

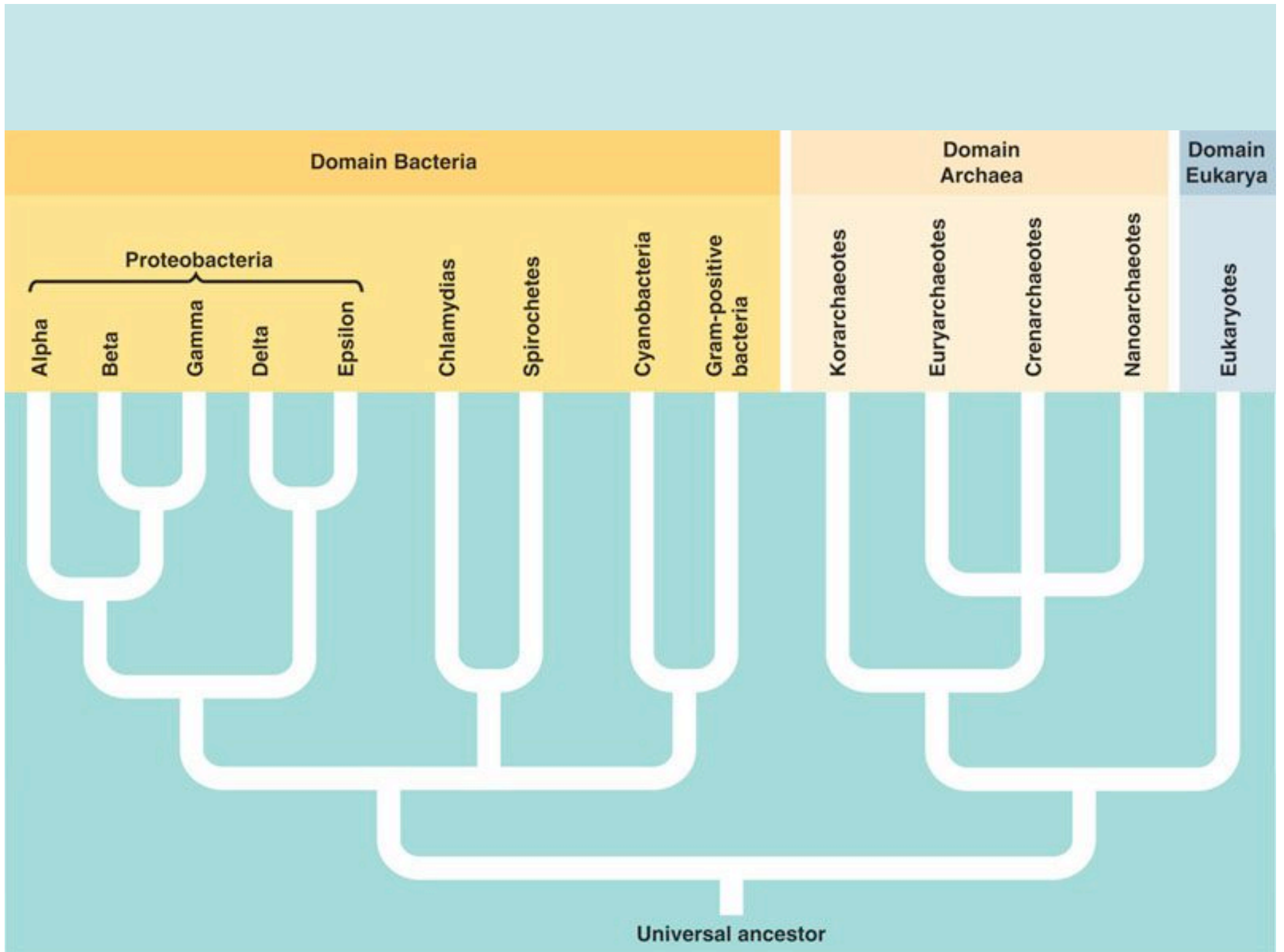
### Example key:

- |    |  |                                   |
|----|--|-----------------------------------|
| 1. | 1a: The organism is motile                   | (2)                               |
|    | 1b: The organism is stationary               | (3)                               |
| 2. | 2a: The organism is aquatic                  | (4)                               |
|    | 2b: The organism is terrestrial              | (5)                               |
| 3. | 3a: The organism is aquatic                  | (6)                               |
|    | 3b: The organism is terrestrial              | (7)                               |
| 4. | 4a: The organism has ray fins                | (Class Osteichthyes or bony fish) |
|    | 4b: The organism lacks ray fins              | (9)                               |
| 5. | 5a: The organism has four legs               | (10)                              |
|    | 5b: The organism has 0, 2, 6, 8 or many legs | (11)                              |
| 6. | 6a: The organism is green                    | (12)                              |
|    | 6b: The organism is not green                | (13)                              |
| 7. | 7a: The organism has a woody stem            | (14)                              |
|    | 7b: The organism has an herbaceous stem      | (15)                              |

-Try to use morphological characters when possible.

-Include only two statements per couplet.

-In a couplet, the statements must be parallel.





EUKARYOTIC CELL

PROKARYOTIC CELL

Membrane

Cytoplasm

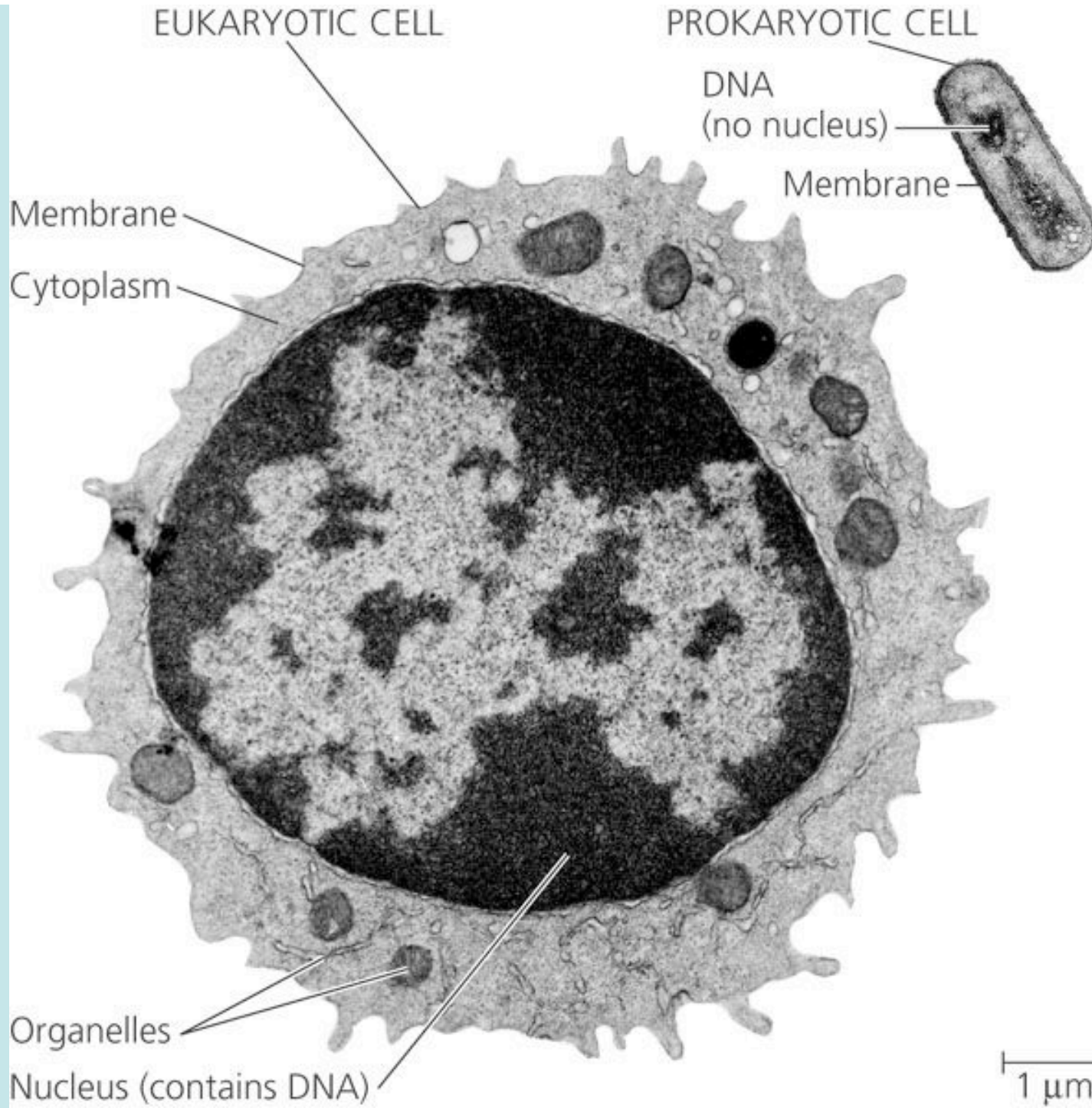
DNA  
(no nucleus)

Membrane

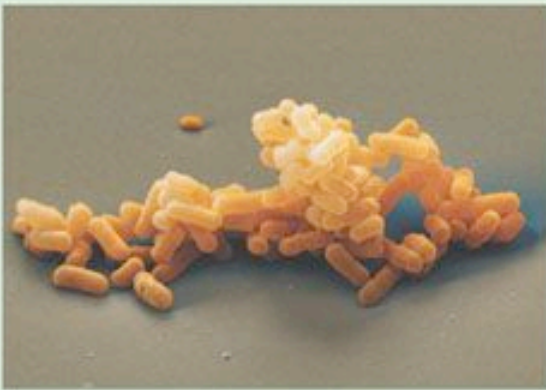
Organelles

Nucleus (contains DNA)

1  $\mu\text{m}$



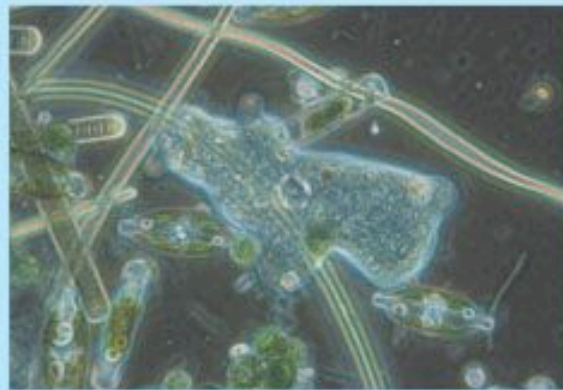
## DOMAIN BACTERIA



**Bacteria** are the most diverse and widespread prokaryotes and are now divided among multiple kingdoms. Each of the rod-shaped structures in this photo is a bacterial cell.

4  $\mu\text{m}$

## DOMAIN EUKARYA



**Protists** (multiple kingdoms) are unicellular eukaryotes and their relatively simple multicellular relatives. Pictured here is an assortment of protists inhabiting pond water. Scientists are currently debating how to split the protists into several kingdoms that better represent evolution and diversity.

100  $\mu\text{m}$



**Kingdom Plantae** consists of multicellular eukaryotes that carry out photosynthesis, the conversion of light energy to food.

## DOMAIN ARCHAEA



Many of the prokaryotes known as **archaea** live in Earth's extreme environments, such as salty lakes and boiling hot springs. Domain Archaea includes multiple kingdoms. The photo shows a colony composed of many cells.

0.5  $\mu\text{m}$



**Kindom Fungi** is defined in part by the nutritional mode of its members, such as this mushroom, which absorb nutrients after decomposing organic material.



**Kindom Animalia** consists of multicellular eukaryotes that ingest other organisms.



## Characteristics of the Major Groups of Organisms

<b>Group/Char</b>	<b>Prokaryotic or Eukaryotic</b>	<b>Unicellular or Multicellular</b>	<b>Nutritional Mode</b>	<b>Cell wall</b>
Prokaryotes	pro	unicellular	autotrophic/ heterotrophic	yes-varied
Protista	eu	unicell; colonial; multi-poorly dev. tissues	auto/hetero	yes-varied/no
Fungi	eu	multi-well dev. tissues	heterotrophic- absorptive	yes-chitin
Plants	eu	multi-well dev. tissues	autotrophic	yes-cellulose
Animals	eu	multi-well dev. tissues	heterotrophic- ingestive	no



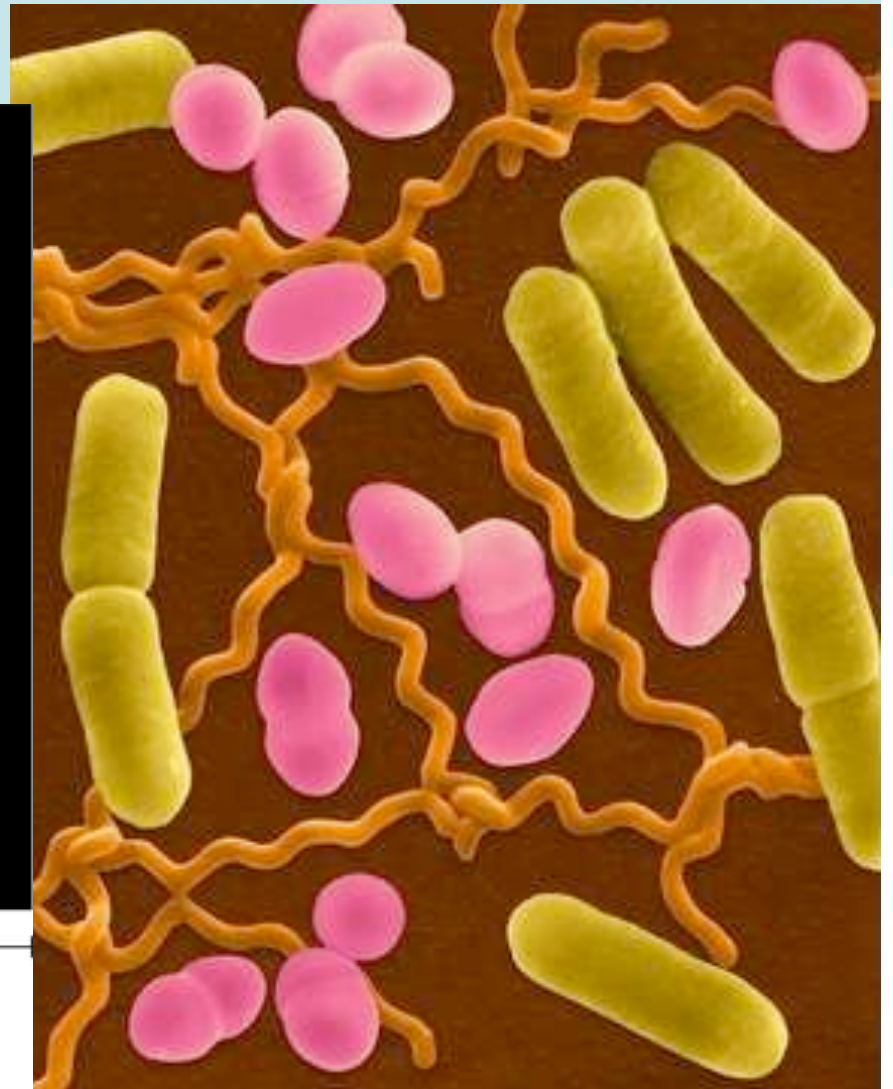
(a) Spherical (cocci)



