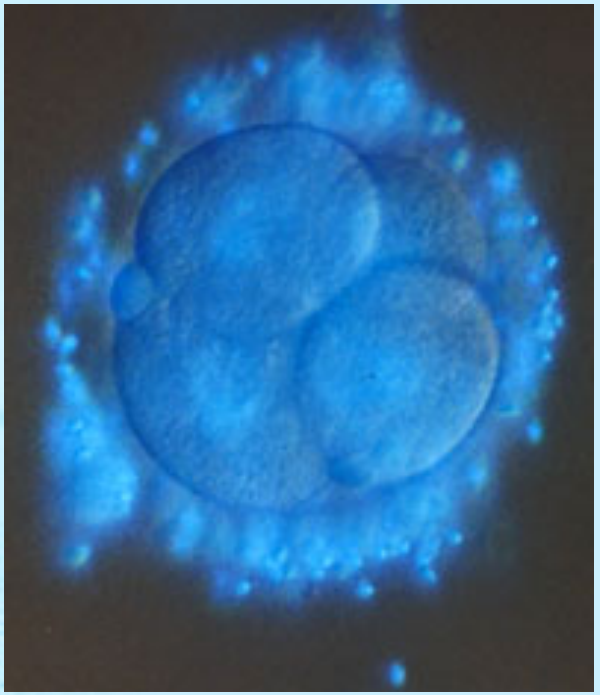
Cell Structure and Function



I. Types of Microscopes and Their Advantages and Limitations

Resolution= the ability of the microscope to show two close objects as separate in the image.

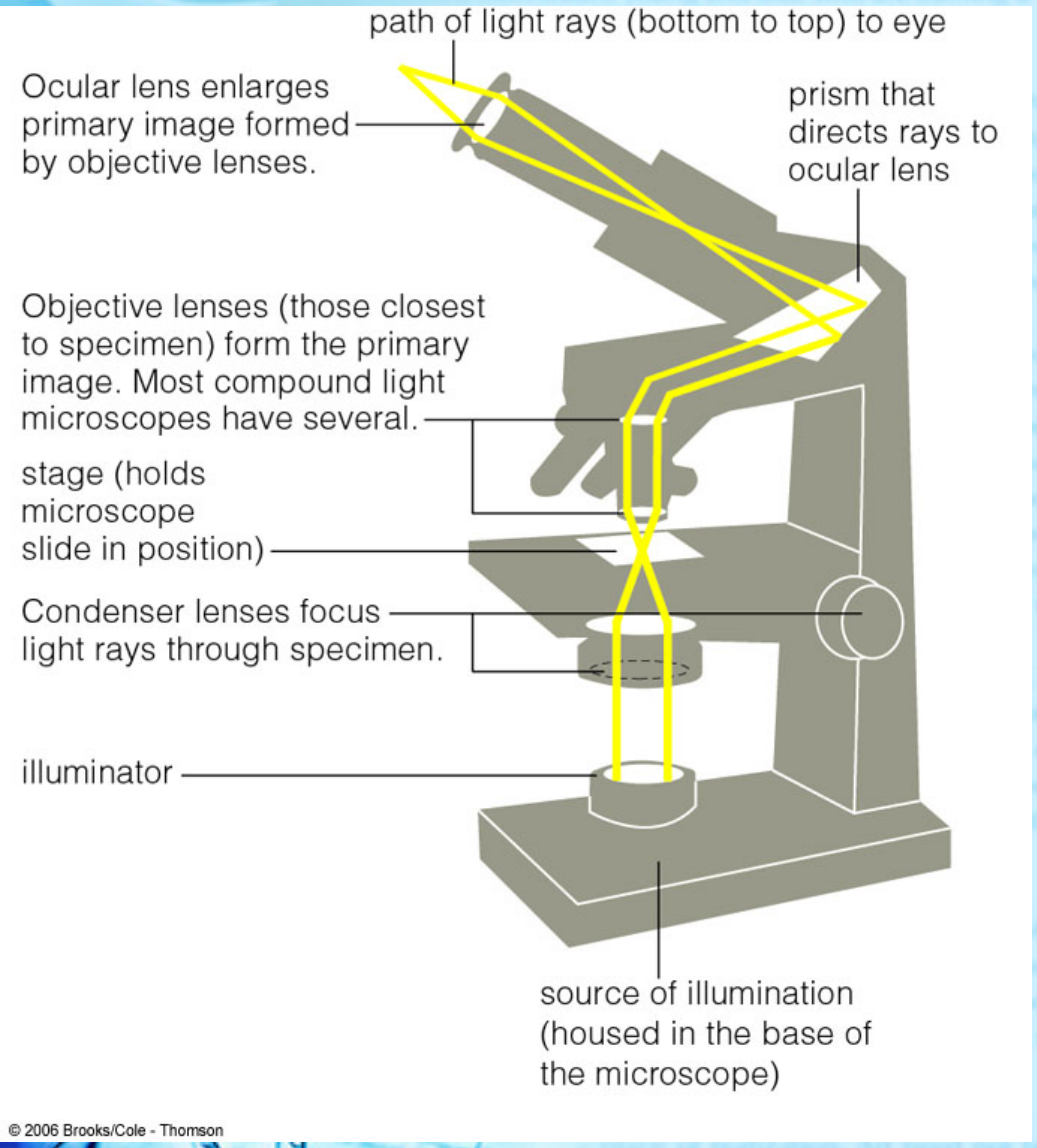
Magnification= the increase in the size of the **image** when compared to its real life size.

Light microscope

Transmission Electron Microscope (TEM)

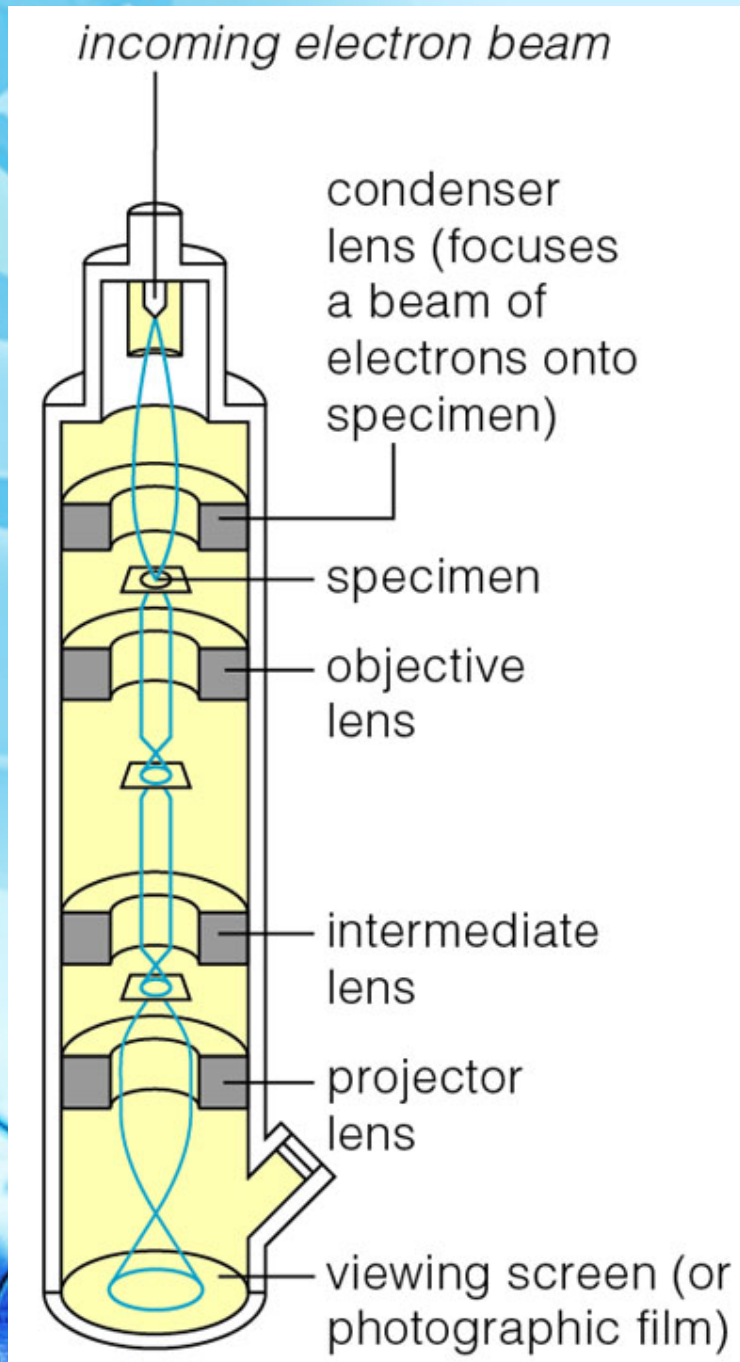
Scanning Electron Microscope (SEM)

ALGAE



© 2006 Brooks/Cole - Thomson

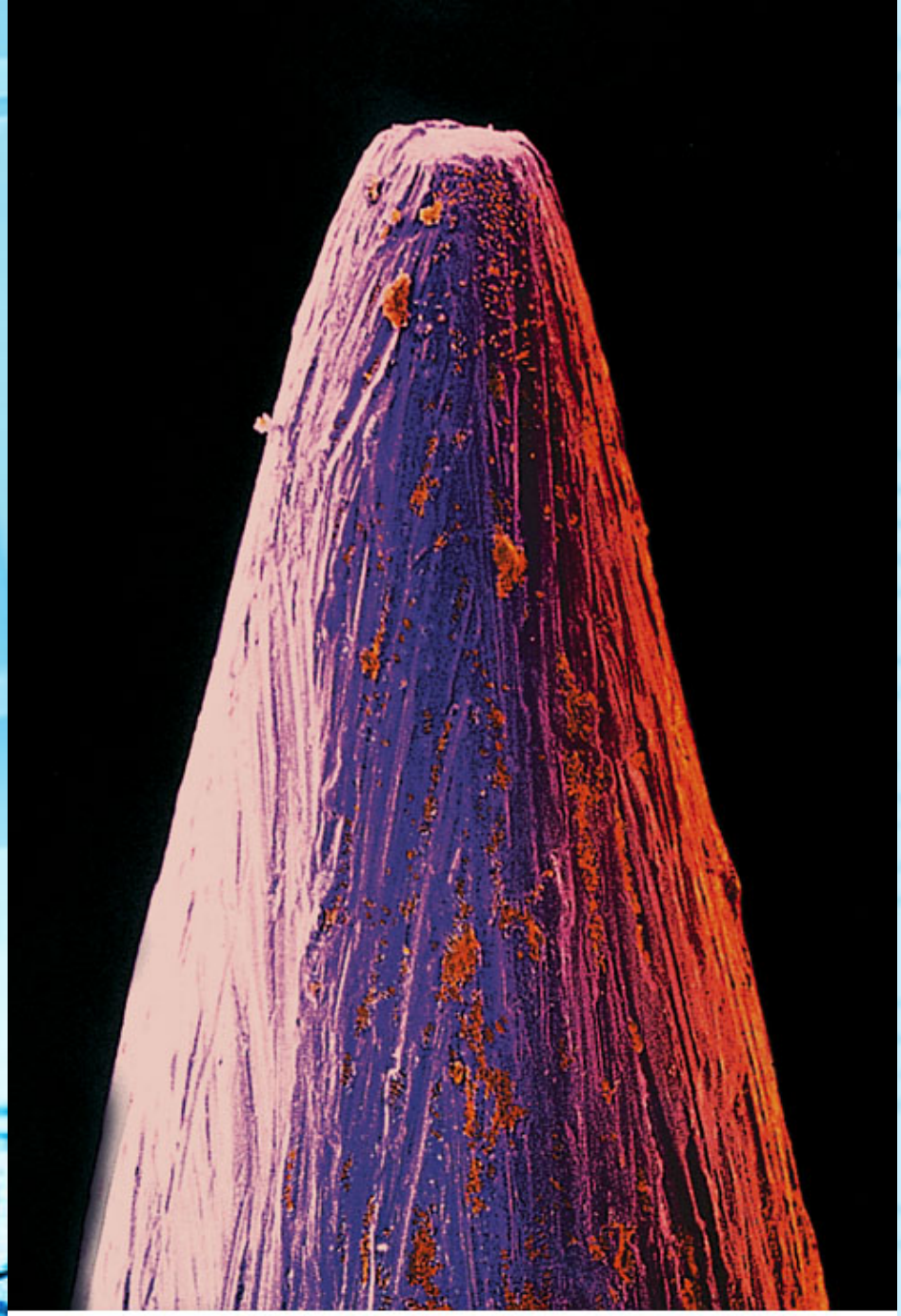
© 2006 Brooks/Cole - Thomson



© 2006 Brooks/Cole - Thomson

© 2006 Brooks/Cole - Thomson

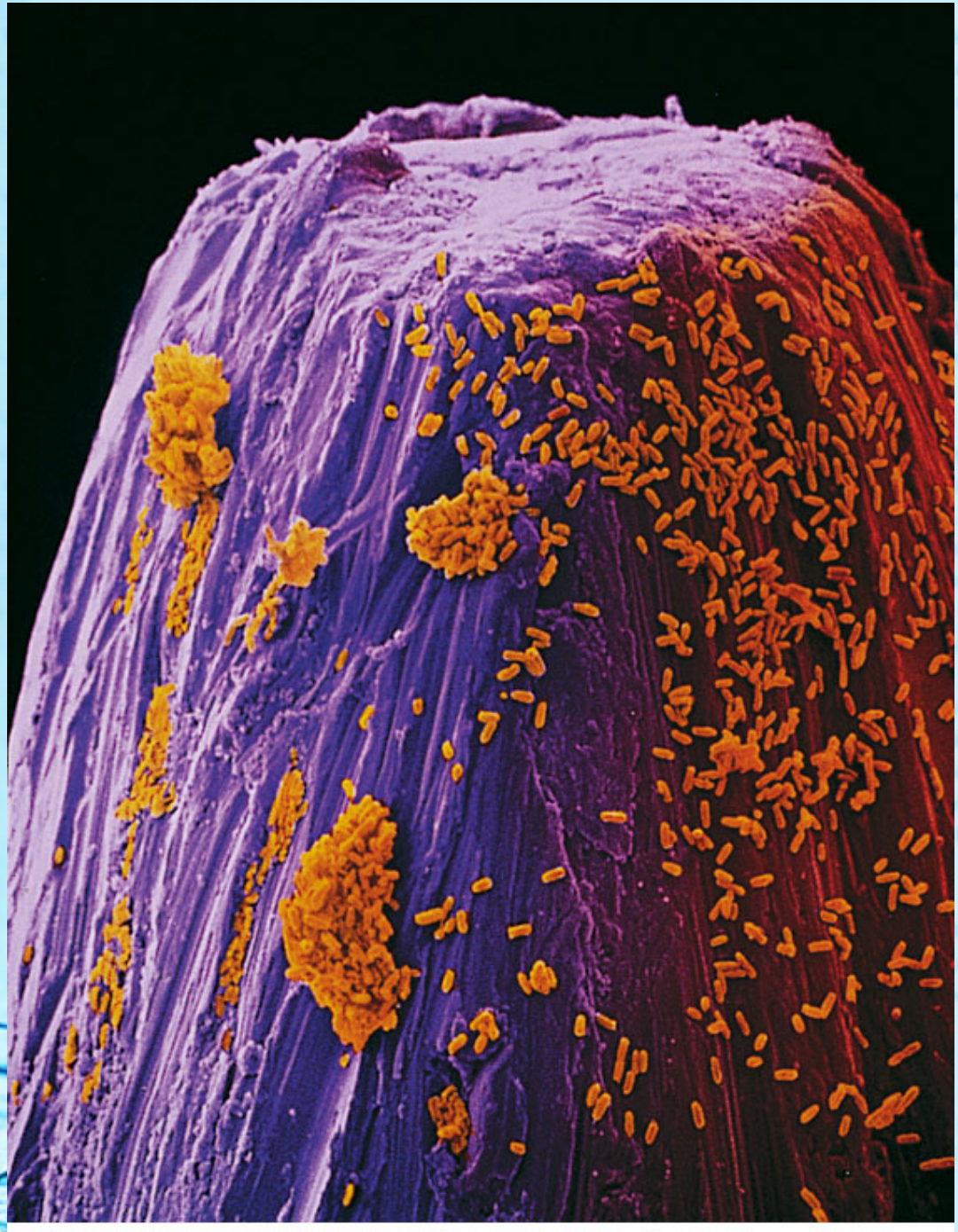
	Light	Transmission Electron Microscope (TEM)	Scanning Electron Microscope (SEM)
Energy Source			
Max. resolution			
Max. magnification			
Type of image			
Limitations	1. 2.	1. 2. 3. 4. 5. 6	
Advantages	1. 2. 3. 4. 5.	1. 2.	



