

Cytoskeleton

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The cytoskeleton is a [network](#) of [fiber](#)s composed of [proteins](#) contained within a cell's [cytoplasm](#). Although the name implies the cytoskeleton is stable, it is a dynamic structure, parts of which are constantly destroyed, renewed, or newly constructed.

[Cytoskeletal protein](#).

Cytoskeleton Classification

The cytoskeleton is divided into three main types of filaments based on their size, protein composition, and function. A fourth group, **septins**, is emerging as a potential cytoskeletal element.

~~CLOSE~~ Microfilaments (Actin Filaments)

- **Diameter:** ~7 nm
- **Main protein:** Actin (G-actin polymerizes into F-actin)
- **Polarity:** Yes (plus and minus ends)
- **Functions:**
 - Maintains cell shape
 - Cell motility (lamellipodia, filopodia)
 - Cytokinesis (contractile ring)
 - Intracellular transport (with myosin)
 - Endocytosis and exocytosis
- **Associated proteins:** Arp2/3 complex, cofilin, profilin, myosin

~~CLOSE~~ Intermediate Filaments

- **Diameter:** ~10 nm
- **Main proteins** (tissue-specific):
 - Keratins (epithelial cells)
 - Vimentin (mesenchymal cells)
 - Desmin (muscle)
 - Neurofilaments (neurons)
 - Lamins (nuclear envelope)
- **Polarity:** No
- **Functions:**
 - Mechanical support and structural stability
 - Anchoring organelles
 - Nuclear integrity (nuclear lamina)

~~CLOSE~~ Microtubules

- **Diameter:** ~25 nm
- **Main protein:** Tubulin (α/β dimers)
- **Polarity:** Yes
- **Functions:**
 - Organelle and vesicle transport (kinesin, dynein)
 - Mitotic spindle formation (cell division)
 - Cilia and flagella structure
 - Cell polarity and spatial organization
- **Dynamic instability:** Rapid growth and shrinkage

~~CLOSE~~ Septins (Emerging Group)

- **Diameter:** ~10 nm (filament-like structures)
- **Main proteins:** GTP-binding septins
- **Polarity:** Yes (suggested)
- **Functions:**
 - Cytokinesis (septin ring)
 - Membrane dynamics
 - Cell polarity
 - Potential scaffolding role
- **Status:** Considered a “fourth cytoskeletal system” by some researchers

Summary Table

Component	Diameter	Protein(s)	Polarity	Main Functions
Microfilaments	~7 nm	Actin	Yes	Shape, motility, endocytosis, cytokinesis
Intermediate Filaments	~10 nm	Keratin, vimentin, etc.	No	Mechanical support, nuclear structure

Component	Diameter	Protein(s)	Polarity	Main Functions
Microtubules	~25 nm	α/β -tubulin	Yes	Transport, division, cilia/flagella, polarity
Septins (optional)	~10 nm	Septins (GTP-binding)	Suggested	Cytokinesis, polarity, scaffolding

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