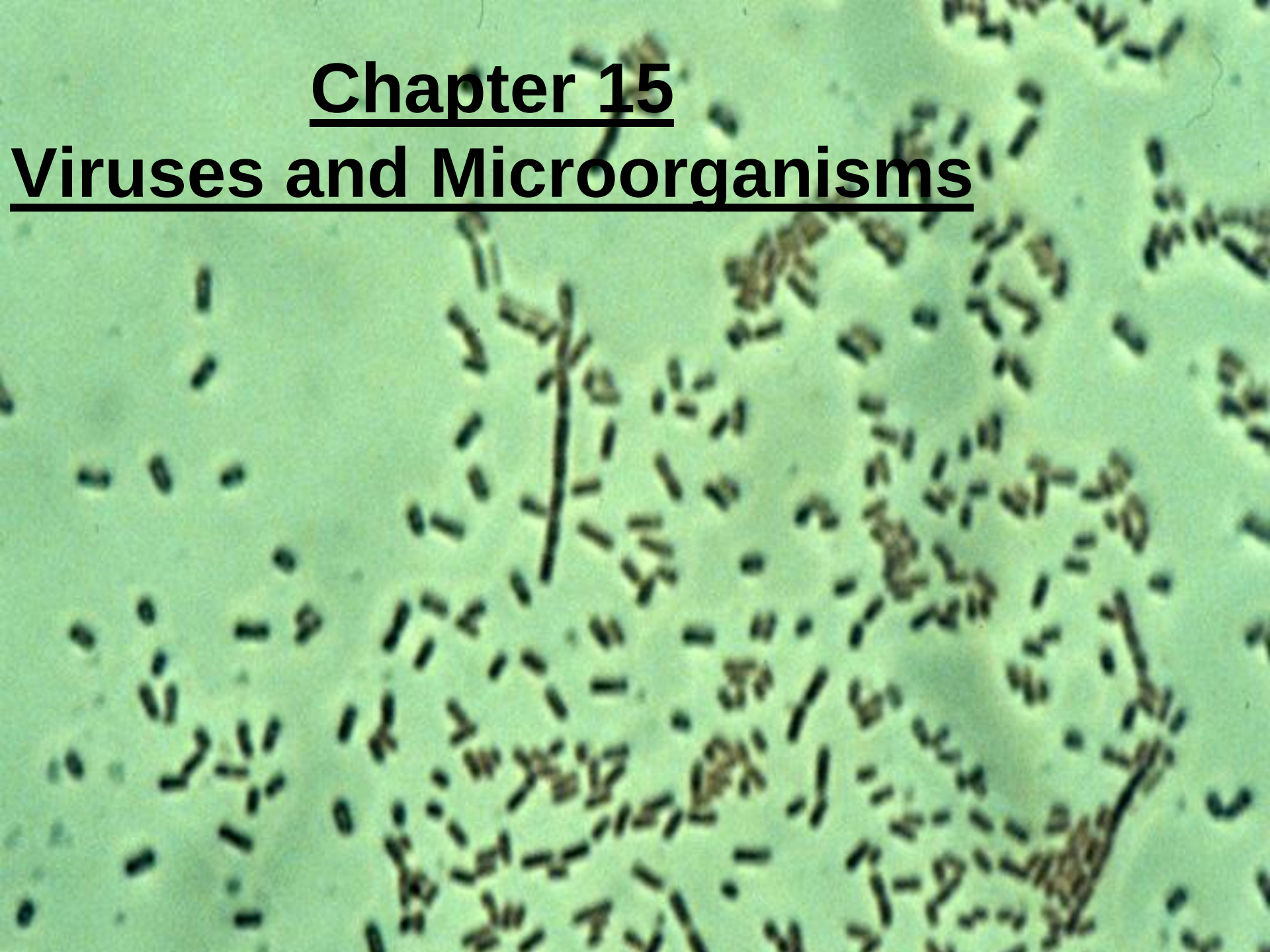
# Chapter 15
# Viruses and Microorganisms



# Viruses

- Latin meaning poison
- Structure
  - Protein coat
  - Nucleic acid inside
  - Either DNA of RNA
- So small they can't be seen with a light microscope
