



**MATERI KULIAH BIOLOGI UMUM**  
**STRUKTUR FUNGSI PADA TINGKAT SEL,**  
**JARINGAN, DAN ORGAN**  
Structure and function of cell, tissue, and organ

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# Hierarki organisasi biologis

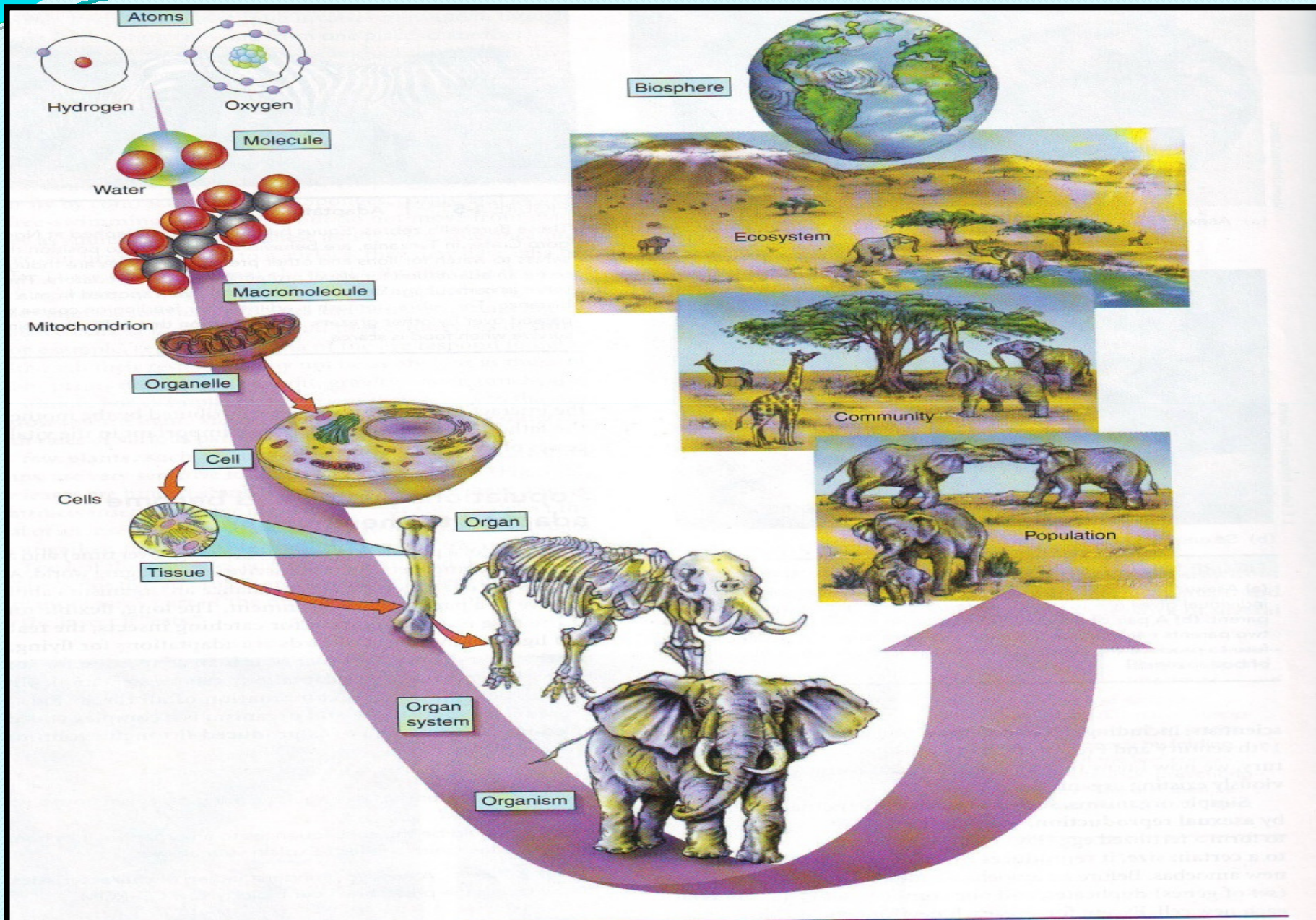




Fig. 5-UN2a

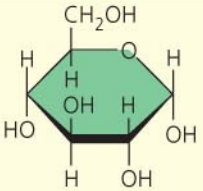
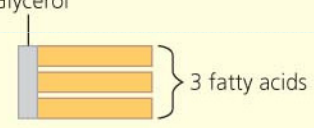

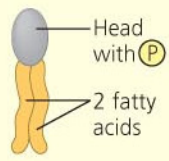
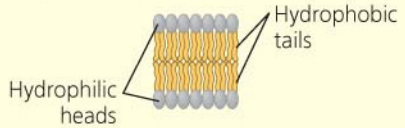
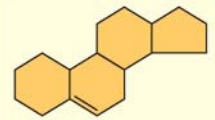
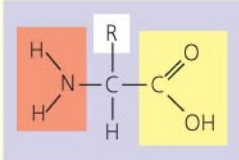
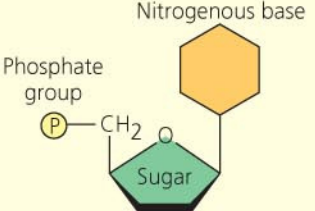


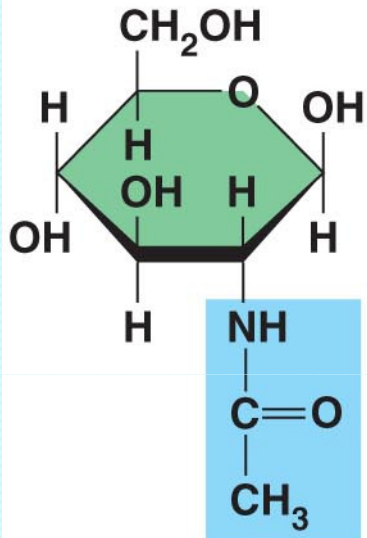
Large Biological Molecules	Components	Examples	Functions	
<b>Concept 5.2</b> <b>Carbohydrates</b> serve as fuel and building material	 <p>Monosaccharide monomer</p>	Monosaccharides: glucose, fructose  Disaccharides: lactose, sucrose  Polysaccharides: <ul style="list-style-type: none"> <li>• Cellulose (plants)</li> <li>• Starch (plants)</li> <li>• Glycogen (animals)</li> <li>• Chitin (animals and fungi)</li> </ul>	Fuel; carbon sources that can be converted to other molecules or combined into polymers   <ul style="list-style-type: none"> <li>• Strengthens plant cell walls</li> <li>• Stores glucose for energy</li> <li>• Stores glucose for energy</li> <li>• Strengthens exoskeletons and fungal cell walls</li> </ul>	
	<b>Concept 5.3</b> <b>Lipids</b> are a diverse group of hydrophobic molecules and are not macromolecules	Glycerol 	Triacylglycerols (fats or oils): glycerol + 3 fatty acids	Important energy source 
		Phospholipids: phosphate group + 2 fatty acids	Lipid bilayers of membranes 	
 <p>Steroid backbone</p>	Steroids: four fused rings with attached chemical groups	<ul style="list-style-type: none"> <li>• Component of cell membranes (cholesterol)</li> <li>• Signals that travel through the body (hormones)</li> </ul>		

Fig. 5-UN2b

Large Biological Molecules	Components	Examples	Functions
<p><b>Concept 5.4</b>  <b>Proteins</b> have many structures, resulting in a wide range of functions</p>	 <p>Amino acid monomer (20 types)</p>	<ul style="list-style-type: none"> <li>• Enzymes</li> <li>• Structural proteins</li> <li>• Storage proteins</li> <li>• Transport proteins</li> <li>• Hormones</li> <li>• Receptor proteins</li> <li>• Motor proteins</li> <li>• Defensive proteins</li> </ul>	<ul style="list-style-type: none"> <li>• Catalyze chemical reactions</li> <li>• Provide structural support</li> <li>• Store amino acids</li> <li>• Transport substances</li> <li>• Coordinate organismal responses</li> <li>• Receive signals from outside cell</li> <li>• Function in cell movement</li> <li>• Protect against disease</li> </ul>
<p><b>Concept 5.5</b>            Nucleic acids store and transmit hereditary information</p>	 <p>Nucleotide monomer</p>	<p>DNA: </p> <ul style="list-style-type: none"> <li>• Sugar = deoxyribose</li> <li>• Nitrogenous bases = C, G, A, T</li> <li>• Usually double-stranded</li> </ul> <p>RNA: </p> <ul style="list-style-type: none"> <li>• Sugar = ribose</li> <li>• Nitrogenous bases = C, G, A, U</li> <li>• Usually single-stranded</li> </ul>	<p>Stores all hereditary information</p> <p>Carries protein-coding instructions from DNA to protein-synthesizing machinery</p>

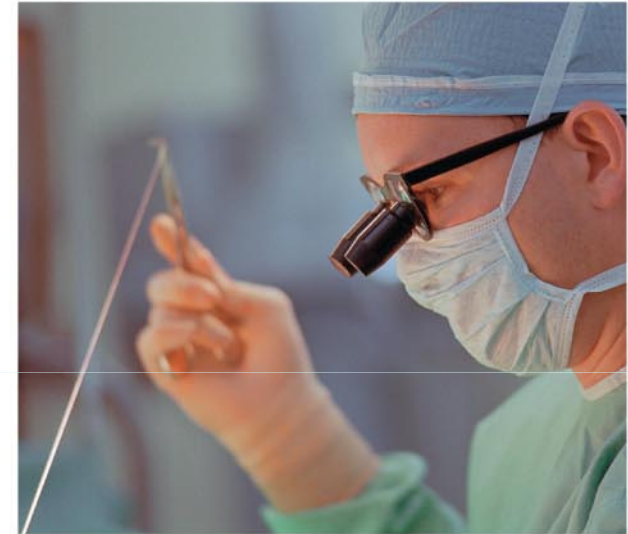
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**(a) The structure of the chitin monomer.**

