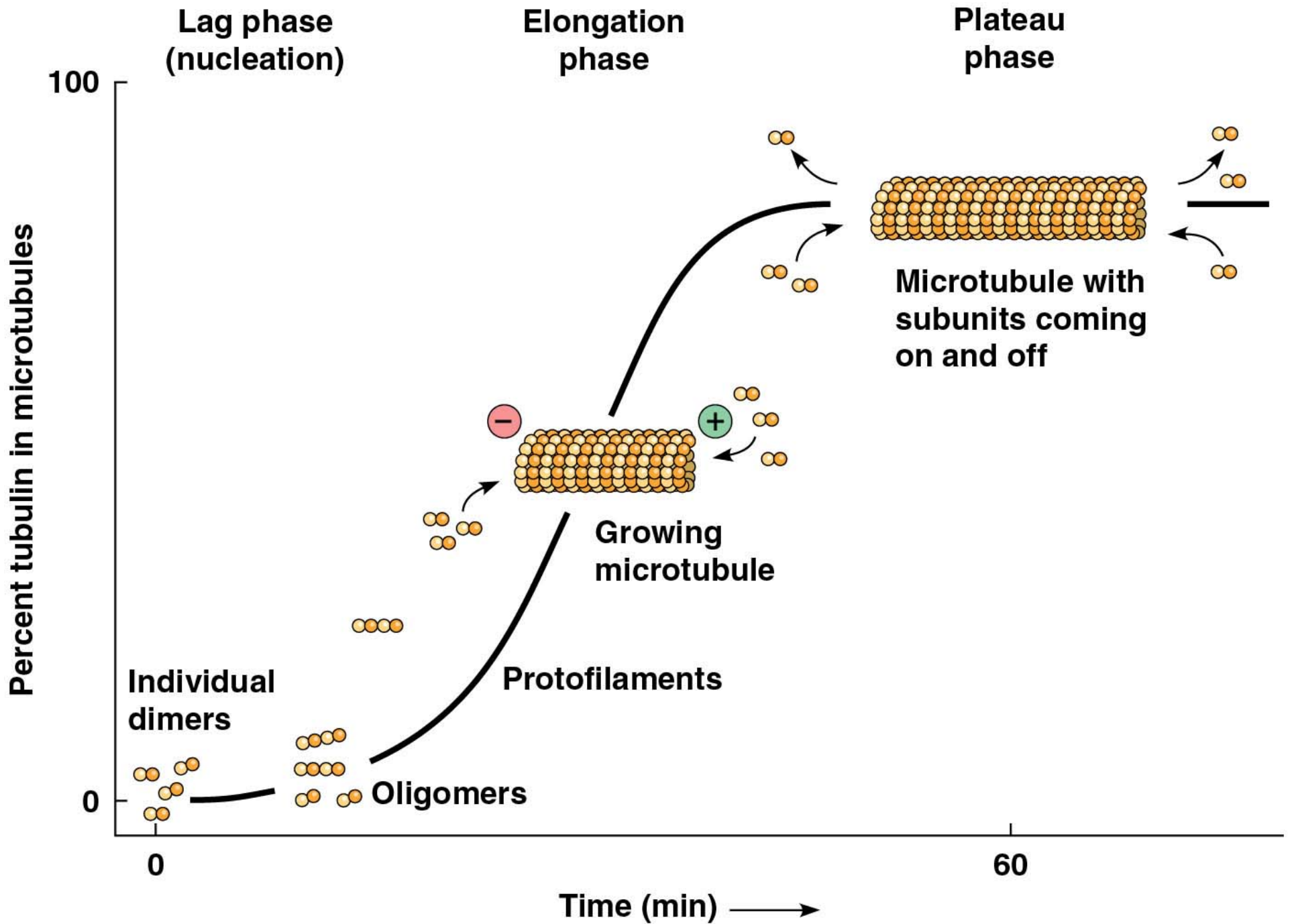
(a) Microtubule structure

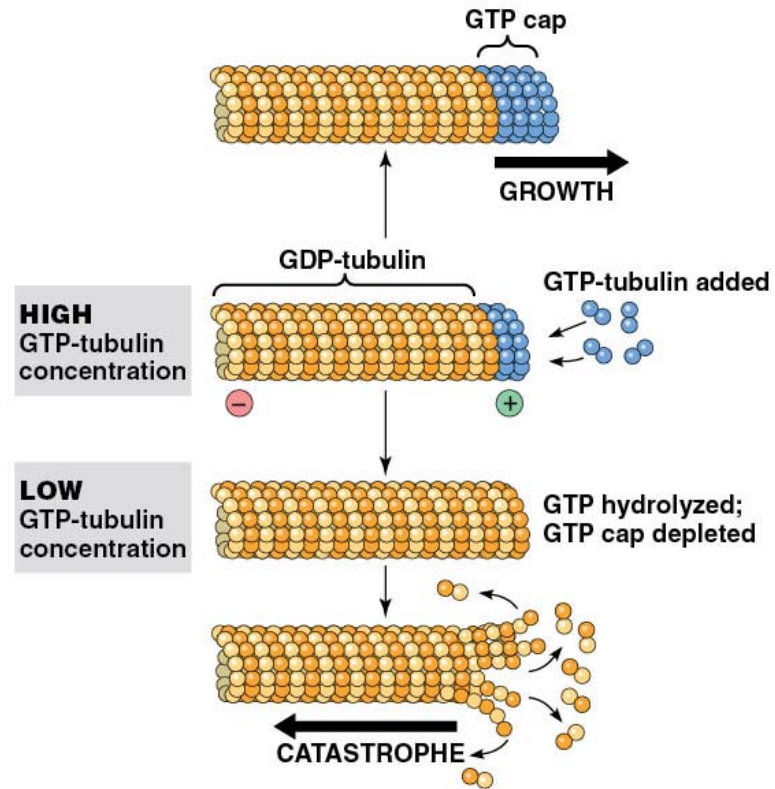


(b) Microtubules in an axon

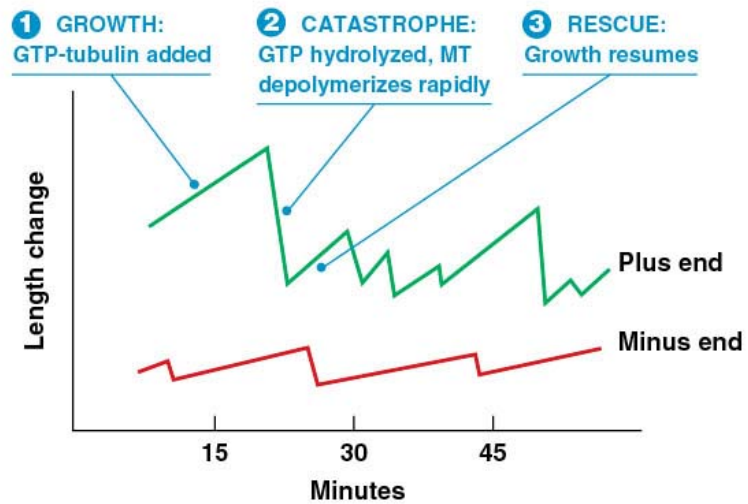