- Must use an electron microscope
- Shapes vary
- Do not carry on life processes

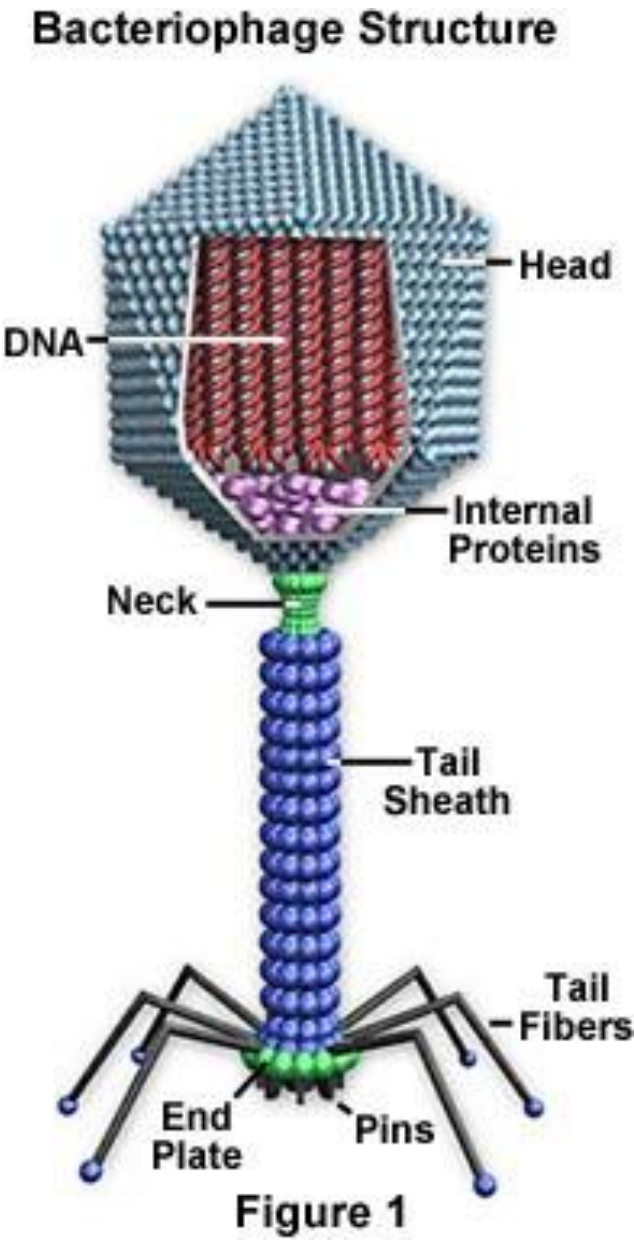
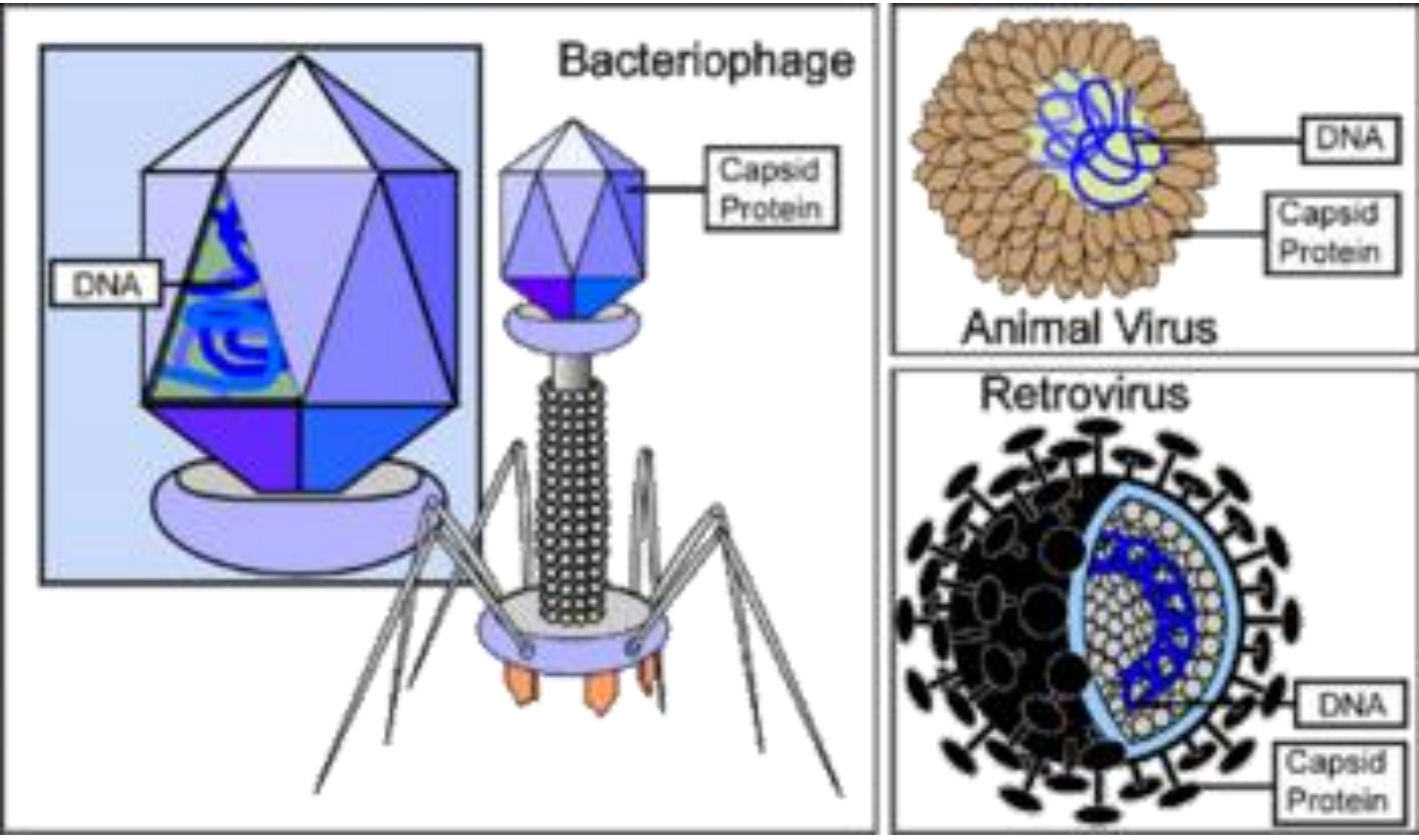
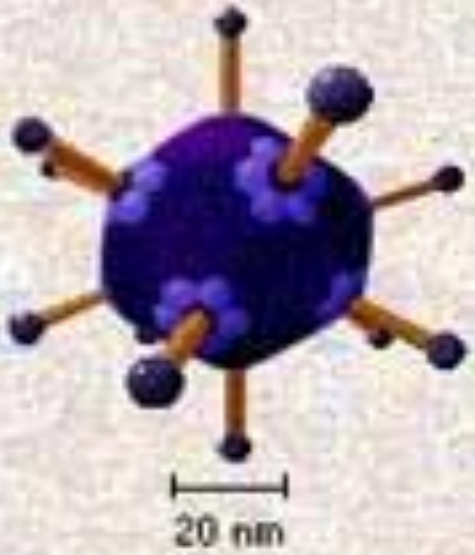