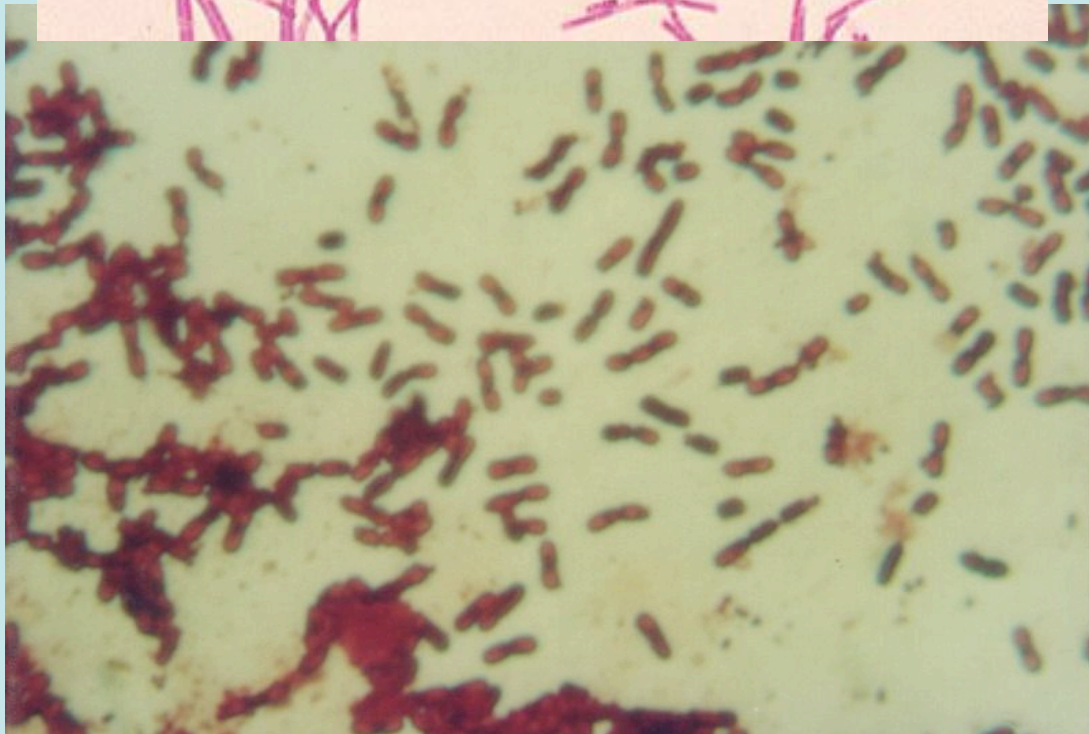
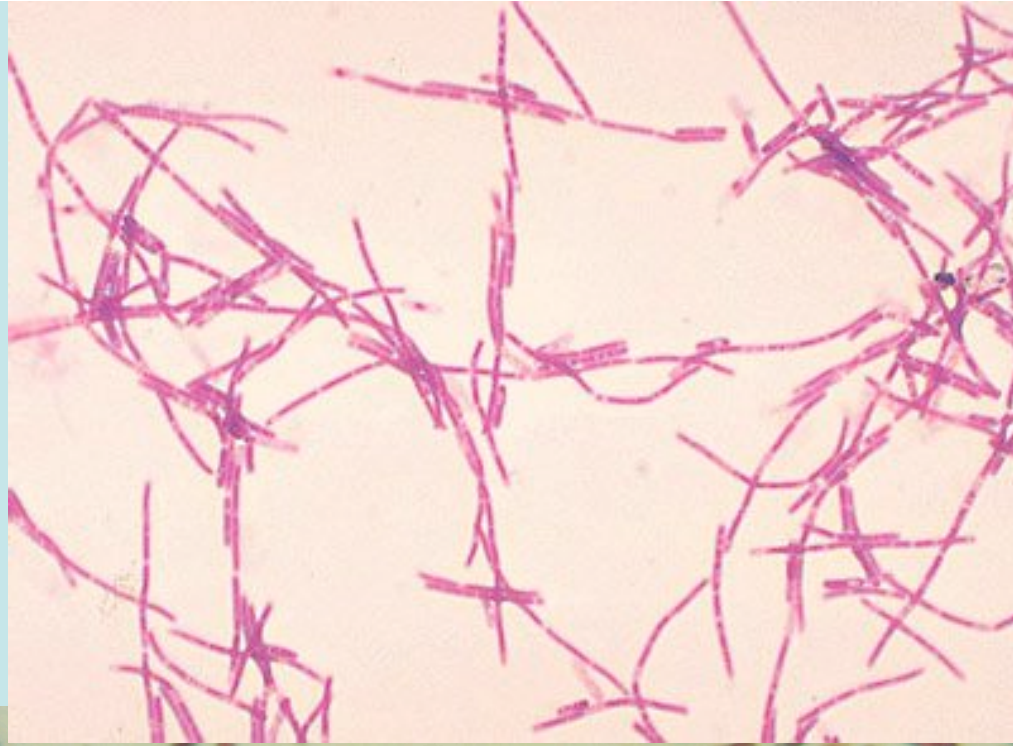
(b) Rod-shaped (bacilli)



(c) Spiral

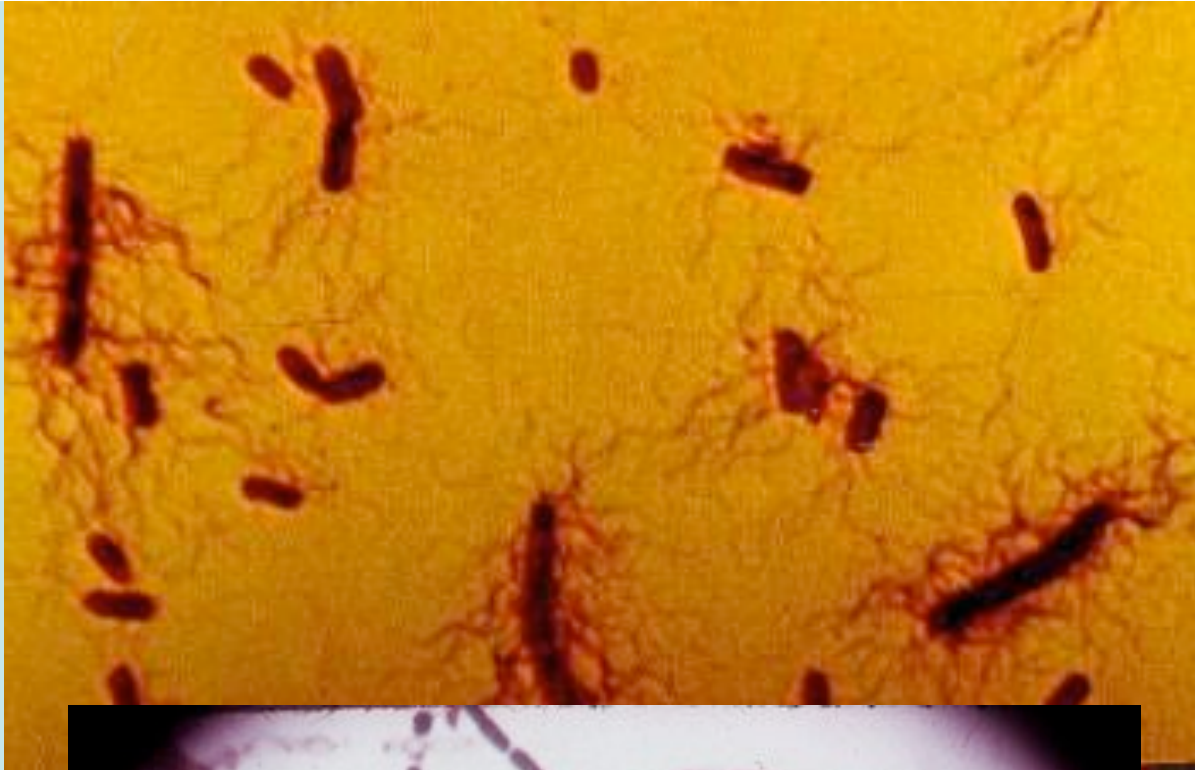


2





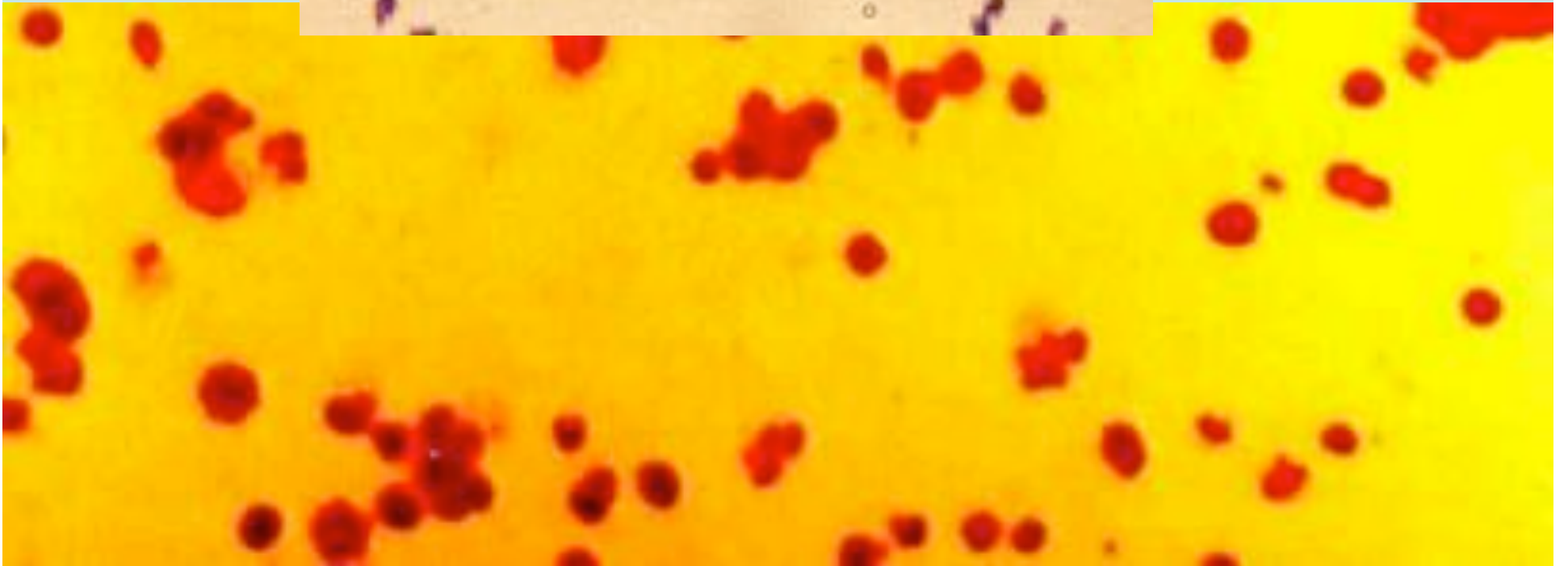
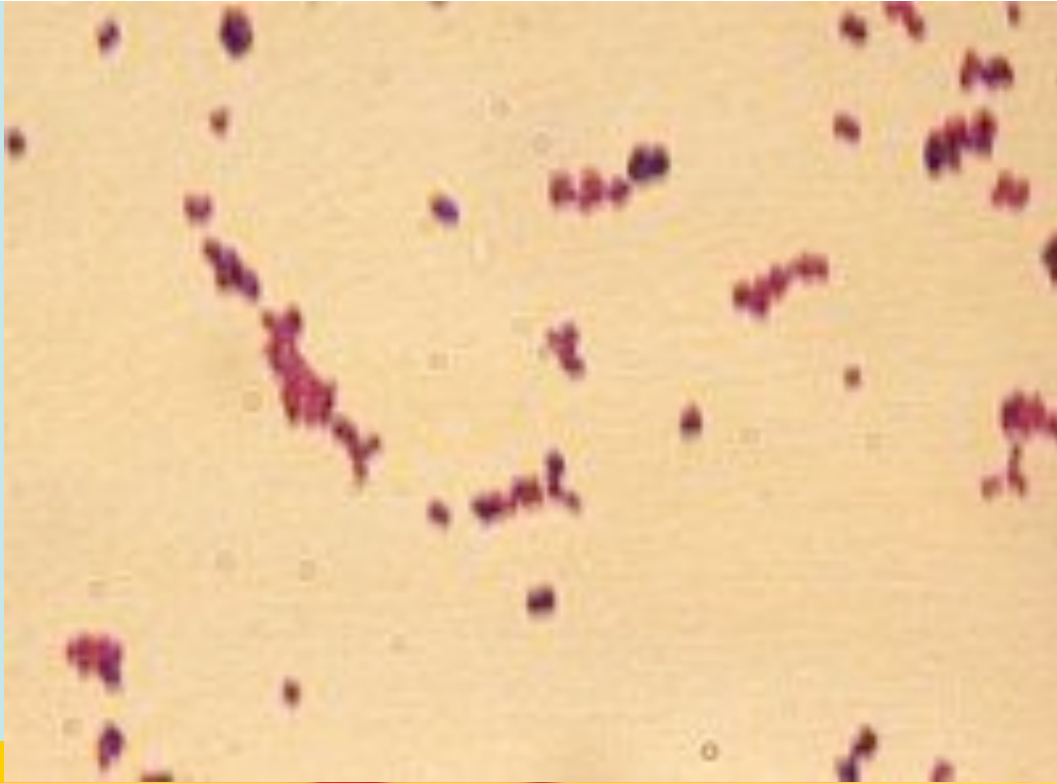
3



**bacillus**  
with flagella

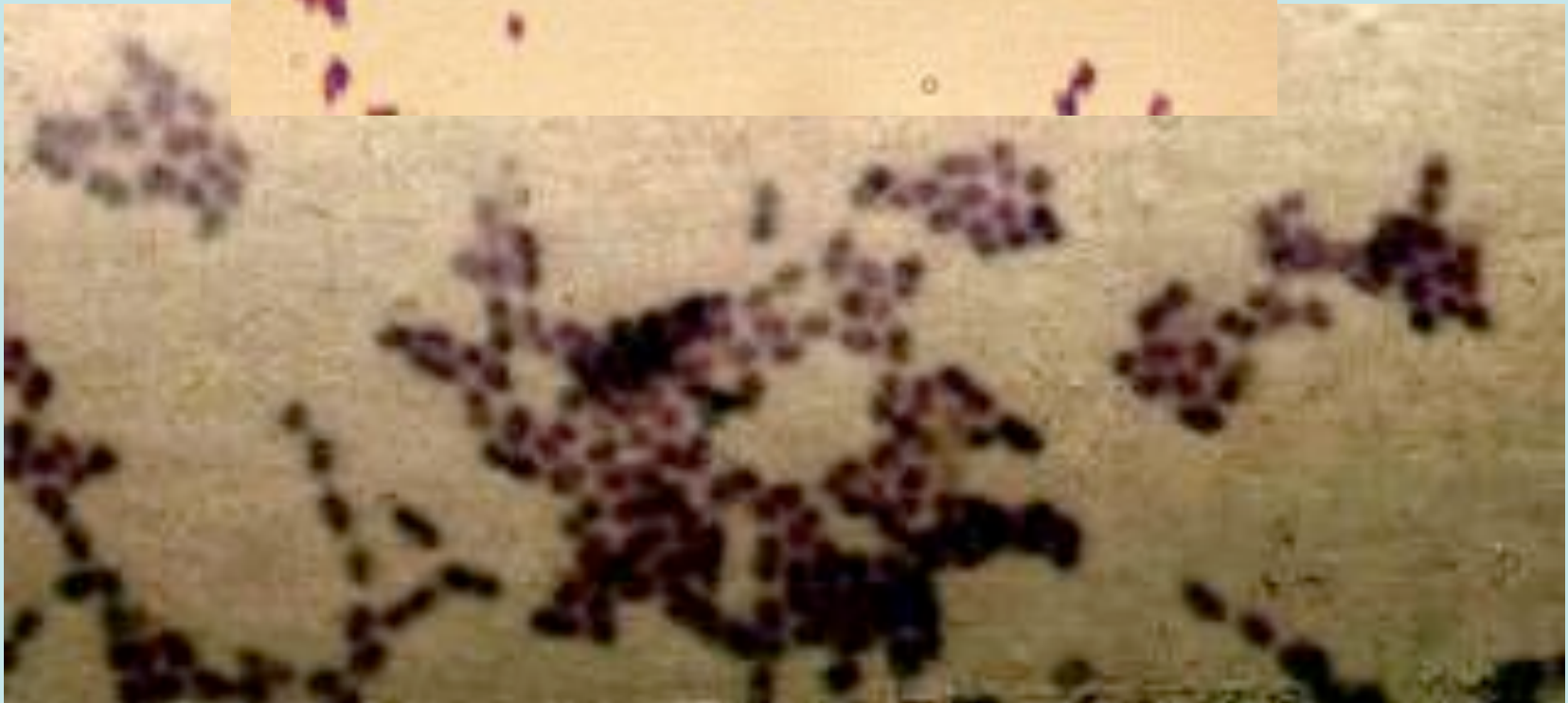
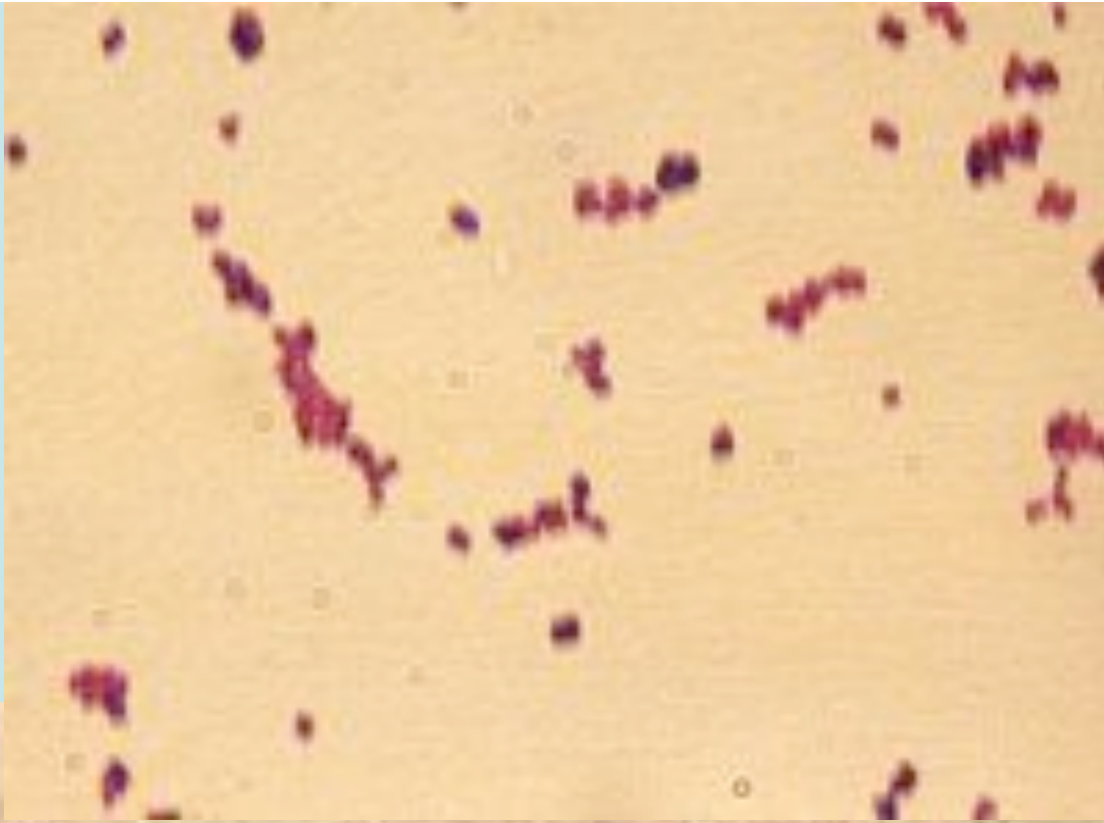