© 2006 Brooks/Cole - Thomson

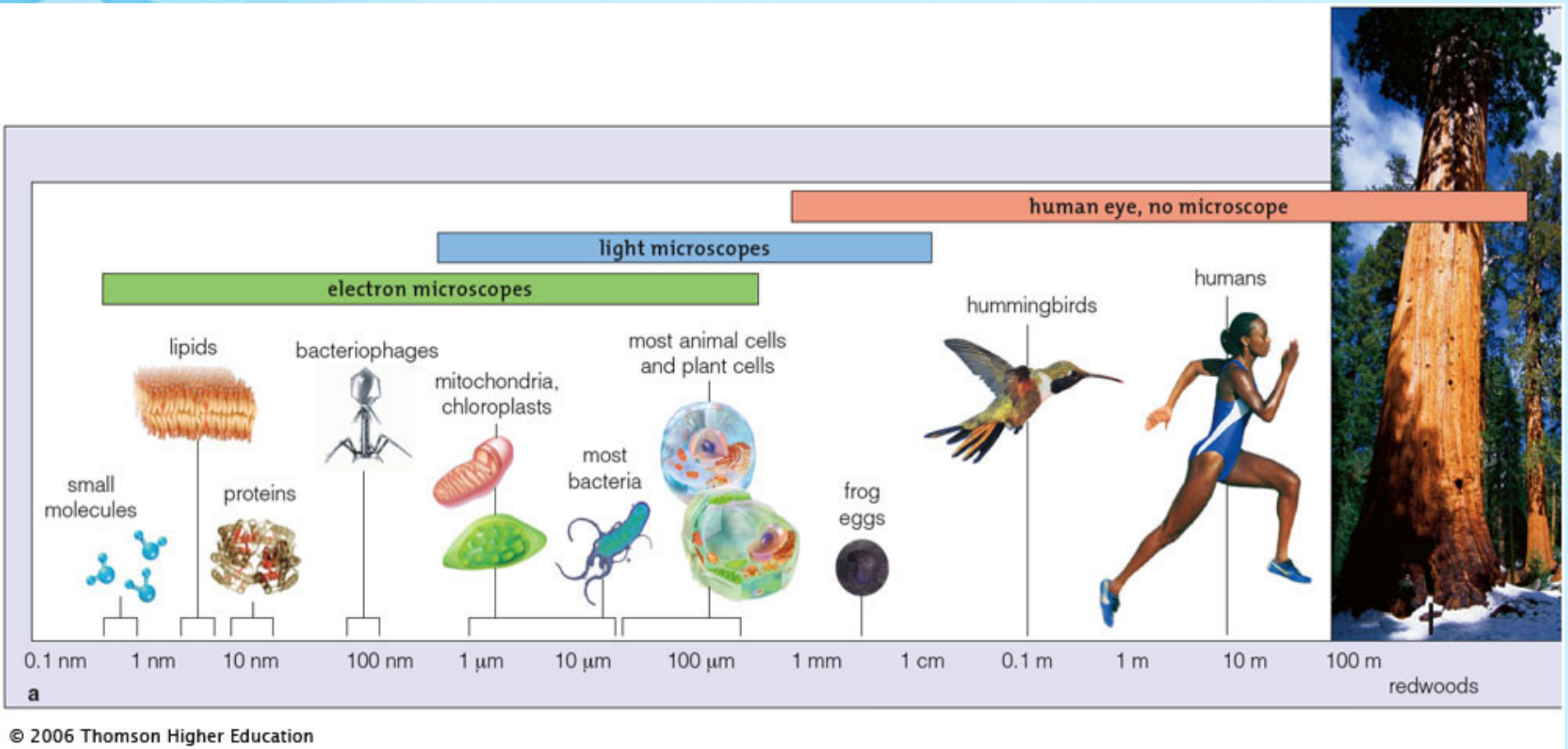
What is this?

What kind of microscope was used?



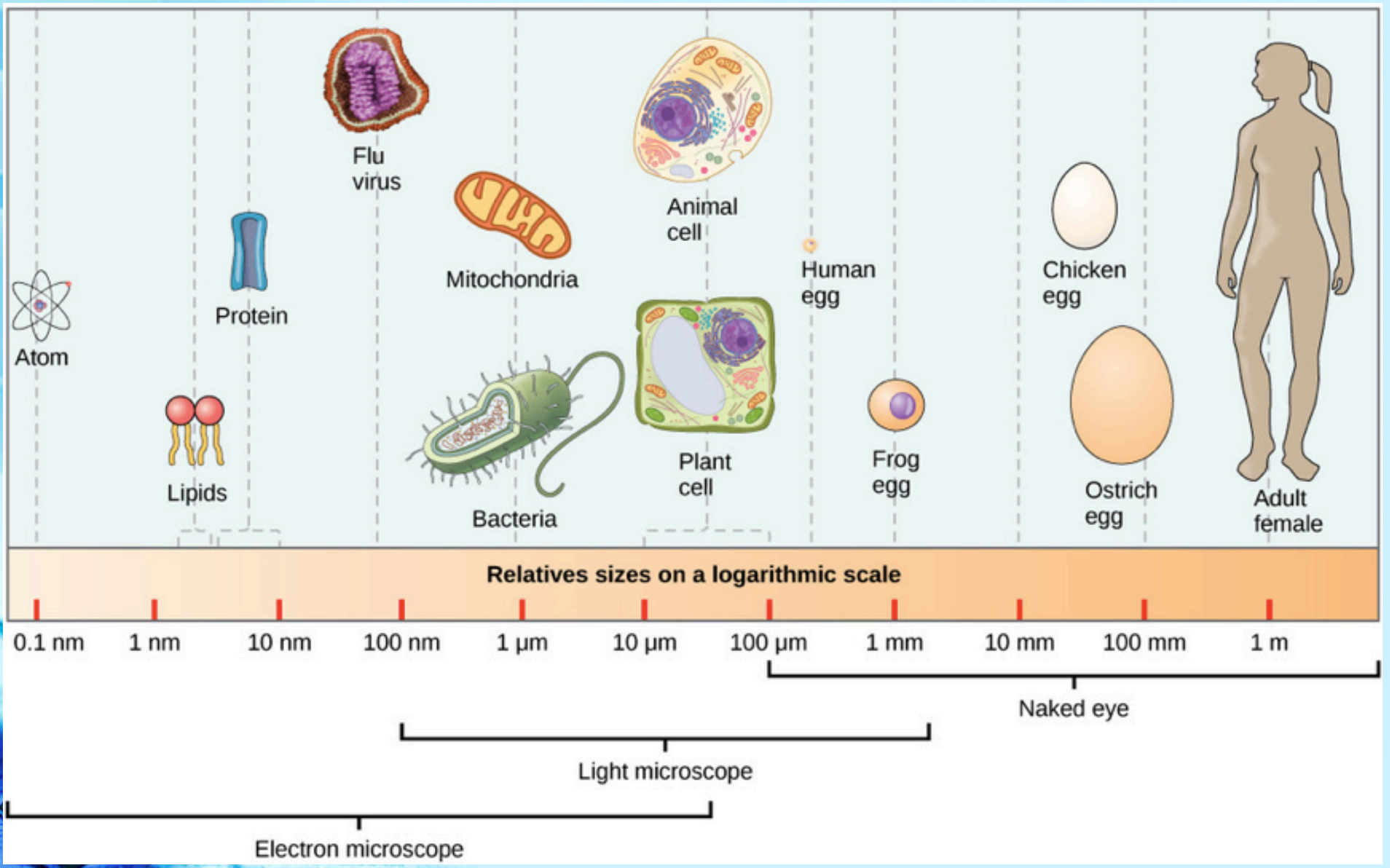
© 2006 Brooks/Cole - Thomson

© 2006 Brooks/Cole - Thomson



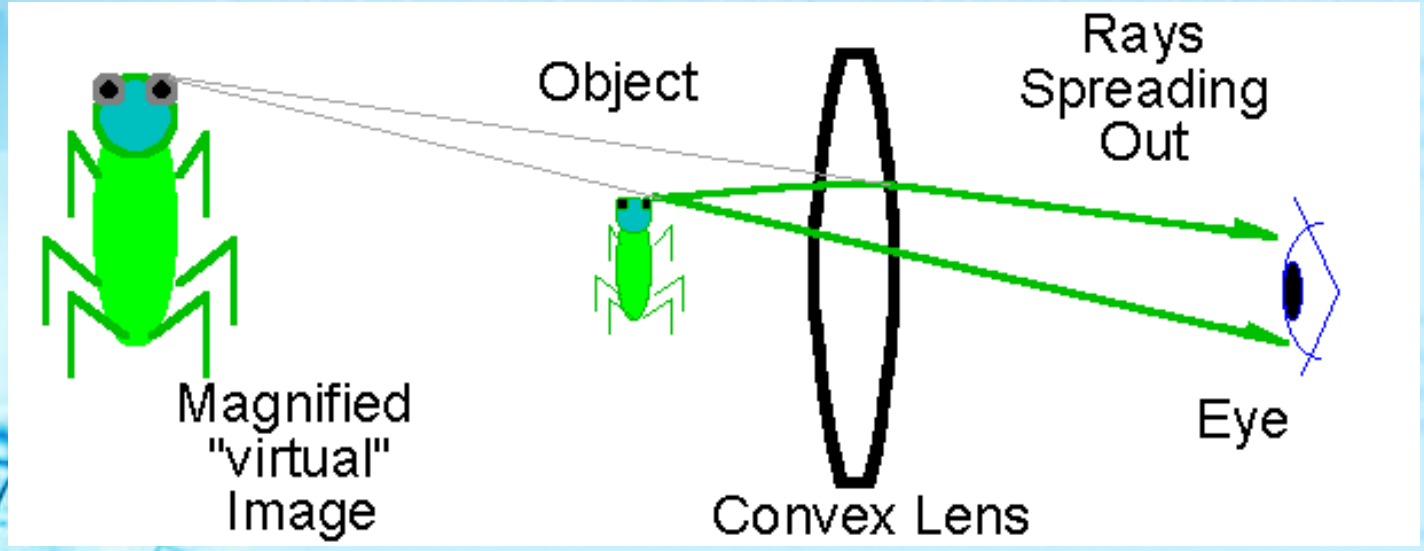
© 2006 Thomson Higher Education

Relative Sizes of Things!


Flu virus
Animal cell
Mitochondria
Protein
Human egg
Chicken egg
Atom
Plant cell
Frog egg
Lipids
Bacteria
Ostrich egg
Adult female
Relatives sizes on a logarithmic scale
0.1 nm
1 nm
10 nm
100 nm
1 µm
10 µm
100 µm
1 mm
10 mm
100 mm
1 m
Naked eye
Light microscope
Electron microscope

II. History of Cell Theory

- 1500s- Convex lenses with a magnification of about 5x

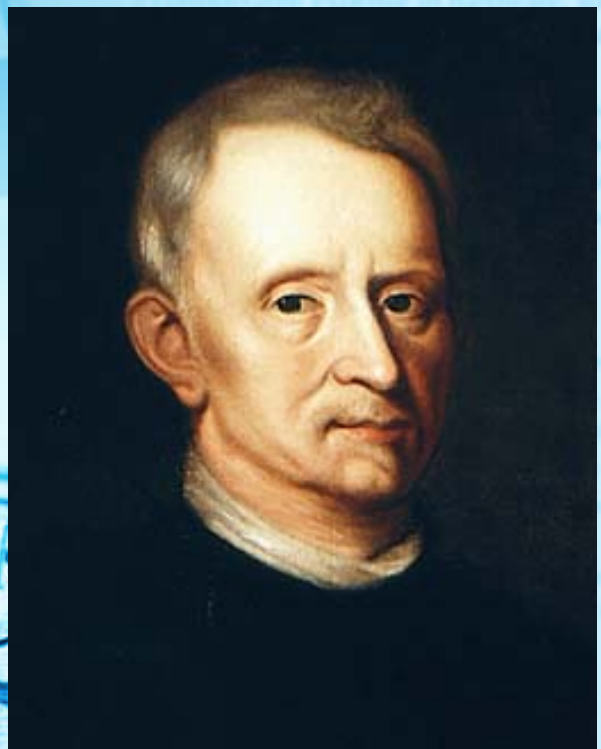


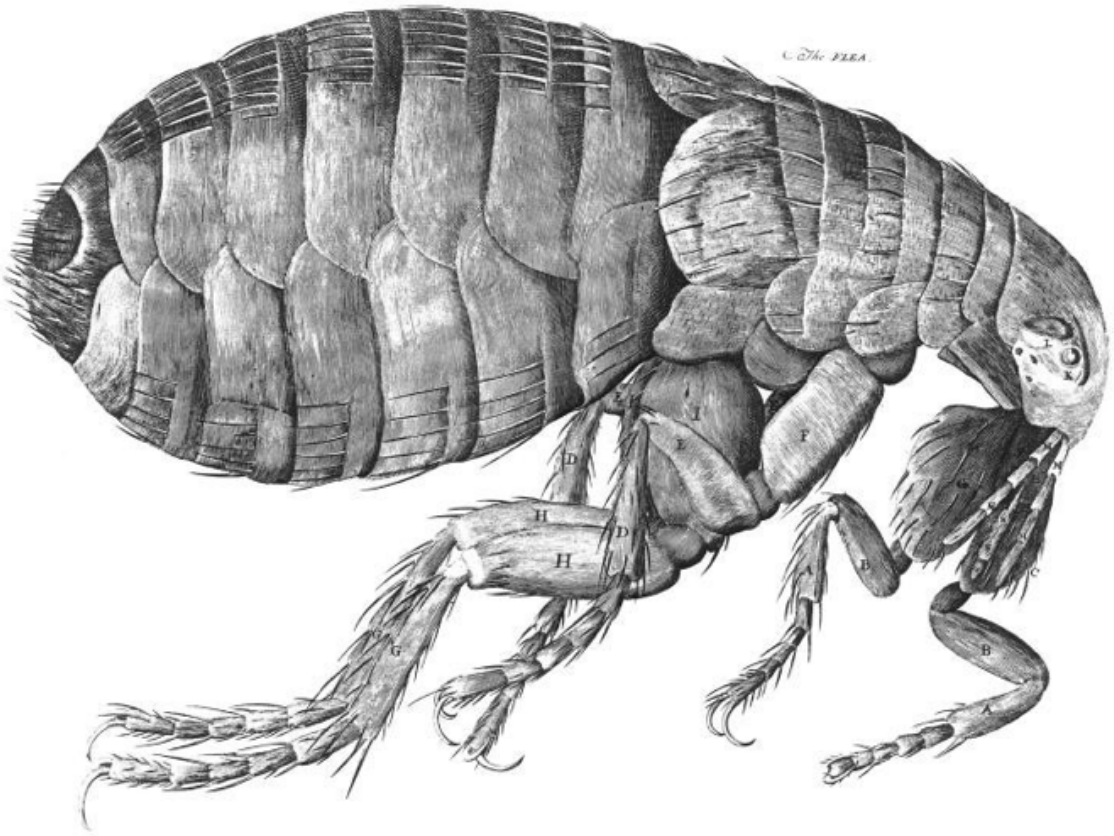
- 1590- Jansen- Dutch, invented the <u>compound</u> microscope- poor quality

FIG. 1. ZACHARIAS JANSSEN, THE INVENTOR OF THE COMPOUND MICROSCOPE. (FROM "DE VERO TELESCOPII INVENTORE.")