Figure 1


Bacteriophage
DNA
Capsid Protein
DNA
Capsid Protein
Animal Virus
Retrovirus
DNA
Capsid Protein


Helical

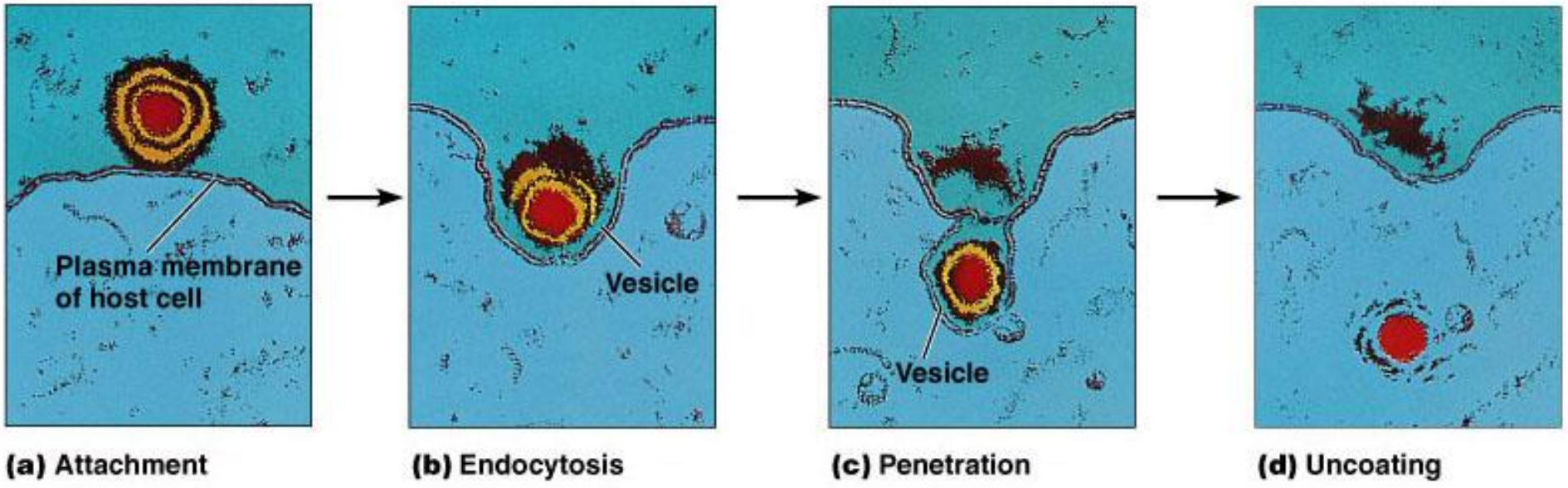



Polyhedral/Icosahedral


Complex

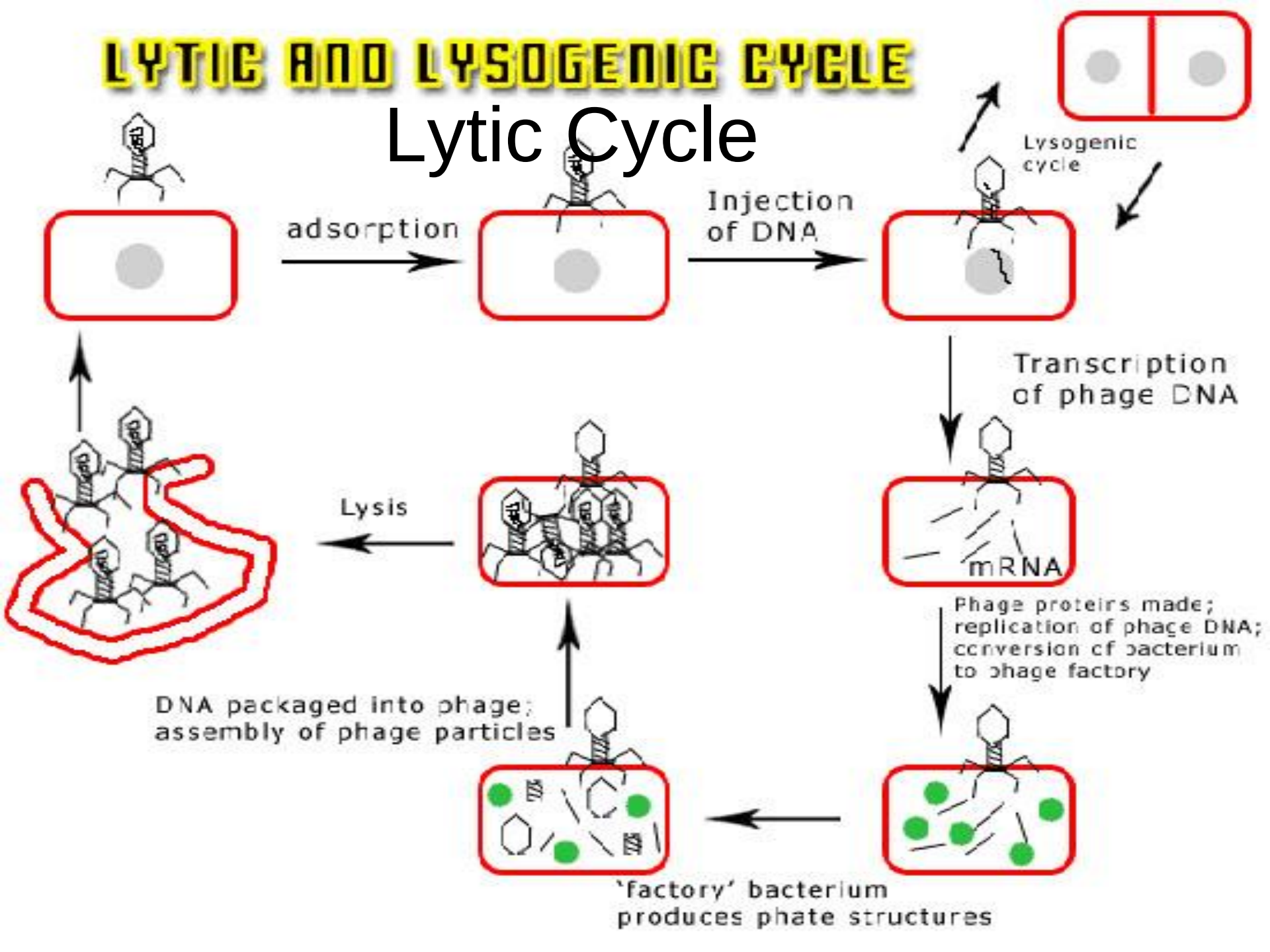
# Viral Cycles

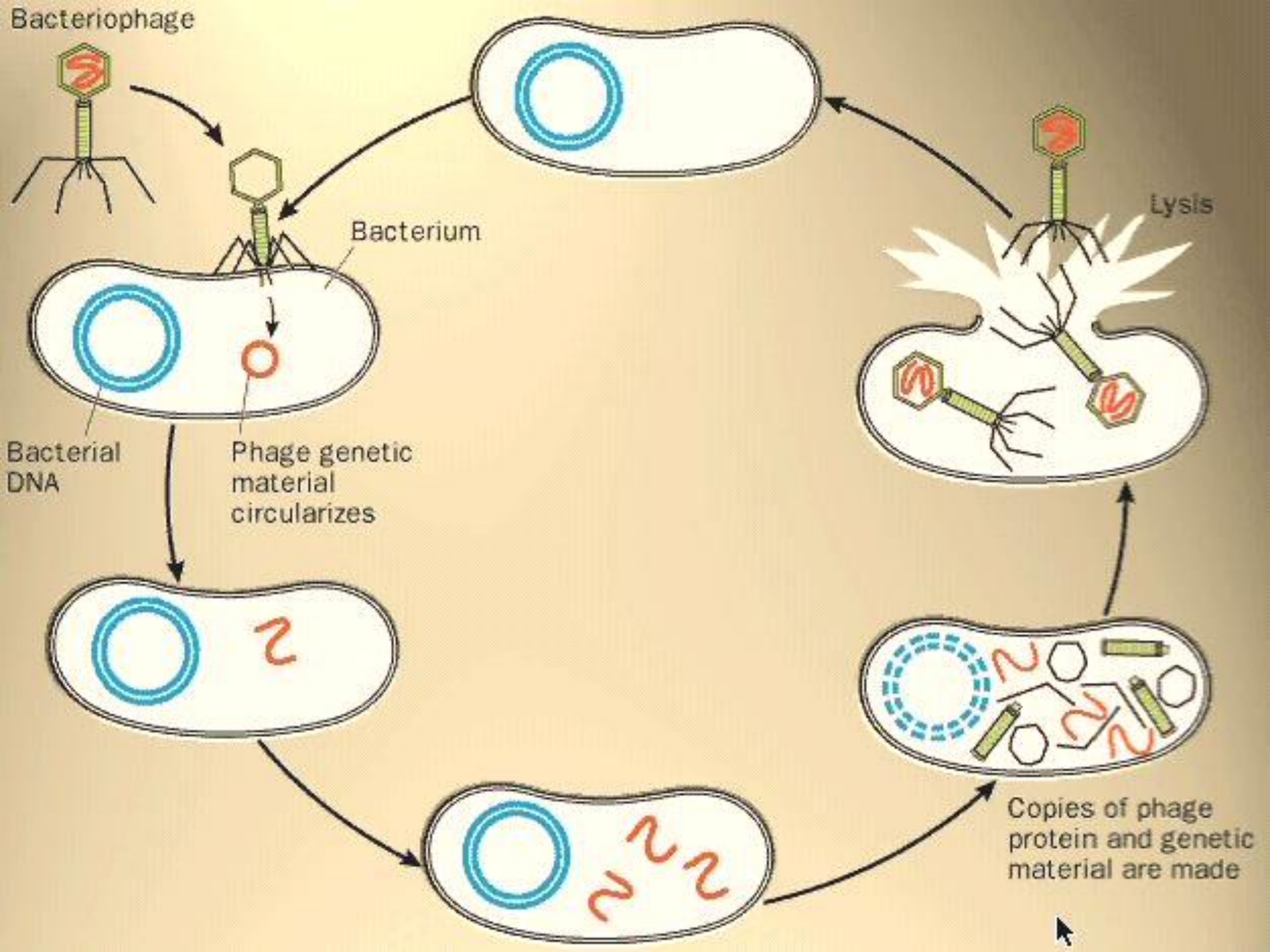
- **Attach to cells**
- **Reproduce in the cells using the cells energy and building materials**
- **Lysis- burst out of the cell**