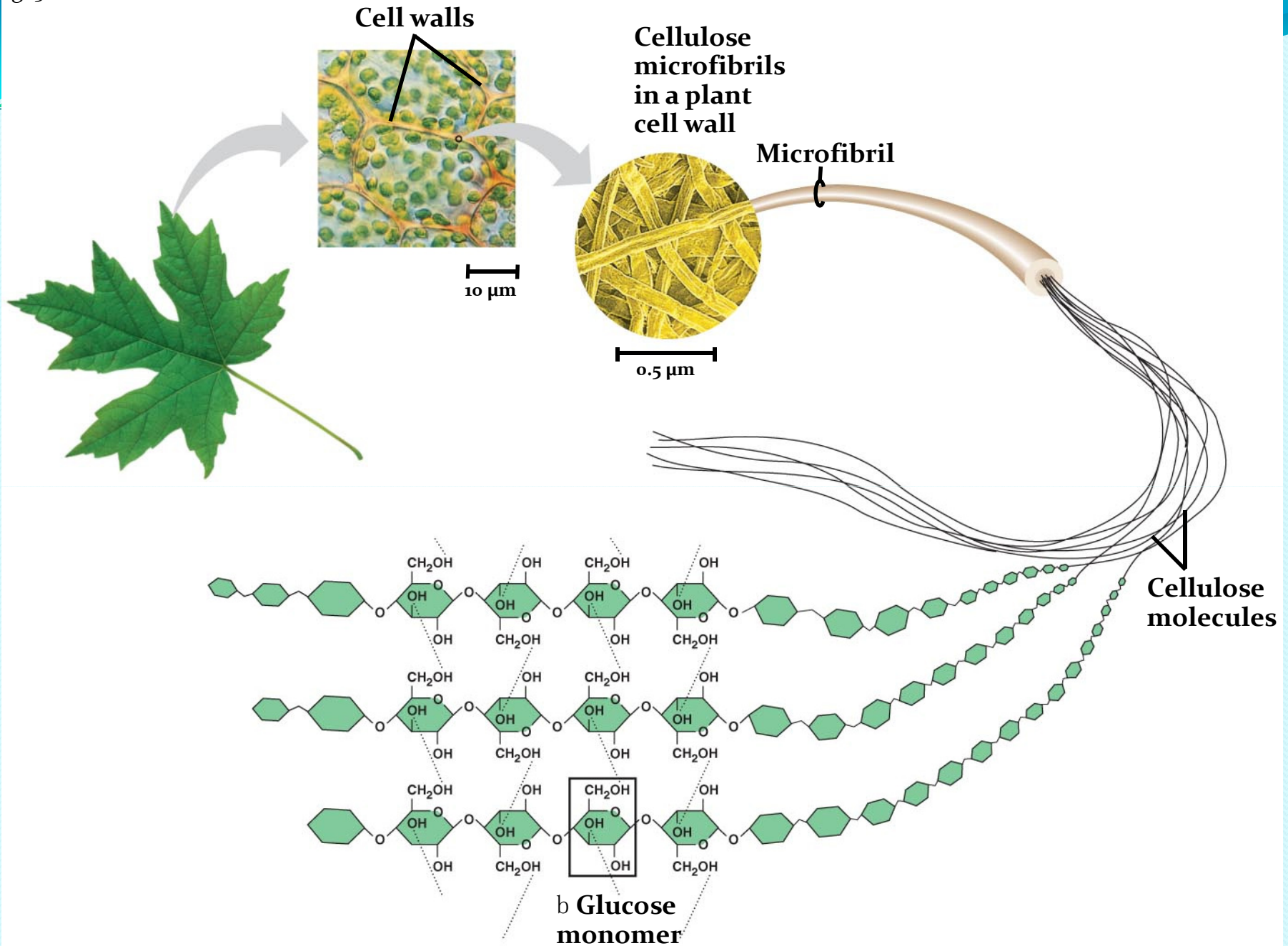


**(b) Chitin forms the exoskeleton of arthropods.**



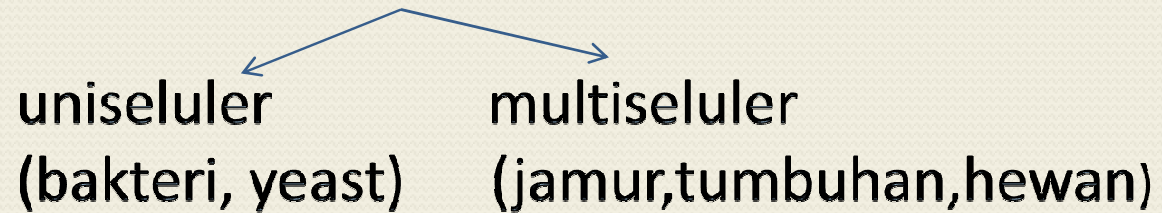
**(c) Chitin is used to make a strong and flexible surgical thread.**

Fig. 5-8





Sel → sangat mendasar, seluruh organisme terdiri dari sel



Tumbuhan; hewan → tubuh kerjasama dari berbagai jenis sel

Sel → jaringan → organ

Sel → sebagian besar berukuran 1-100  $\mu\text{m}$



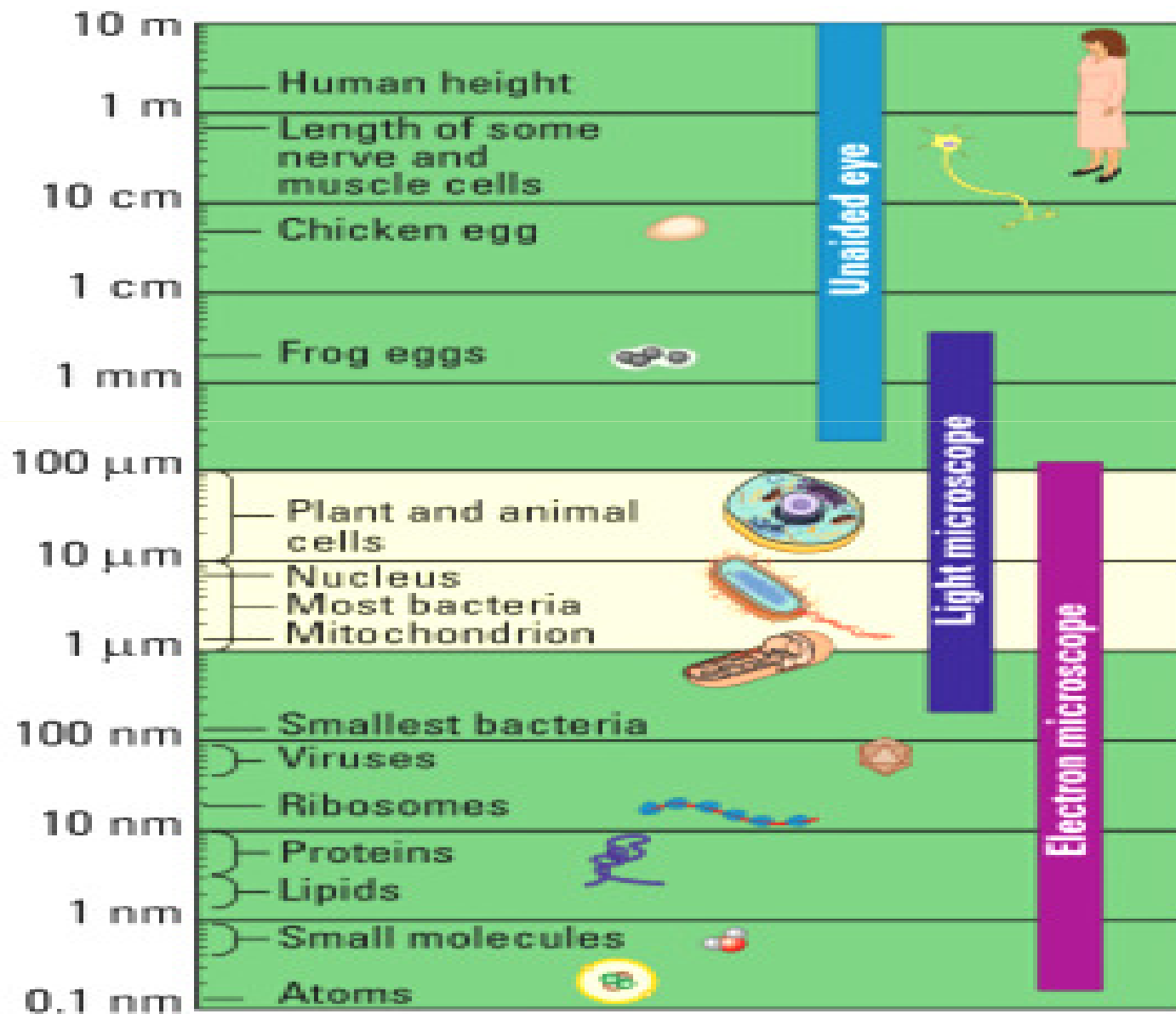
# Sel: Unit Fundamental dari makhluk hidup

