**The Cell and the Cytoplasm**

- **Main function**: homeostasis
- **Common structural features**: model quantity, appearance, distribution vary by cell type/function

**The Nucleus**

- Largest organelle
- 1 or more nucleoli
- Chromatin containing DNA = stain with basic dyes
- Nuclear envelope = double membrane
  - ➔ Cell membrane
- Nuclear pores = movement

**The Cell Cytoplasm and Organelles**

- **3 major elements**: cytosol, organelles, inclusions
  - Cytosol = translucent fluid cytoskeleton proteins
  - Organelles = mitochondria, ER, Golgi, ribosomes, lysosomes, peroxisomes
  - Inclusions = insulable crystals, energy storage materials, lipids
The Cell Membrane

"two-dimensional liquid with freely diffusing lipid+protein molecules"
- bilayer = phospholipids, proteins (channels & pumps), junctions, glycoproteins
- lipid = 50%, 2 types of amphipathic lipids, lipid rafts
- carbohydrate = glycoproteins & lipids
- proteins = range of different types, responsible for multiple functions, 50%

Membrane Transport Processes

Introduction Epithelium

-four basic tissues: epithelium, connective tissue
- including blood, muscle and nervous tissue
- "epithelium" comes from Greek "epi" = "upon" and "thel = "breast"
- epithelium contains cells on the breast originally
- a relatively avascular and almost wholly cellular (i.e., having little or no connective tissue associated with it) aggregation of cells
- cells are specialized for absorptive, excretory, protective, or sensory activities
- can occur as sheets of cells (= lining covering epithelium), or as solid aggregations of cells (glandular epithelium)
### Epithelial Classification

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<th>Layers</th>
<th>Cell Shape</th>
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<td>Simple</td>
<td>Cuboidal</td>
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<td>Squamous</td>
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### Simple Epithelia
- Only one layer of cells
- Underlying basement membrane
  - Architect epithelium to loose of underneath

### Simple Squamous
- Squamous cells in contact with basement membrane
  - Irregular shaped cells
  - Flat
  - Cell nucleus can create a bump
  - Easy diffusion to basement membrane
  - Smooth surface
  - Liquids can easily flow over

### Use and Location
- Lining of body cavities and capillaries
  - To reduce friction
  - Also in alveoli of lung
  - Facilitate gas exchange
**Simple Cuboidal**
- Cuboidal (square shaped) cells
- Nucleus directly in the center
- Single layer attached to basal surface
- Found on surface of ovaries, lining of nephrons, renal tubules, eye of thyroid
  - Perform absorption/secretion
  - Body appearance
  - Active or passive
  - Depending on location

**Simple Columnar**
- Columnar cells (rectangular)
- Unilayered above a basement membrane
- Lining in the uterus and most organs
  - With or without mucus cells
  - Majority of columnar epithelium
- Gastro-intestinal tract & gallbladder
  - Secretion and absorption
- Non-ciliated:
  - Urethra (male)
  - Moves mucus etc. (vis cilia)
  - Uterus
- Ciliated:
  - Upper respiratory tract, fallopian tubules, etc.
  - Moves egg towards uterus

**Pseudostratified**
- Comprising only a single layer
  - Nuclei position suggestive of stratification
  - Impression that there are multiple layers
- All cells attach to basement membrane
  - Not all cells extend to luminal surface
- Providing replacement for lost/damaged cells
- Concluded columnar, as rarely occurs as squamous/cuboidal
- Ciliated:
  - Upper respiratory tract
  - May contain goblet cells
- Non-ciliated:
  - Urethra (male)