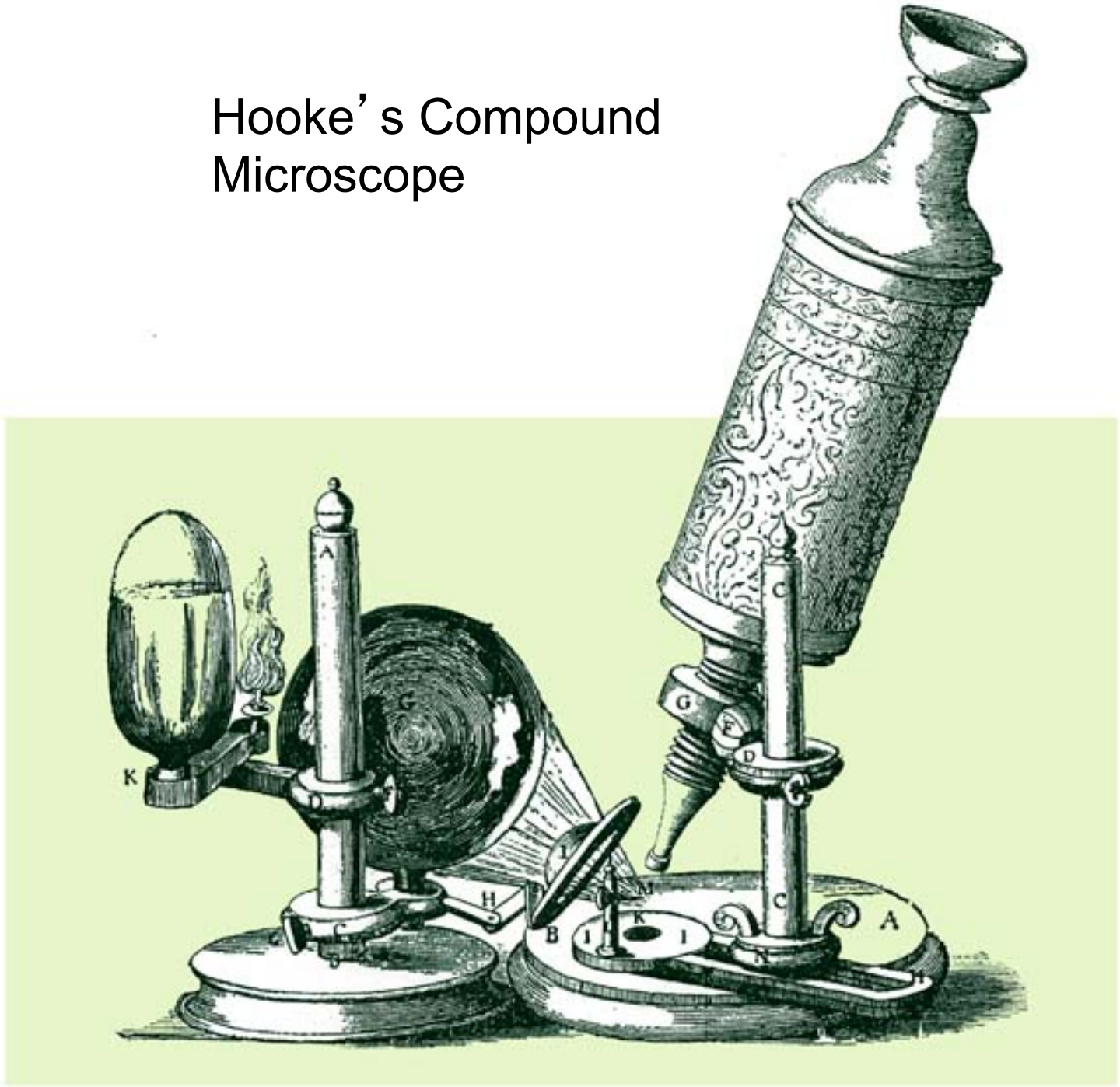
1595

- 1662- Robert Hooke- English physician, observed “dead” cork cells
- 1665- Hooke published sketches

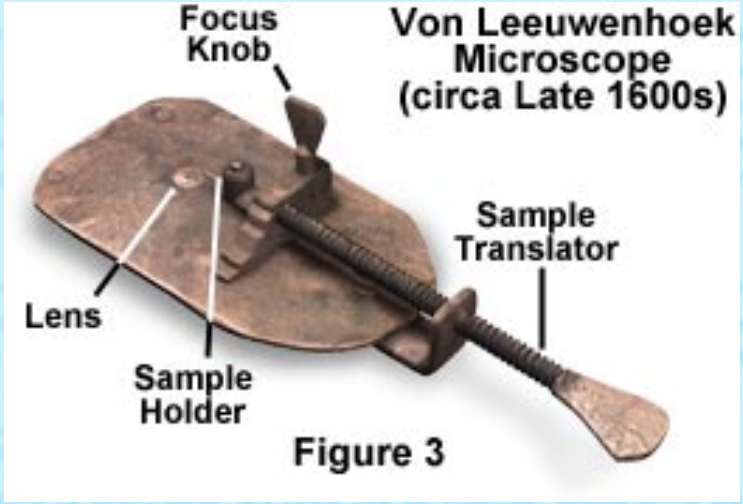



The FLEA.

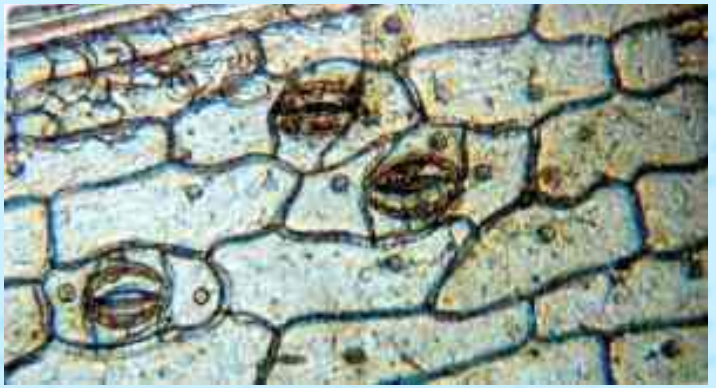
Hooke's Compound Microscope



- C. 1673- Antony van Leeuwenhoek- Dutch microscope maker and merchant, observed and described *living* microscopic (and many unicellular) organisms

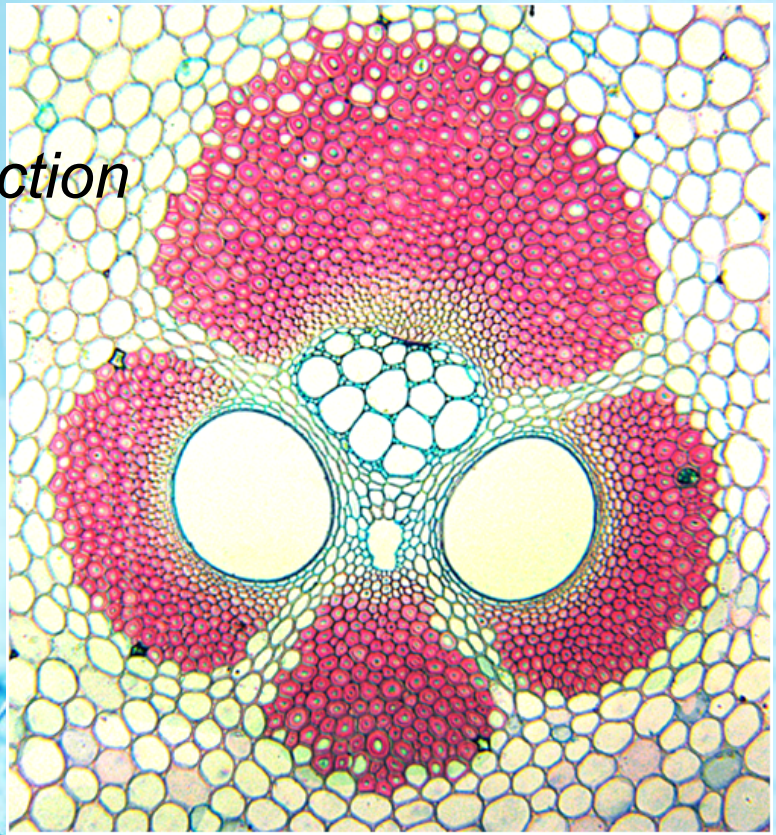


- 1838- Robert Brown- Scottish physician and botanist, named the *nucleus* and noted its presence in all cells



- 1838- Matthais Schleiden- German botanist, declared all PLANTS made of cells, 1 of 3 credited with the origination of the cell theory.

Bamboo Cross section



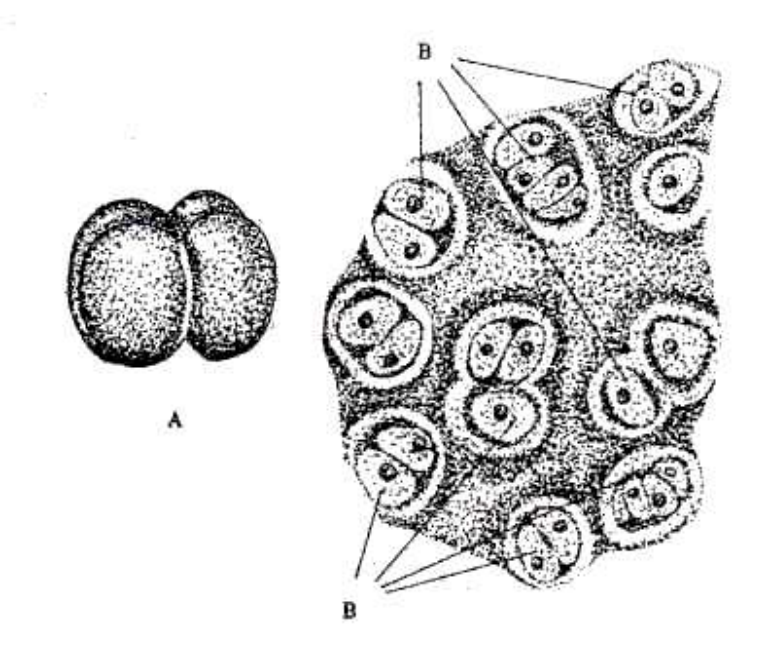
Library of Congress

- 1839- Theodor Schwann, German zoologist declared all ANIMALS made of cells, 1 of 3 credited with the origination of the cell theory.

Library of Congress

- 1855- Rudolph Virchow- German physician and professor, he popularized cell theory and was the 3rd man associated with cell theory.

"Think microscopically."

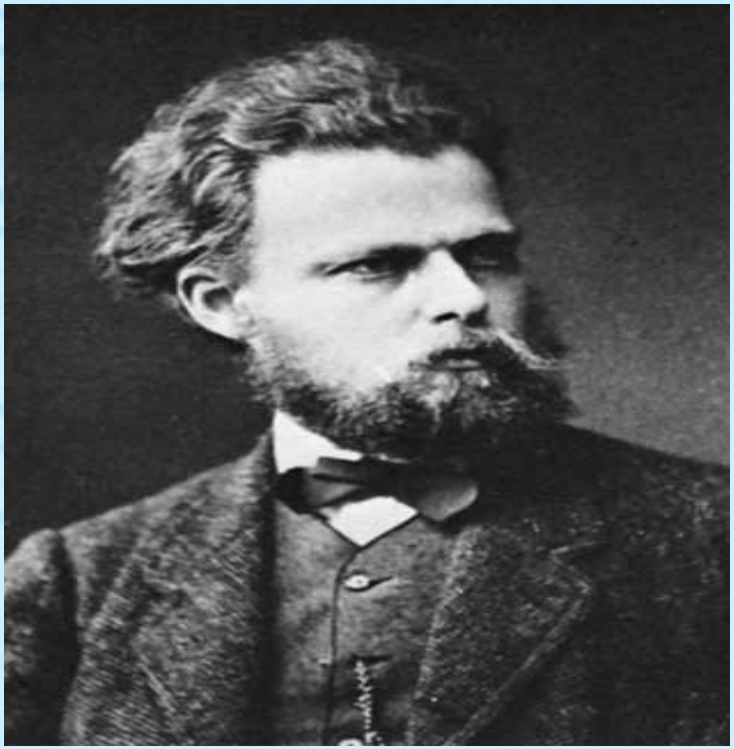


Omnis cellulae e cellulae.

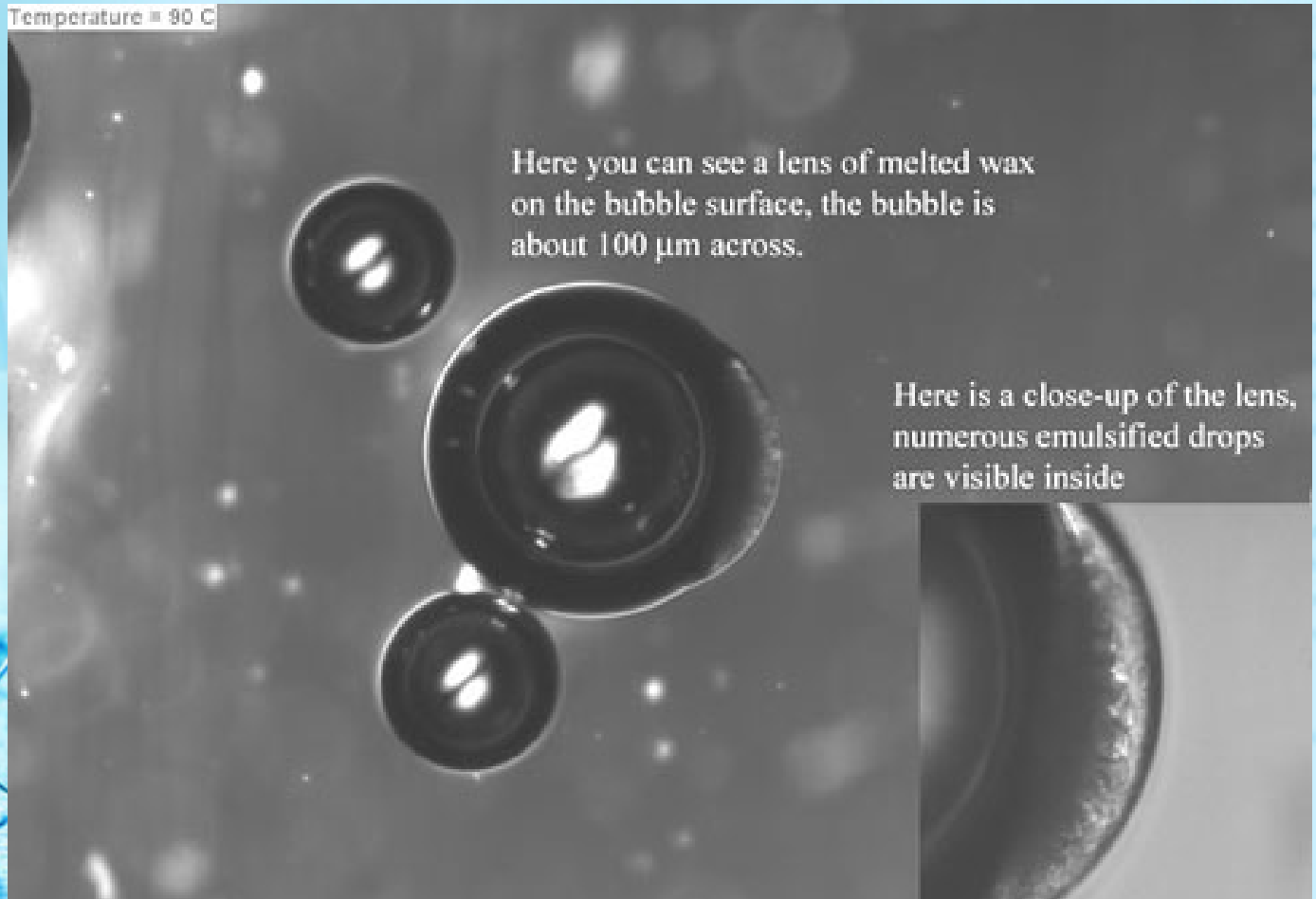
All cells come from pre-existing cells.

- 1880-August Weismann- German biologist.