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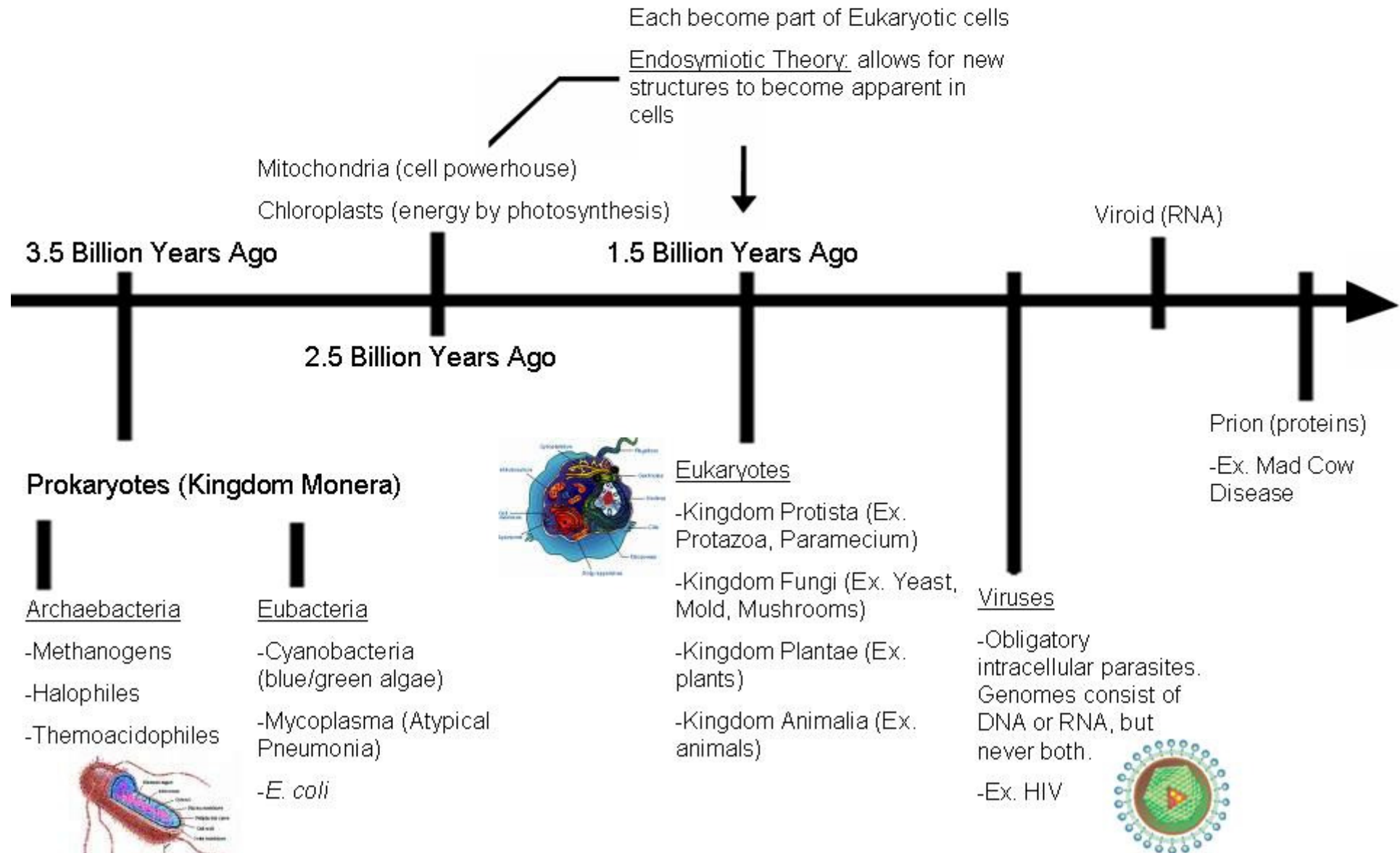
- Seluruh organisme tersusun atas sel
  - Sel adalah kumpulan bahan yang paling sederhana yang mampu menyelenggarakan kehidupan
  - Struktur sel sangat berhubungan dengan fungsinya
  - Seluruh sel berhubungan dengan sel yang sudah ada sebelumnya (sel induk)
-



## PERBANDINGAN UKURAN



# Cell Evolution Time Line





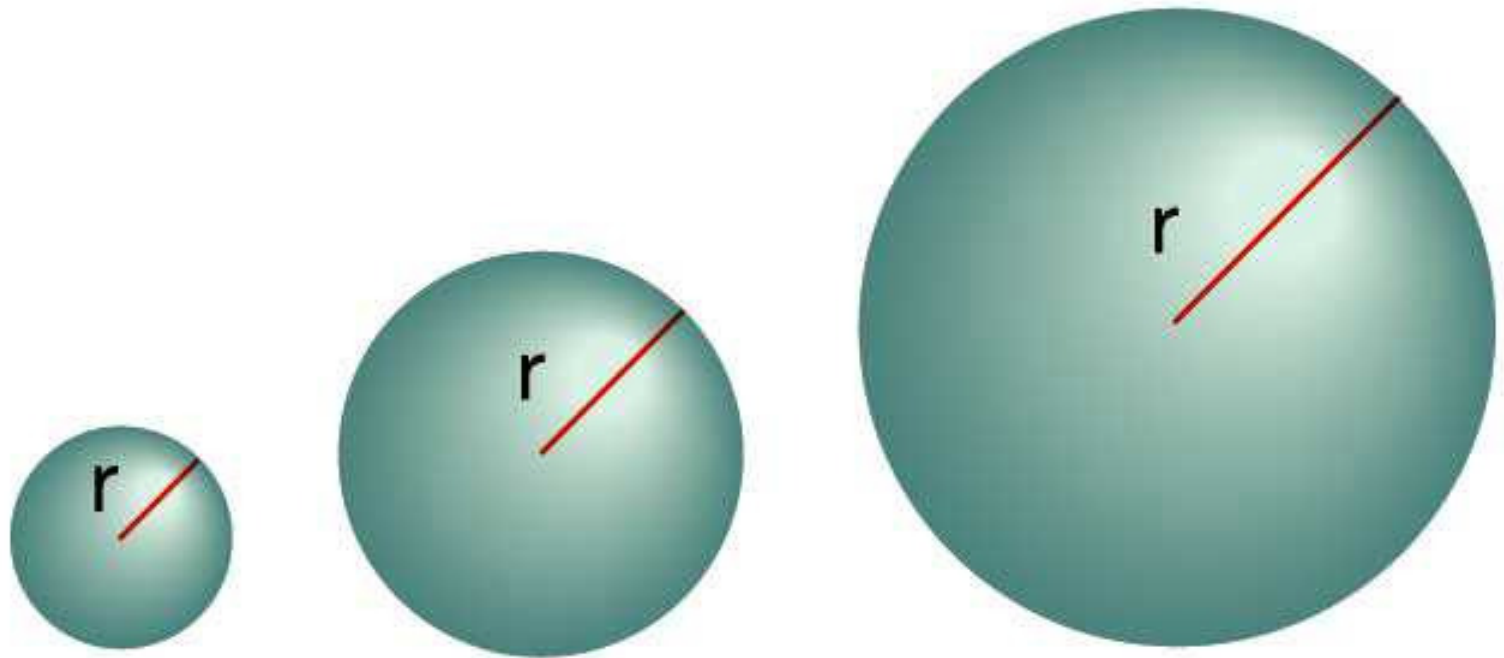
# Cell Size

- 1–100 $\mu\text{m}$

Why is there a limit to cell size?

- a. Surface-to-volume ratio
- b. Distance from surface to center

center



distance to  
center ( $r$ )

1.0

2.0

3.0

surface area  
( $4\pi r^2$ )

12.6

50.3

113.1

volume  
( $\frac{4}{3}\pi r^3$ )