(c) Different types of microtubules

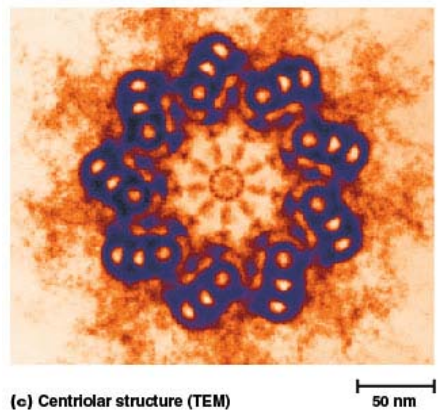
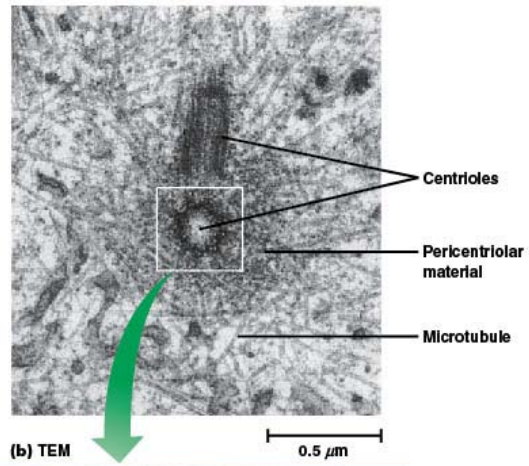
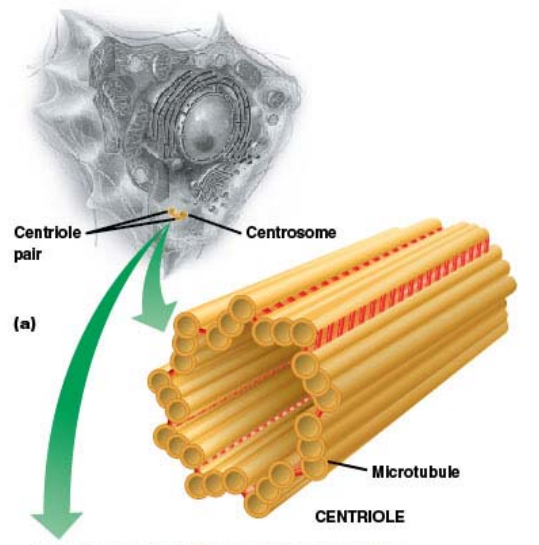