4





5

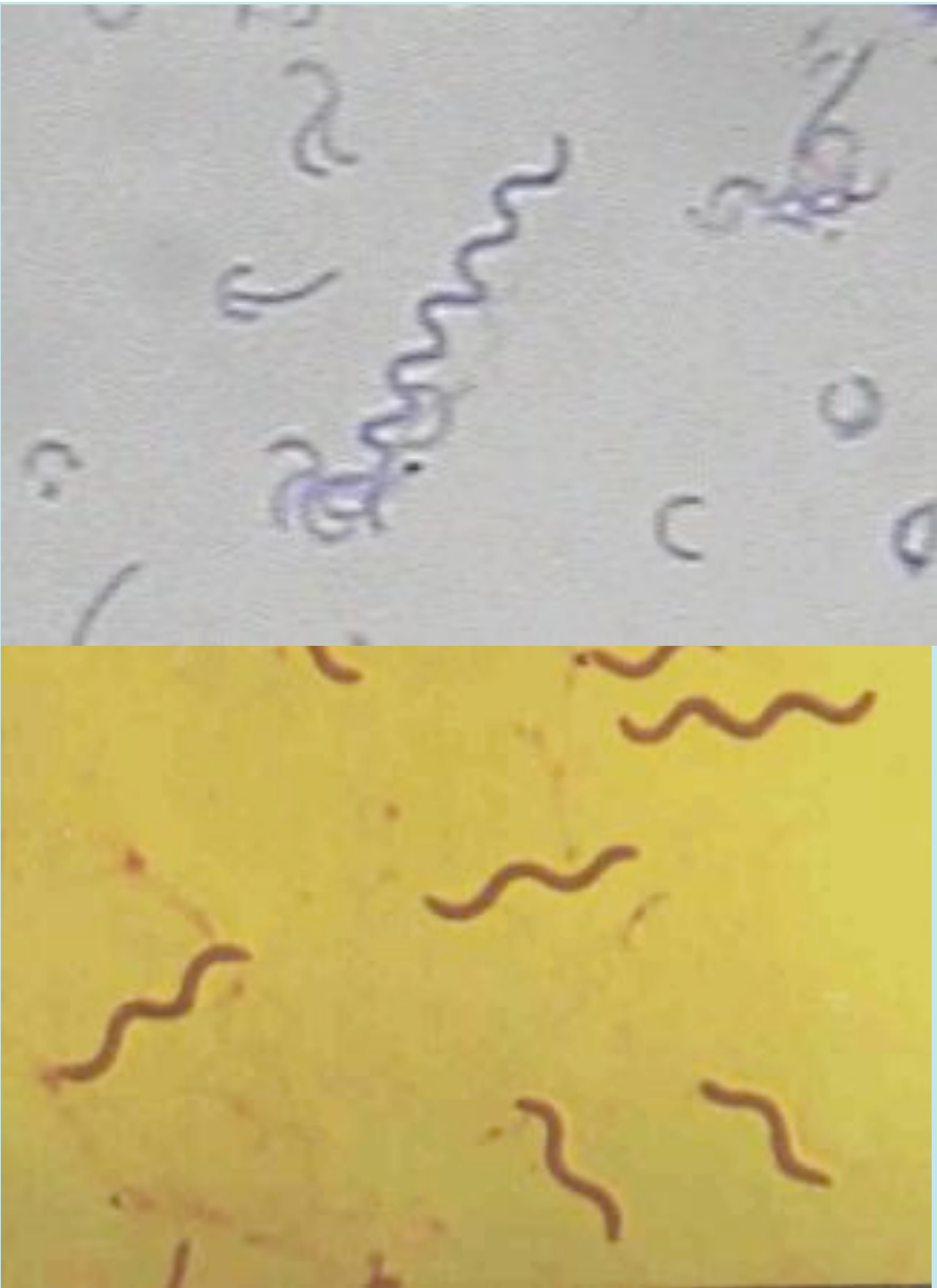


6



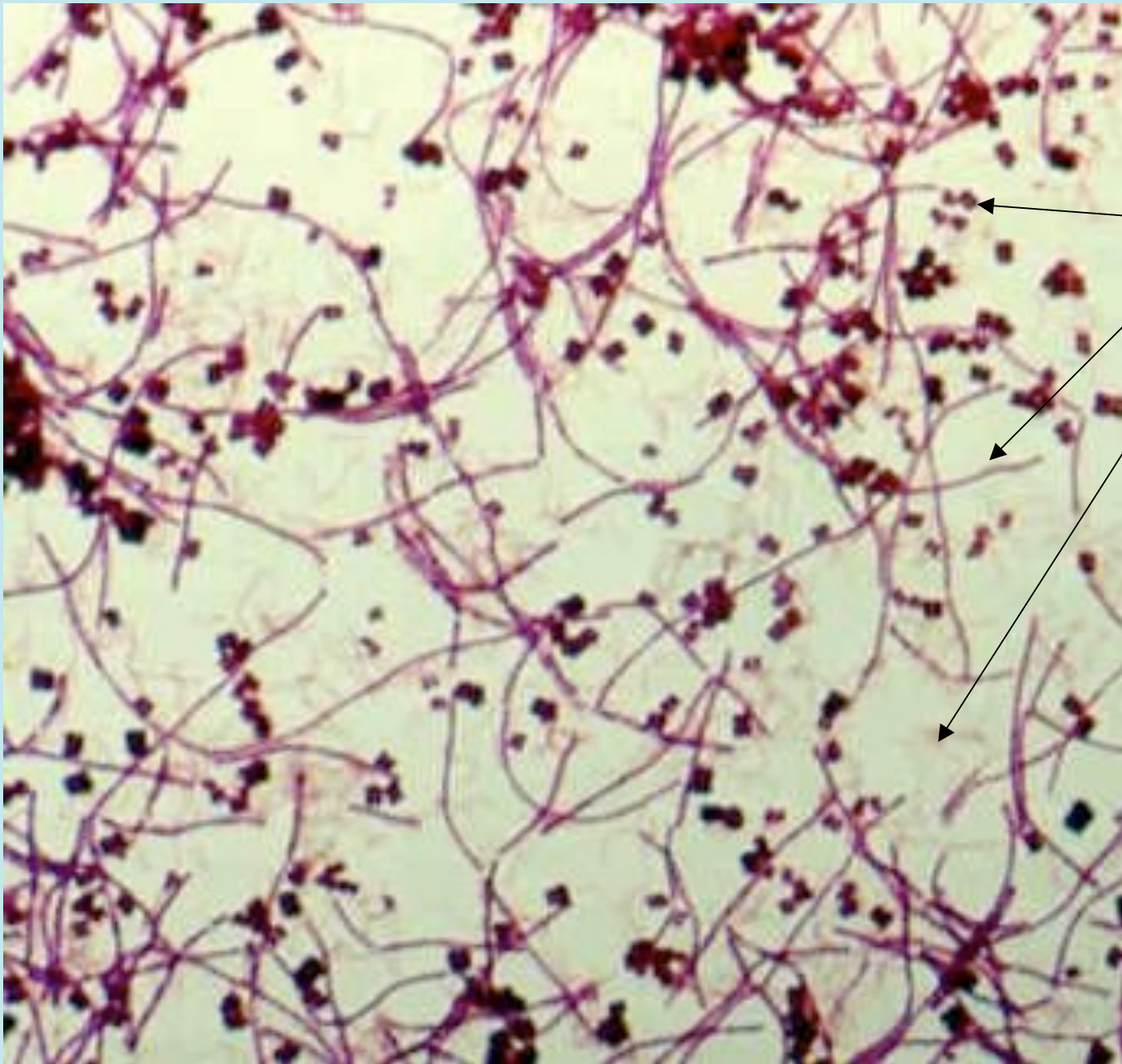








9

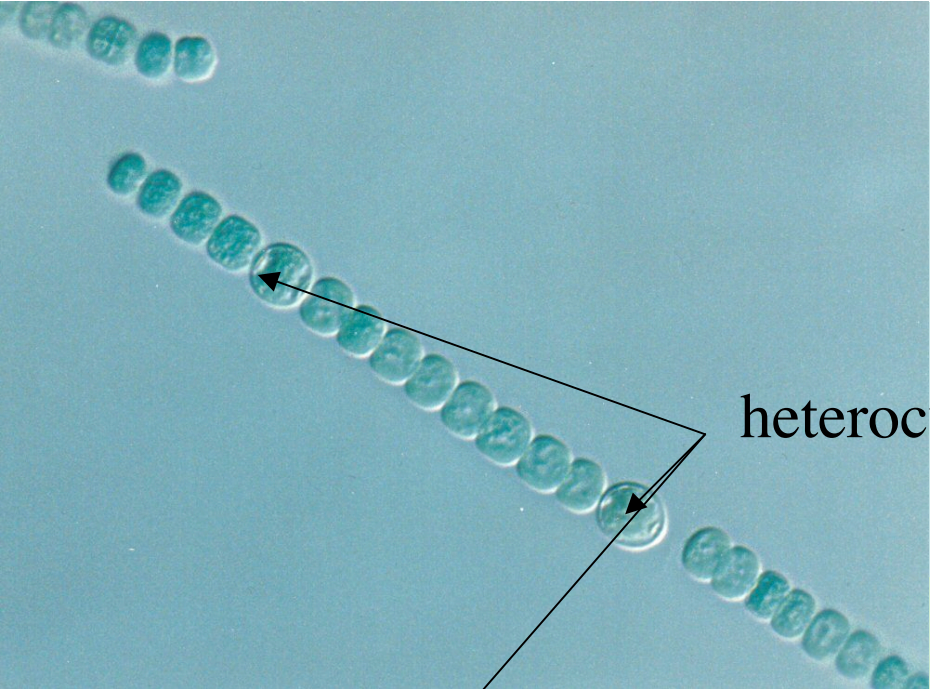


coccus

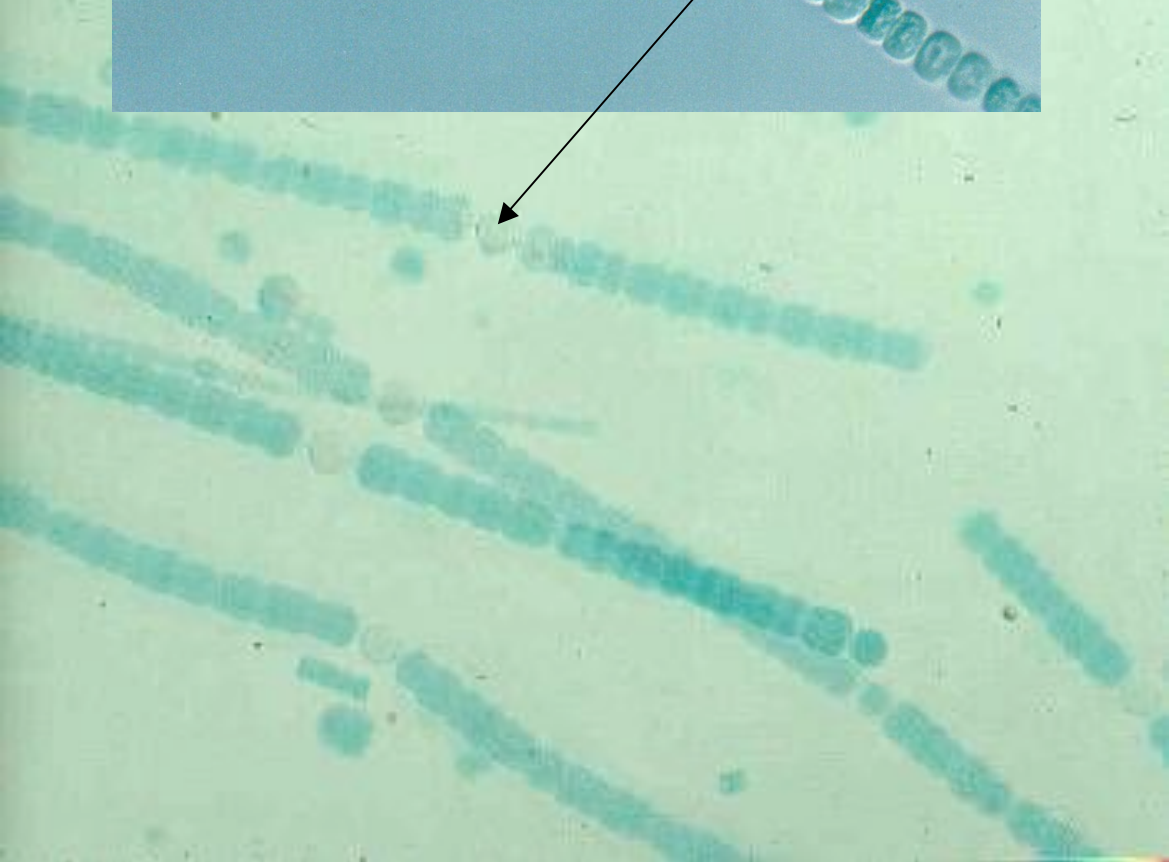
bacillus

spirillus

10

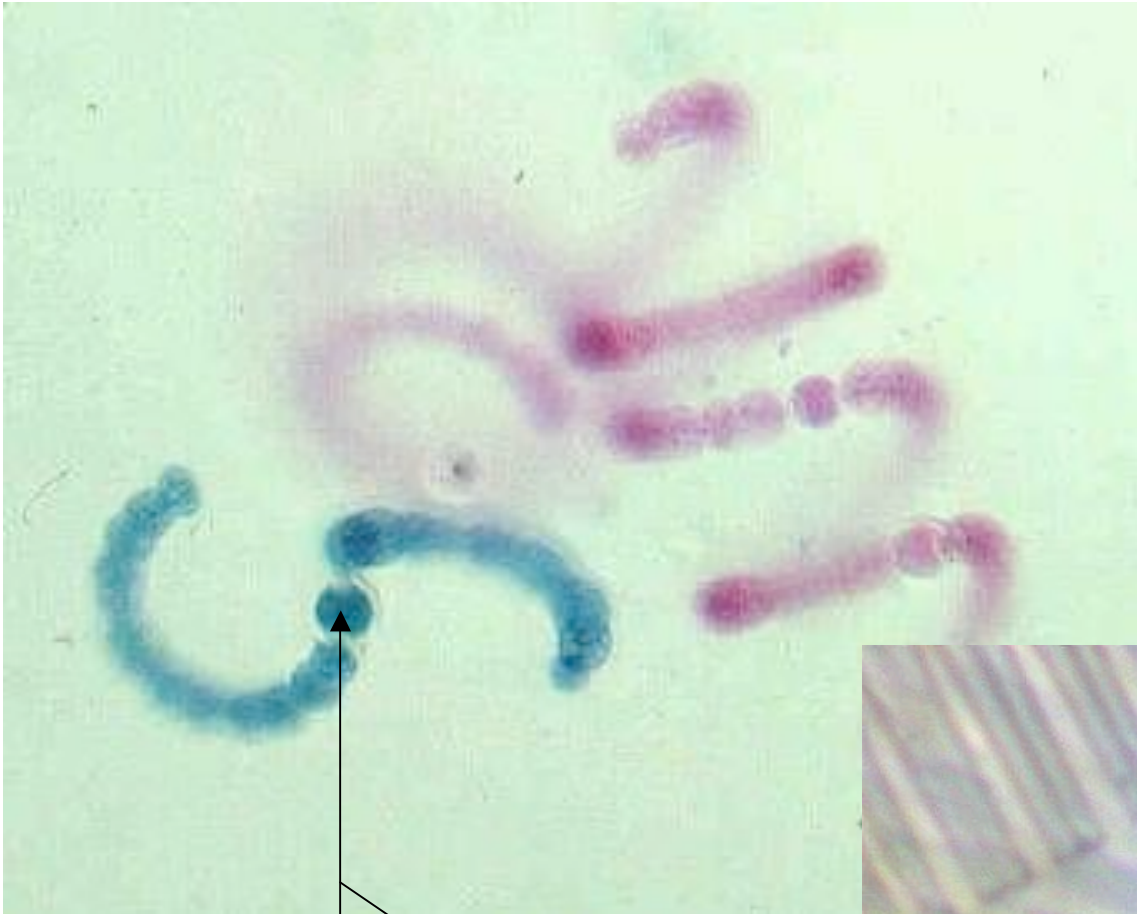


heterocysts



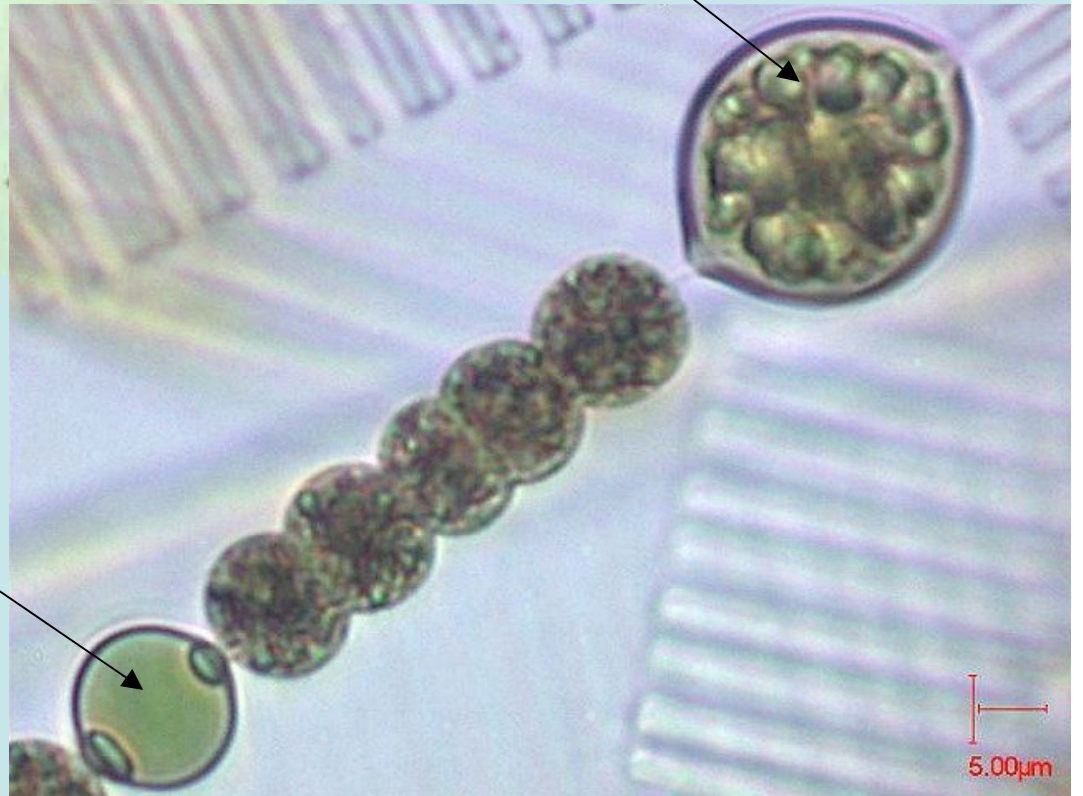


11



heterocysts

akinetete



5.00μm



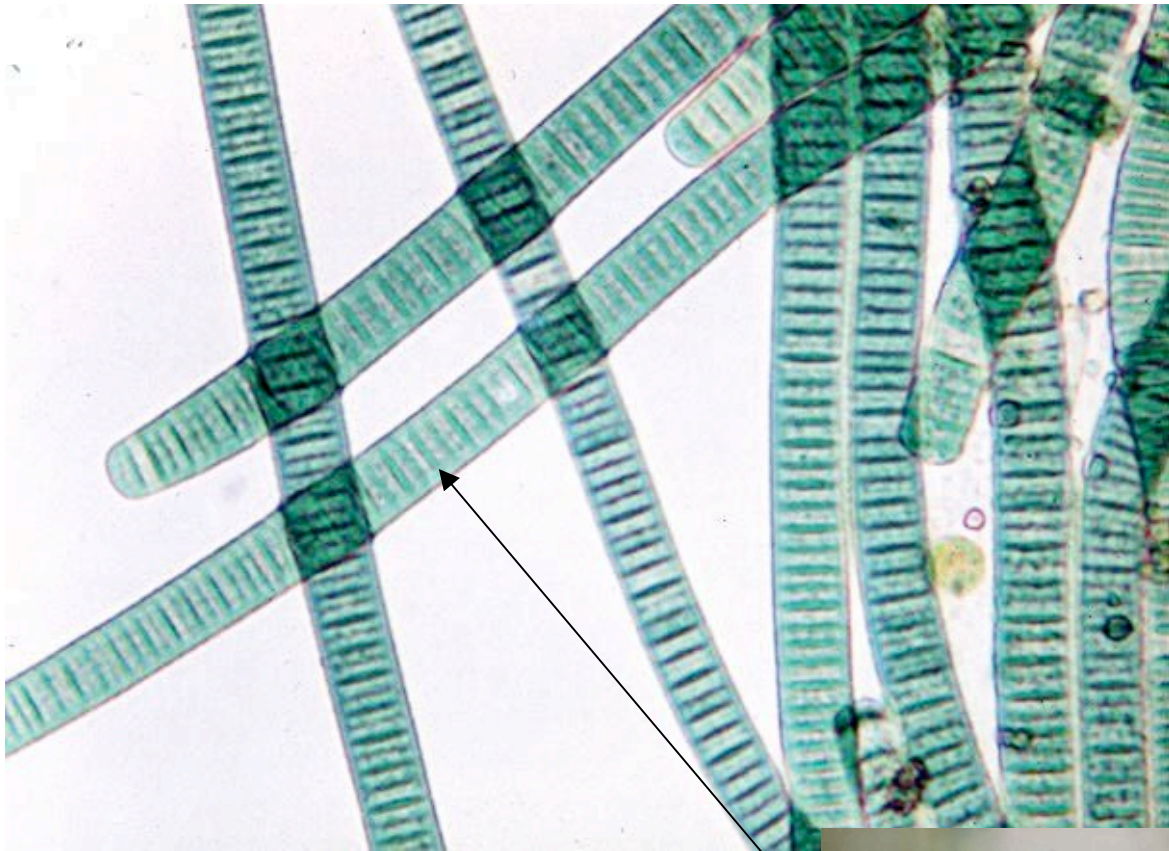
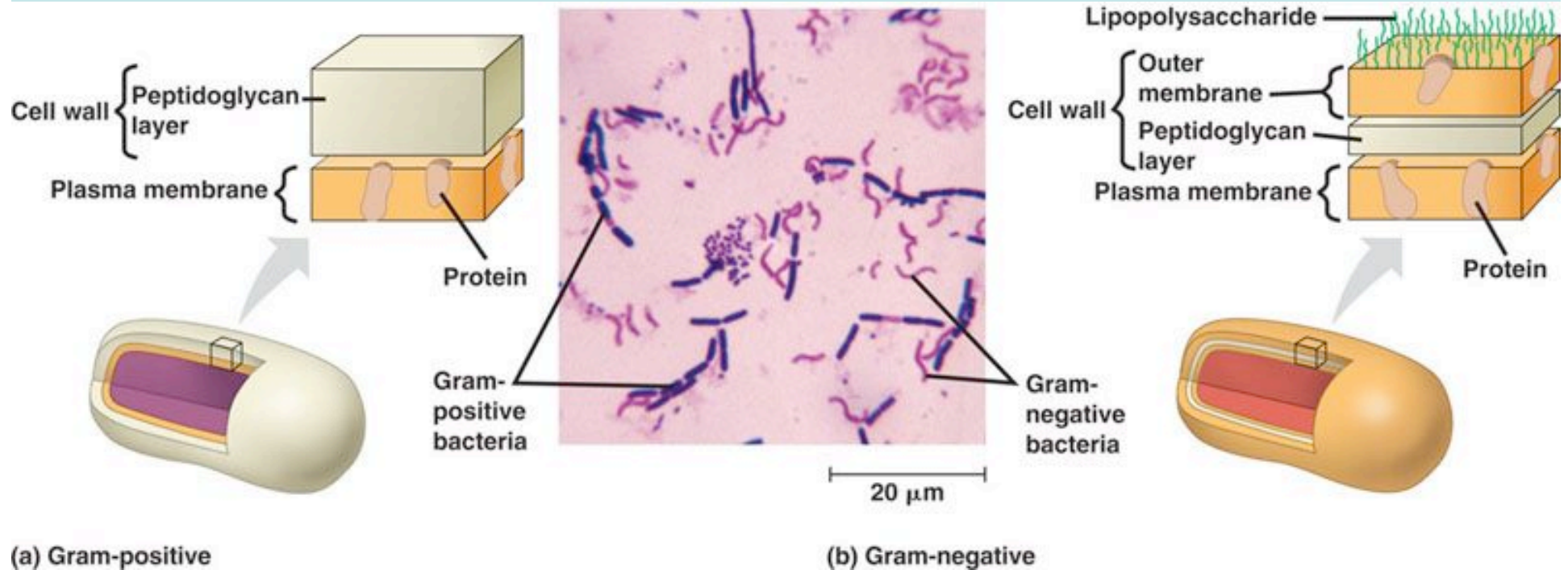