4.2

33.5

113.1

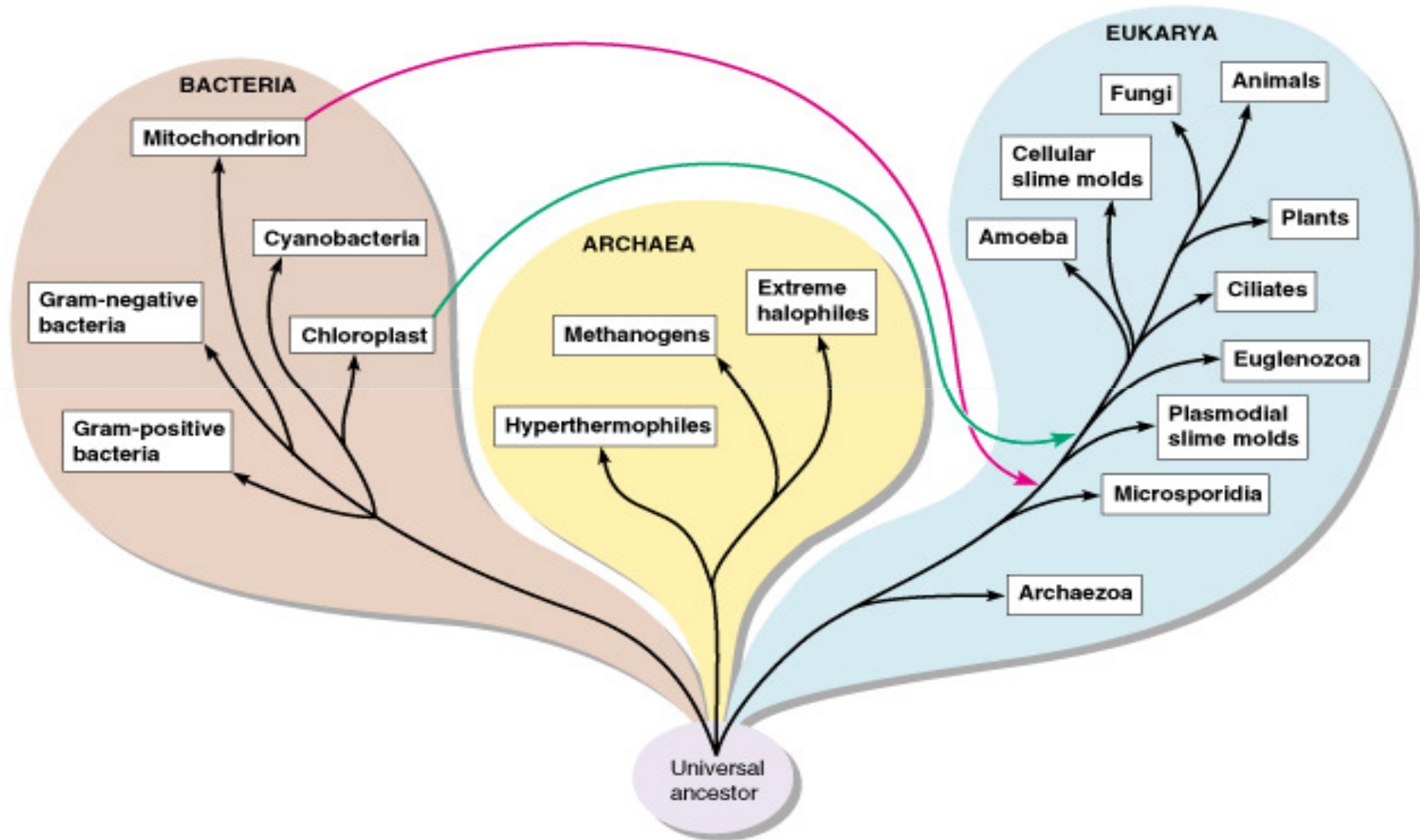
area/volume

3.0

1.5

1.0





# Karakteristik Archae, Bakteri, dan Eukarya




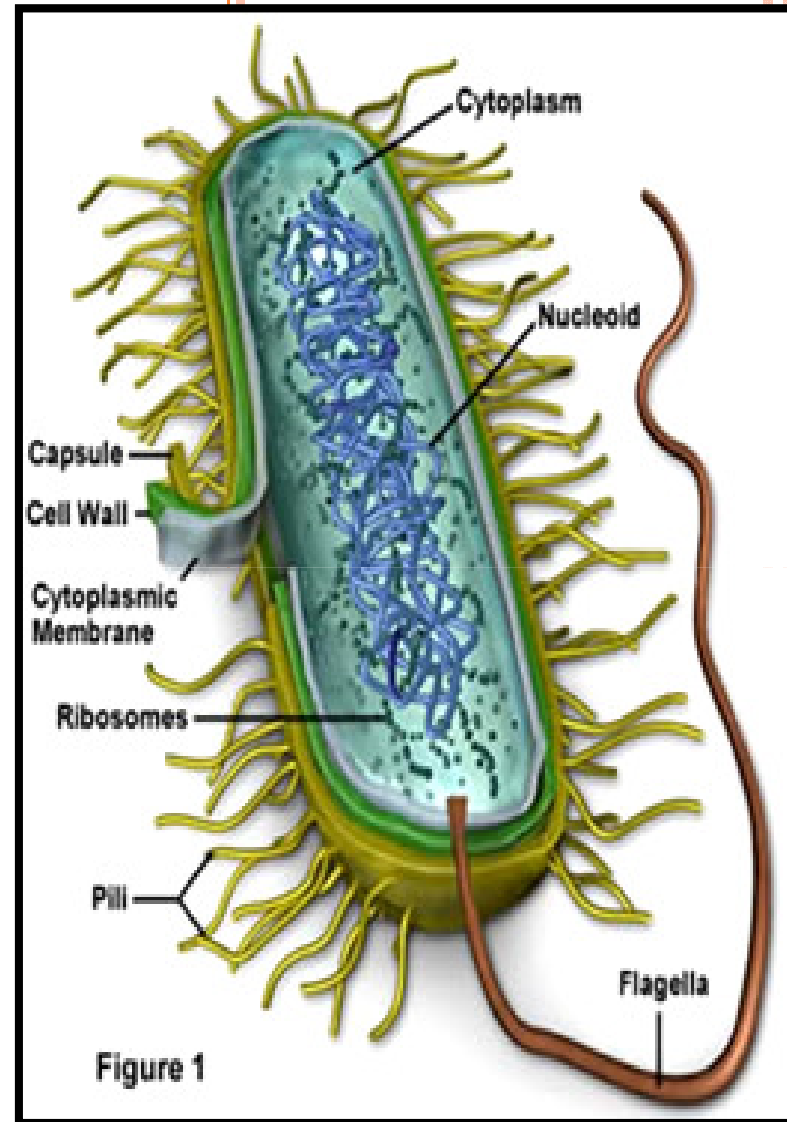
	Archaea	Bacteria	Eukarya
	 <p><i>Methanosarcina</i></p>	 <p><i>E. coli</i></p>	 <p><i>Amoeba</i></p>
<b>Cell Type</b>	Prokaryotic	Prokaryotic	Eukaryotic
<b>Cell Wall</b>	Varies in composition; contains no peptidoglycan	Contains peptidoglycan	Varies in composition; contains carbohydrates
<b>Membrane Lipids</b>	Composed of branched carbon chains attached to glycerol by ether linkage	Composed of straight carbon chains attached to glycerol by ester linkage	Composed of straight carbon chains attached to glycerol by ester linkage
<b>First Amino Acid in Protein Synthesis</b>	Methionine	Formylmethionine	Methionine
<b>Antibiotic Sensitivity</b>	No	Yes	No

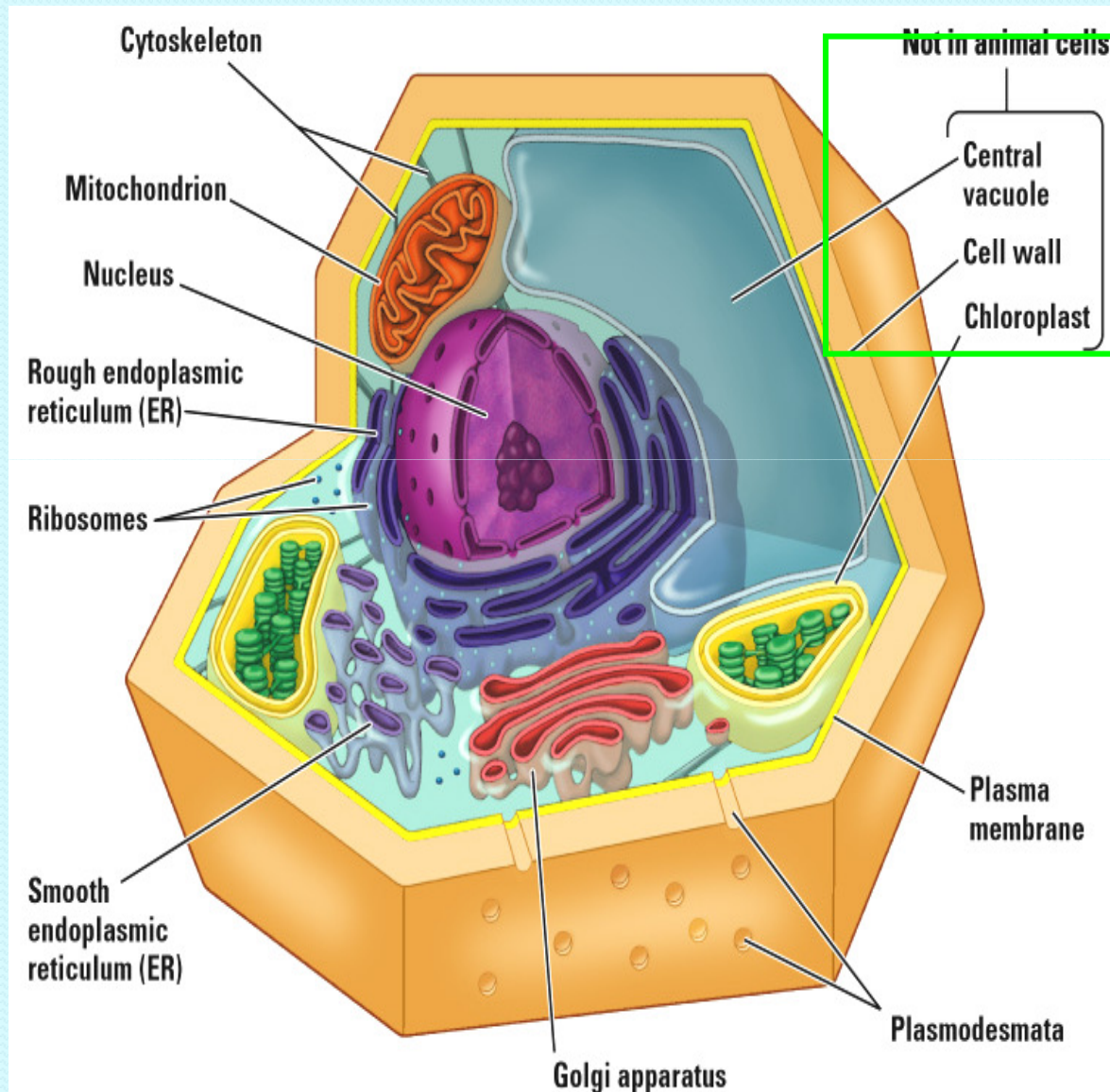
Table 10.1

## STRUKTUR UMUM SEL BAKTERI

- Sel prokariotik
- diameter 0,2-2,0 $\mu\text{m}$ ; panjang 2,0-8,0 $\mu\text{m}$
- Epulopiscium fishelsoni* (0,6 mm)
- *Thiomargarita namibiensis* (0,75 mm)
- Struktur eksternal ddg sel:**
- Glycocalyx, flagella, axial filamen, fimbriae, dan pili
- Struktur internal ddg sel:**
- membran sitoplasma, sitoplasma, nucleoid, dan ribosom