# LYTIC AND LYSOGENIC CYCLE

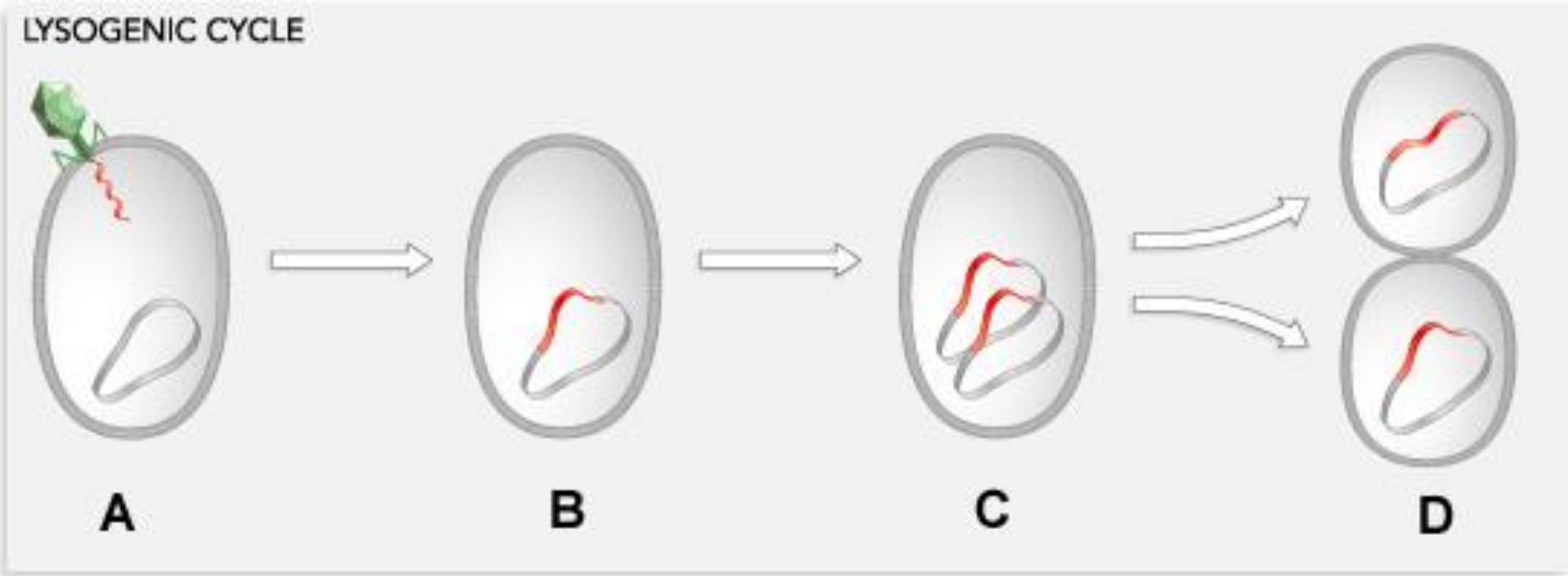
## Lytic Cycle

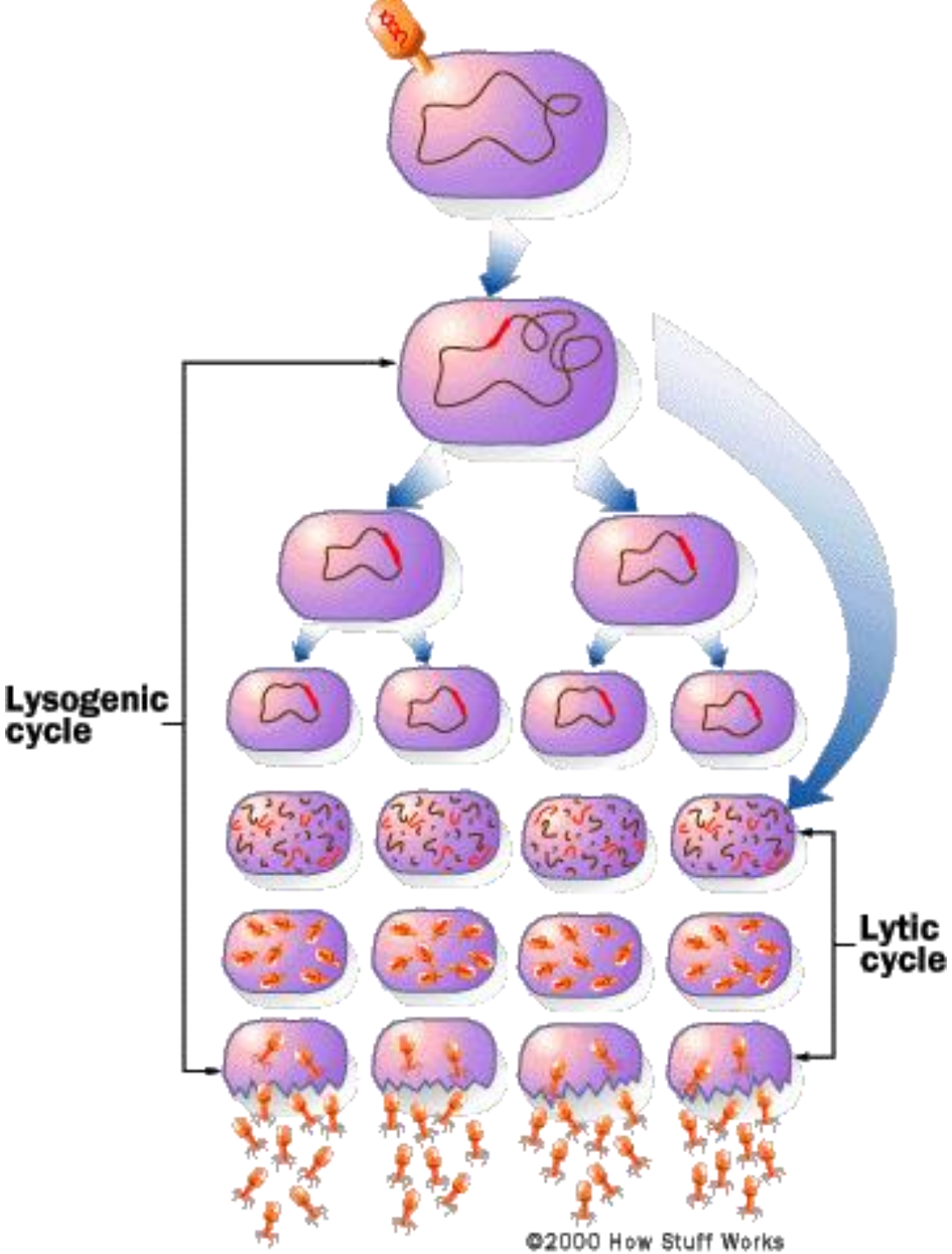



Bacteriophage
Bacterium
Bacterial DNA
Phage genetic material circularizes
Lysis
Copies of phage protein and genetic material are made

# Viral Cycles

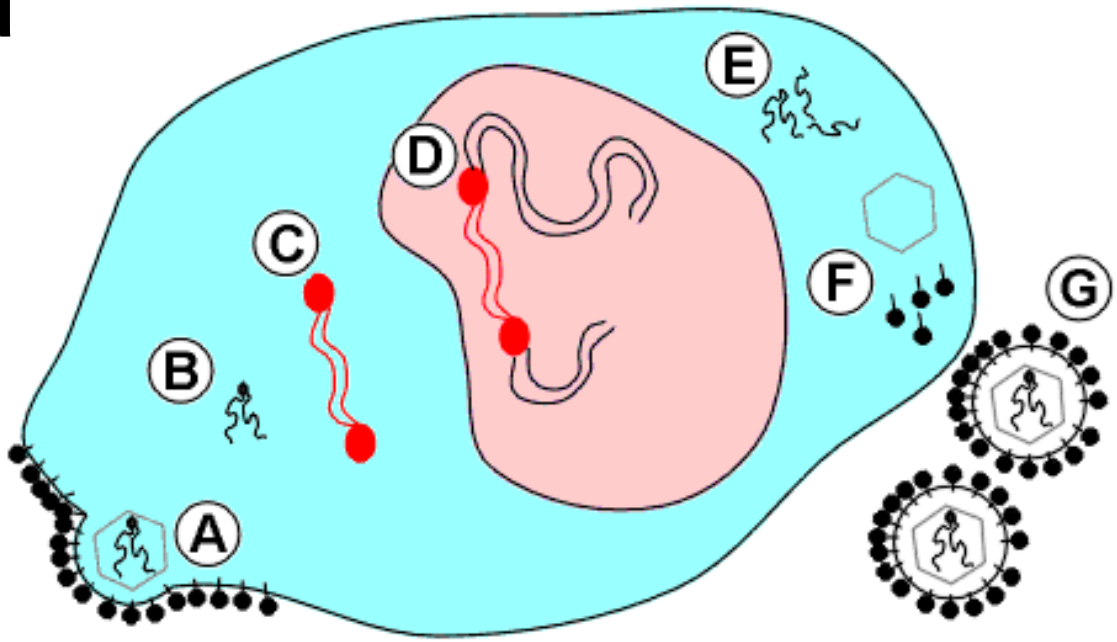
- **Lysogenic cycle**
- **Cells lyse only after certain conditions**
- **This type of virus is called a provirus**



