

**Prokaryotic Ribosome**

70S

50S subunit: 23S RNA, 5S RNA

30S subunit: 16S RNA


**Eukaryotic Ribosome**

80S

60S subunit: 28S RNA, 5.8S RNA

40S subunit: 18S RNA

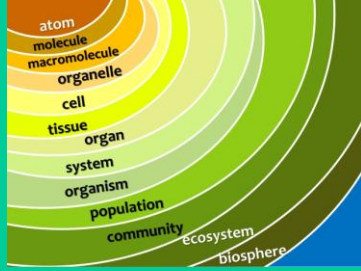
## 2.1 Cell Structure: Subcellular Components



**Chloroplast**

## ENDURING UNDERSTANDING

SYI-1 Living systems are organized in a hierarchy of structural levels that interact.

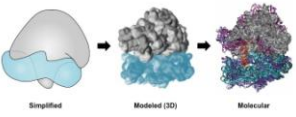
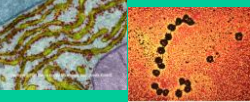



atom  
molecule  
macromolecule  
organelle  
cell  
tissue  
organ  
system  
organism  
population  
community  
ecosystem  
biosphere

### SYI-1.D Describe the structure and/or function of subcellular components and organelles.

Ribosomes

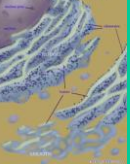

- Ribosomes comprise ribosomal RNA (rRNA) and protein.
- Ribosomes synthesize protein according to mRNA sequence.
- Ribosomes are found in all forms of life (70s and 80s), reflecting the common ancestry of all known life.
- Free ribosomes- produce proteins to be used in the cytosol.
- Bound ribosomes- produce proteins to be used in membranes.

### SYI-1.D Describe the structure and/or function of subcellular components and organelles.

Endoplasmic Reticulum



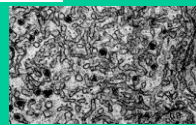

- Two forms—smooth and rough.
- Continuous with outer membrane of the nuclear envelope.
- Most extensive portion of endomembrane system.
- Rough ER (associated with membrane-bound ribosomes)
  - Makes secretory proteins (mainly glycoproteins)
  - Packages proteins as transport vesicles.
  - Makes new membranes to compartmentalize cell.

### SYI-1.D Describe the structure and/or function of subcellular components and organelles.

Smooth ER (no ribosomes)

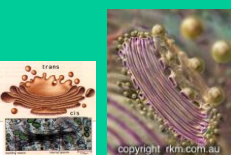

- Synthesizes lipids, phospholipids, and steroids.
- In Liver
  - Converts glycogen to glucose to regulate blood sugar.
  - Detoxifies drugs and poisons (adds hydroxyl groups making them water soluble).
- Stores Ca<sup>2+</sup> in muscle, calcium is pumped from cytosol into cisternal space.

### SYI-1.D Describe the structure and/or function of subcellular components and organelles.

Golgi Complex

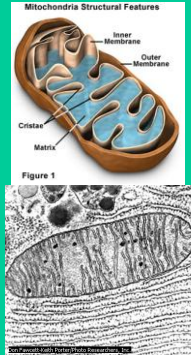
- A membrane-bound structure that consists of a series of flattened membrane sacs
- Receives protein-filled vesicles that bud from the ER.
- Vesicle fuses with inner face membrane of Golgi (cis face).
- Proteins are correctly folded, chemically modified and repackaged in vesicles for protein trafficking.
- Vesicles form from membrane of trans face of the Golgi.
- At plasma membrane, they discharge their contents as secretions.

**SYI-1.D Describe the structure and/or function of subcellular components and organelles.**

☐ Mitochondria

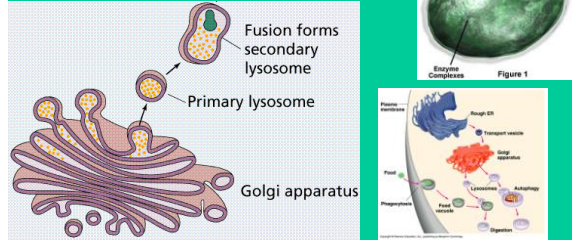
- Have a double membrane that allows compartmentalization
- Outer membrane is smooth
- Inner membrane is highly convoluted, forming folds called cristae.
  - Cristae contain enzymes important to ATP production
  - Cristae also increase the surface area for ATP production
- Sites of cellular respiration.
- Contain ribosomes (70s) and their own DNA (circular loop)
- Specialize in energy capture and transformation.



**SYI-1.D Describe the structure and/or function of subcellular components and organelles.**

☐ Lysosomes

- Membrane-enclosed vesicles produced by the Golgi
- Contain hydrolytic digestive enzymes.
  - Enzymes work best at low pH (5)
  - Membrane pumps in H<sup>+</sup>
  - Isolates digestion.



**SYI-1.D Describe the structure and/or function of subcellular components and organelles.**

☐ Vacuoles

- A membrane-bound sac that plays roles in intracellular digestion and the release of cellular waste products.
- In plants, a large central vacuole serves many functions
  - Storage of pigments or poisonous substances
  - Cell growth and support
  - Allows for a large surface area to volume ratio.
  - Membrane is called the tonoplast
- Types include: food, digestive, and in some protists, water-regulating contractile vacuoles.



**SYI-1.D Describe the structure and/or function of subcellular components and organelles.**

☐ Chloroplasts

- Found in photosynthetic algae and plants.
- Chloroplasts have a double outer membrane.
- Chloroplasts are a type of organelle called a plastid.
  - Amyloplasts, which store starch (amylose, amylopectin)
  - Chromoplasts, which contain red and orange pigments.