# Sel tumbuhan



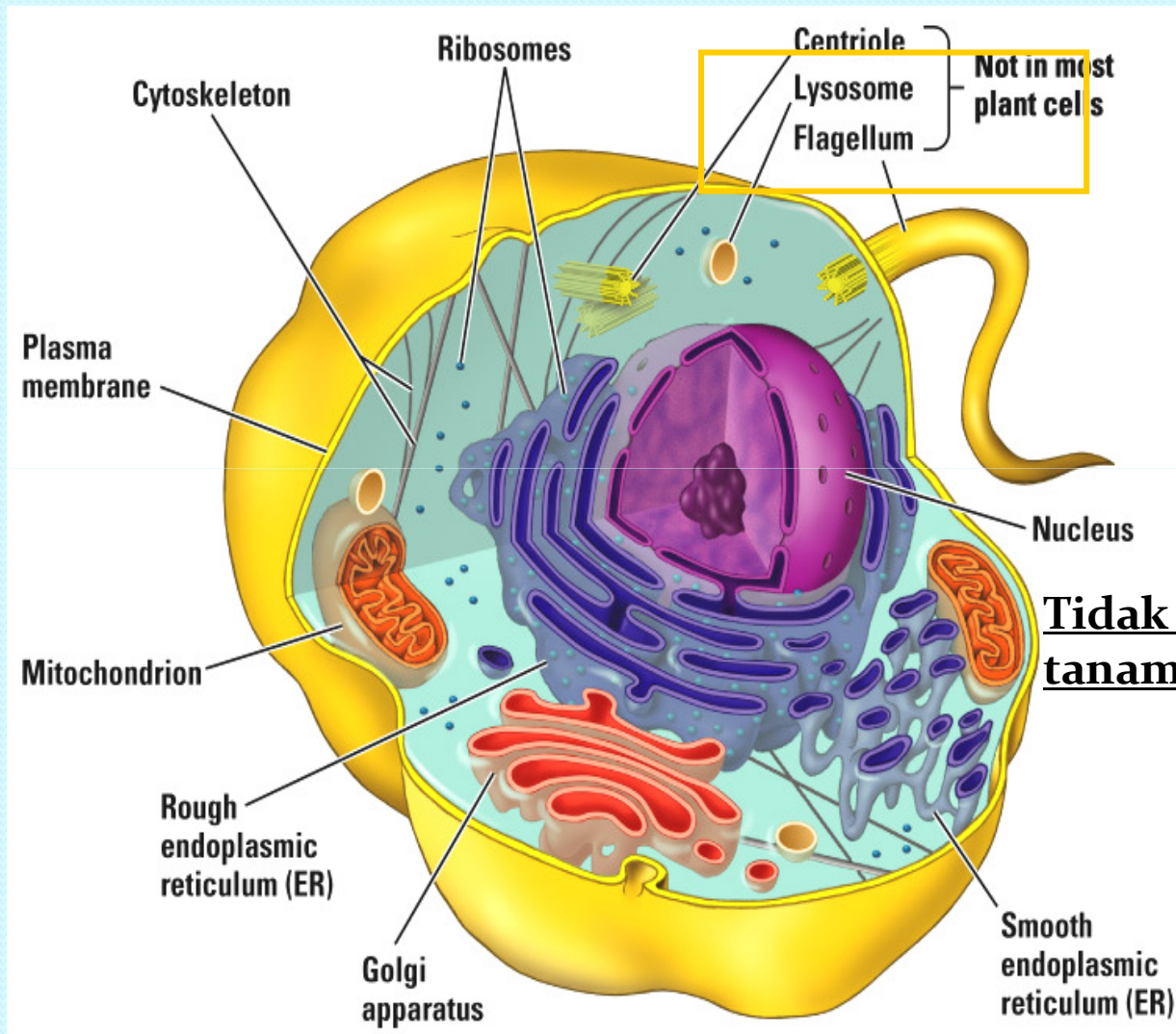
Nucleus  
Ribosomes  
ER  
Golgi apparatus  
Vesicles  
Mitochondria

Hanya pd sel tanman:

- Central Vacuole
- Chloroplasts
- dinding sel



# Sel hewan



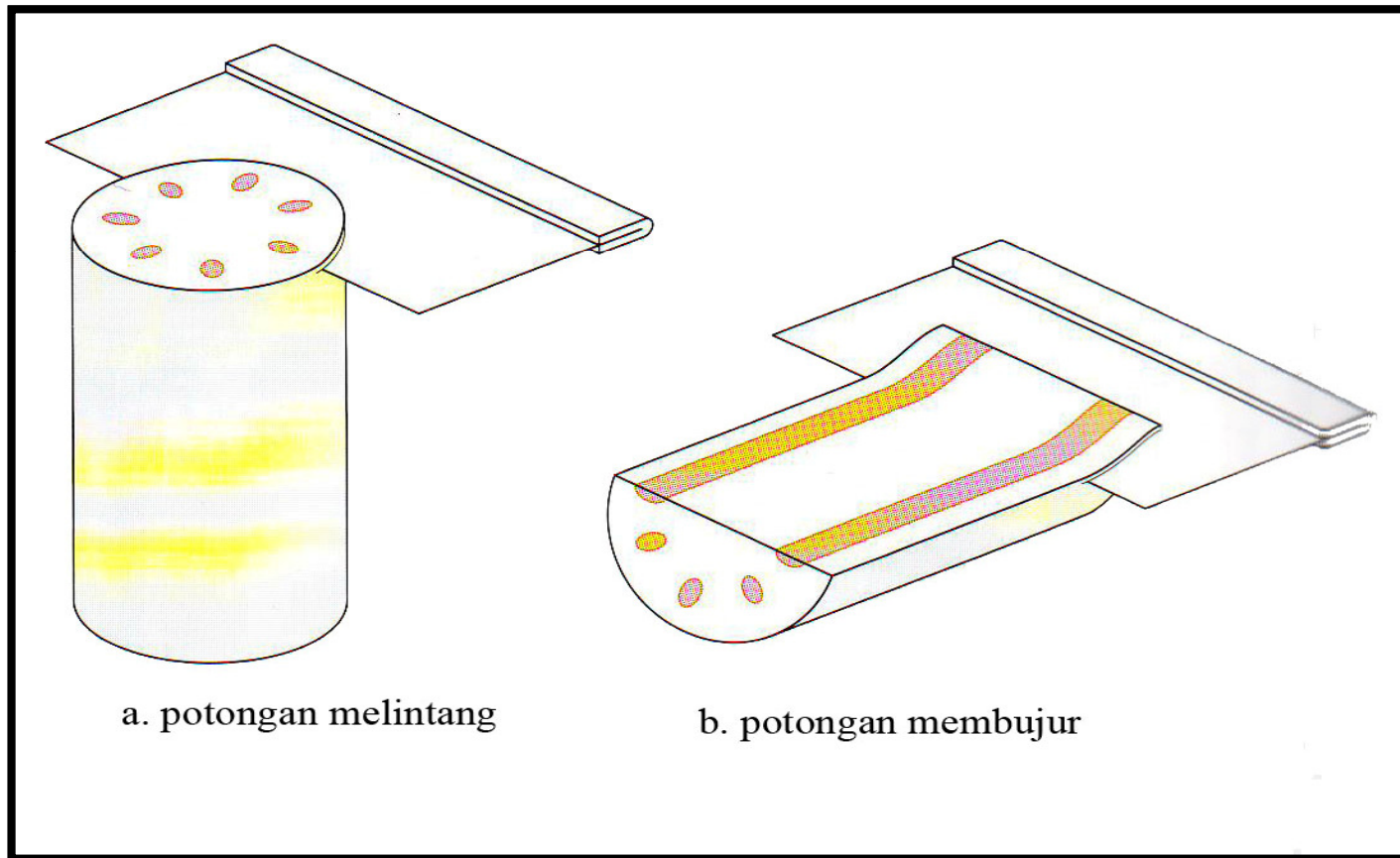
Nucleus  
Ribosomes  
ER  
Golgi apparatus  
Vesicles  
Mitochondria

Tidak ada pd may.sel tanaman:

- Centriole
- Lysosome
- Flagellum

## Bagaimana melihat struktur sel secara sederhana?

Irisan tipis (potongan) ex: daun → mikroskop → struktur spt kotak (sel)  
potongan membujur ; potongan melintang



## Komponen sel pada umumnya:

membran sel: mengelilingi sitoplasma; selektif permeabel

sitoplasma: cairan (90% air); organella

organella (“organ kecil”):

mitokondria=transformasi energi

ribosom=penyusun protein

retikulum endoplasma=membentuk membran;fungsi biosintetik

aparatus golgi= menyelesaikan,menyortir,mengirim produk sel

lisosom=ruangan pencernaan

nukleus (inti sel): materi genetik

membran inti (sel eukariotik=jamur, tumbuhan, hewan)