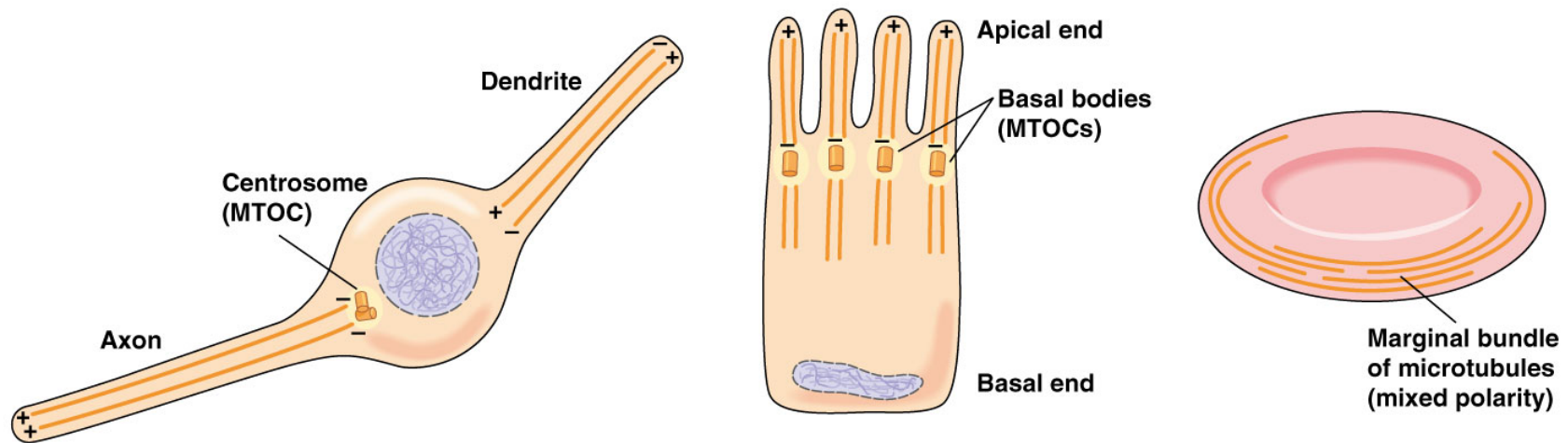


(a) Model for how the GTP cap functions



(b) Evidence for dynamic instability

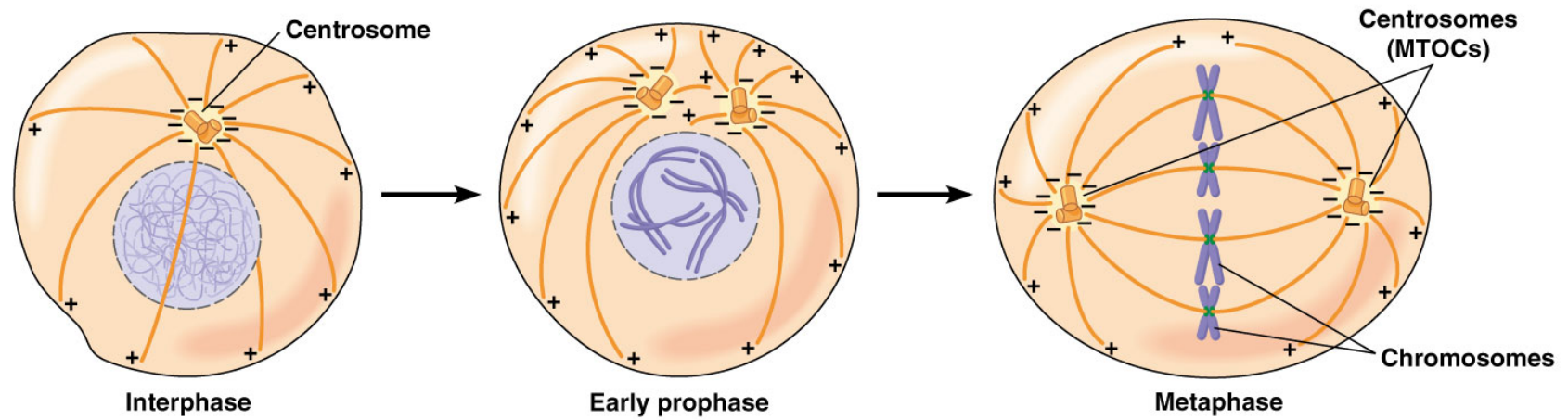




(a) Nerve cell