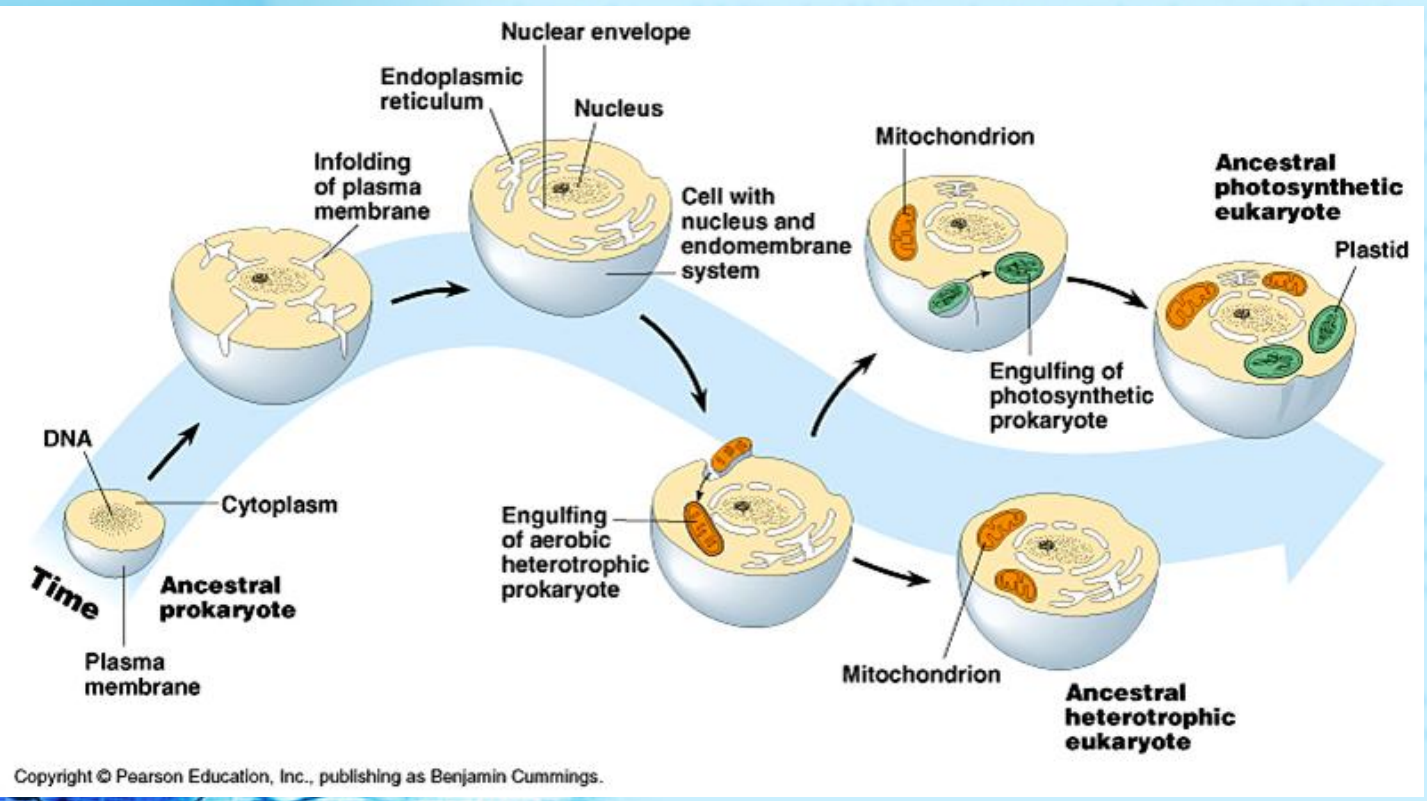
- Germ cells are the root of all inheritance.
- All traits of offspring, are determined at beginning of life. No soft inheritance.



- 1931- Janet Plowe- American scientist, cell membranes are a physical structure- NOT an interface between 2 liquids



- 1970- Lynn Margulis- American scientist, certain organelles were once free-living organisms themselves.



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

III. Cell Theory

- All living things are composed of cells or cell products.
- Only the division of pre-existing cells forms new cells.
- The cell is the minimal or fundamental unit of life; the chemical reactions of life take place in cells.

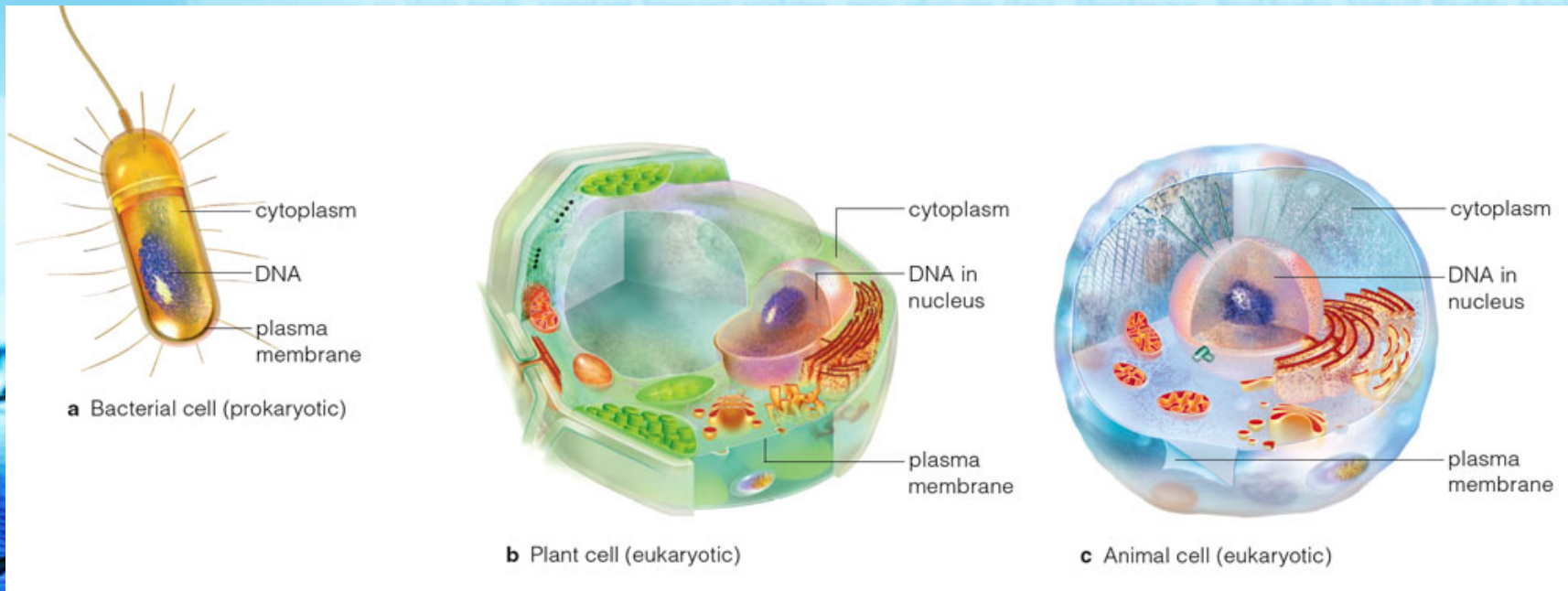
IV. Cell Types

- PROKARYOTIC
- Pro = before
- Karyo = nucleus
- Bacteria

- EUKARYOTIC
- Eu = true
- Karyo = nucleus
- Animals, Plants, Fungi, Protists

V. Cell Comparisons

- Excellent table on page 199 in textbook for review.
- Check your illustrations and functions as we complete the table!



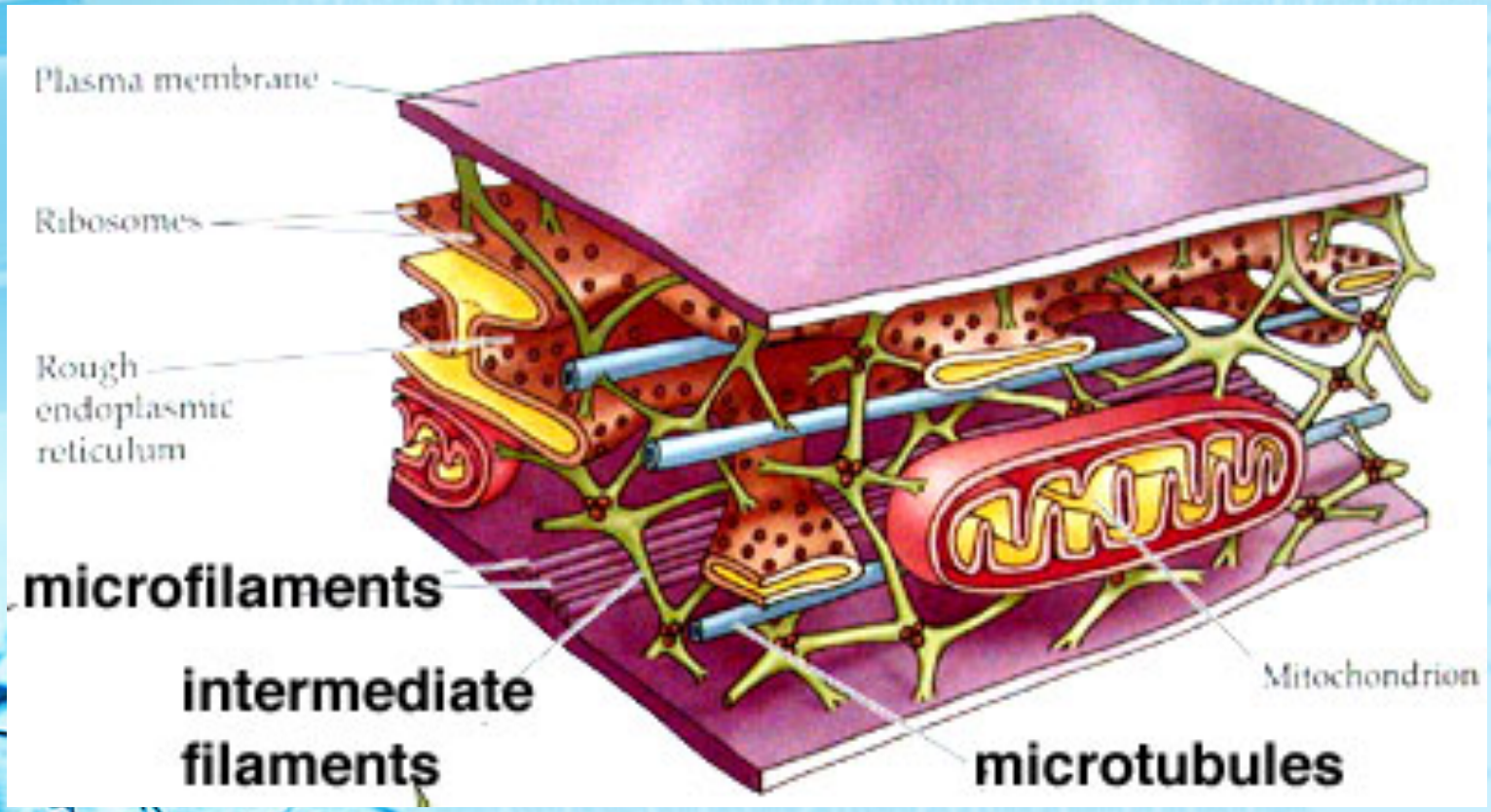
Cell Feature/ Cell Type	Prokaryotic	Eukaryotic	
		Plants	Animals
Typical size			
Type of genetic material			
Location of genetic material		*	*
Cell Membrane			
Cytoplasm			
Ribosomes			
Cell Wall			
Capsule			

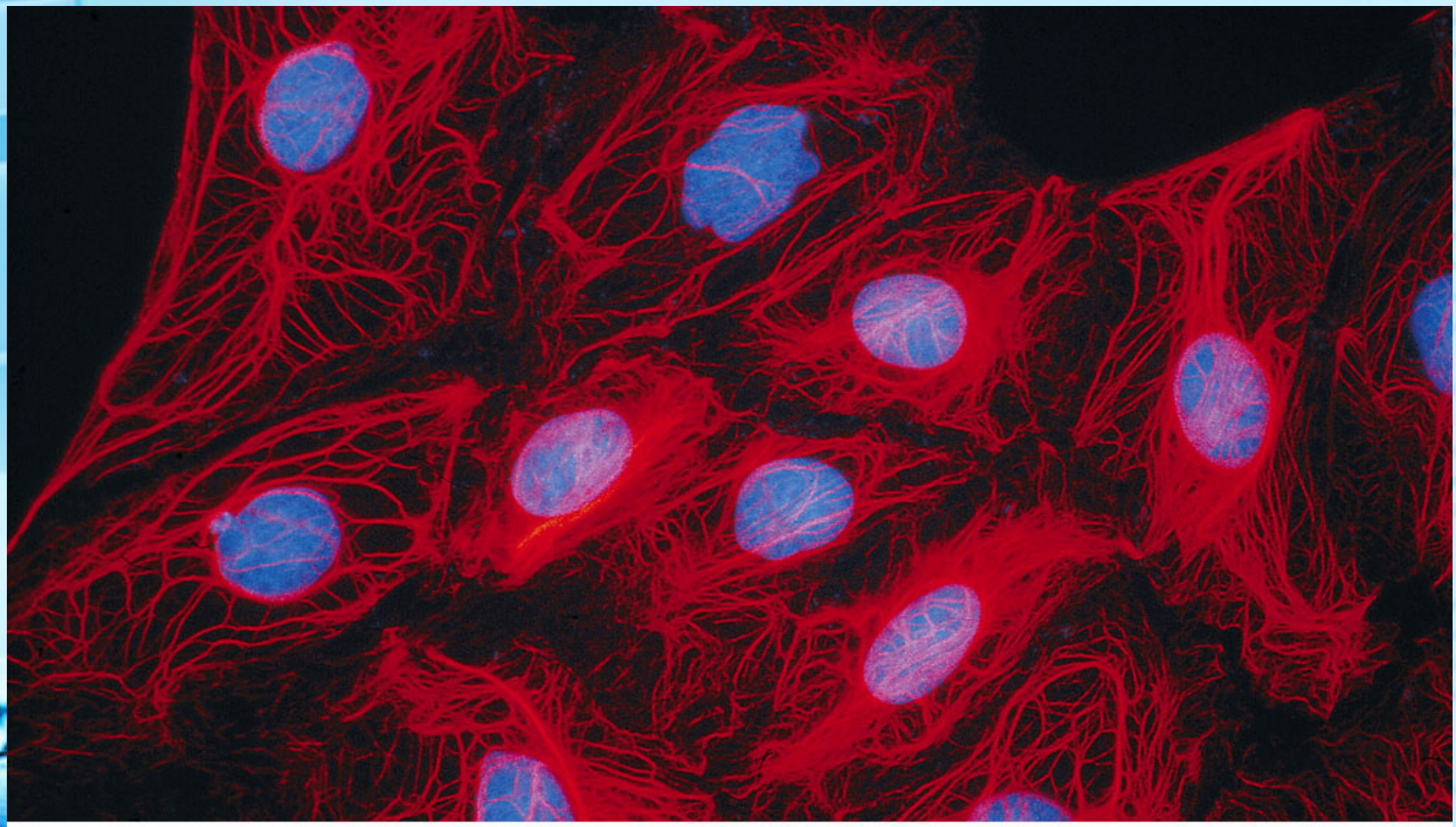
Table continued….

