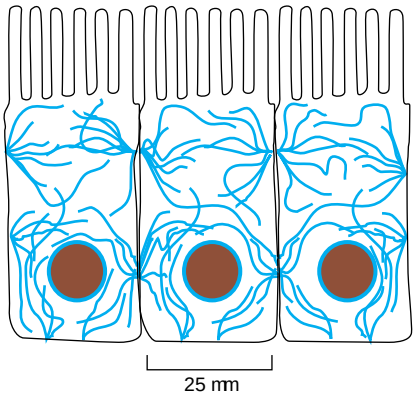
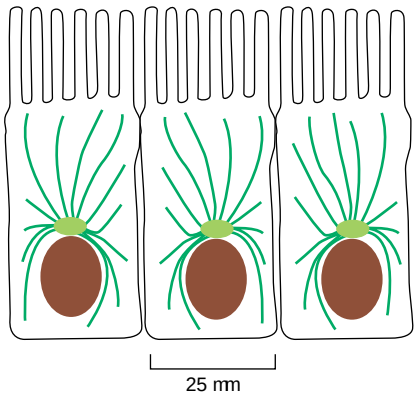
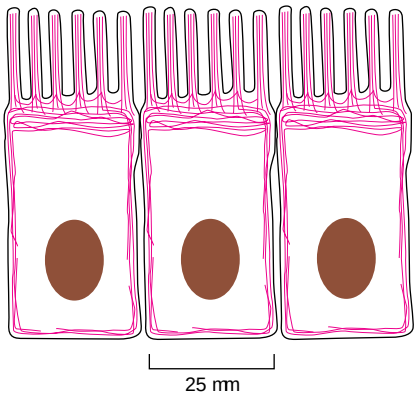
Cytoskeleton



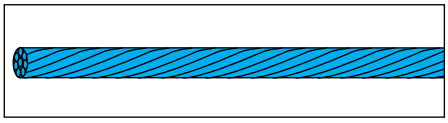
INTERMEDIATE FILAMENTS



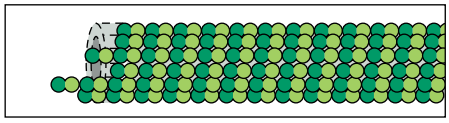
MICROTUBULES



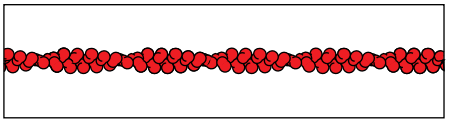
ACTIN FILAMENTS



Intermediate filaments are ropelike fibers with a diameter of about 10 nm; they are made of intermediate filament proteins, which constitute a large and heterogeneous family. One type of intermediate filament forms a meshwork called the nuclear lamina just beneath the inner nuclear membrane. Other types extend across the cytoplasm, giving cells mechanical strength and carrying the mechanical stresses in an epithelial tissue by spanning the cytoplasm from one cell-cell junction to another. (Micrograph courtesy of Roy Quinlan.)



Microtubules are long, hollow cylinders made of the protein tubulin. With an outer diameter of 25 nm, they are more rigid than actin filaments or intermediate filaments. Microtubules are long and straight and typically have one end attached to a single microtubule-organizing center called a *centrosome*, as shown here. (Micrograph courtesy of Richard Wade.)



Actin filaments (also known as *microfilaments*) are helical polymers of the protein actin. They appear as flexible structures, with a diameter of about 7 nm, that are organized into a variety of linear bundles, two-dimensional networks, and three-dimensional gels. Although actin filaments are dispersed throughout the cell, they are most highly concentrated in the *cortex*, just beneath the plasma membrane. (Micrograph courtesy of Roger Craig.)