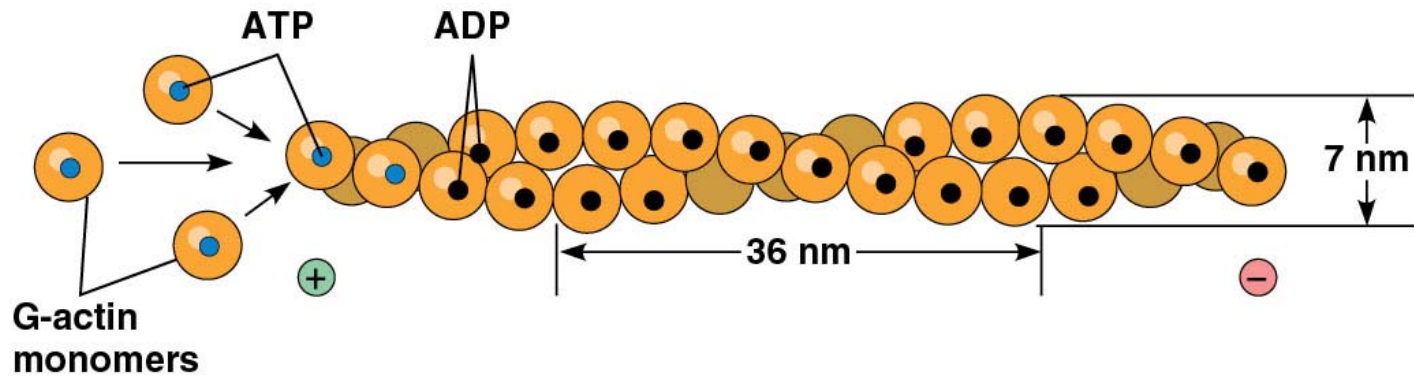
(b) Ciliated epithelial cell

(c) Red blood cell



(d) Dividing cell

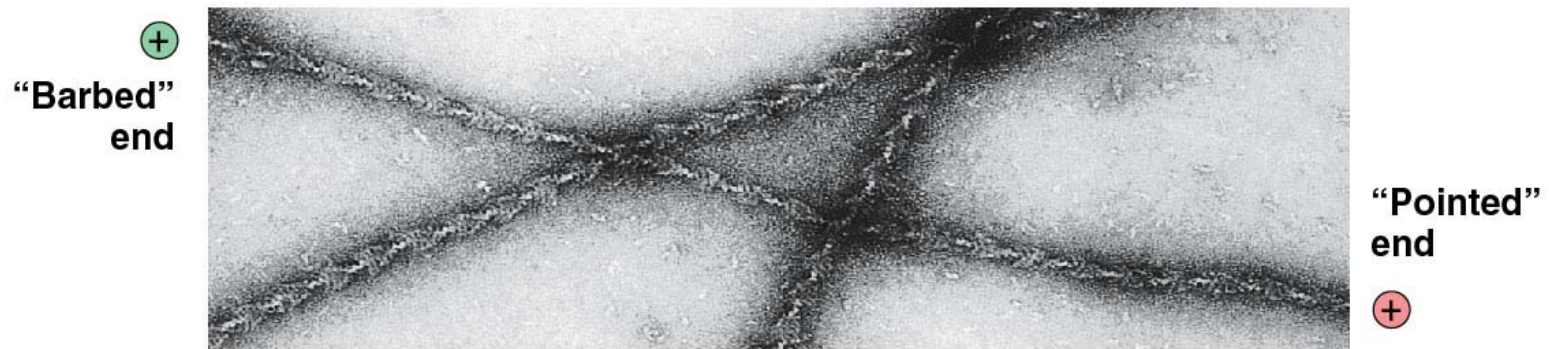
© 2012 Pearson Education, Inc.