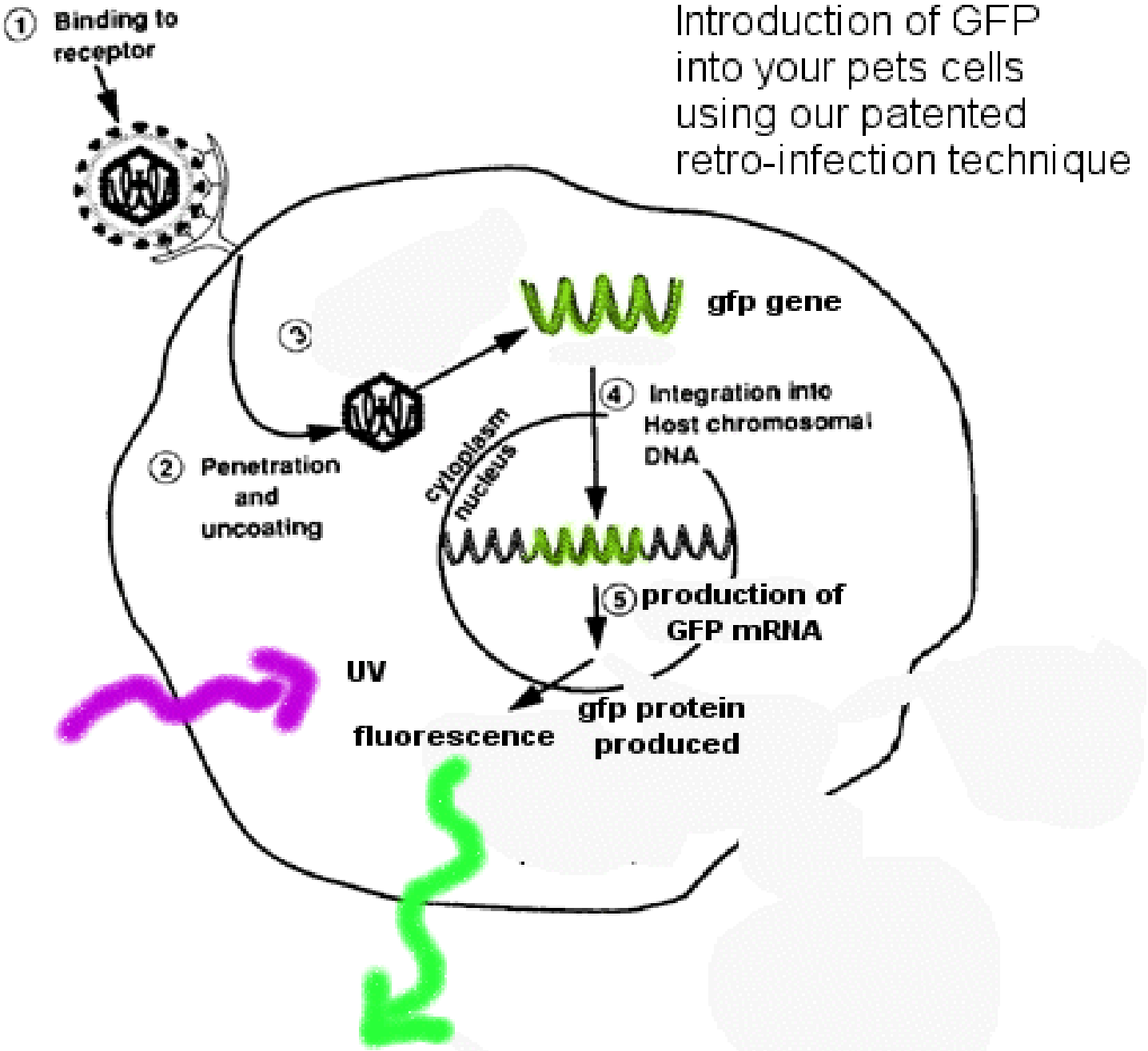

Lysogenic cycle
Lytic cycle
©2000 How Stuff Works

# RNA viruses

- **Use reverse transcriptase to get into DNA code and use DNA bases to produce more viruses**
- **Called *retrovirus* because of the backwards transcription that they do**



Introduction of GFP into your pets cells using our patented retro-infection technique



# Retrovirus

- **An example of this type of virus is AIDS and the common cold**

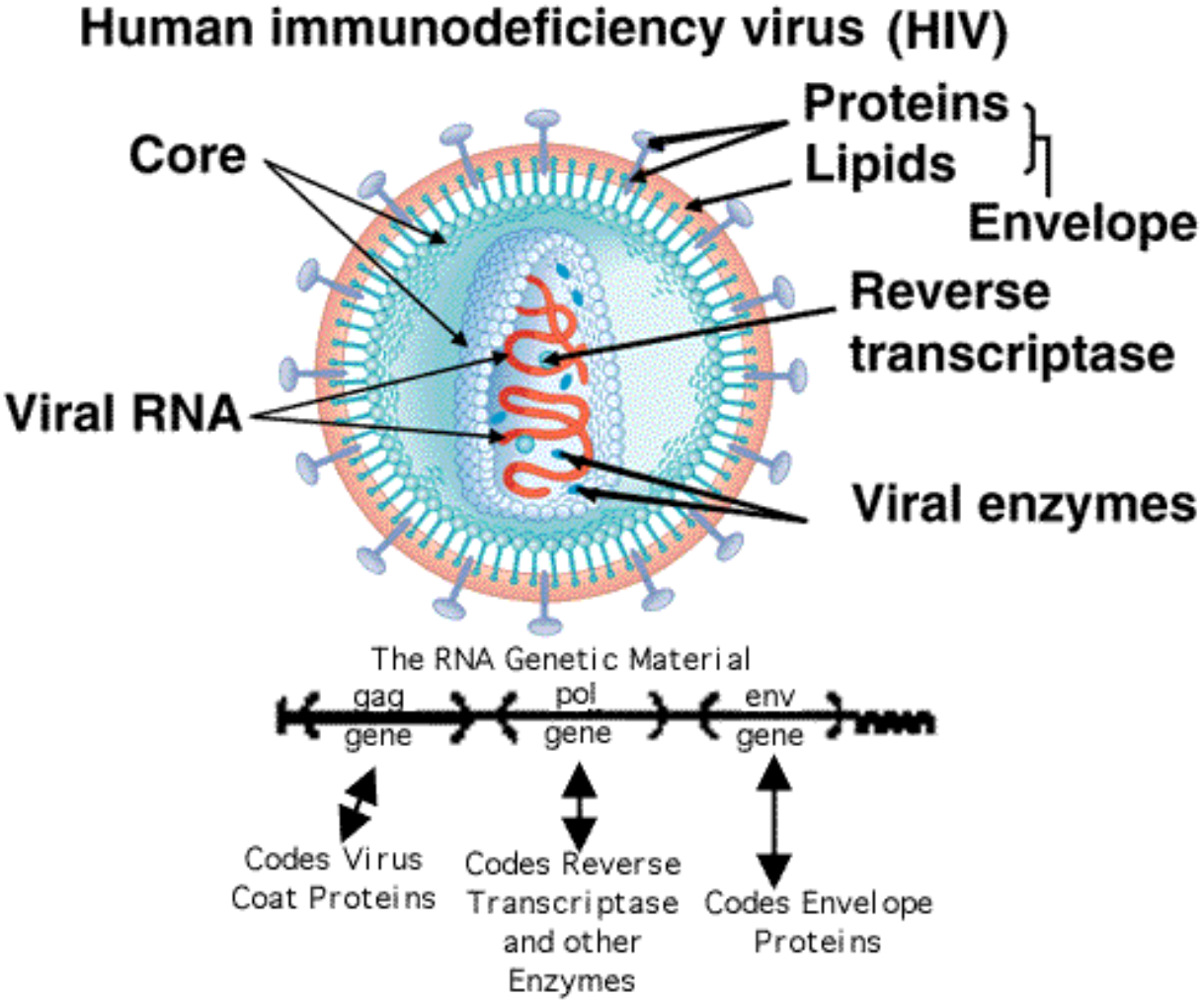
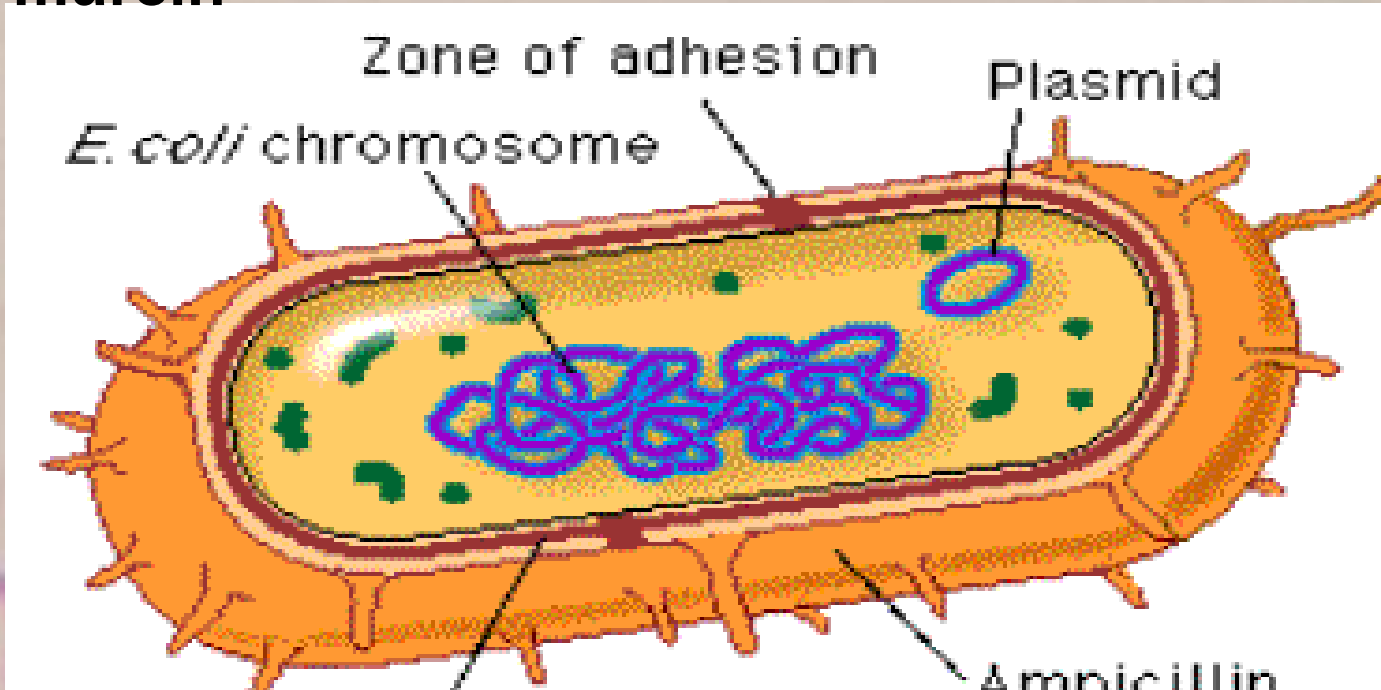