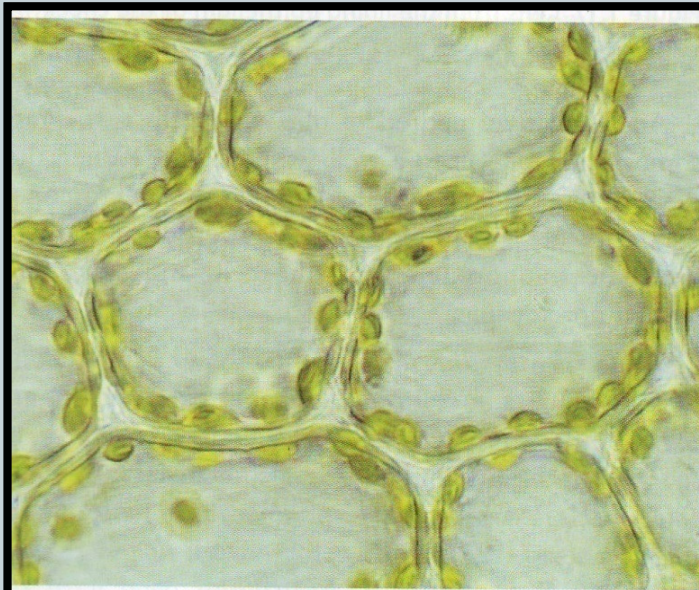
tidak mempunyai membran inti (sel prokariotik=bakteri)



# Penampang melintang

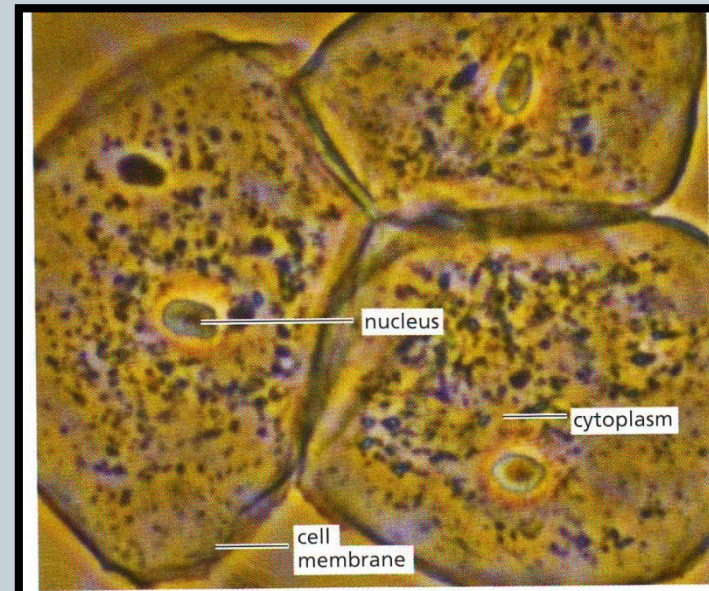
20

## Sel penyusun daun



**Figure 1.16** Cells in a moss leaf ( $\times 500$ ). The vacuole occupies most of the space in each cell. The chloroplasts are confined to the layer of cytoplasm lining the cell wall.