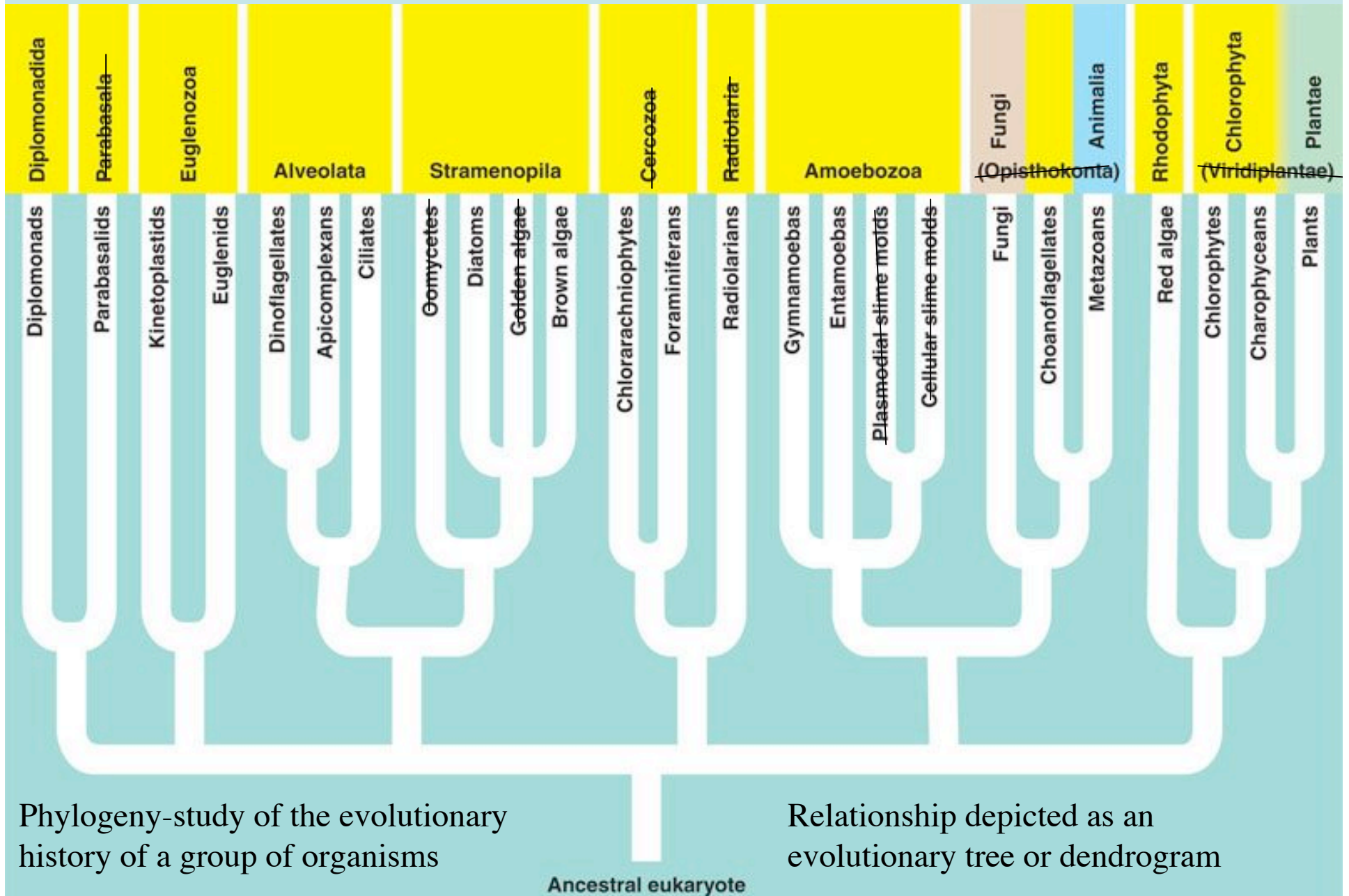
Figure 4 *Oscillatoria* and *Anabaena*

# Gram staining- p. 535



Crystal violet → iodine → decolorizer (alcohol) → safranin

# 13 Phylogeny of Eukaryotes- p. 552

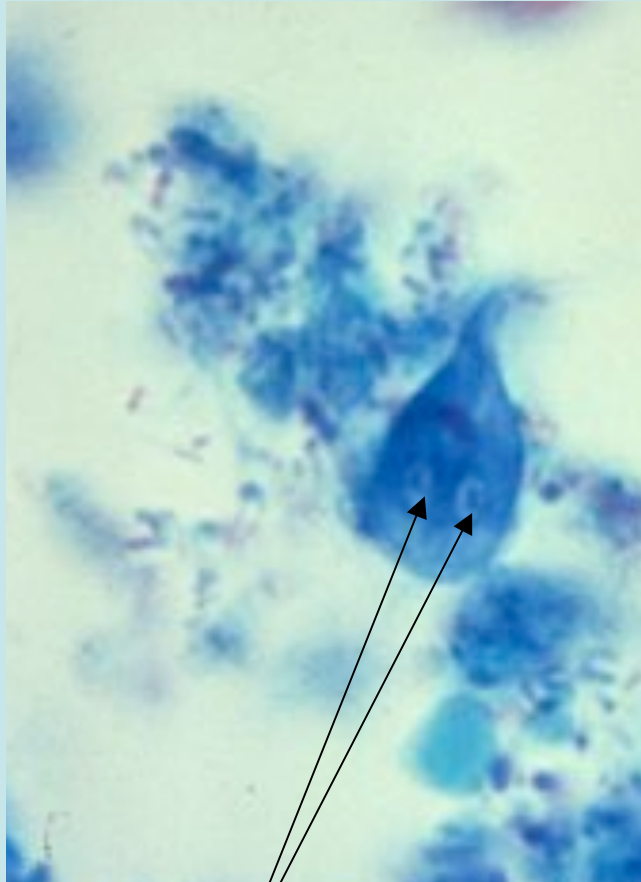


Phylogeny-study of the evolutionary history of a group of organisms

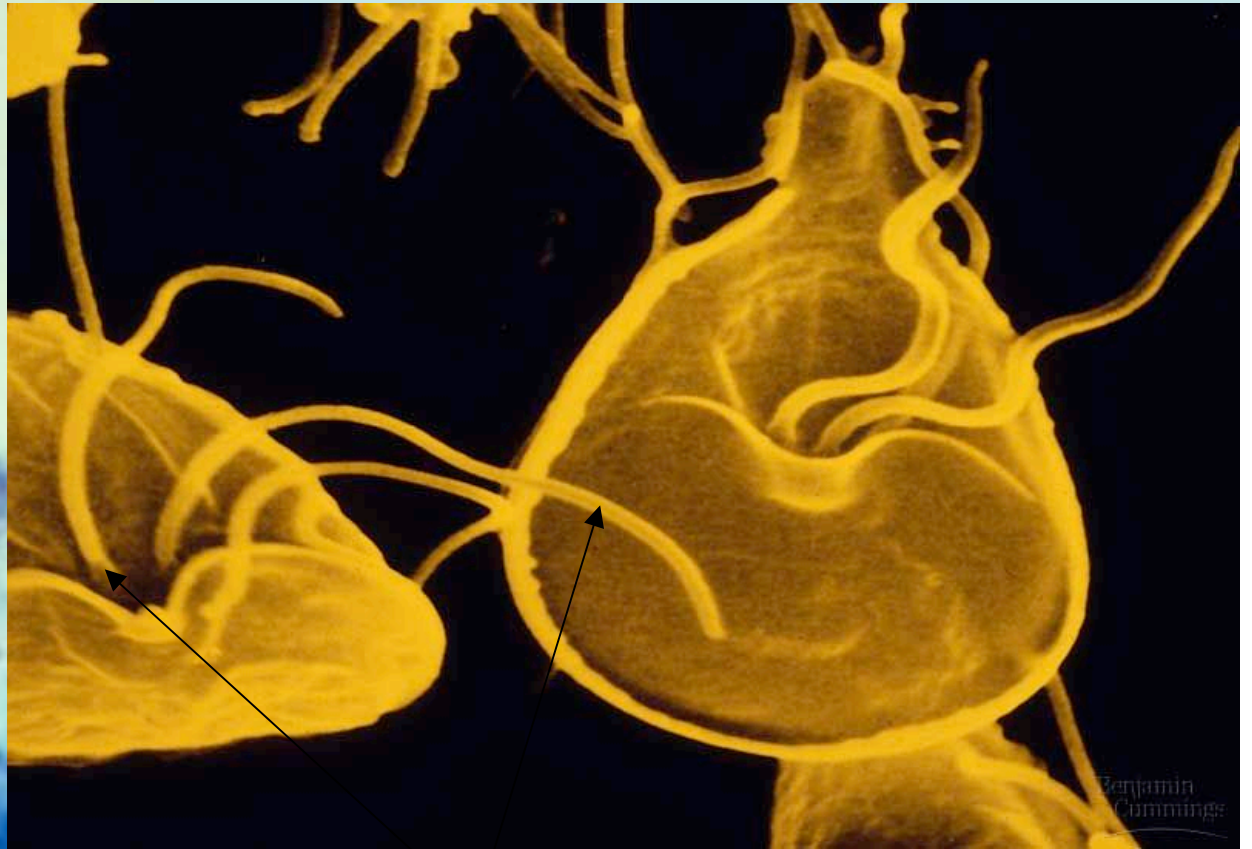
Relationship depicted as an evolutionary tree or dendrogram