Figure 4-4

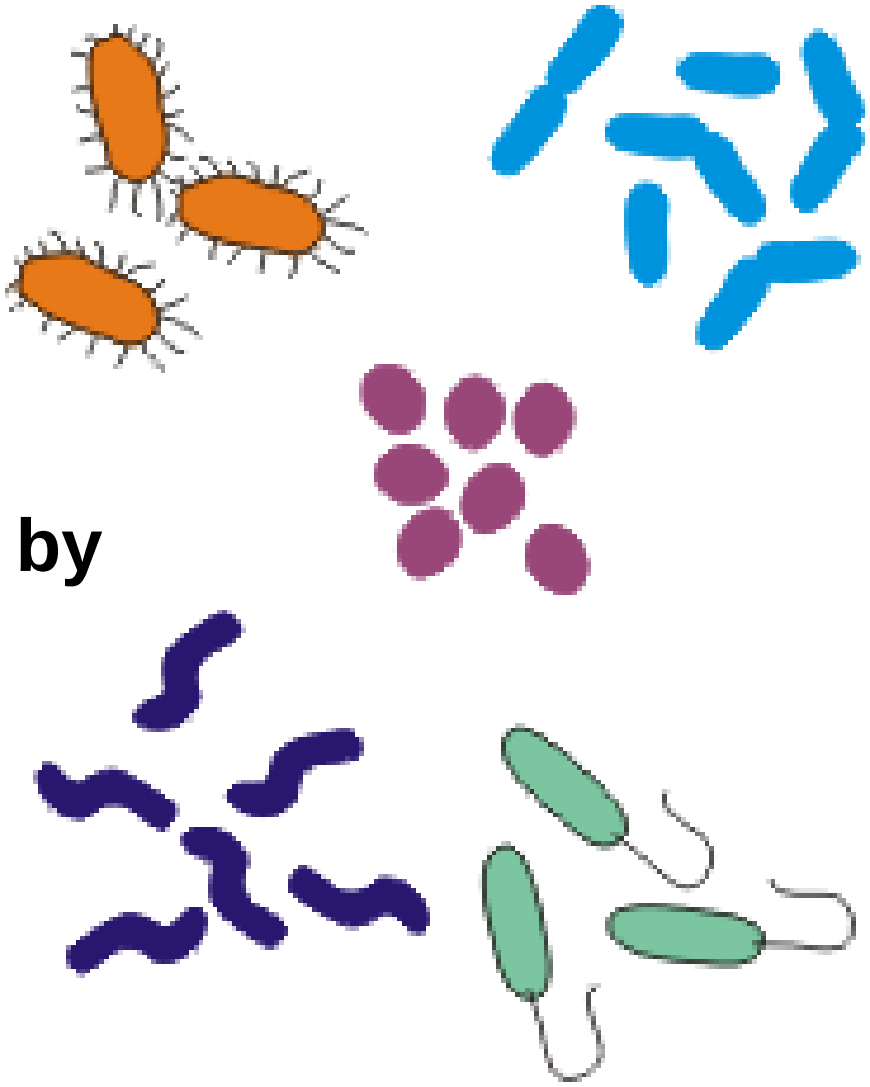
# Kingdom Monera

- **Characteristics**
  - **Prokaryotes**
  - **no membrane bound organelles or microtubules**
  - **cell walls of murein**



# Three Basic Shapes of Bacteria

- **Shapes**
  - **round – cocci**
  - **rod – bacilli**
  - **spiral – spirillia**
- **form endospores**
- **reproduction is asexual by binary fission**



# Bacteria nutrition

- **Heterotrophs- include parasites, saprophytes and symbiotic**
- **Photosynthetic autotrophs**
- **Chemosynthetic autotrophs**
- **Thermosynthetic autotrophs**

# Two Divisions of Bacteria

- Eurobacteria
  - Cyanobactera
    - Blue-green algae
    - Red or black
      - Is what gives the name to the Red Sea
  - Consumer Bacteria
    - Gram positive stains purple because of thick cell wall
    - Gram negative because it stains pink from a thin cell wall
- Archaebacteria
  - Usually found in extreme conditions

# Ancient Bacteria (Archebacteria)

- **nutrition different from true bacteria**
- **Methane producers**
- **salt loving**
- **Heat and acid loving**

# The importance of bacteria

- Flavoring
- Intestinal vitamins and immunity
- Break down wastes
- Break down chemicals

# Quiz

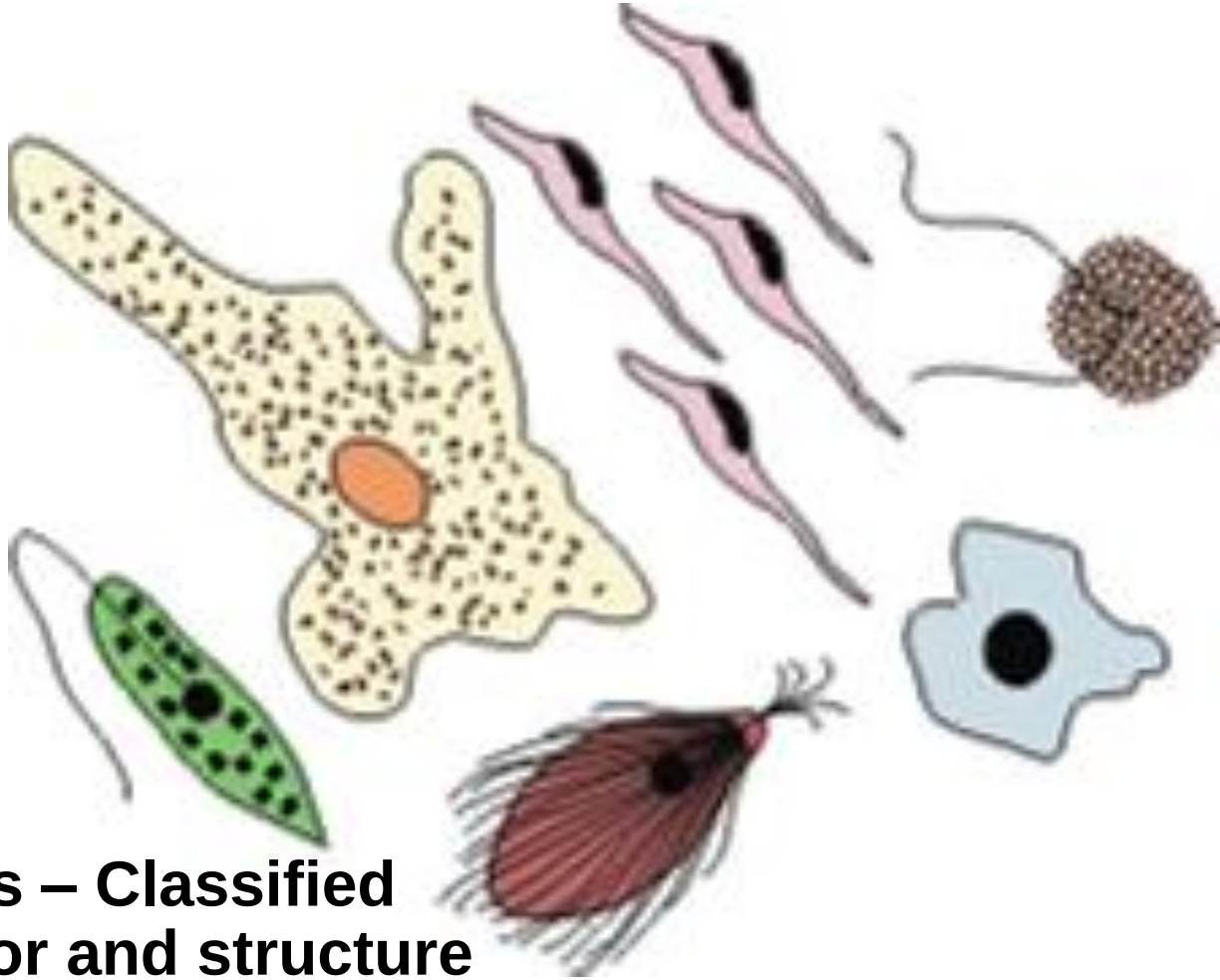
1. What is the basic structure of a virus?
2. Explain the difference between the lytic cycle and the lysogenic cycle in a virus.
3. What is a retrovirus?
4. What are the three shapes of bacteria?
5. What distinguishes the monerans from all other kingdoms.
6. What are the two main groups of bacteria