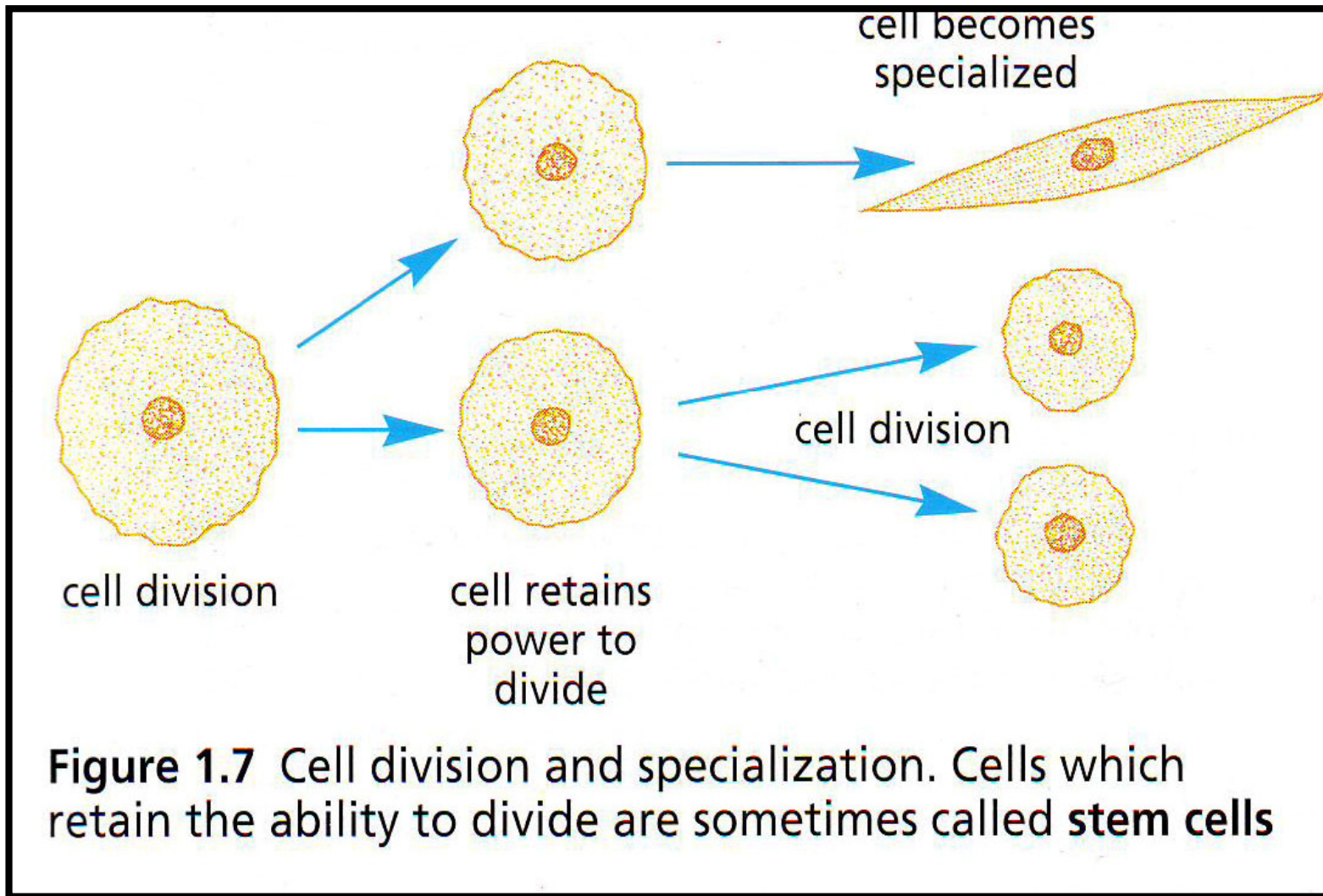
## Sel penyusun epithelium



**Figure 1.17** Cells from the lining epithelium of the cheek ( $\times 1500$ )

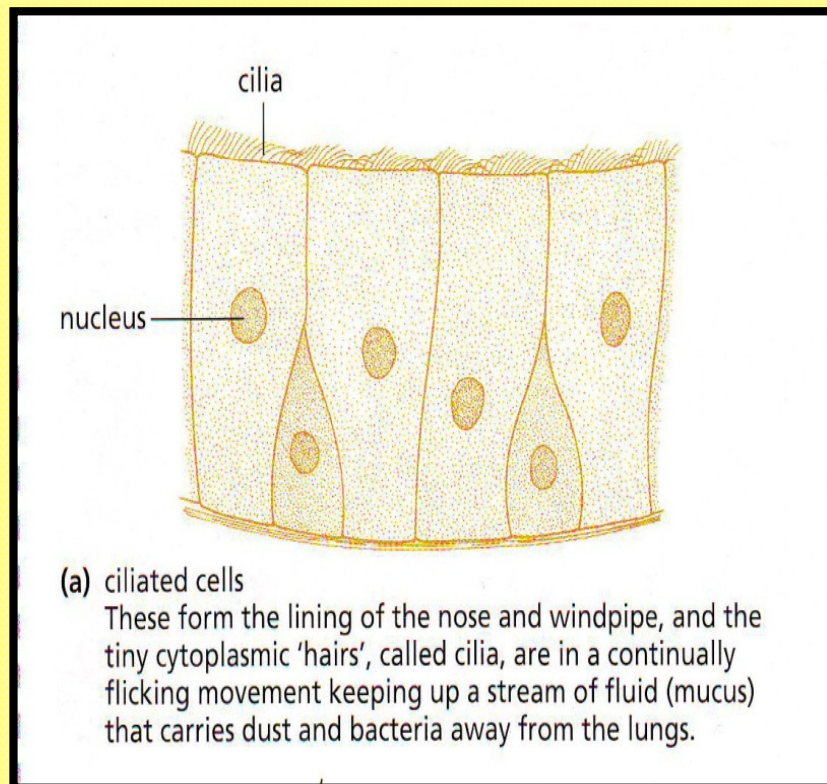


## Pembelahan sel

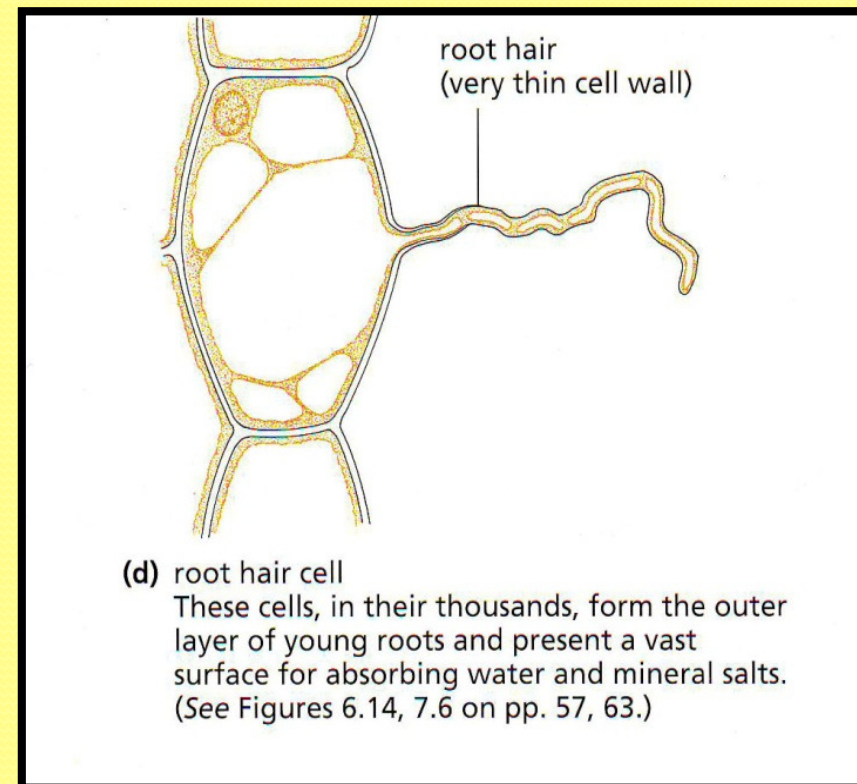


# Spesialisasi sel

## Sel-sel bersilia

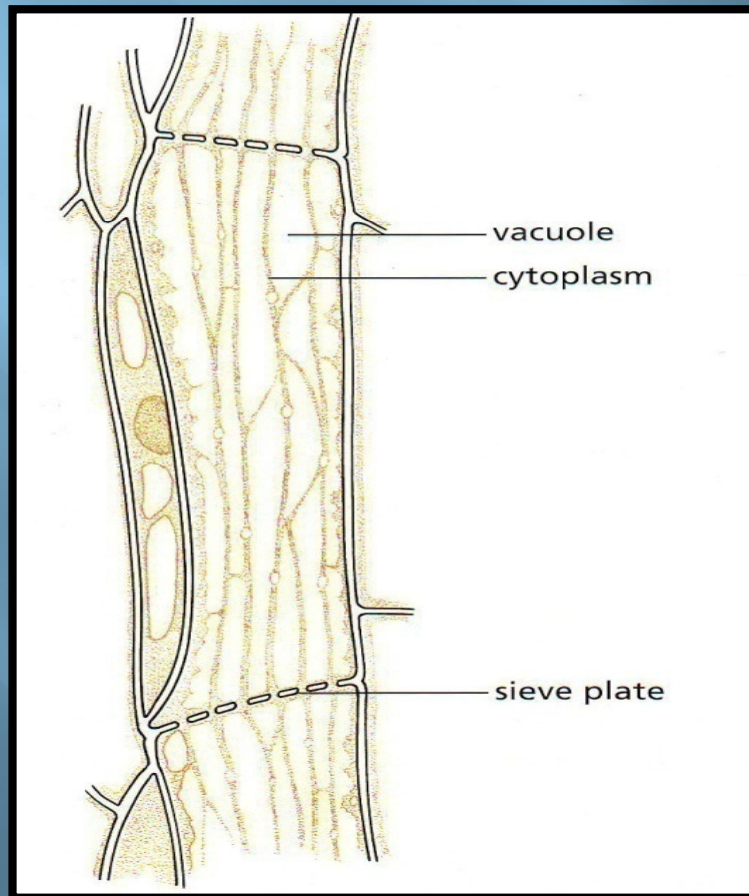


## Sel rambut akar

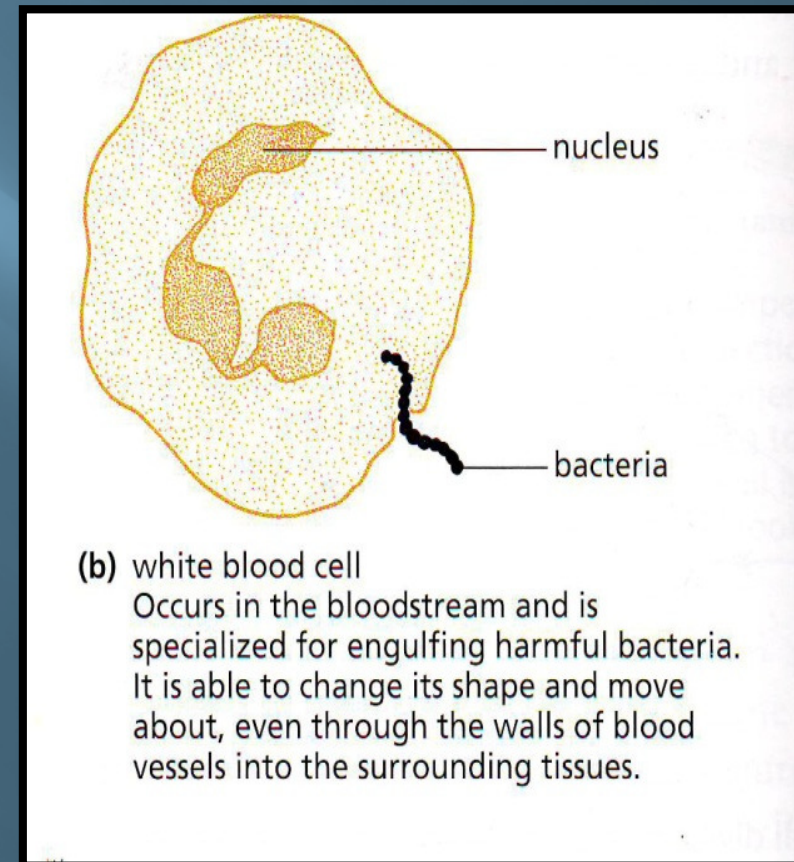


# Spesialisasi sel

## SEL PHLOEM



## SEL DARAH PUTIH

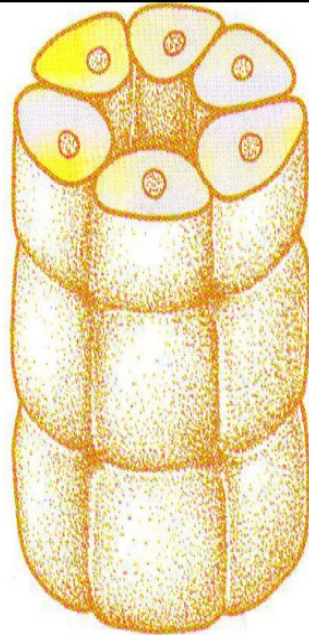




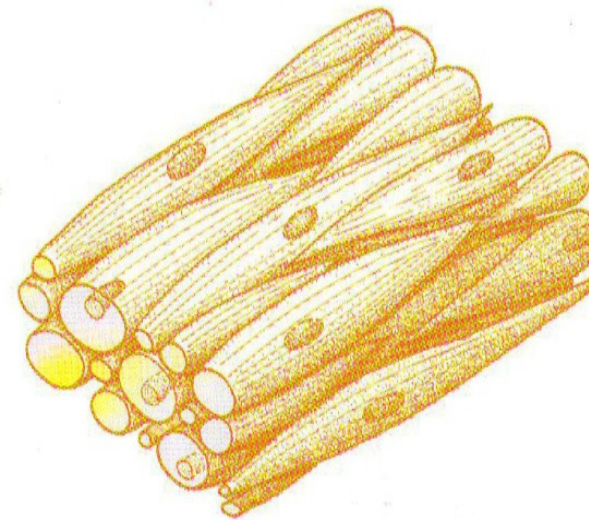
# Bagaimana sel-sel membentuk jaringan

Sel-sel membentuk tabung kecil

Jaringan otot



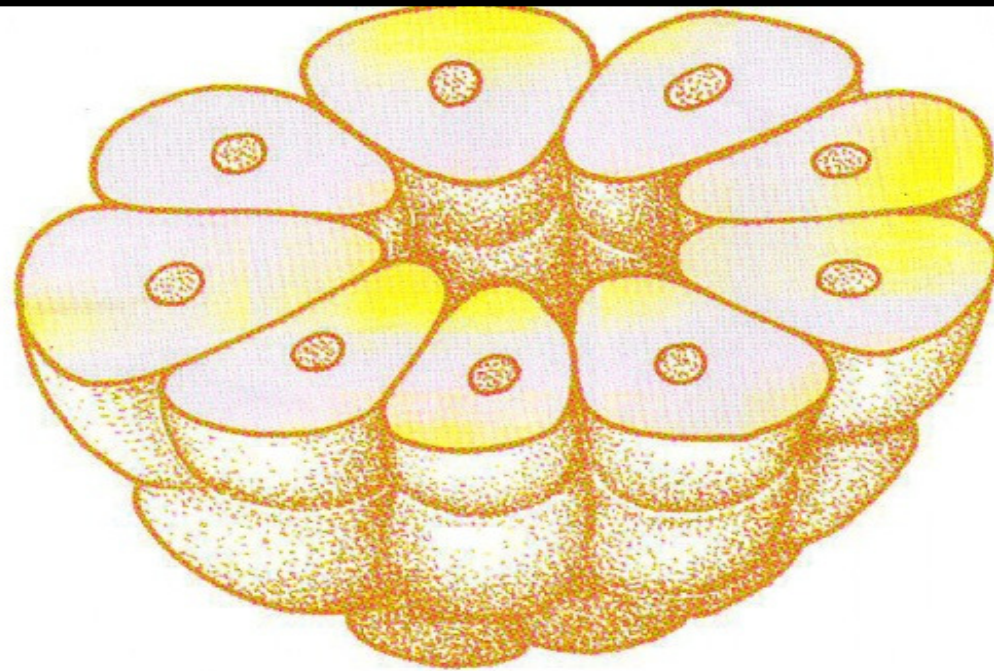
(b) cells forming a small tube  
e.g. a kidney tubule (see p. 132). Tubules such as this carry liquids from one part of an organ to another.