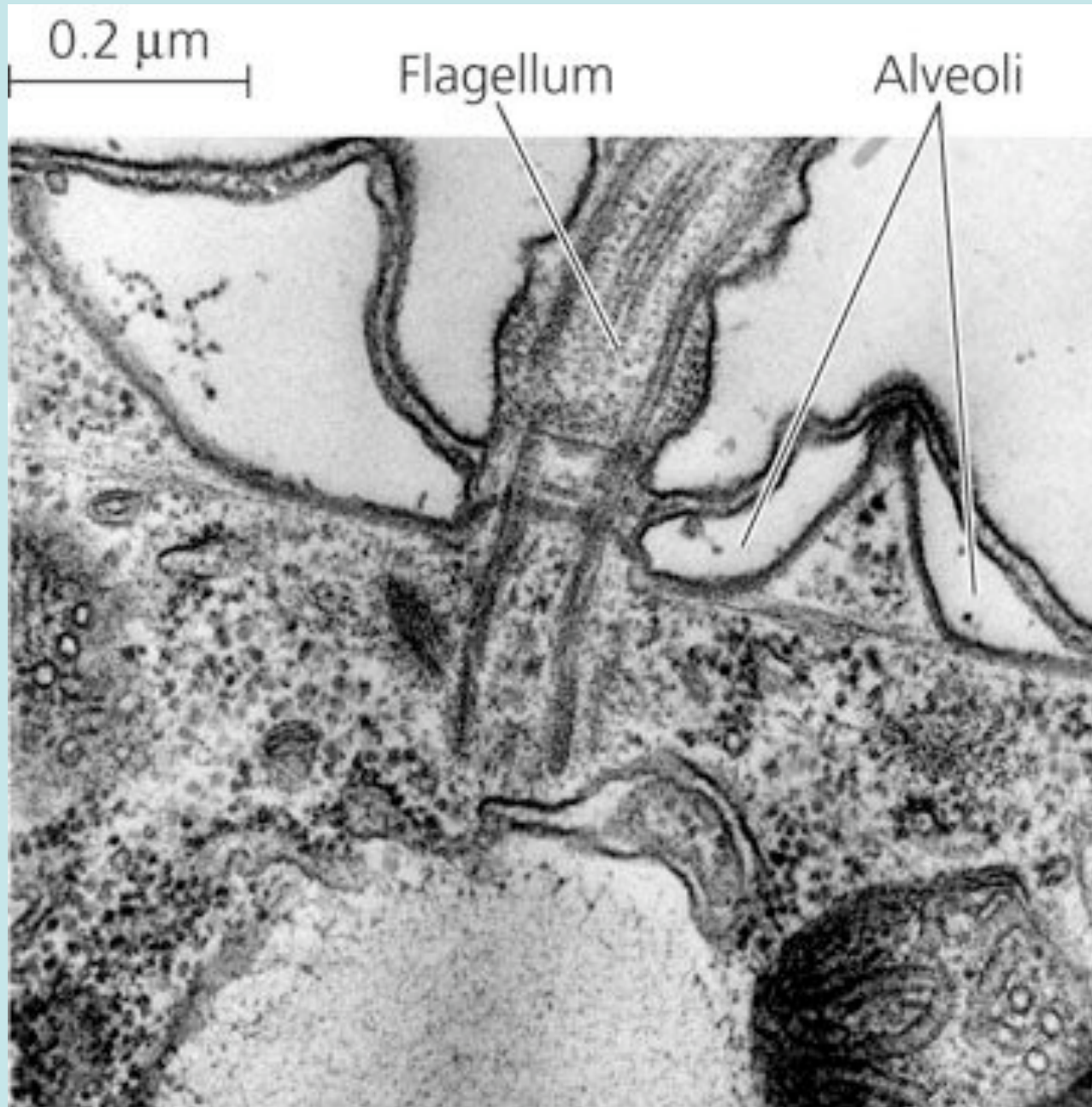
14



nuclei

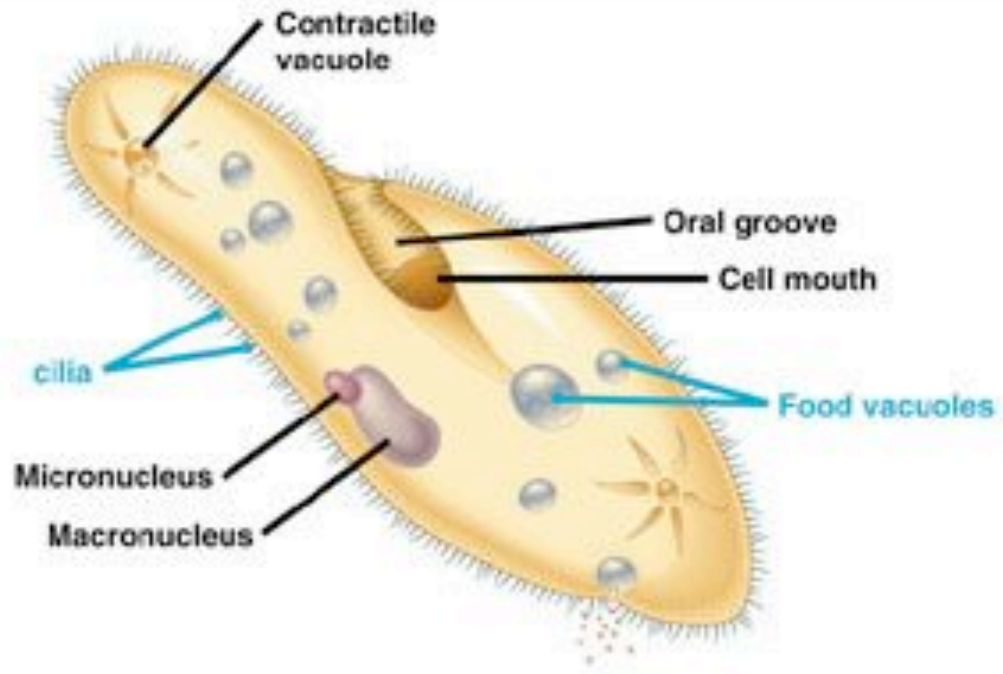


flagella



# 16 Phylum Ciliophora p. 557

## FEEDING, WASTE REMOVAL, AND WATER BALANCE

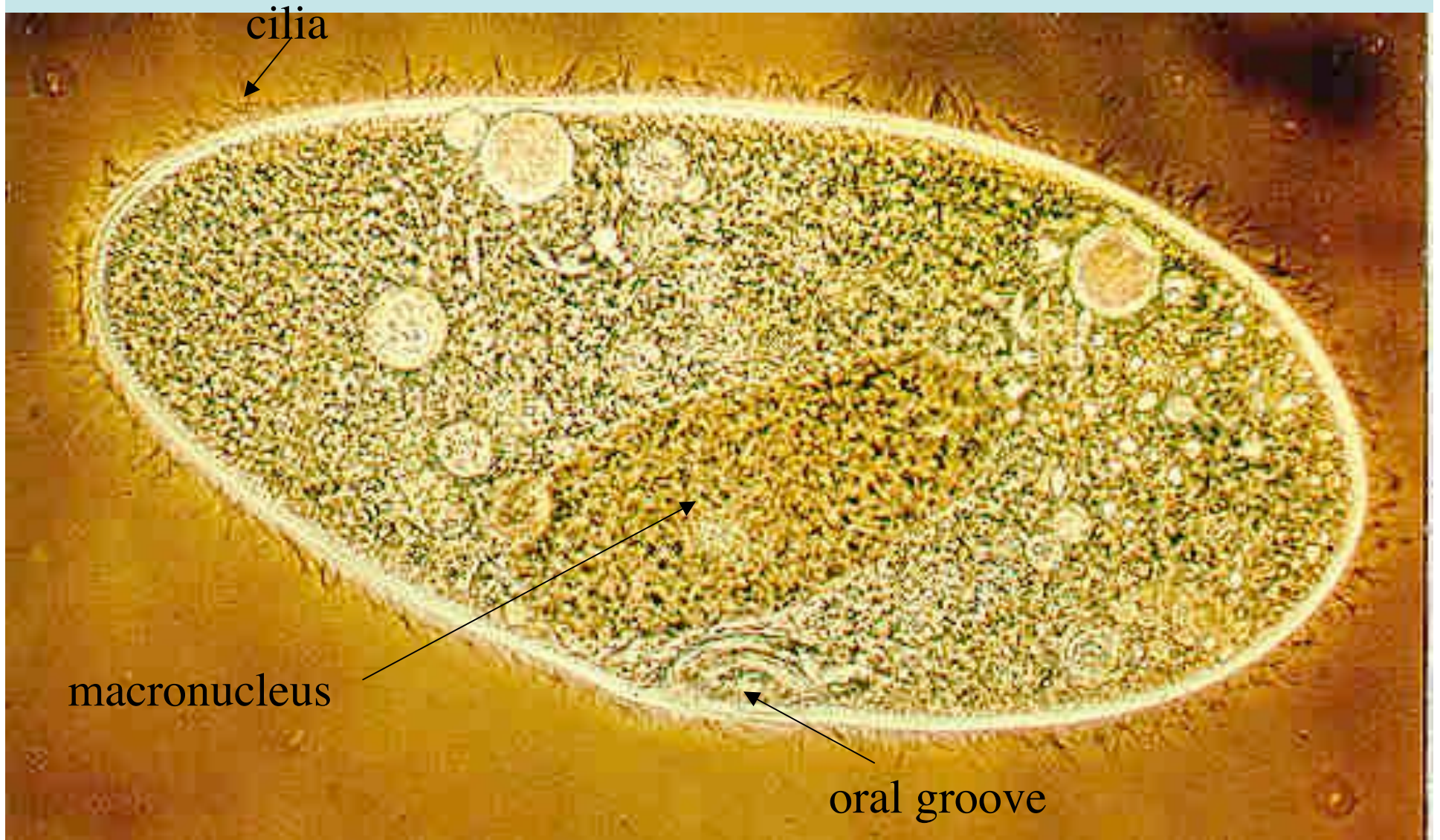


50  $\mu\text{m}$



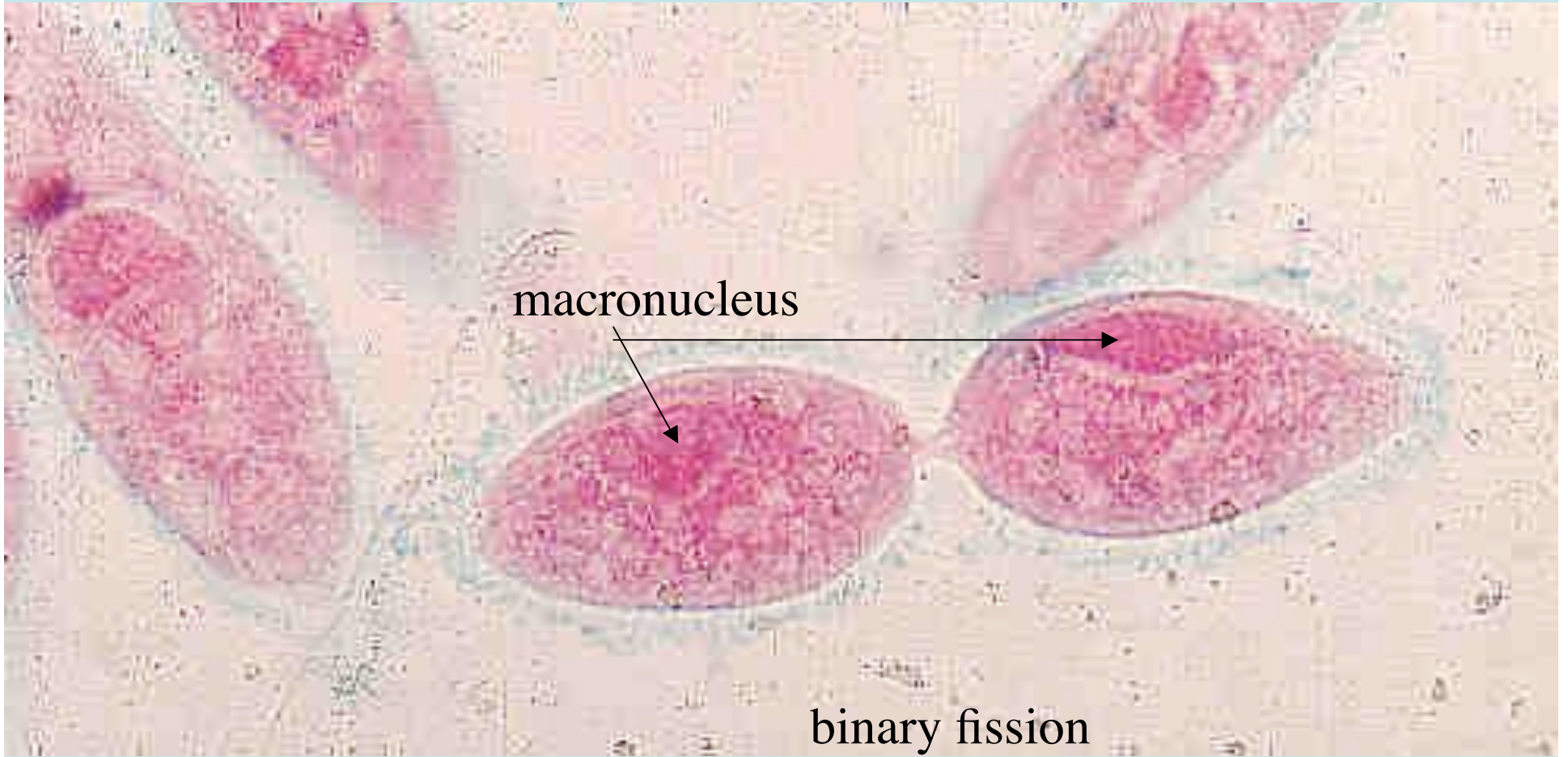


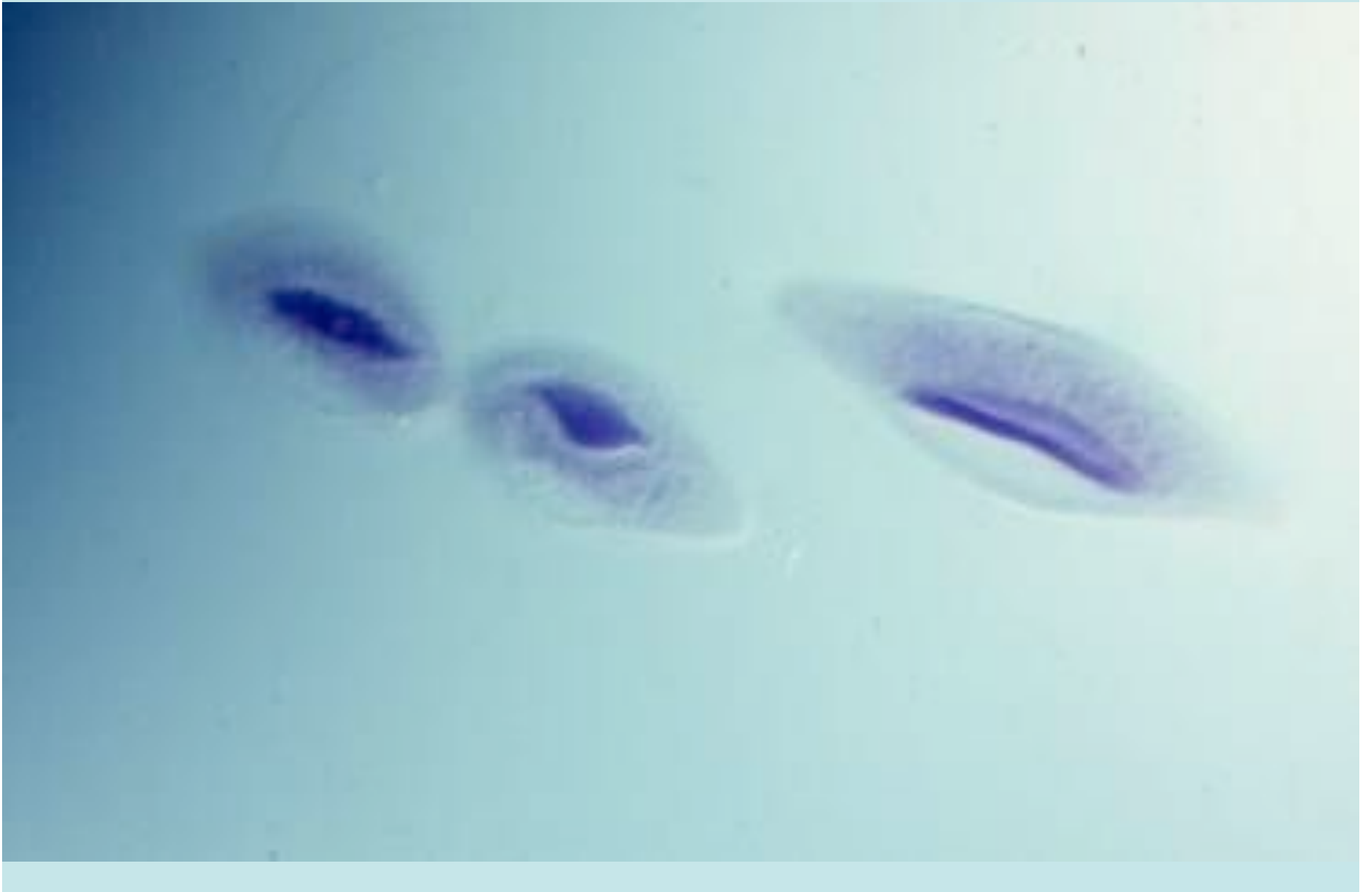
17





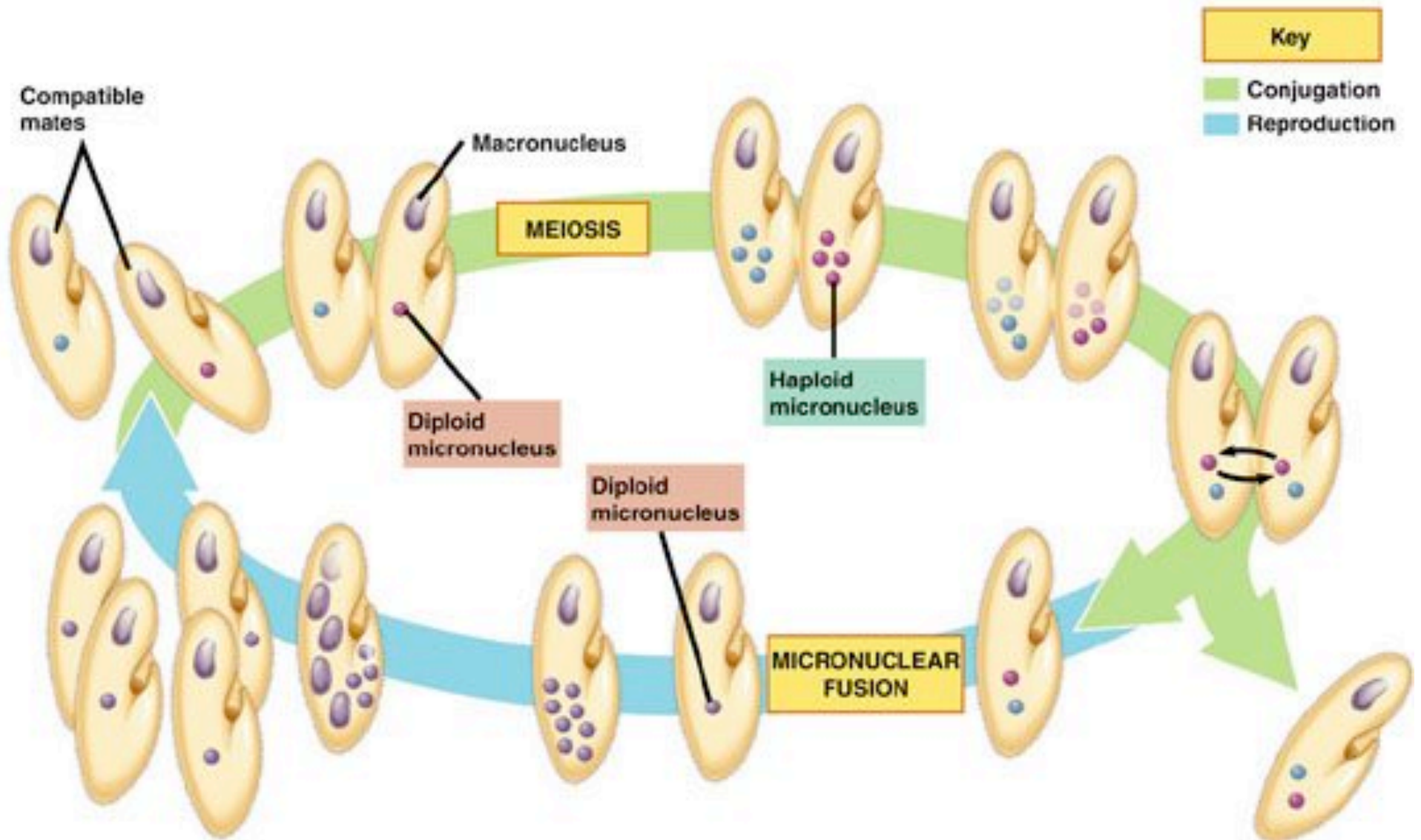