(a) Microfilament (MF) assembly

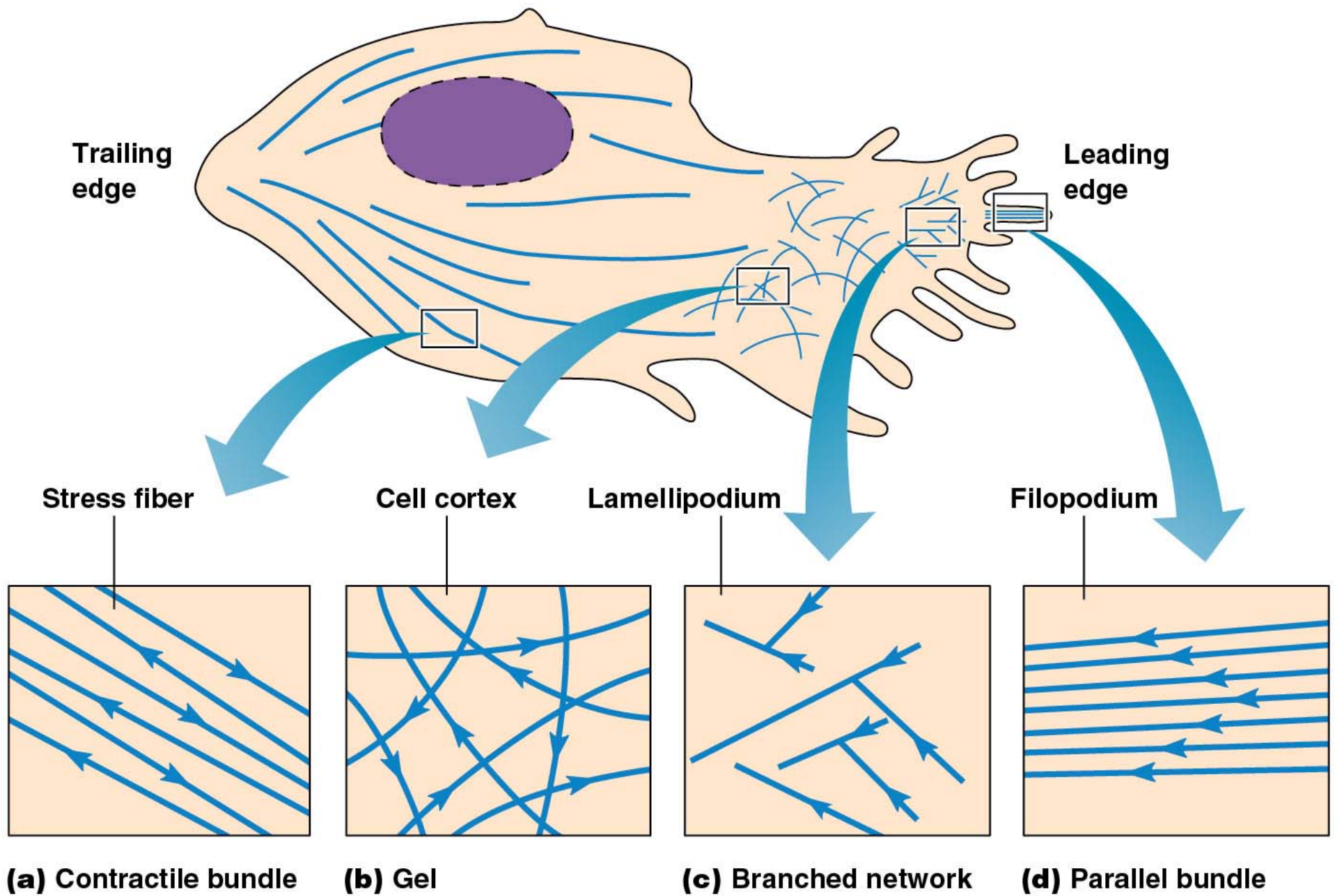


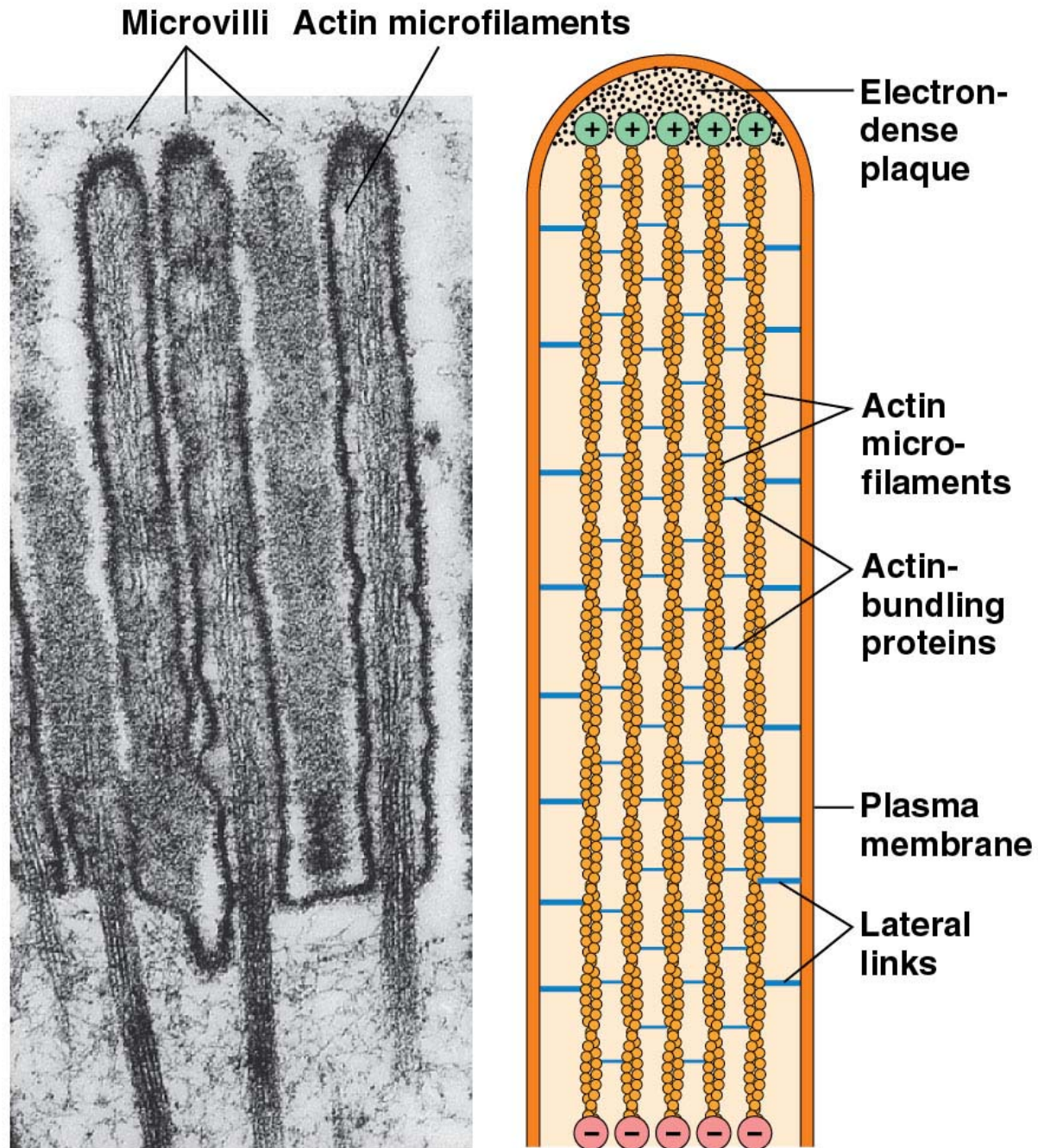
(b) Molecular model



(c) S1 fragments "decorating" actin microfilaments

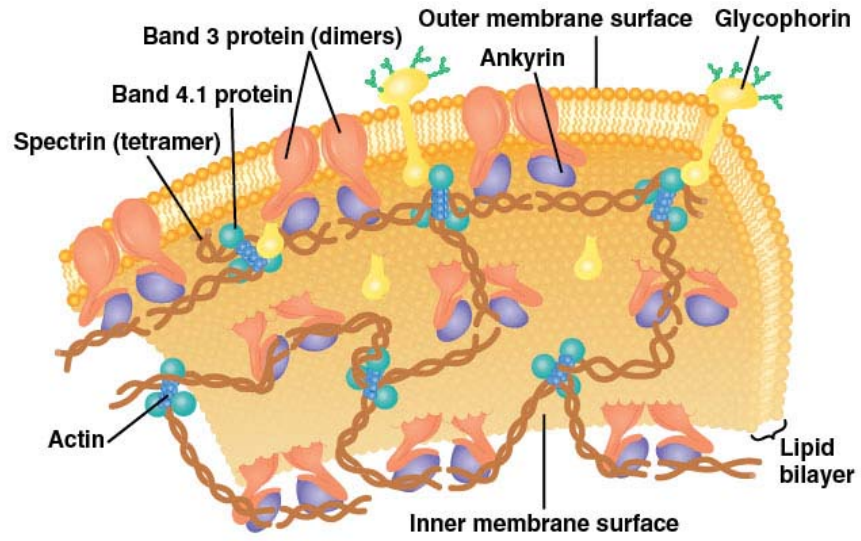
0.25 μ m



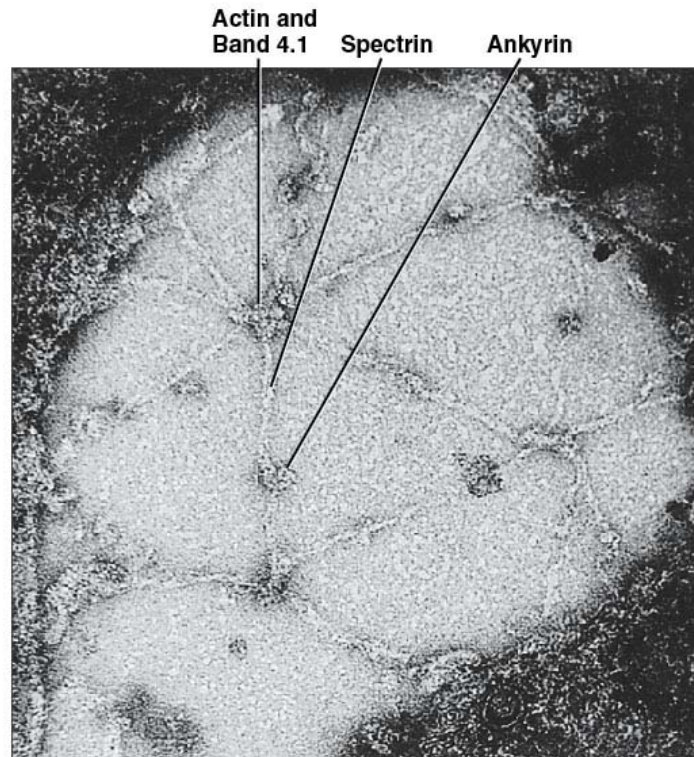


(a) Intestinal microvilli 0.1 μm

