- Microtubules: track for the movement of organelles- determines the shape of the cell
- Intermediate fibres: mechanicalstrength to cells and help maintain their integrity
- Centrioles: component of the cytoskeleton composed of microtubules
  - 2 associated centrioles form the centrosome, which is involved in the assembly and organization of the spindle fibres during cell division

Organisms with flagella and cilia- centrioles are thought to play a role in the positioning of these structures

- Flagella and cilia: flagella are longer than cilia but cilia are usually present in much greater numbers
  - Flagella-cell motility



- oCilia- mobile/ stationary
- Stationary cilia present on the surface of many cells and have an important function in sensory organs such as the nose
- Mobile cilia: beat in a rhythmic manner, creating a current, cause fluids or objects adjacent to the cell to move
- Each cilium contains two central microtubules surrounded by 9 pairs of microtubules arranged like a "wheel"- 9+2 movement
- Pairs of parallel microtubules slide over each other cuing the cilia to move in a beating motion
- Endoplasmic reticulum: network of men branes enclosing flattened sacs called cisternae- connected to the outer membrane of the nucleus
  - o 2 types:

RER: riboso nes bound to the surface and is responsible for the synthesis and transport of proteins

- **Ribosomes:** constructed of RNA molecules made in the nucleus of the cell- site of protein synthesis
- **Golgi apparatus:** compact structure formed of cisternae and doesn't contain ribosomes- role in modifying and packaging proteins (packaging proteins into vesicles either secretory vesicles if to leave the cell, or lysosomes- stay in cell)

## **Protein production**

- Proteins are synthesized in the ribosomes bound to the RER
- Pass into the cisternae and are packaged into transport vesicles
- Vesicles containing the newly synthesized proteins moves towards the Golgi apparatus via the transport function of cytoskeleton
- Vesicles fuse with the cis face of the Golgi apparatus and the proteins enter. The proteins are structurally modified before leaving the Golgi apparatus in vesicles from trans face