# Kingdom Protista

- Characteristics
- Eukaryotes
- Autotrophic, Heterotrophic or both

# Divide into three groups

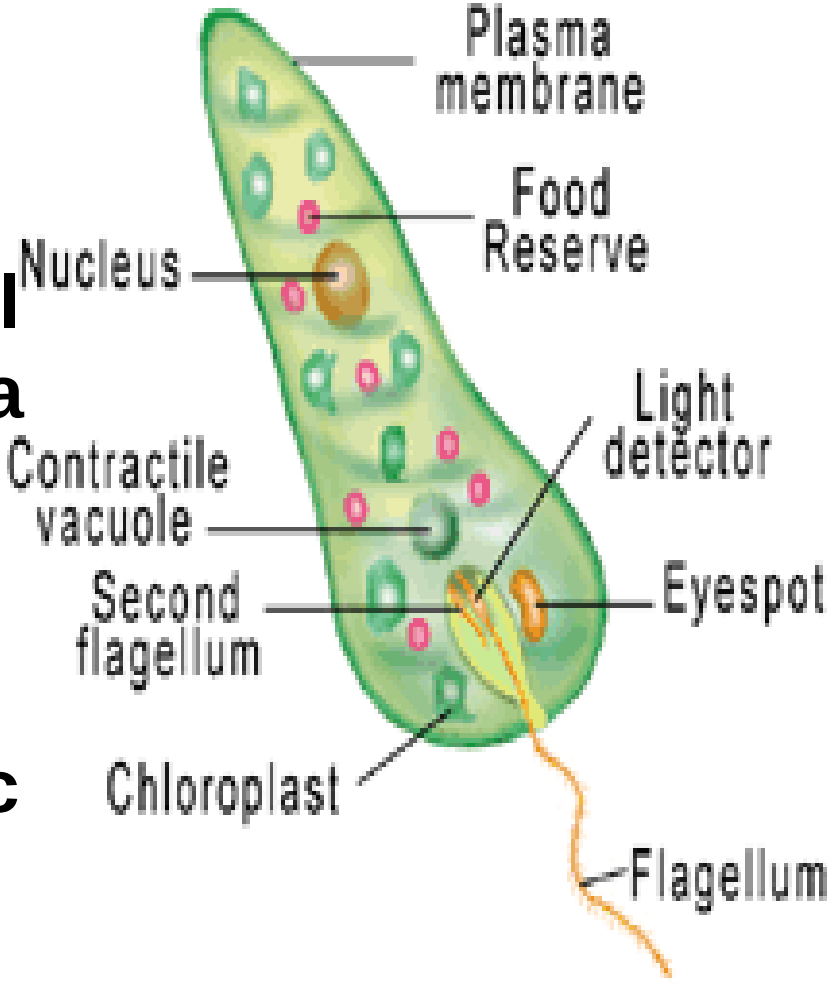
- Plantlike
- Animal like
- Fungi like

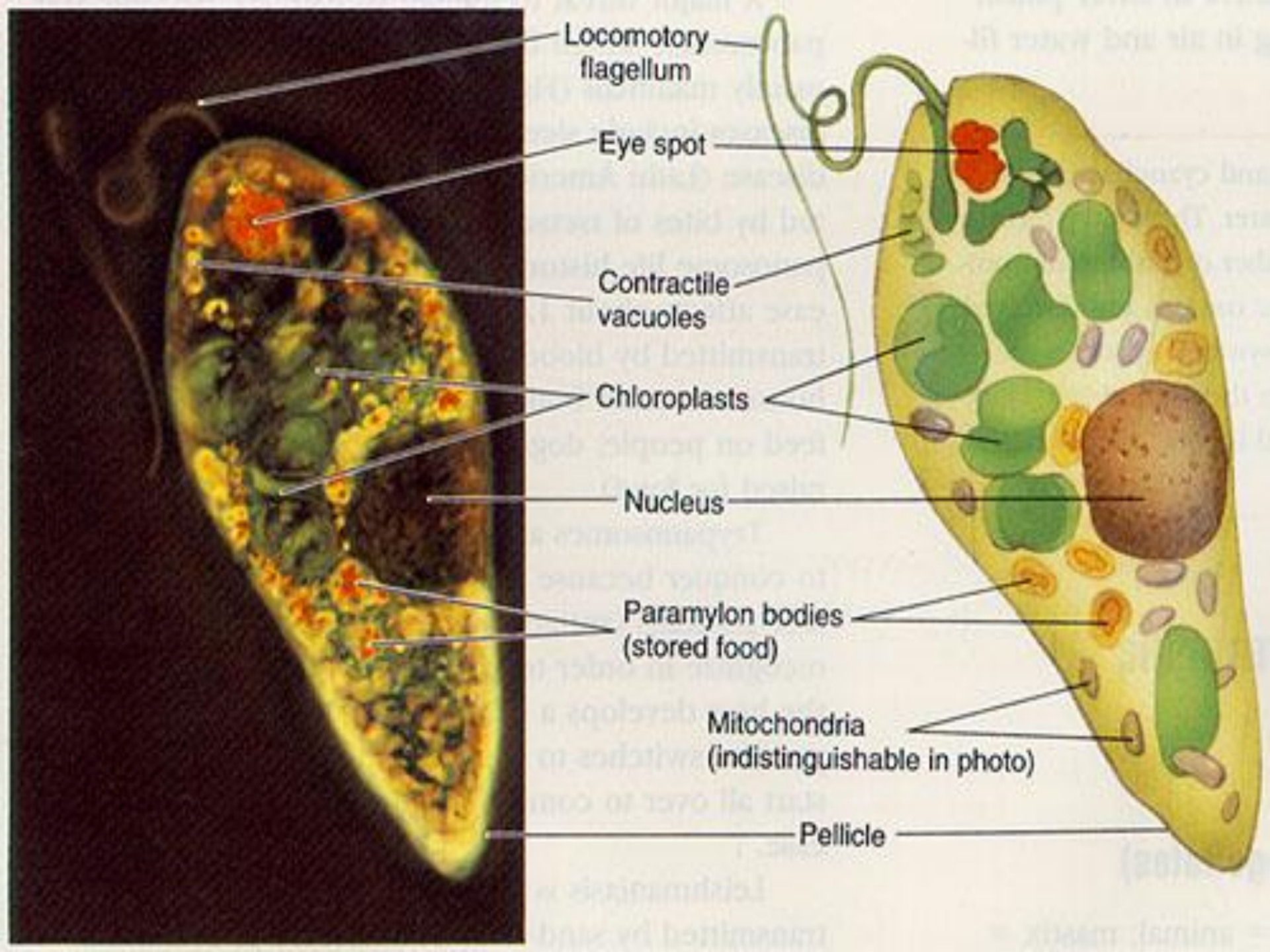


- **Plant like protists – Classified according to color and structure**

# Euglenoids

- **Phylum Euglenophyta**
- **Characteristics of both plants and animals**
- **Like animals they lack cell walls and move by flagella**
- **Like plants they are photosynthetic and have chloroplasts**
- **Can be both heterotrophic and autotrophic**