Cell Feature/ Cell Type	Prokaryotic	Eukaryotic	
		Plants	Animals
*Mitochondria (pl)			
*Chloroplasts			
Single membrane bound organelles RER SER Golgi app. Lysosome Central vacuole			
Centrioles			

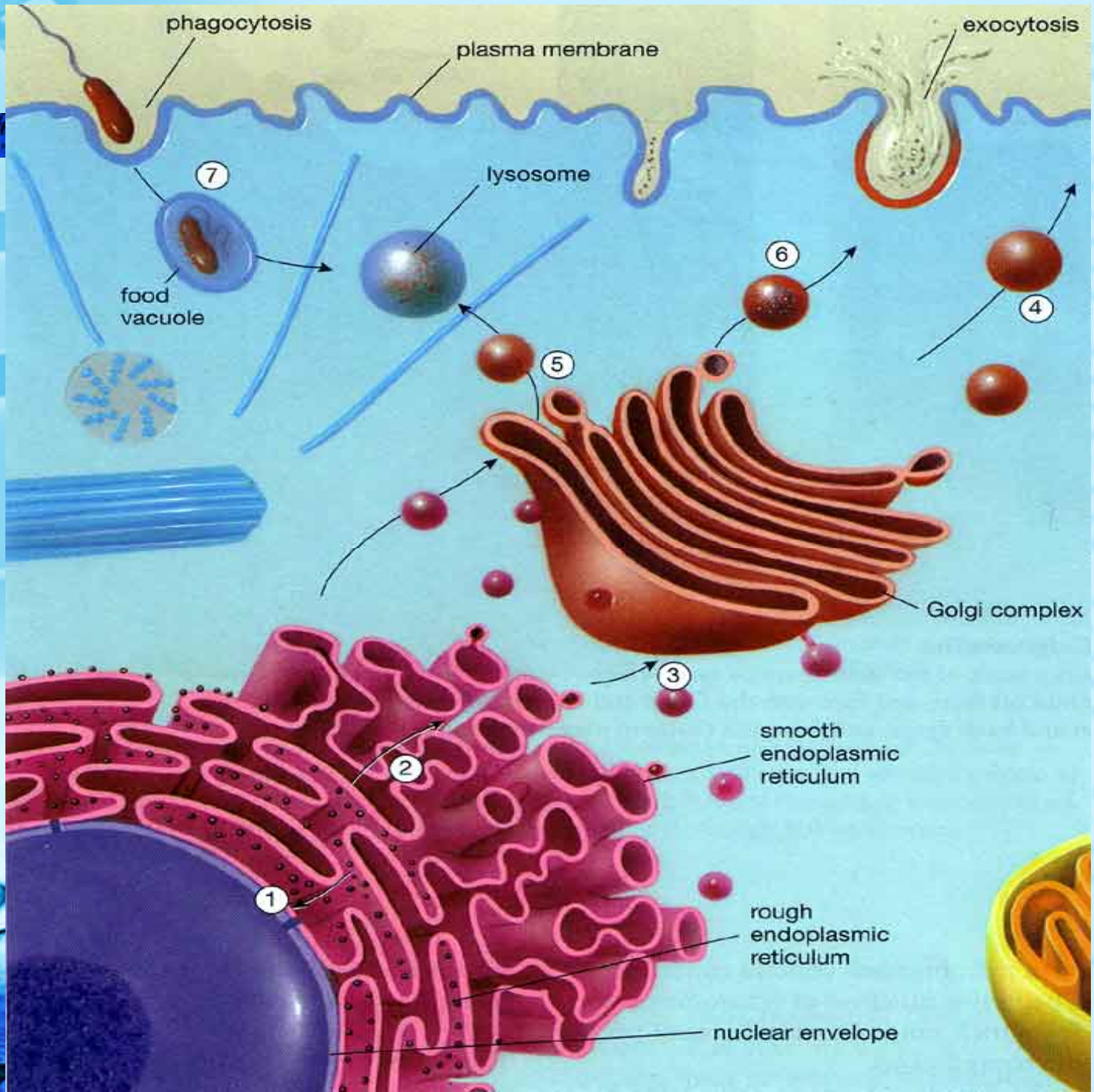
VI. Other Special Features

- Cytoskeleton





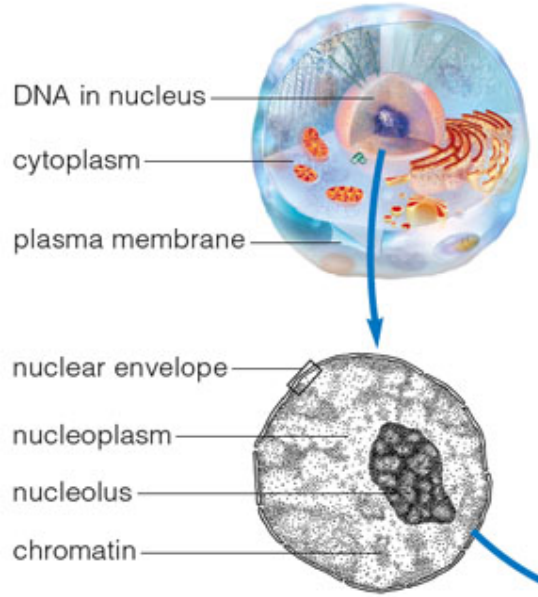
© 2006 Brooks/Cole - Thomson

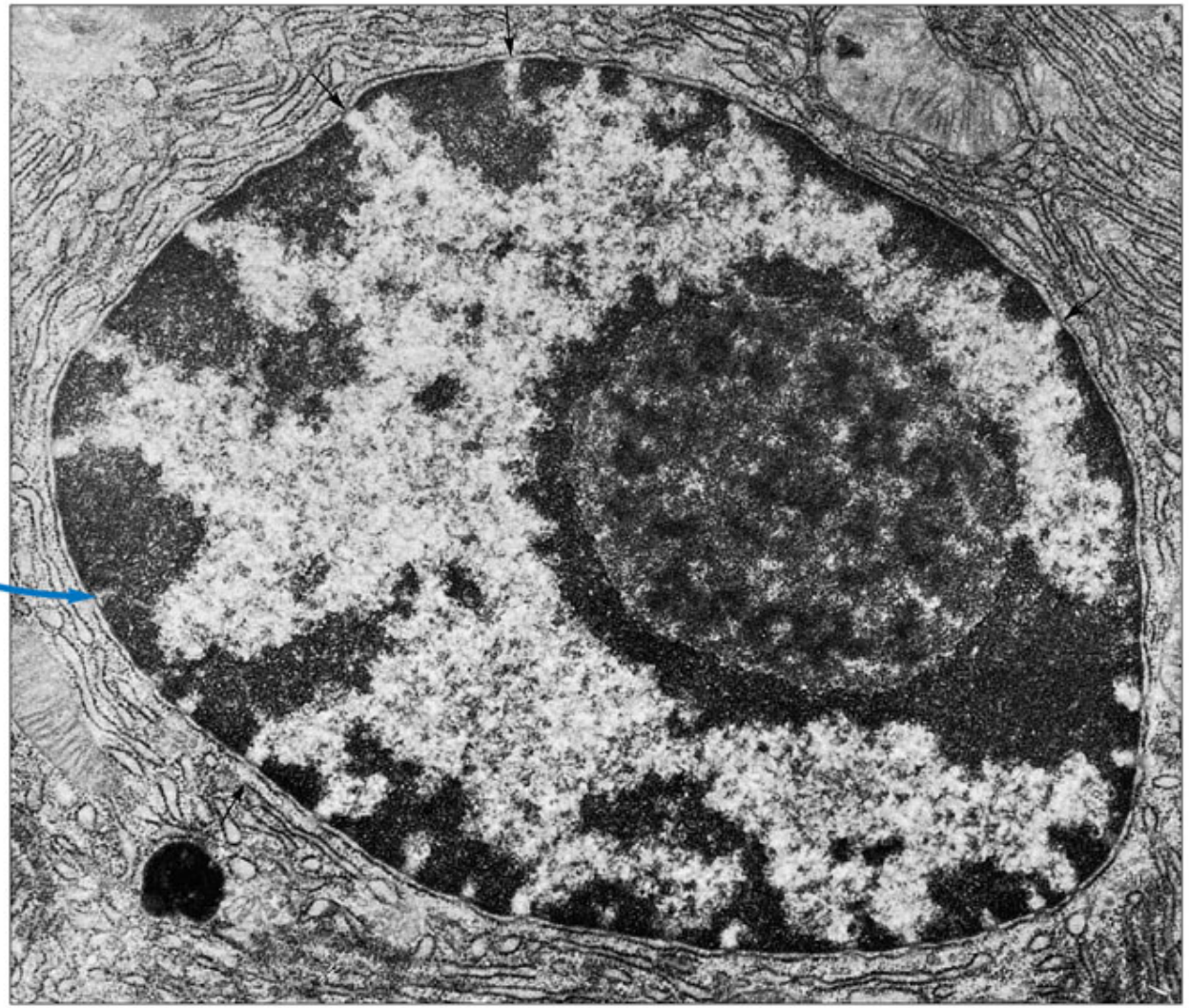

phagocytosis
plasma membrane
exocytosis
7
lysosome
food
vacuole
6
4
5
Golgi complex
3
smooth
endoplasmic
reticulum
2
1
rough
endoplasmic
reticulum
nuclear envelope

Cell Related Definitions

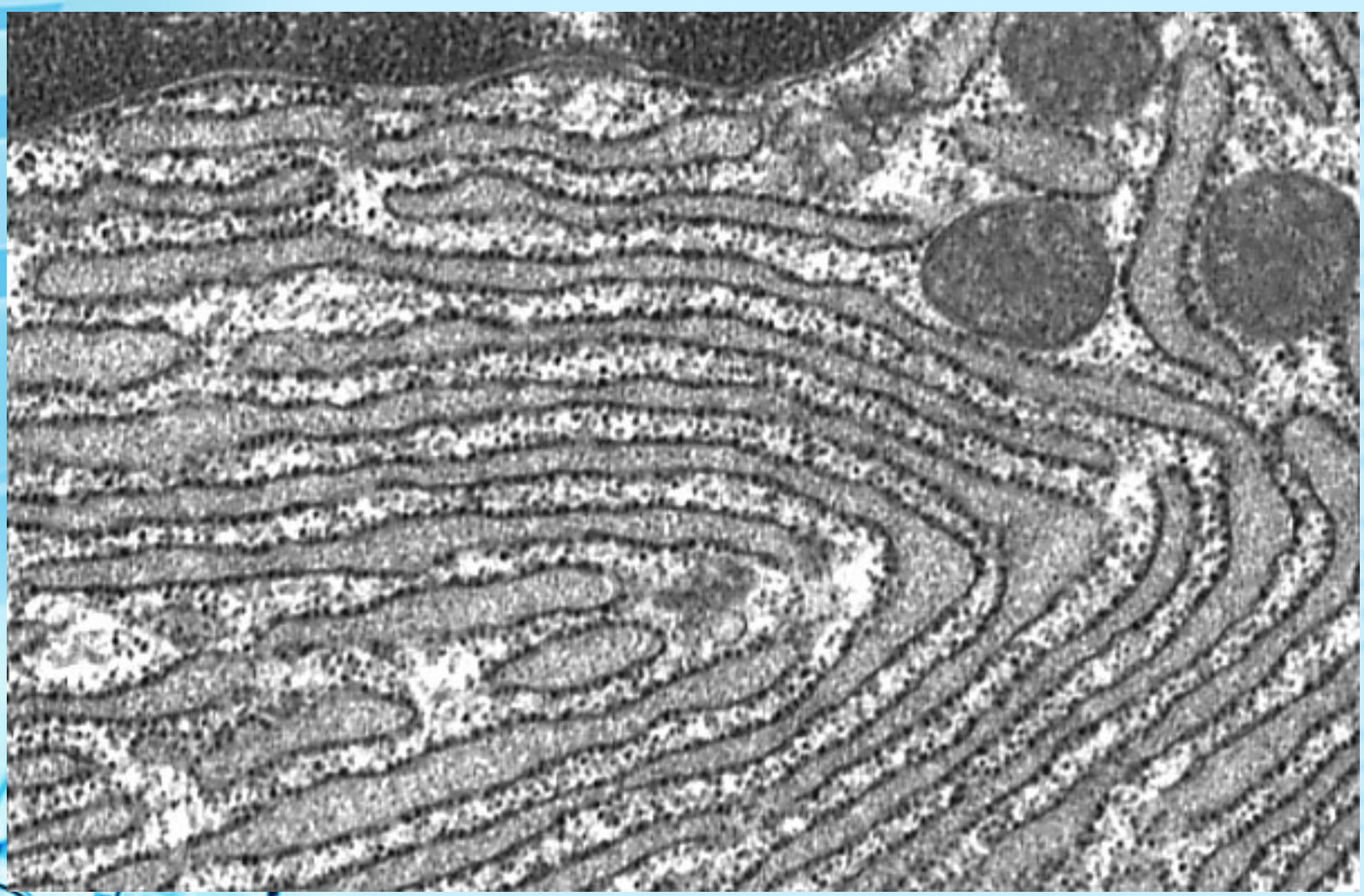
- Organelle: specialized structures that carry out specific functions within a cell.

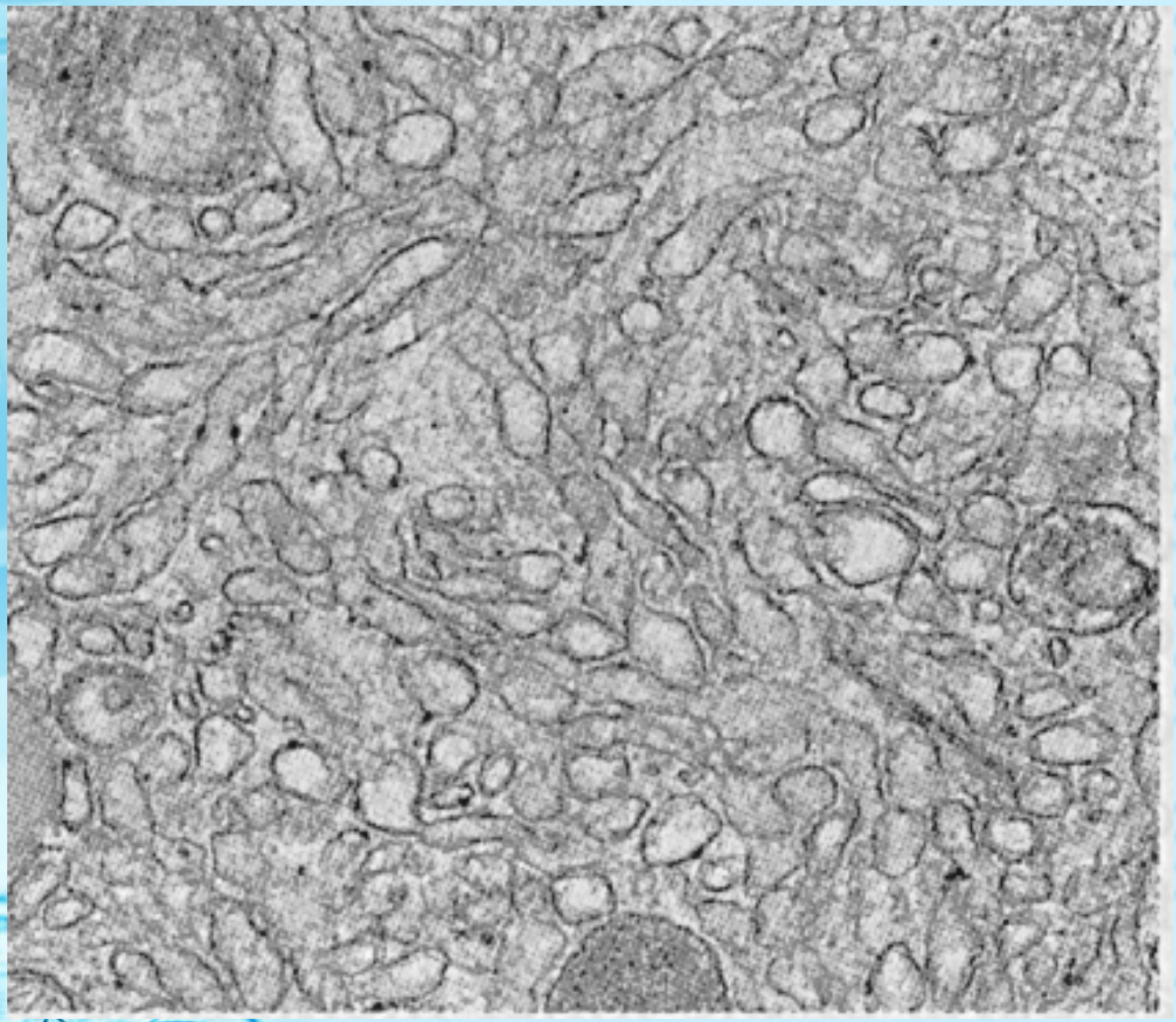
- Tissue: A mass of similar cells within an organism that perform a specific function.