18

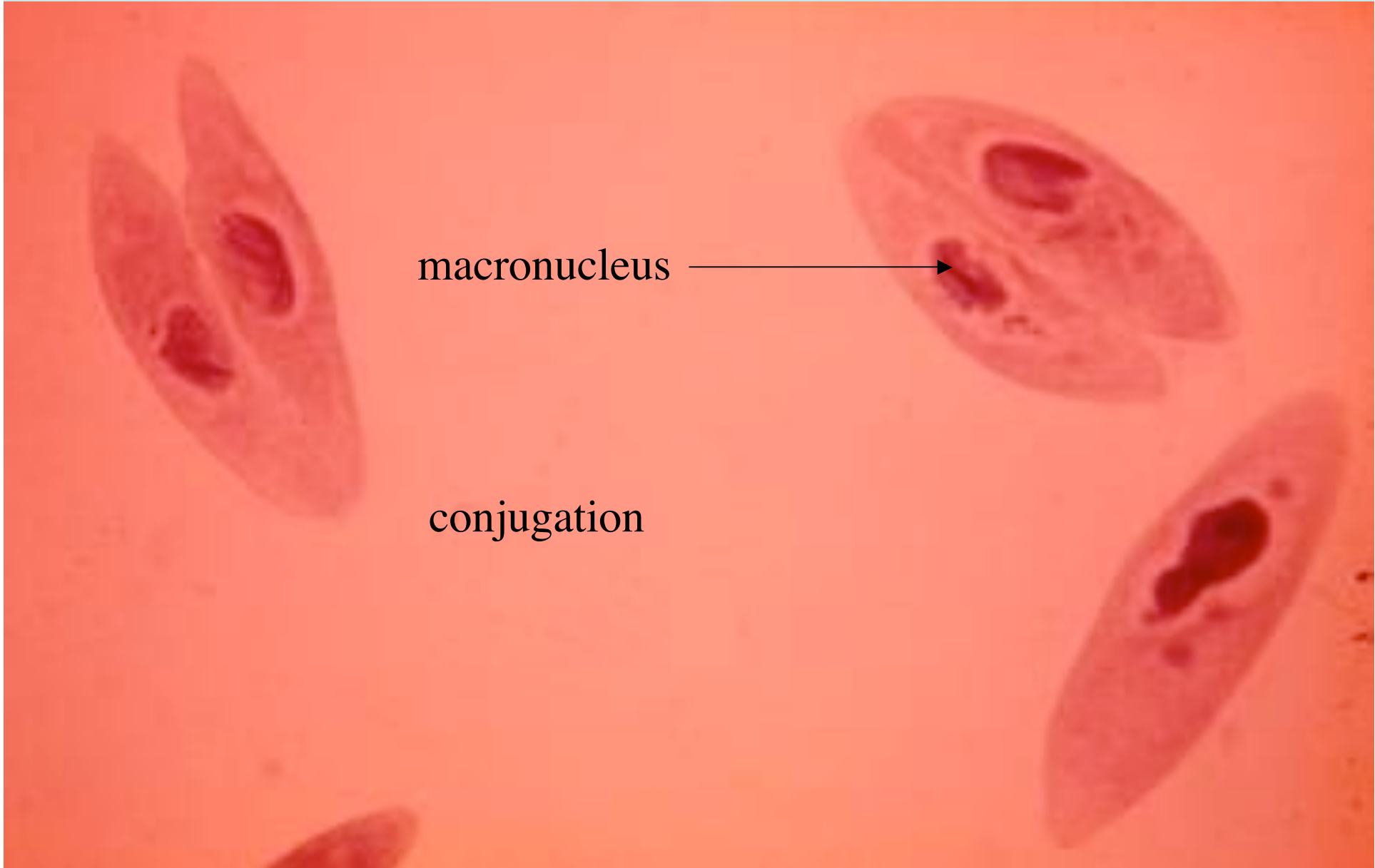






## CONJUGATION AND REPRODUCTION





macronucleus →

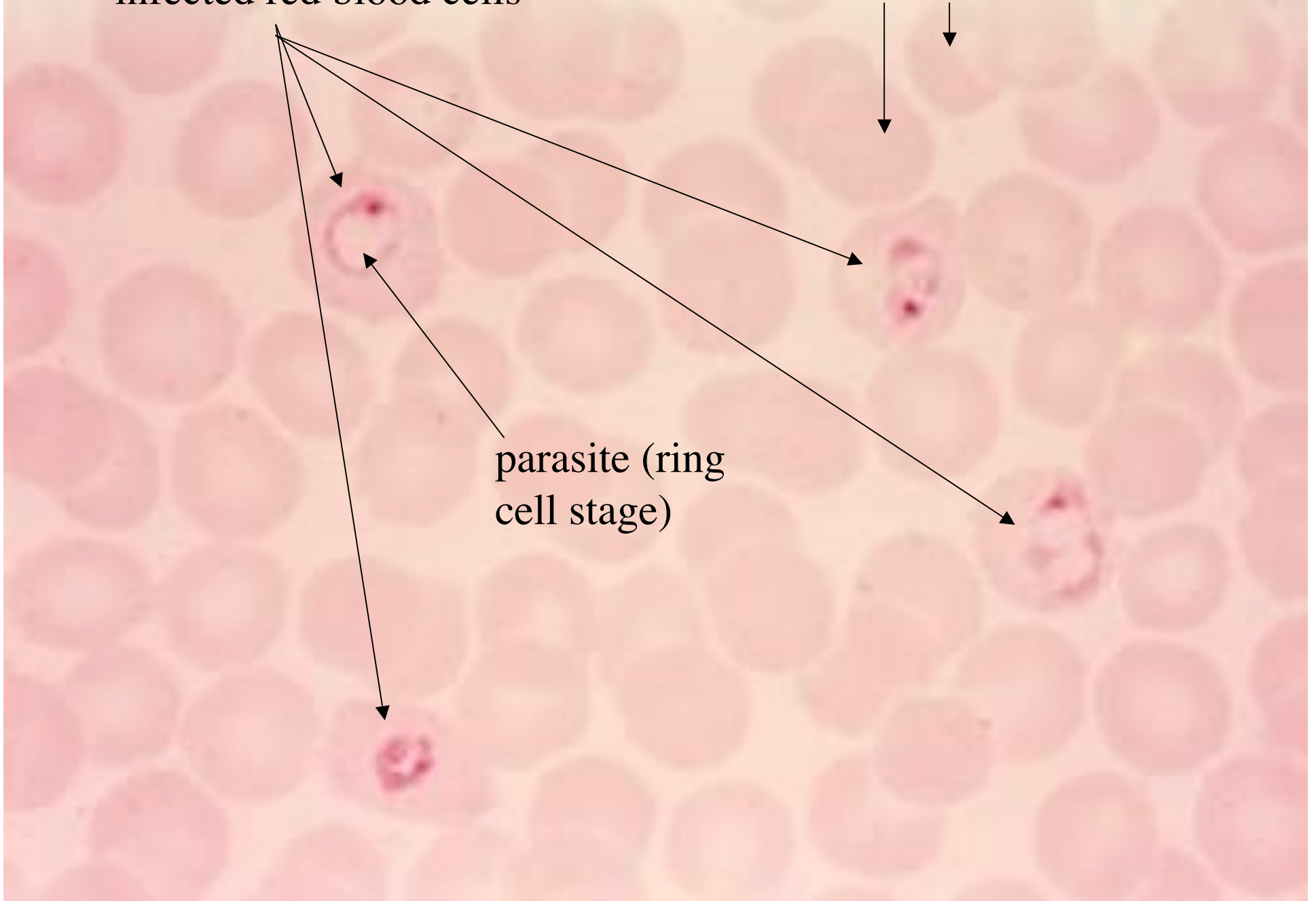
conjugation

infected red blood cells

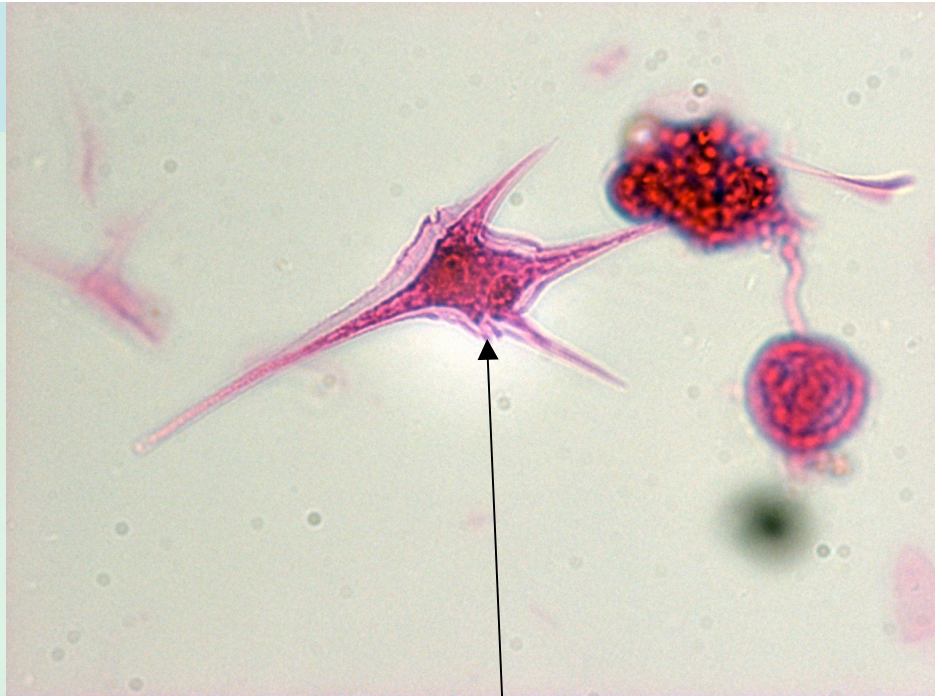
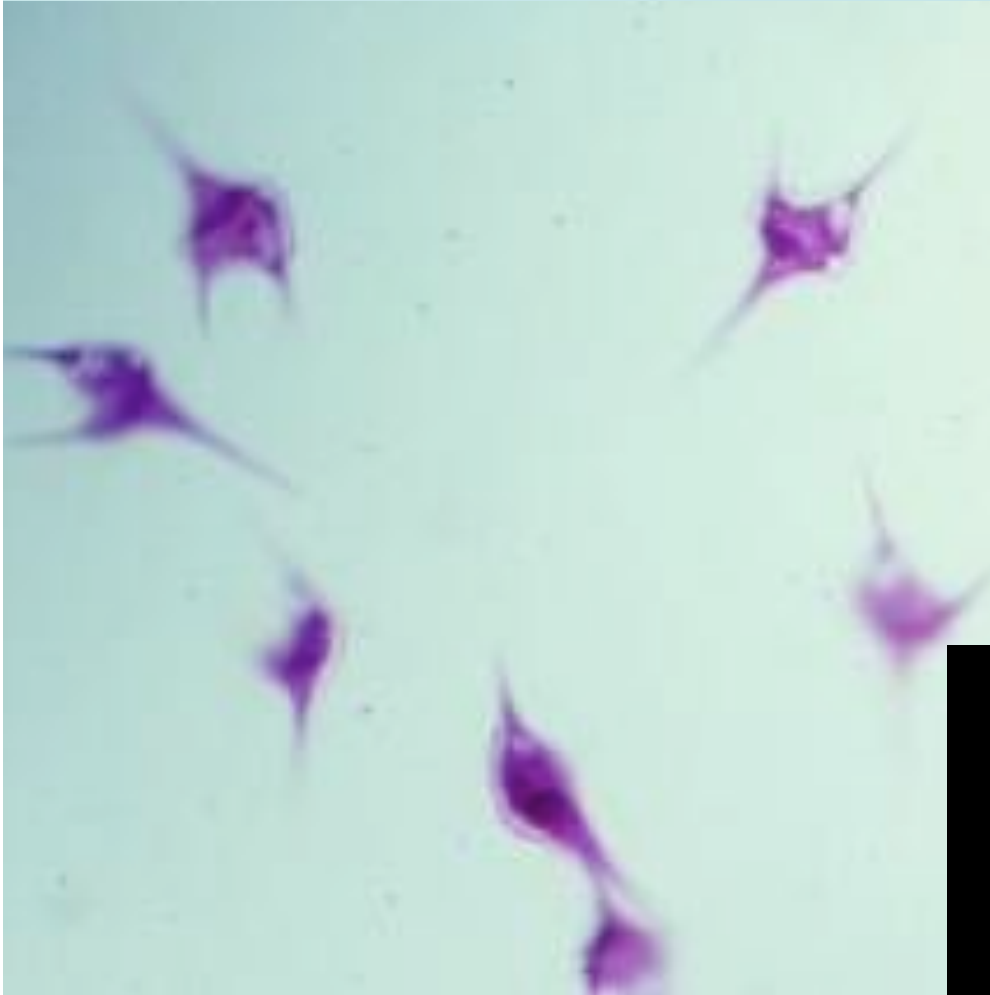
22

uninfected red blood cells

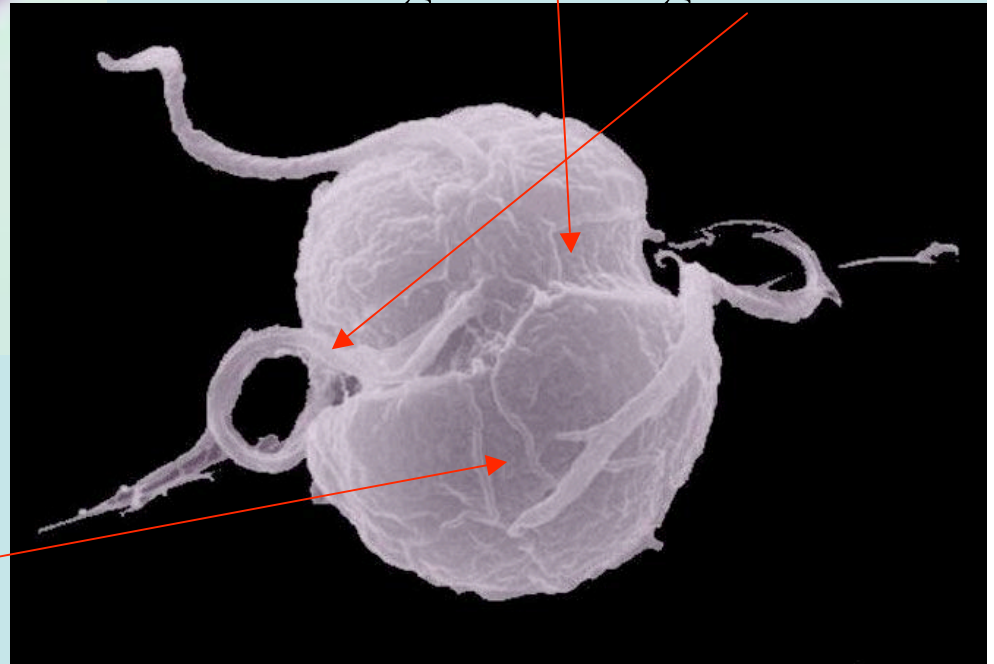
parasite (ring cell stage)