(c) one kind of muscle cell  
Forms a sheet of muscle tissue. Blood vessels, nerve fibres and connective tissues will also be present. Contractions of this kind of muscle help to move food along the food canal or to close down small blood vessels.



## Bagaimana sel-sel membentuk jaringan



- (d) cells forming part of a gland  
The cells make chemicals which are released into the central space and carried away by a tubule such as shown in (b).  
Hundreds of cell groups like this would form a gland like the salivary gland.

# Sistem pada tubuh manusia

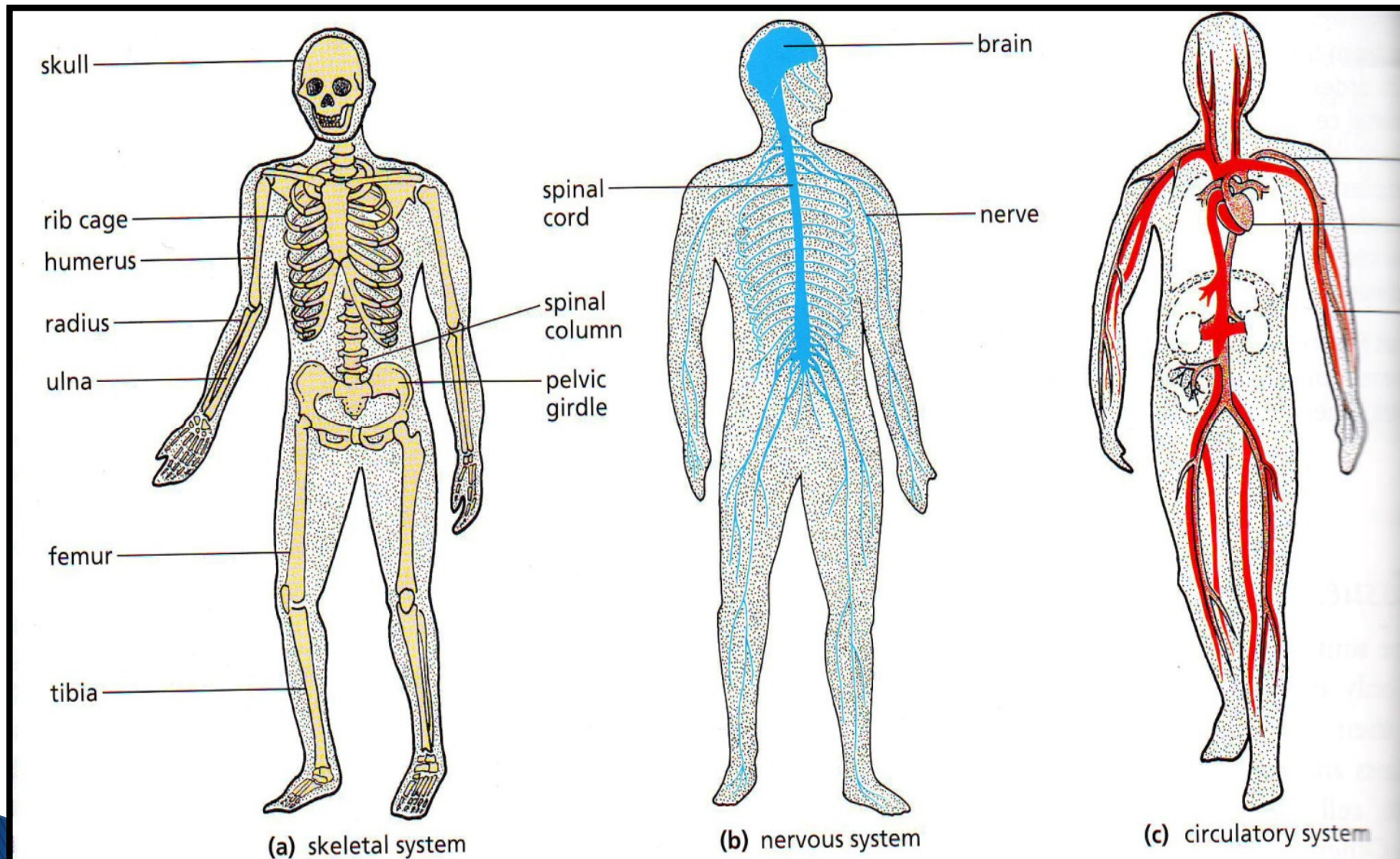
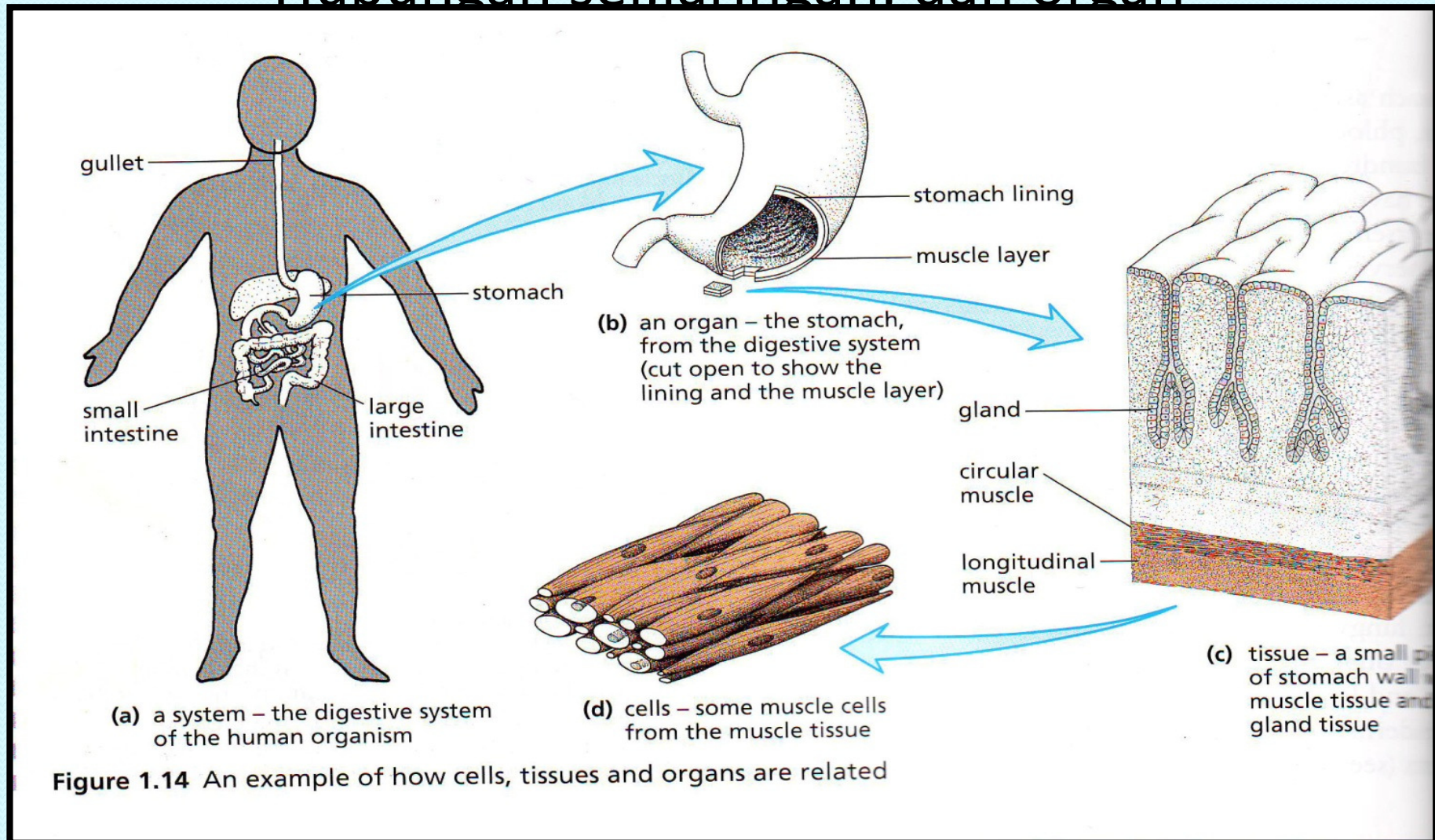


Figure 1.13 Three examples of systems in the human body



# Hubungan sel, jaringan, dan organ



**Figure 1.14** An example of how cells, tissues and organs are related