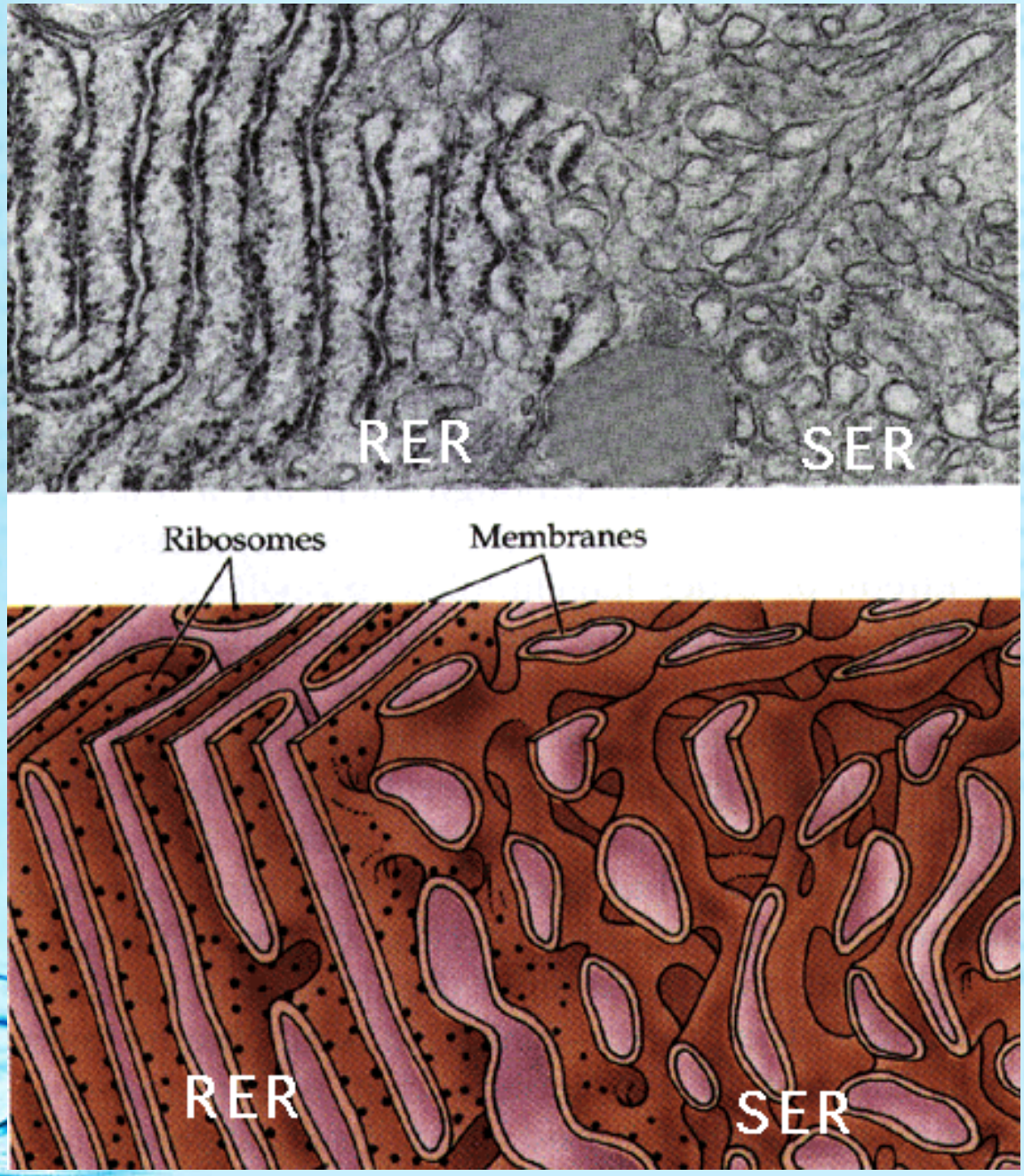


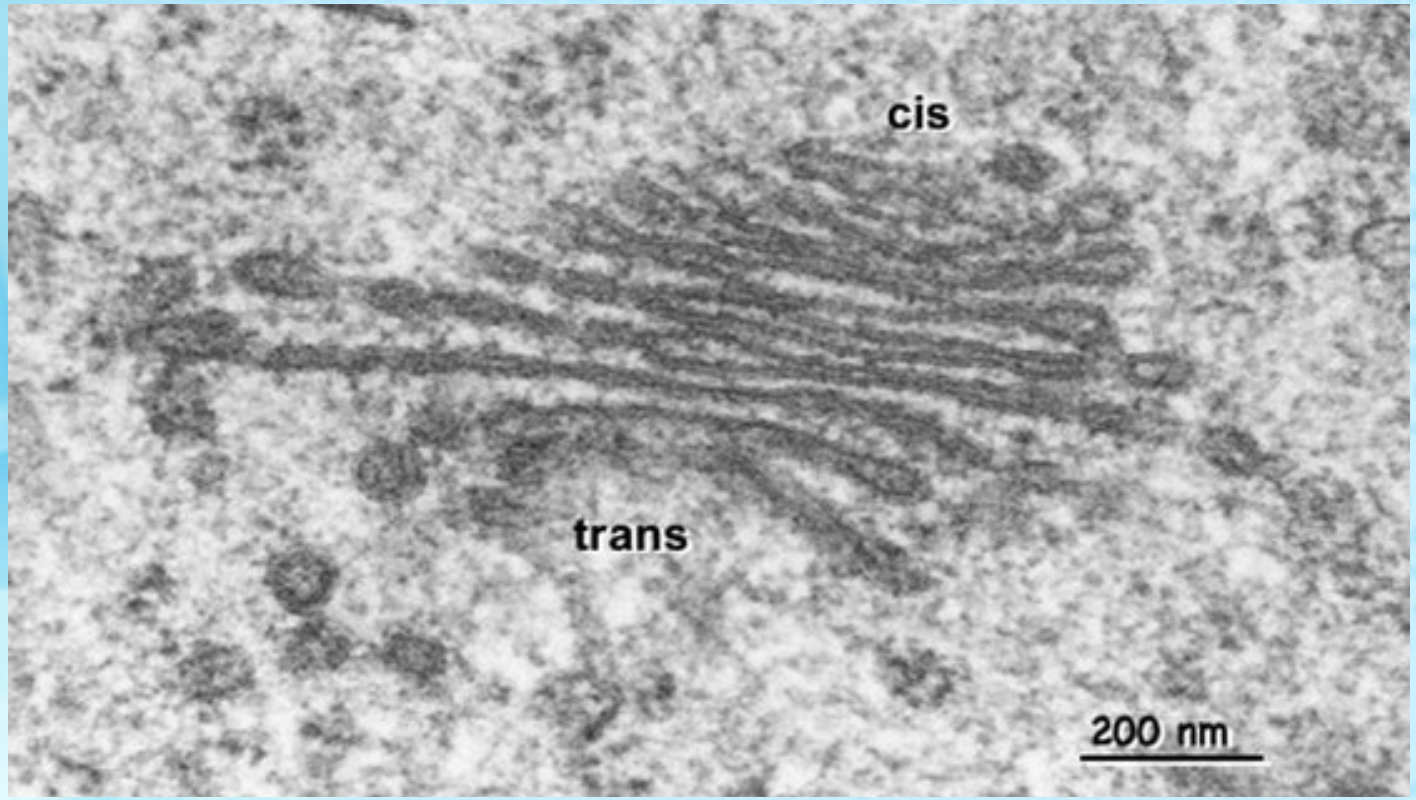


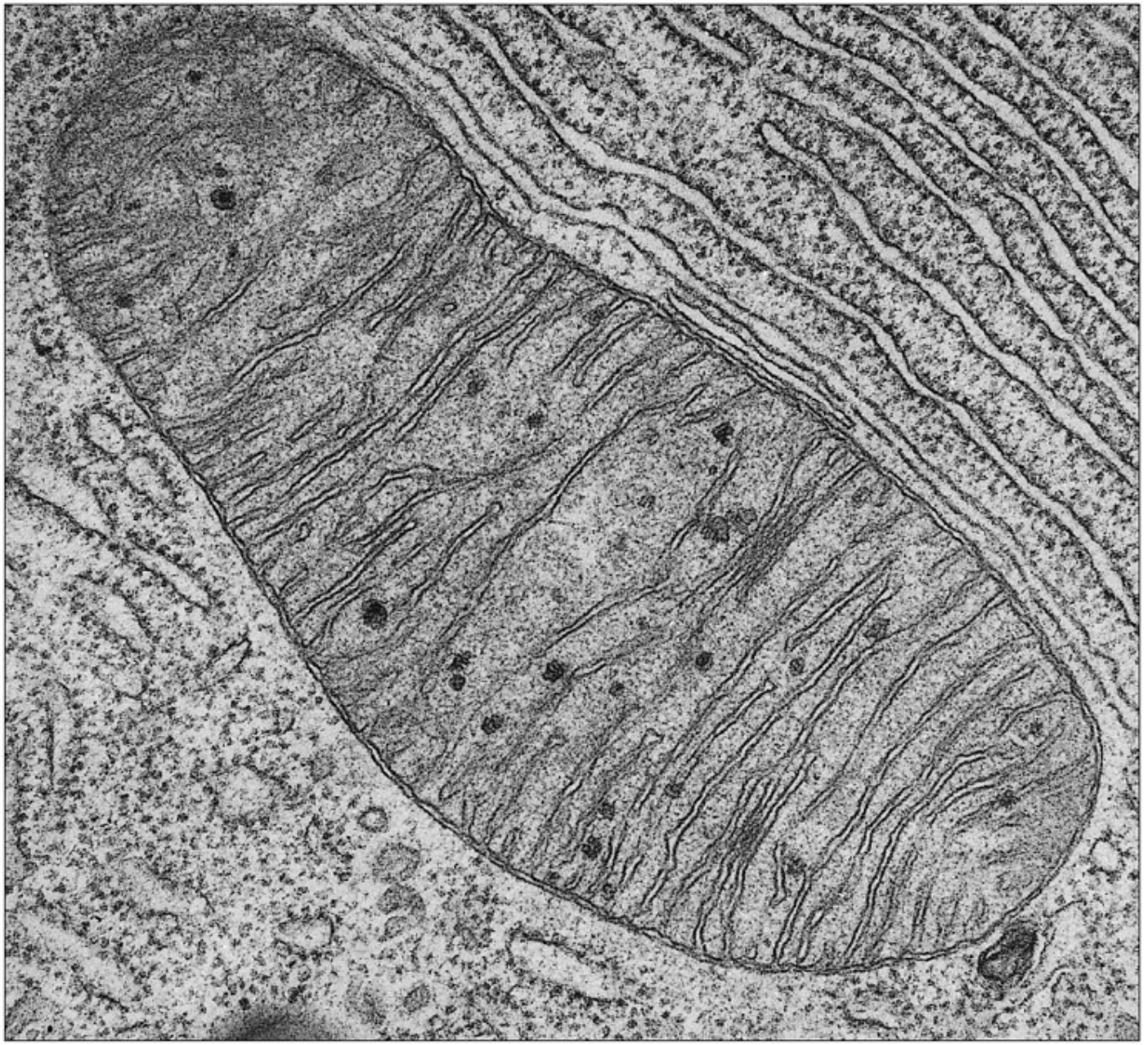
© 2006 Thomson Higher Education





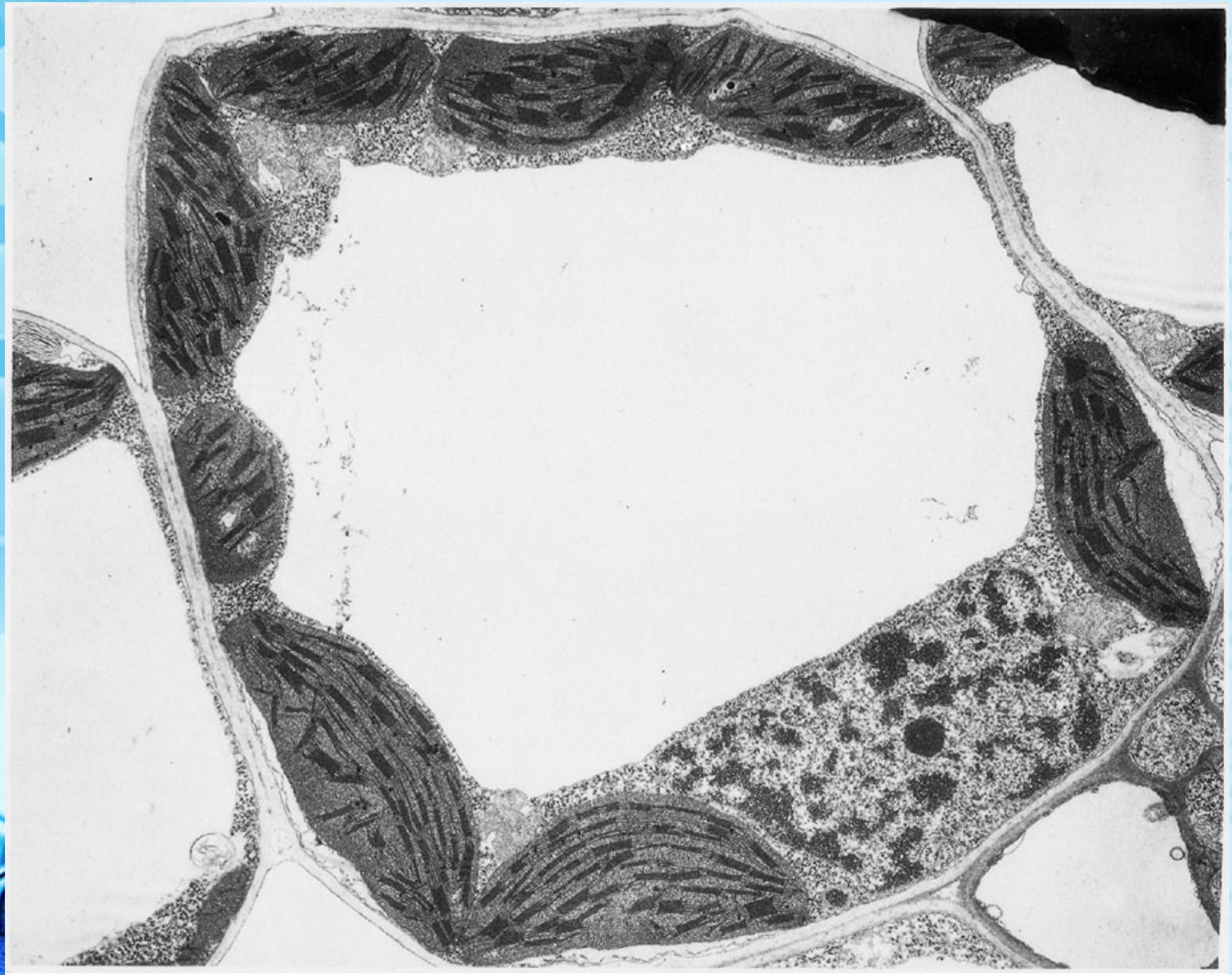

RER
SER
Ribosomes
Membranes
RER
SER


cis
trans
200 nm

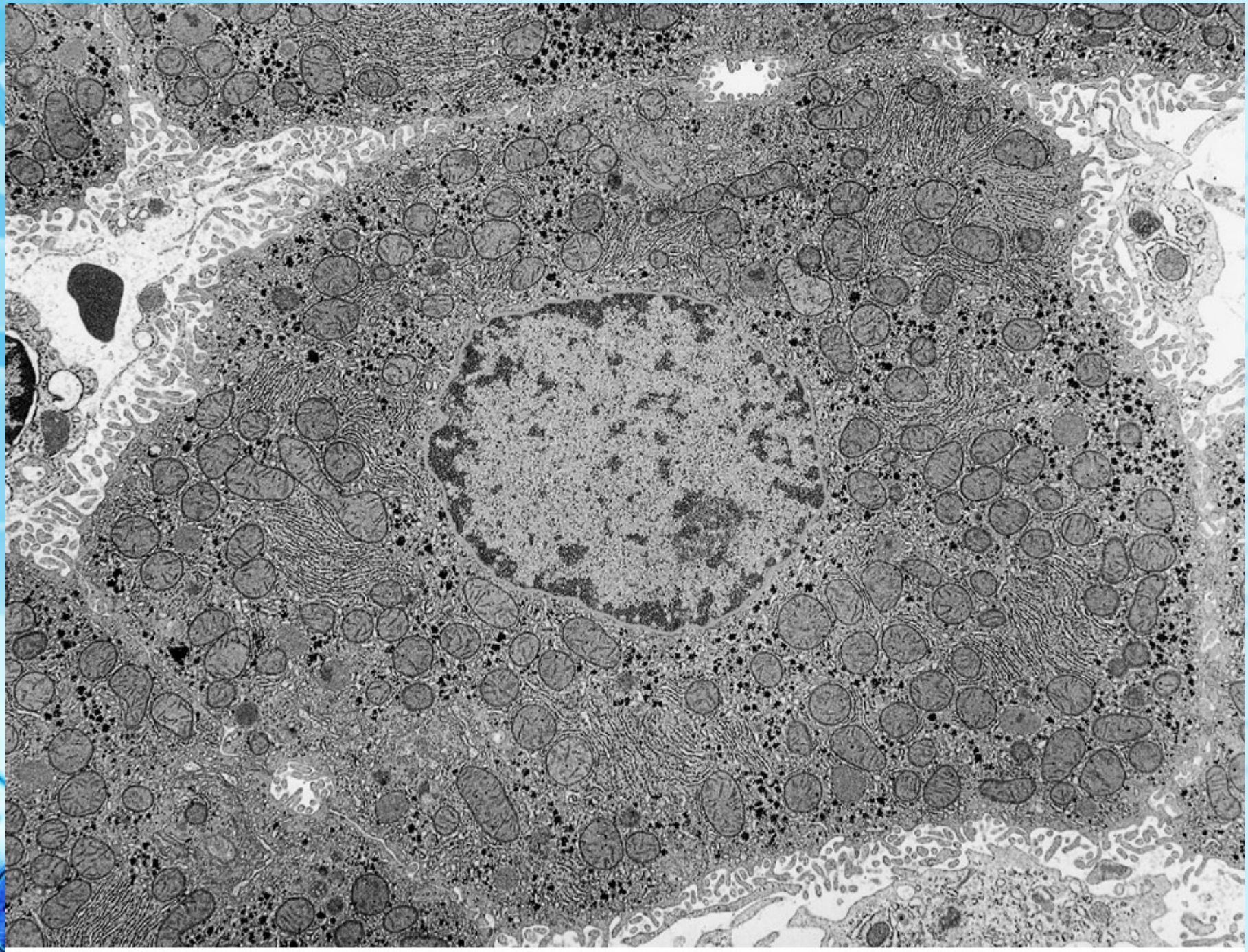


© 2006 Thomson Higher Education

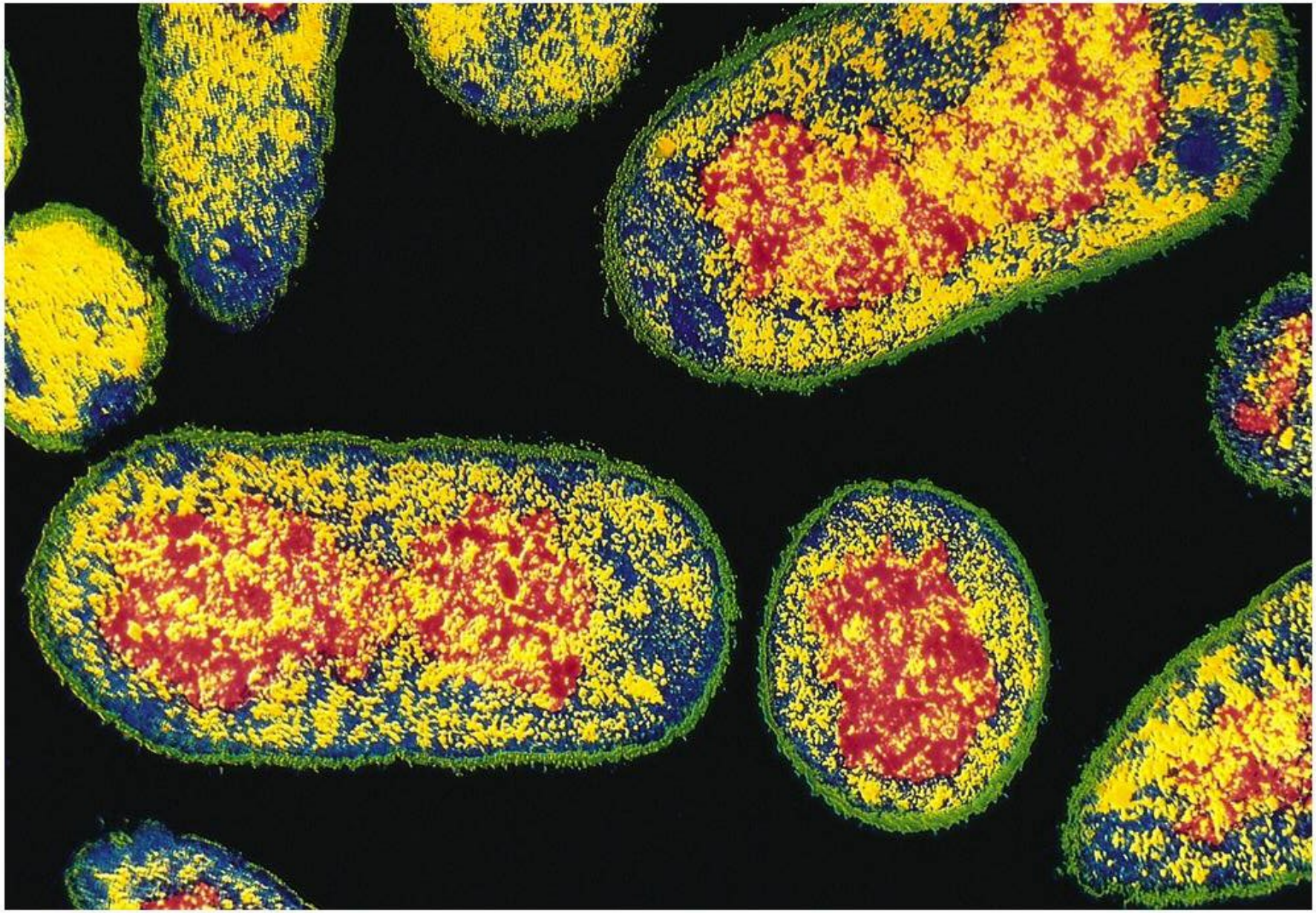