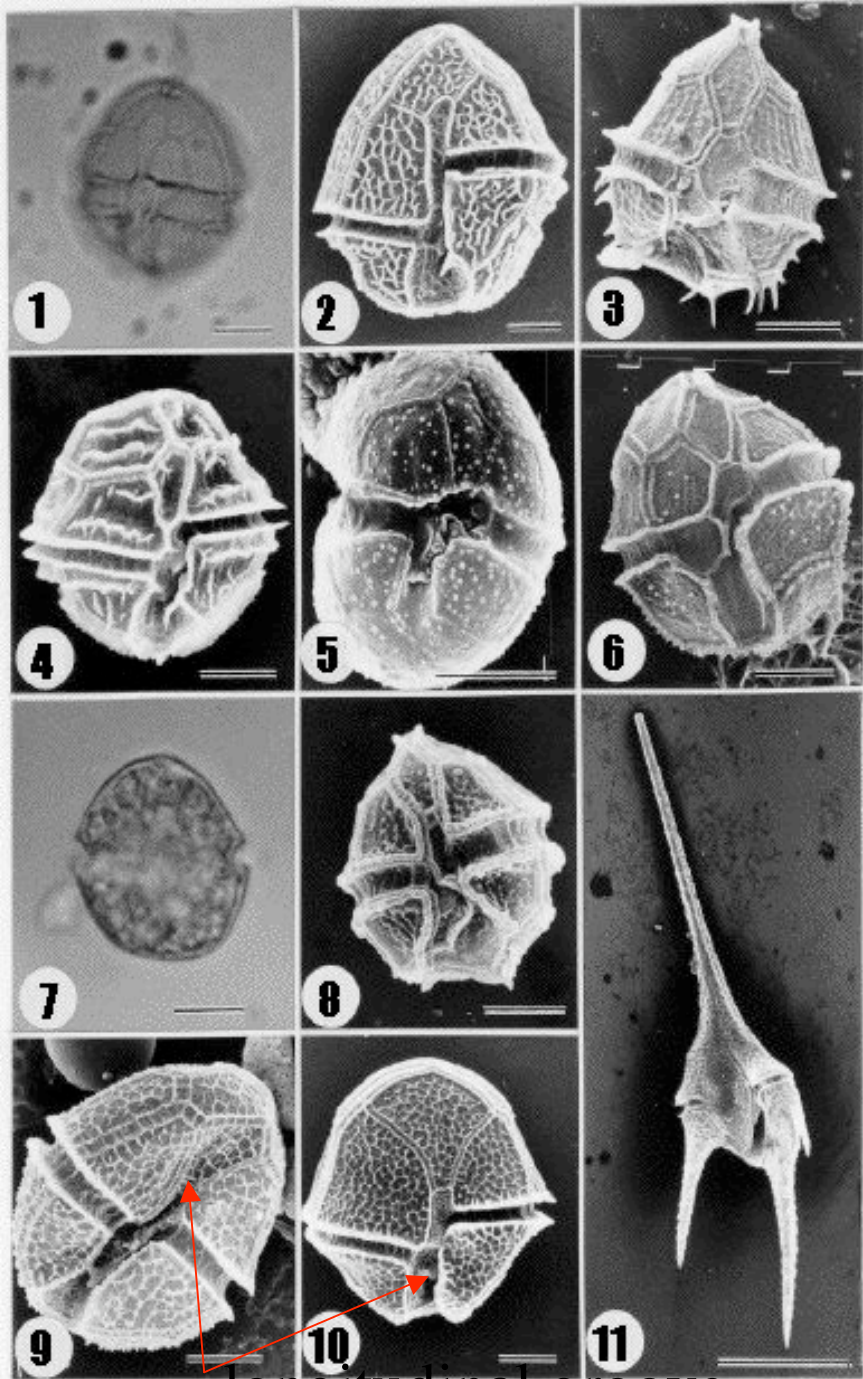




transverse groove/flagellum



longitudinal groove/flagellum



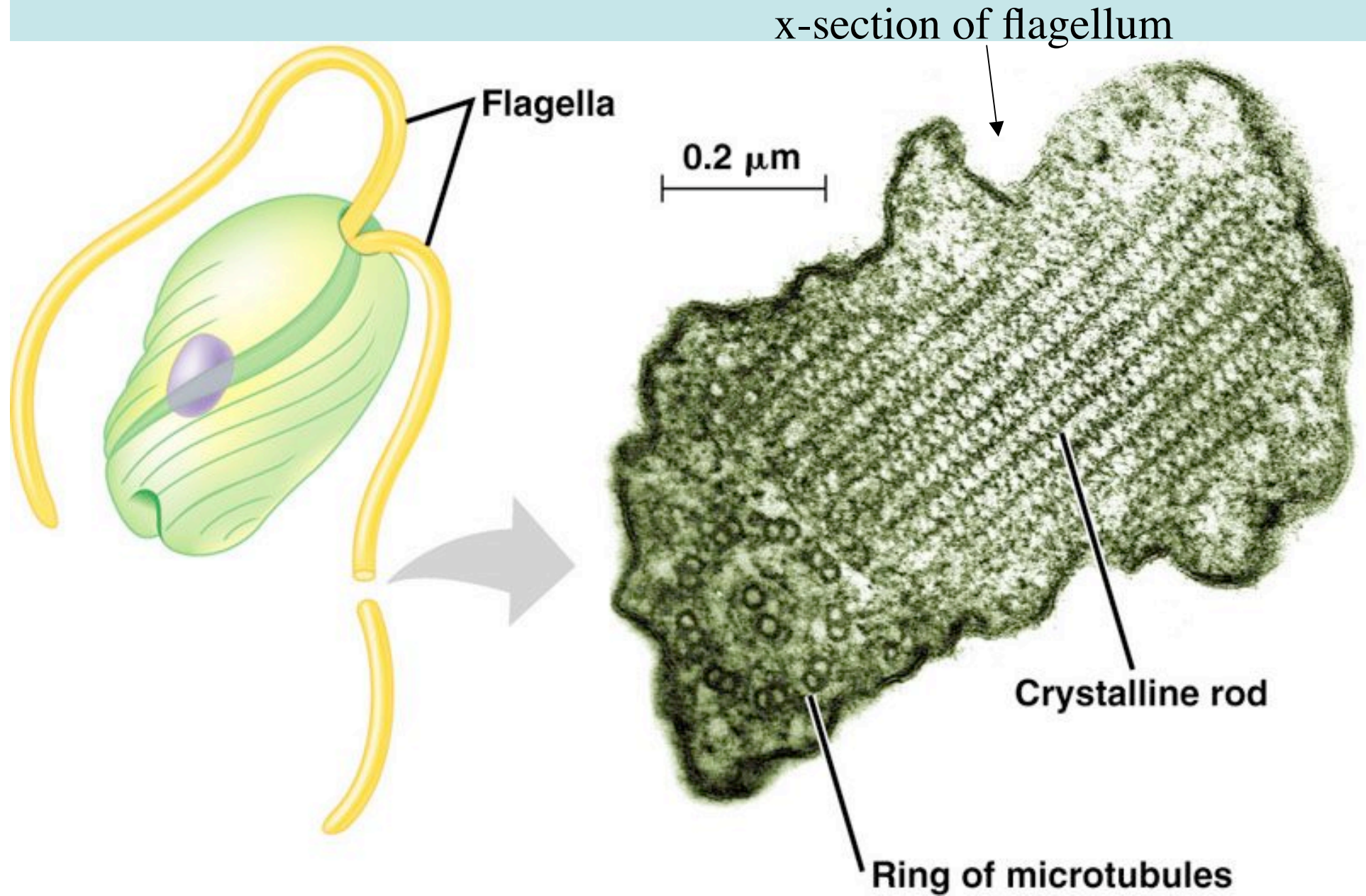
longitudinal groove



渦鞭毛藻のいろいろ

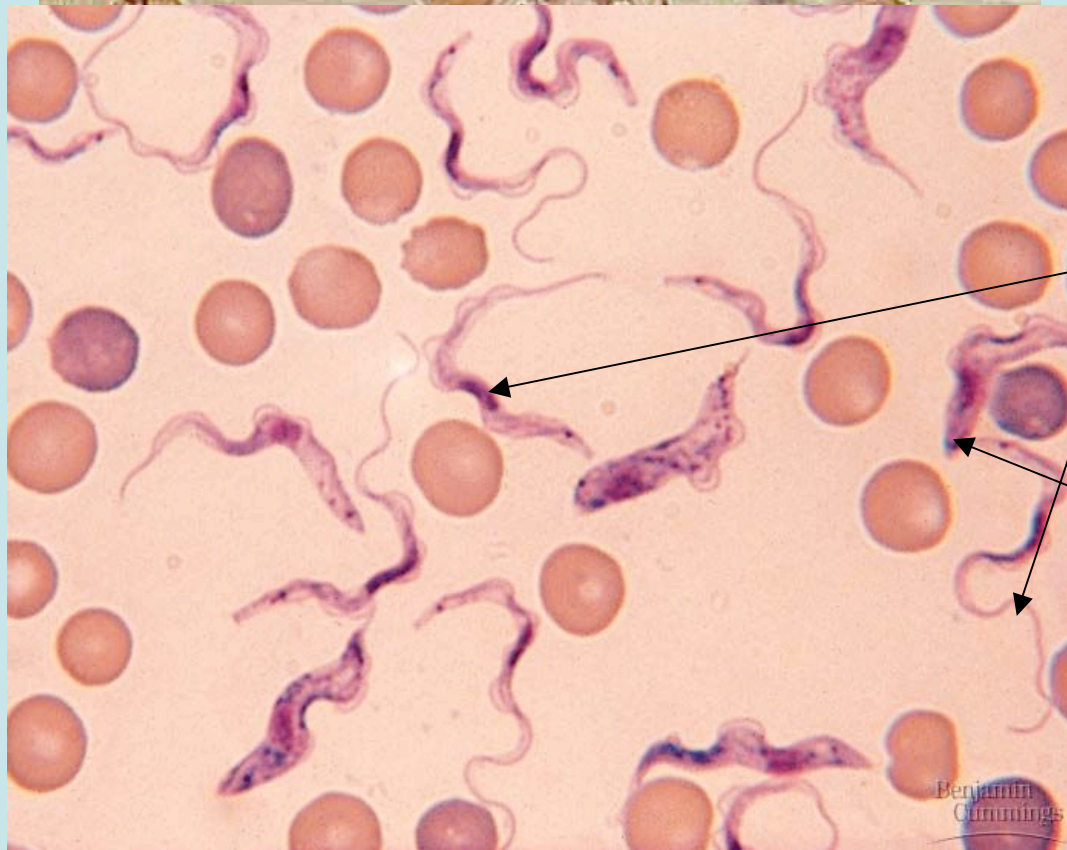


# 25 Kingdom Euglenozoa- p. 553





26

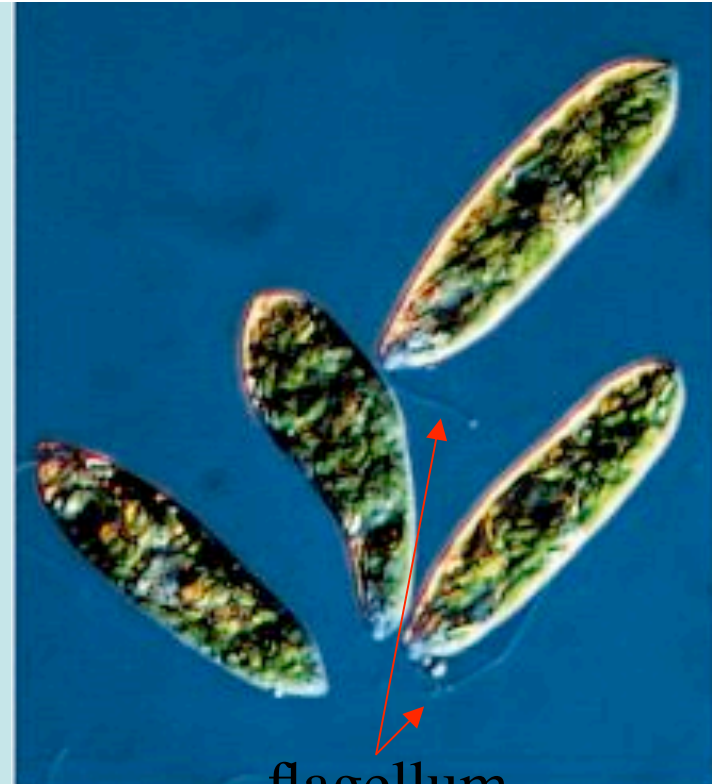


nucleus

flagellum