(b) Structure of a microvillus



(a) Schematic

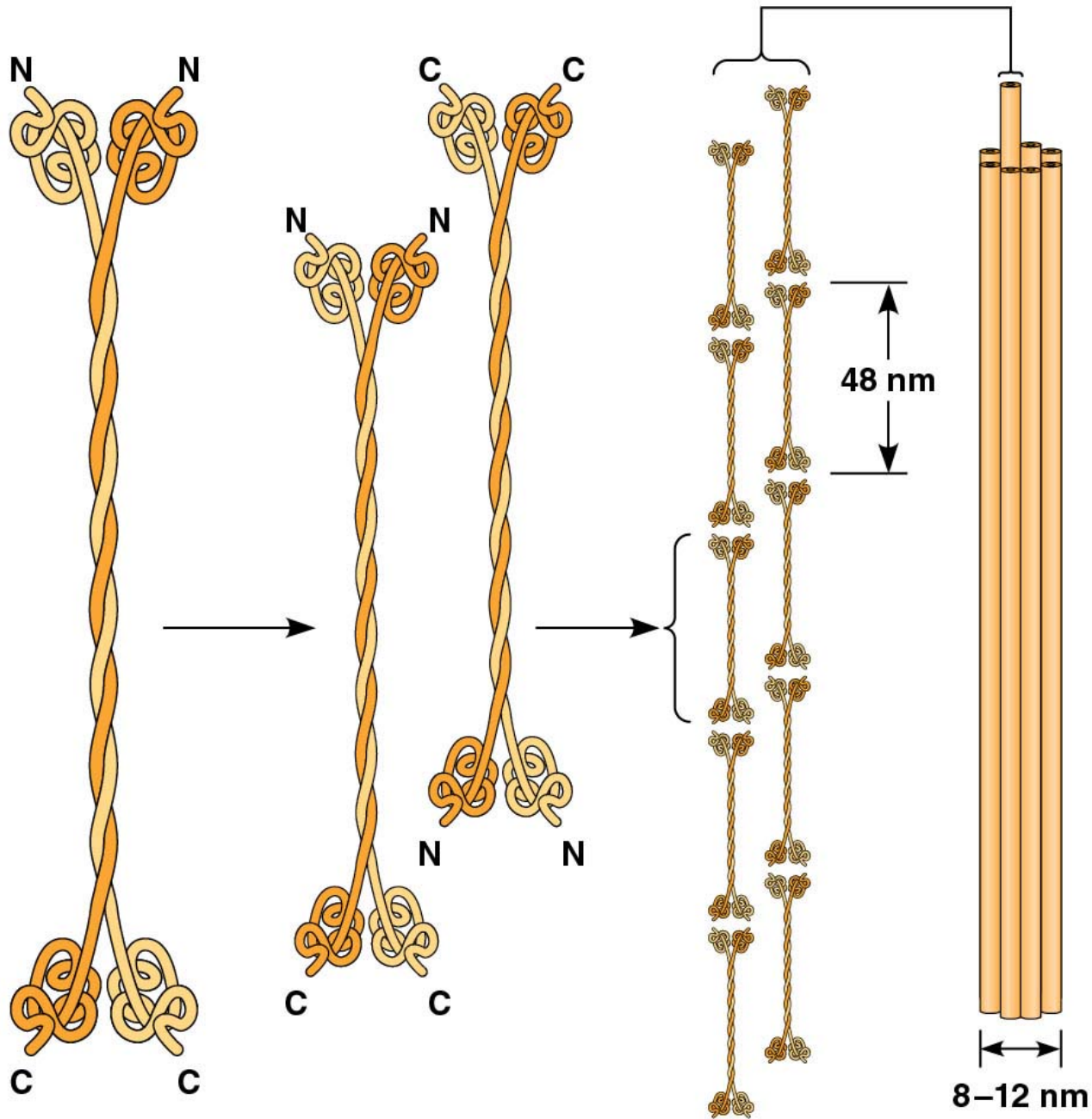


(b) TEM

0.1 μm

Table 13-4 Classes of Intermediate Filaments

Class	IF Protein	Molecular Mass (kDa)	Tissue	Function
I	Acidic keratins	40–56.5	Epithelial cells	Mechanical strength
II	Basic or neutral keratins	53–67	Epithelial cells	Mechanical strength
III	Vimentin	54	Fibroblasts; cells of mesenchymal origin; lens of eye	Maintenance of cell shape
III	Desmin	53–54	Muscle cells, especially smooth muscle	Structural support for contractile machinery
III	GFA protein	50	Glial cells and astrocytes	Maintenance of cell shape
IV	Neurofilament proteins		Central and peripheral nerves	Axon strength; determines axon size
	NF-L (major)	62		
	NF-M (minor)	102		
	NF-H (minor)	110		
V	Nuclear lamins		All cell types	Form a nuclear scaffold to give shape to nucleus
	Lamin A	70		
	Lamin B	67		
	Lamin C	60		
VI	Nestin	240	Neuronal stem cells	Unknown



(a) Dimer

(b) Tetrameric protofilament

(c) Protofilament assembly

(d) Intermediate filament