© 2006 Thomson Higher Education

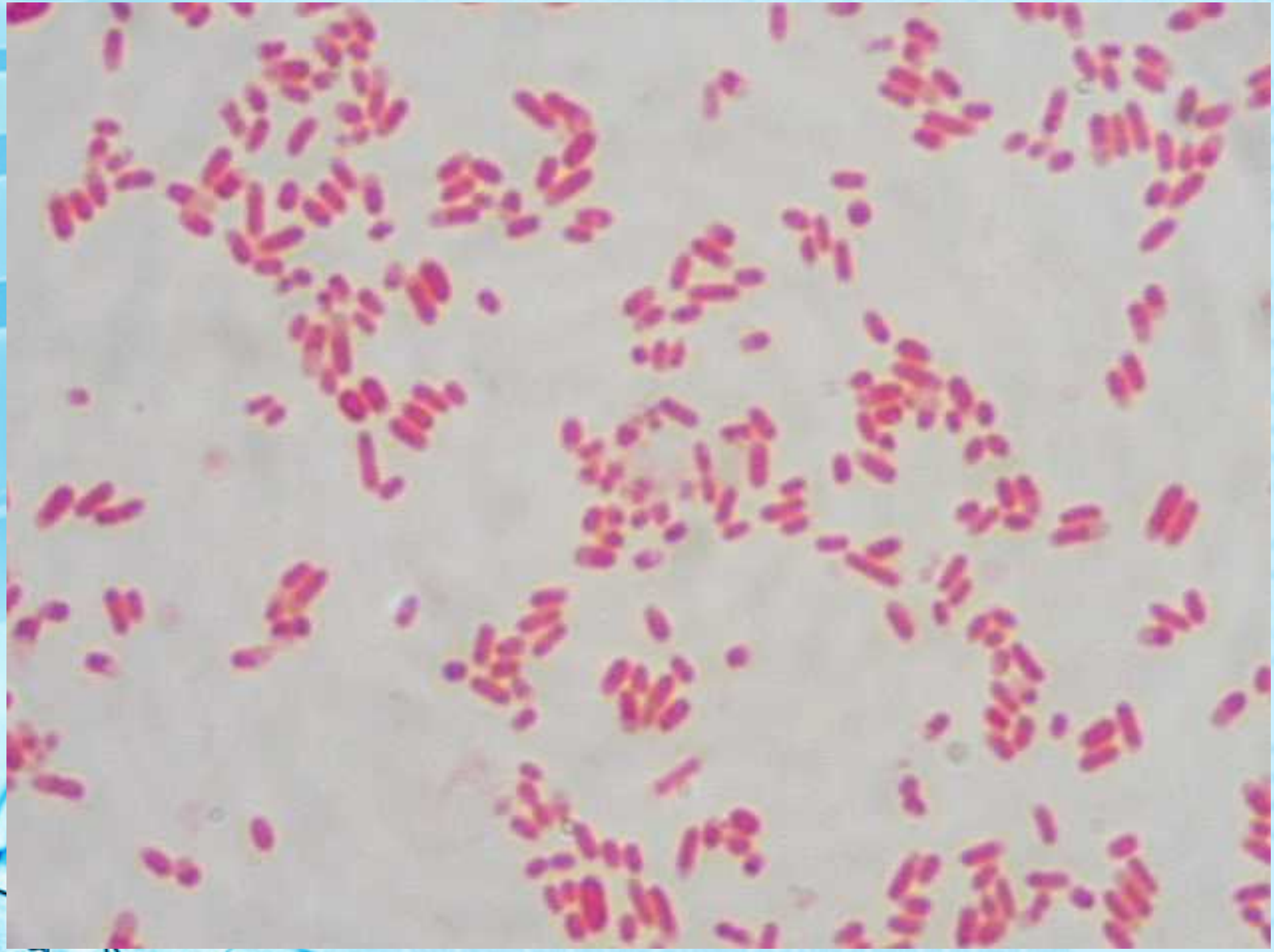


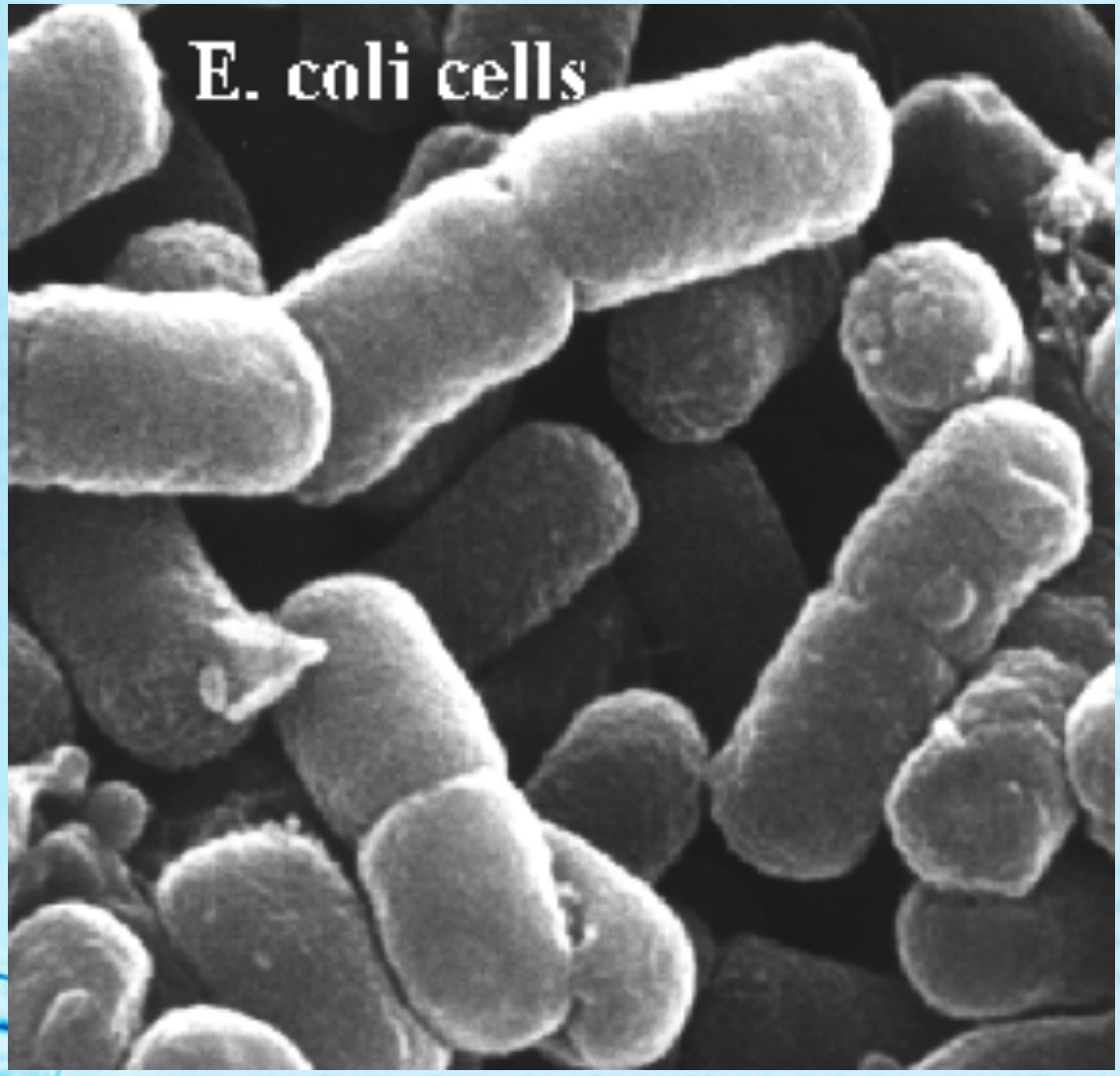
© 2006 Brooks/Cole - Thomson

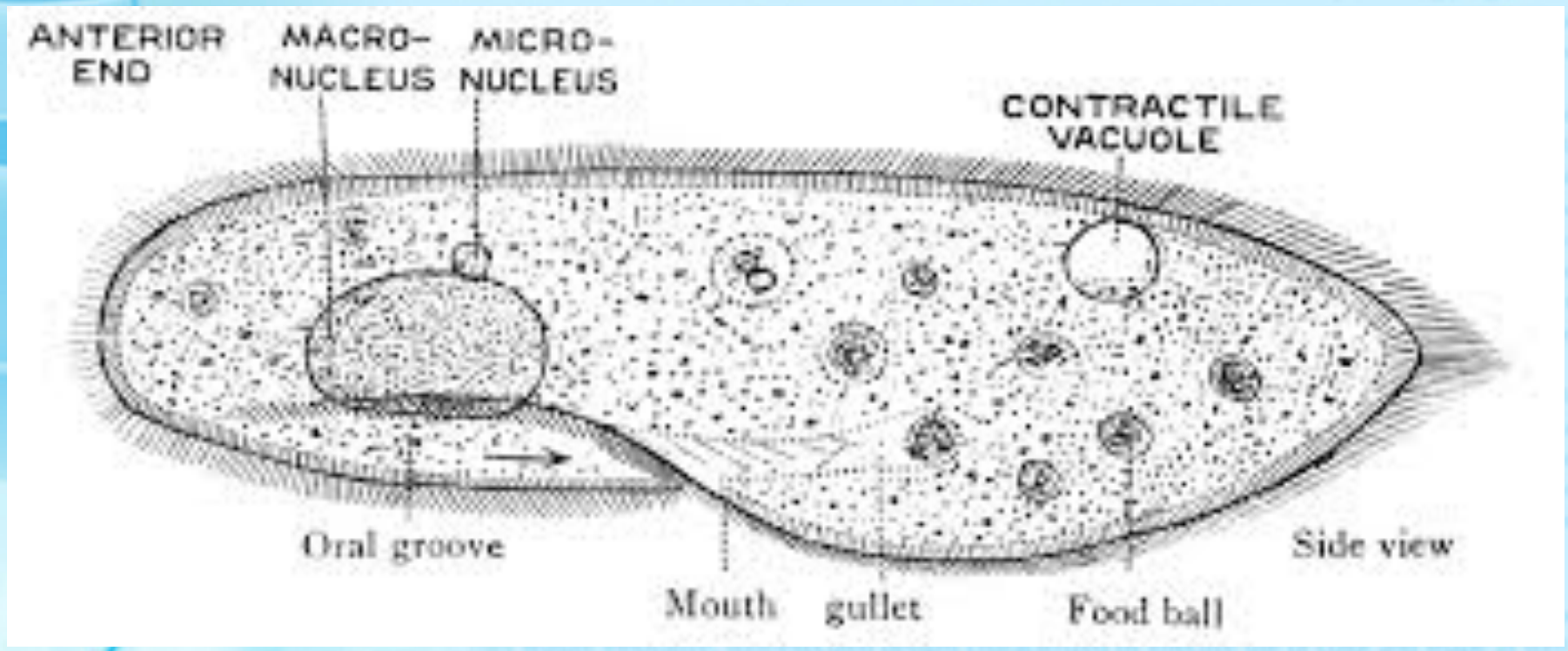


© 2006 Brooks/Cole - Thomson

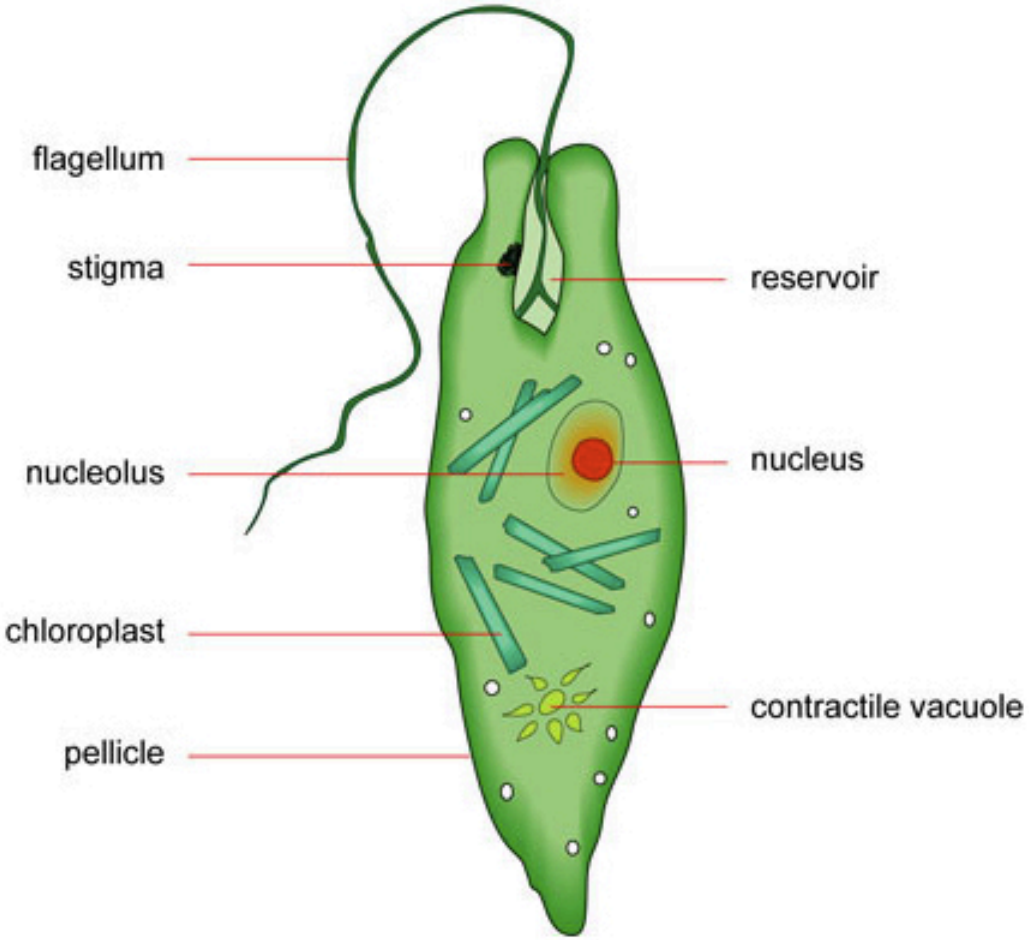




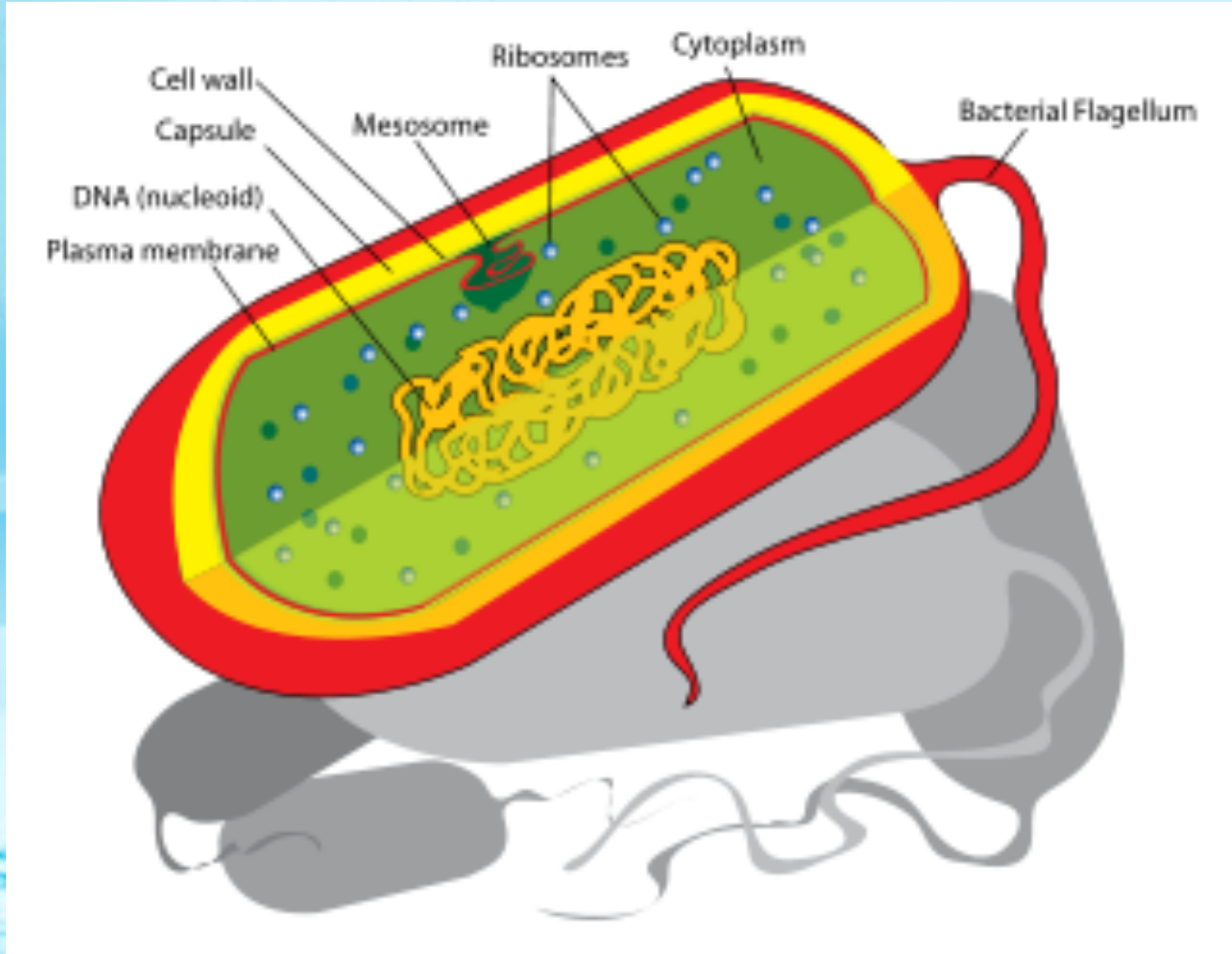

E. coli cells

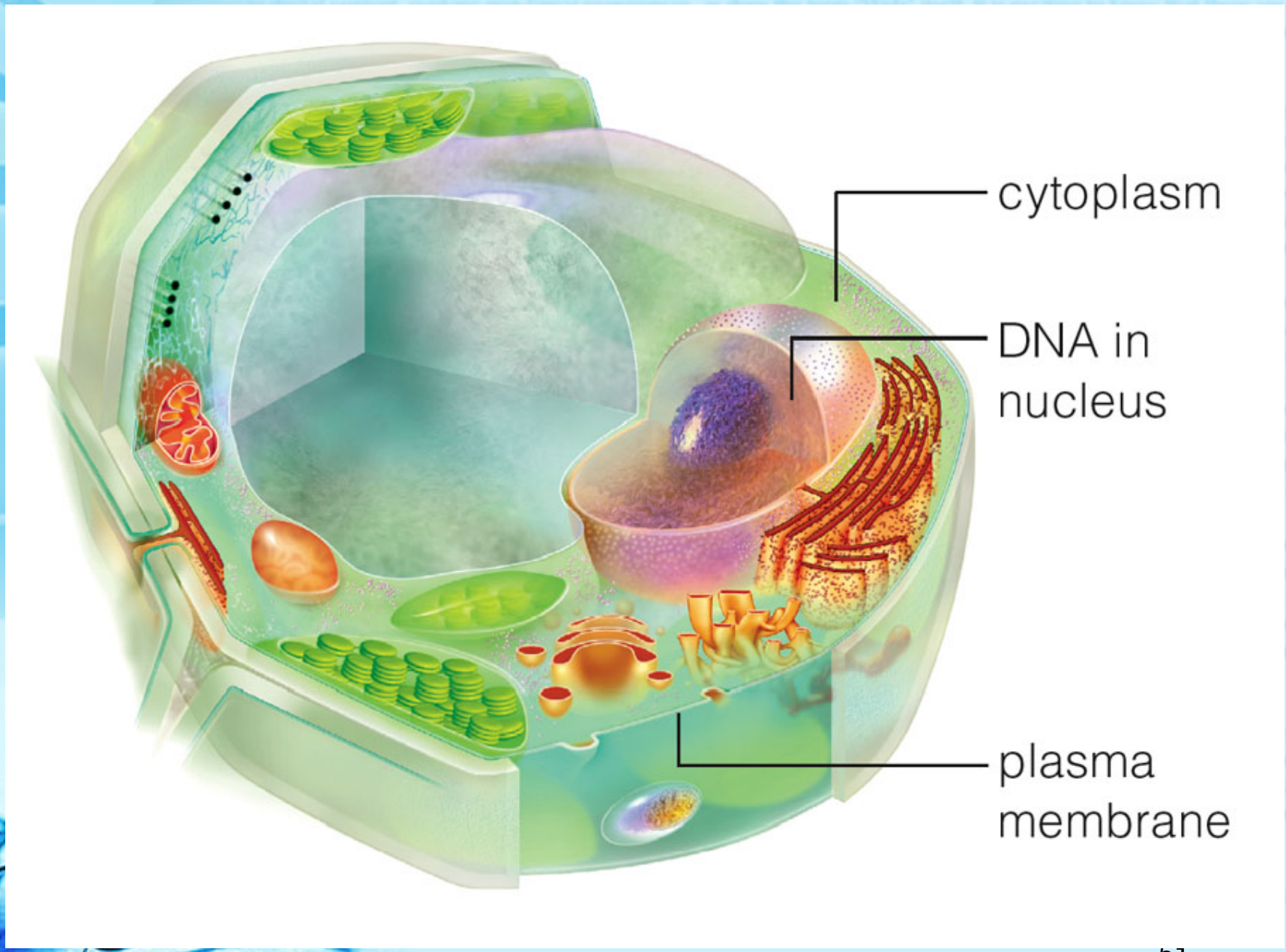