kinetoplastid

27

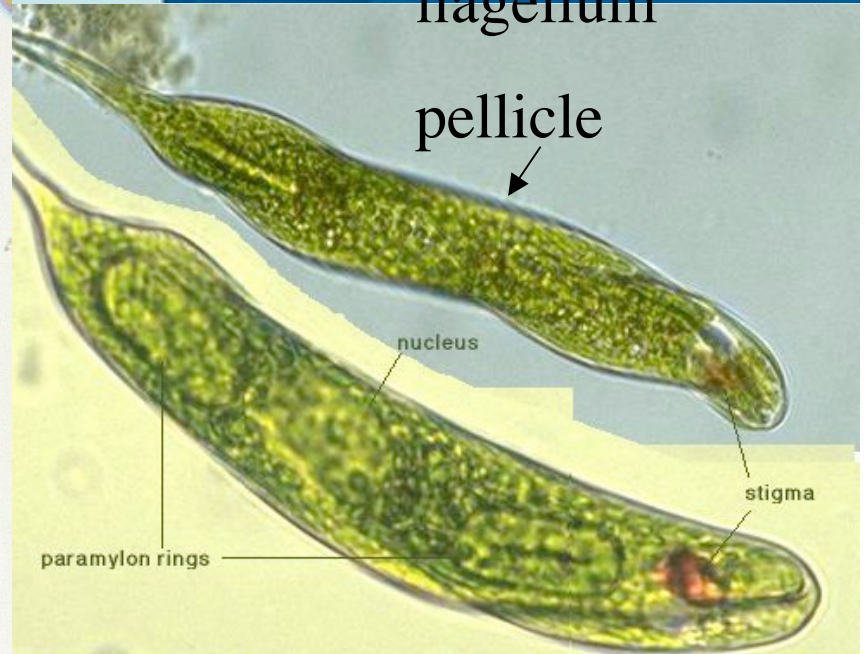


flagellum



20 μm.

Benhaar Bing, Dec. 2003



pellicle

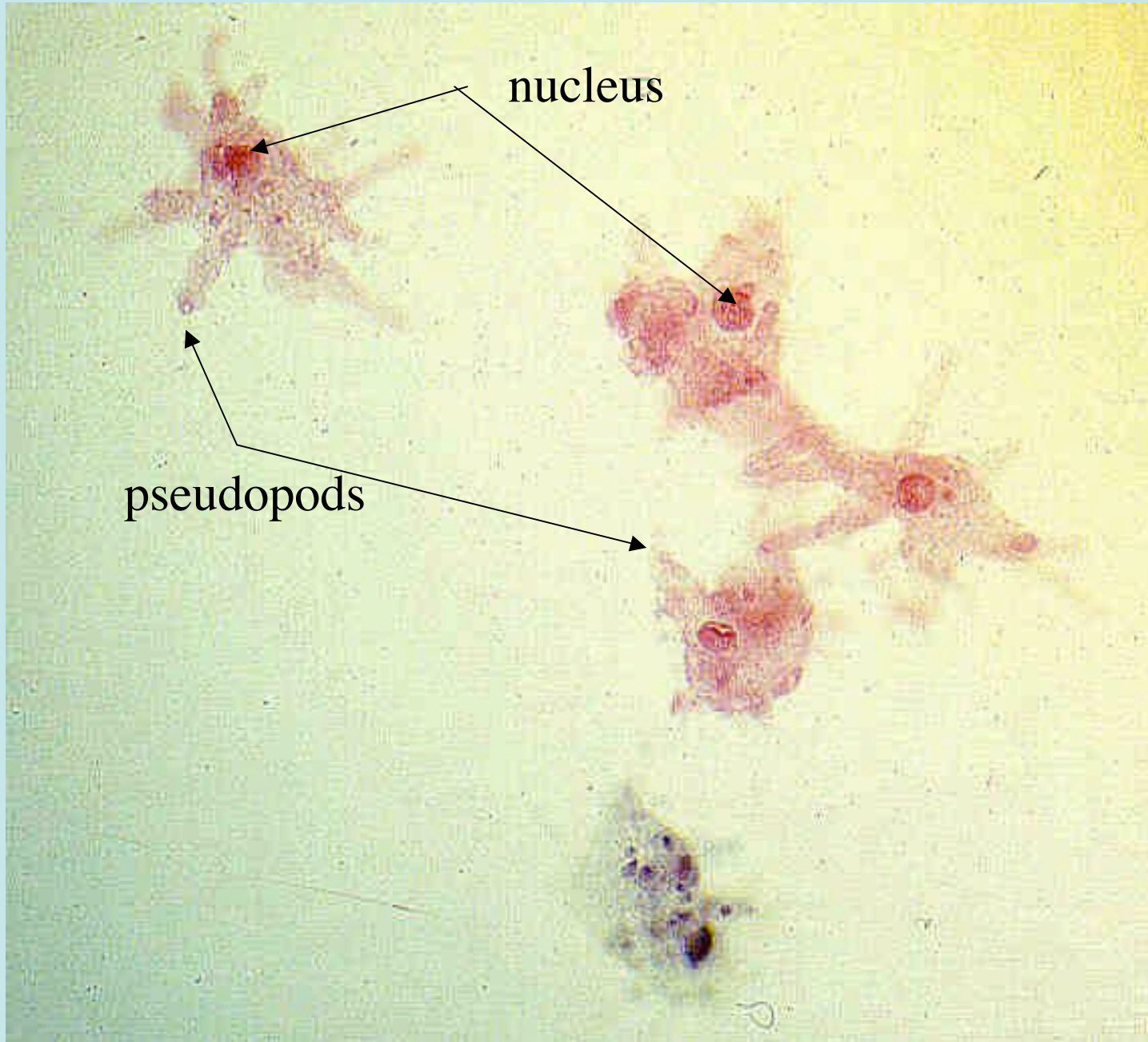
nucleus

stigma

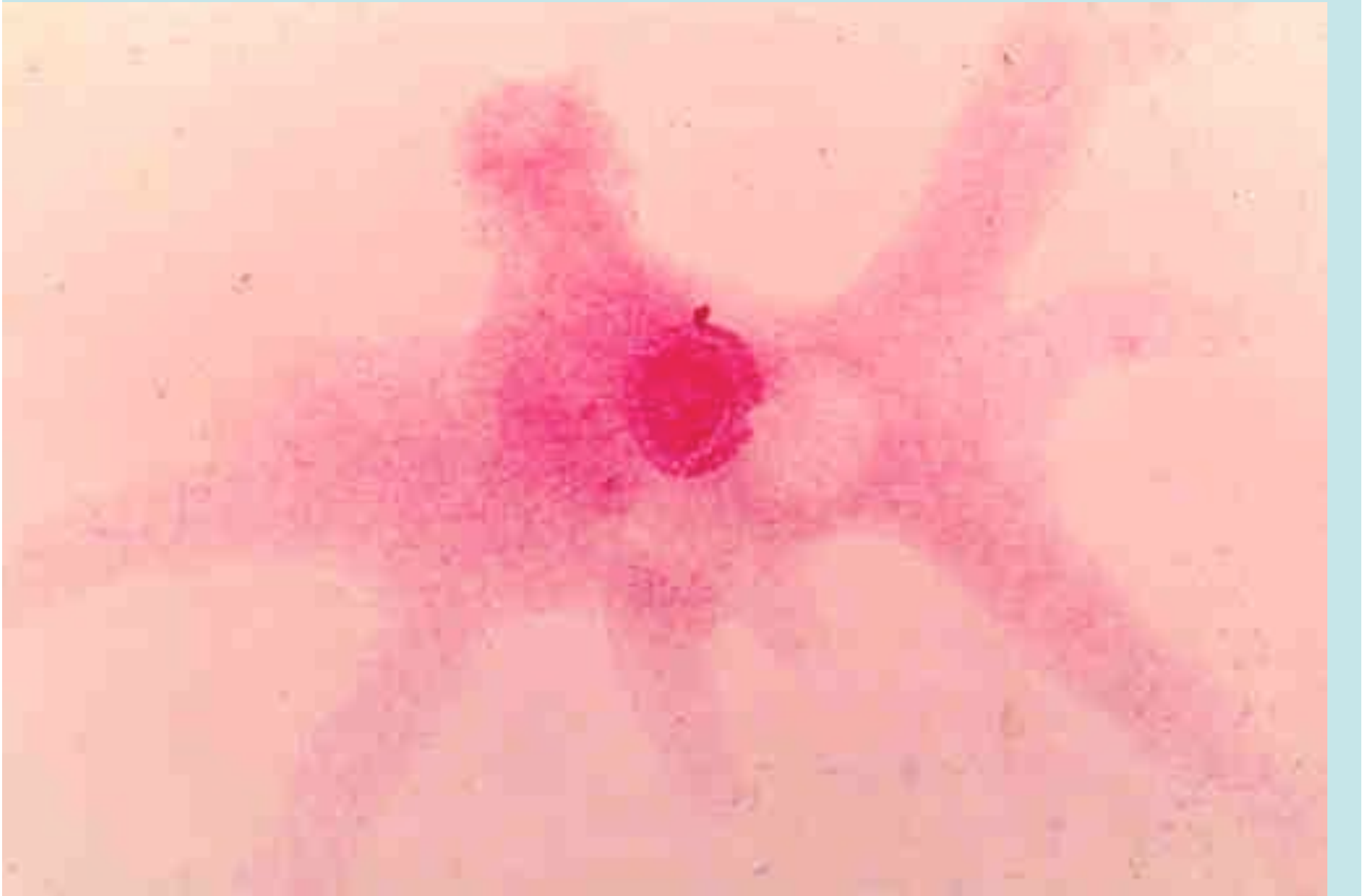
paramylon rings



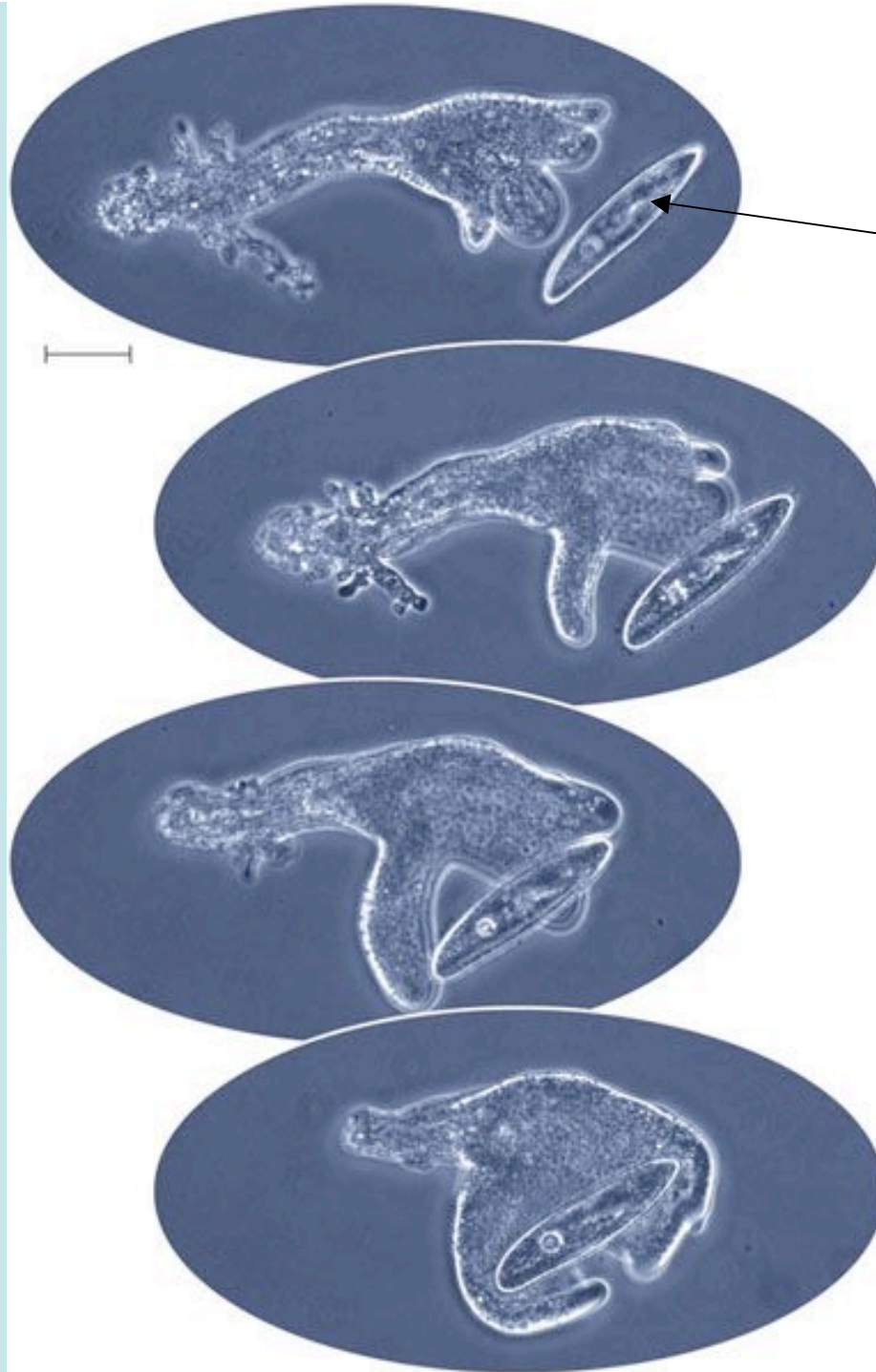
28







30



ciliate being  
engulfed by  
amoeba