ANTERIOR END
MACRO-NUCLEUS
MICRO-NUCLEUS
CONTRACTILE VACUOLE
Oral groove
Mouth
gullet
Food ball
Side view

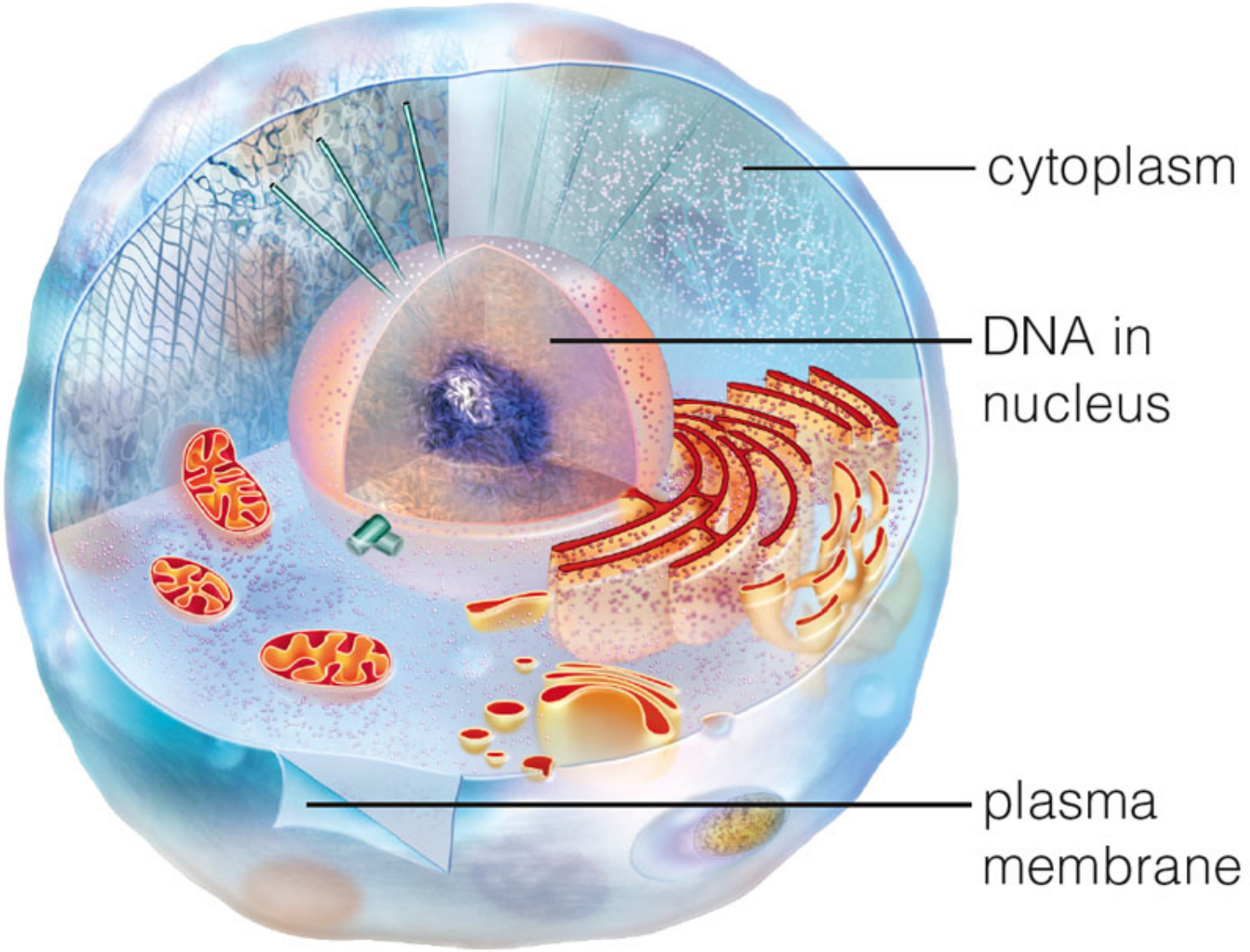
STRUCTURE OF A EUGLENA



Flagella
and
Cilia


Ribosomes
Cytoplasm
Cell wall
Capsule
Mesosome
Bacterial Flagellum
DNA (nucleoid)
Plasma membrane


cytoplasm
DNA in nucleus
plasma membrane


cytoplasm
DNA in nucleus
plasma membrane