Locomotory flagellum
Eye spot
Contractile vacuoles
Chloroplasts
Nucleus
Paramylon bodies (stored food)
Mitochondria (indistinguishable in photo)
Pellicle

# Golden Algae

- Phylum - Chrysophyta
- Yellow green to golden brown
- Diatoms
- Two part outer shell
- Shell is glass like
- Shell deposits left behind called diatomaceous earth

# Green Algae

- Phylum Chlorophyta
- Have pigment chlorophyll
- Include ~~spirogyra~~, volvox, ulva, chlamydomanas, chlorella

# Brown algae

- Phylum phaeophyta
- Examples:  Sargassum, Kelp
  Used as food conditioners and in cosmetics

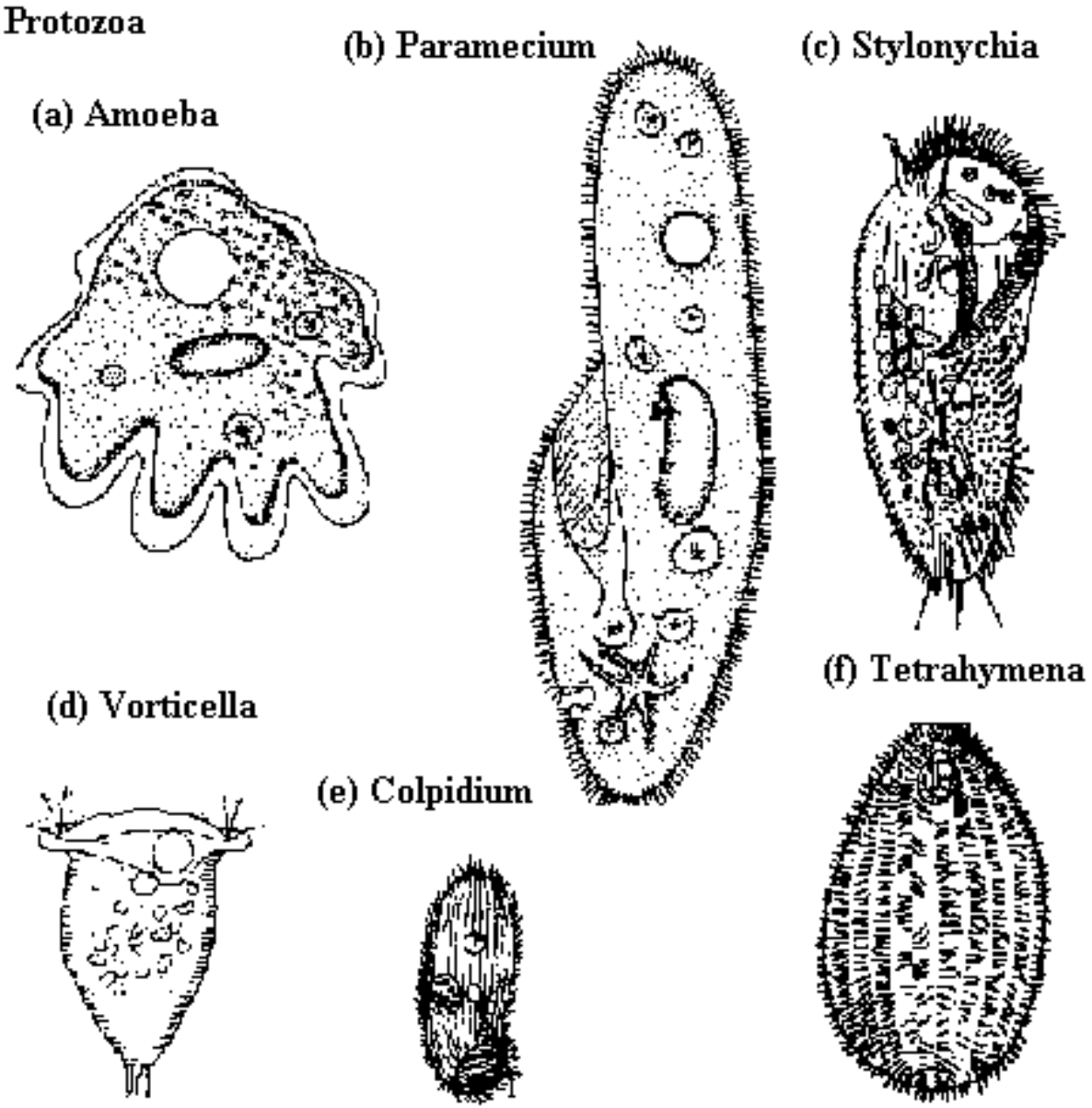

OCEAN
PLANET

# Red Algae

- Phylum Rhodophyta
- Deepest sea producers
- Used in food and bio lab

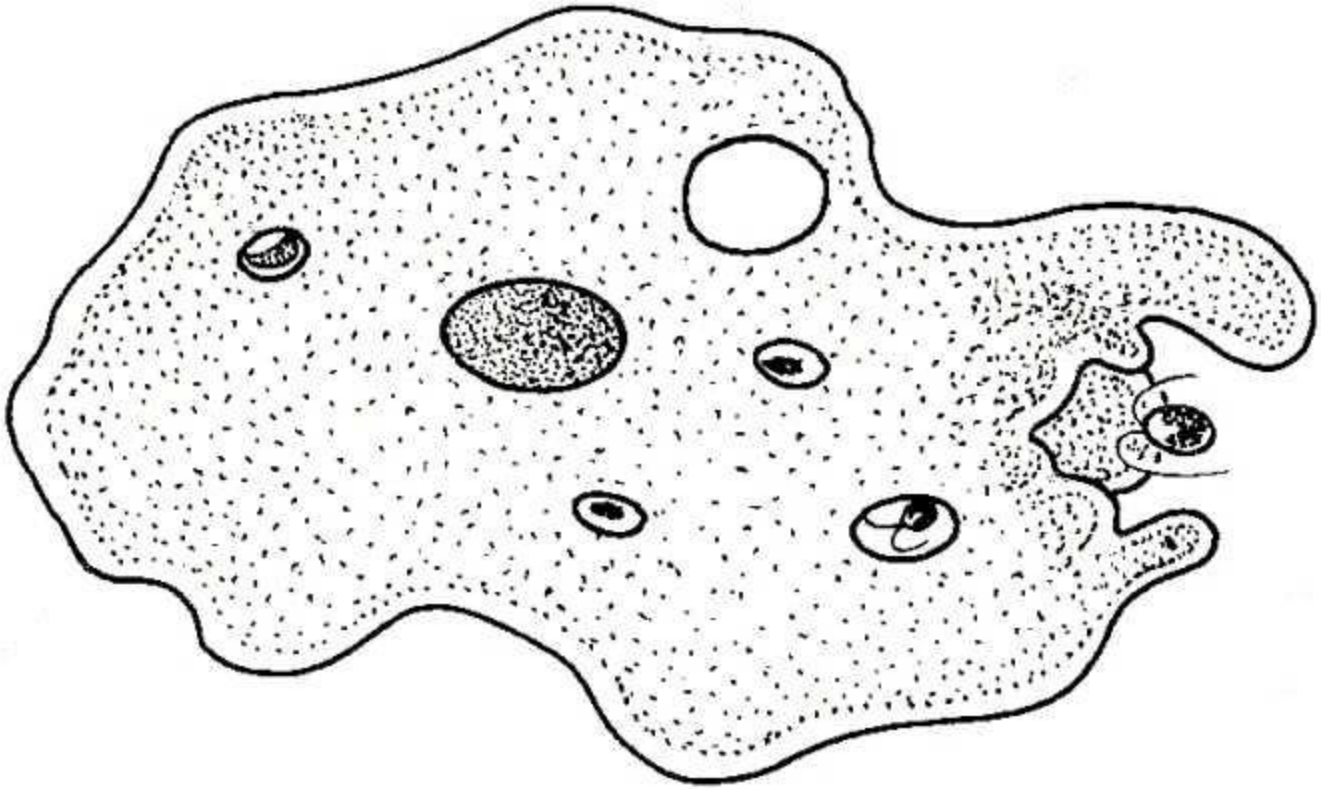
# Animal like Protists

- **Protozoa are *classified by movement***



# Rihzopods – Phylum Rhizopoda

- **Move by pseudopodia**
- **Examples: Amoeba, Forams, Radiolaria**
- **Move by amoeboid movement**

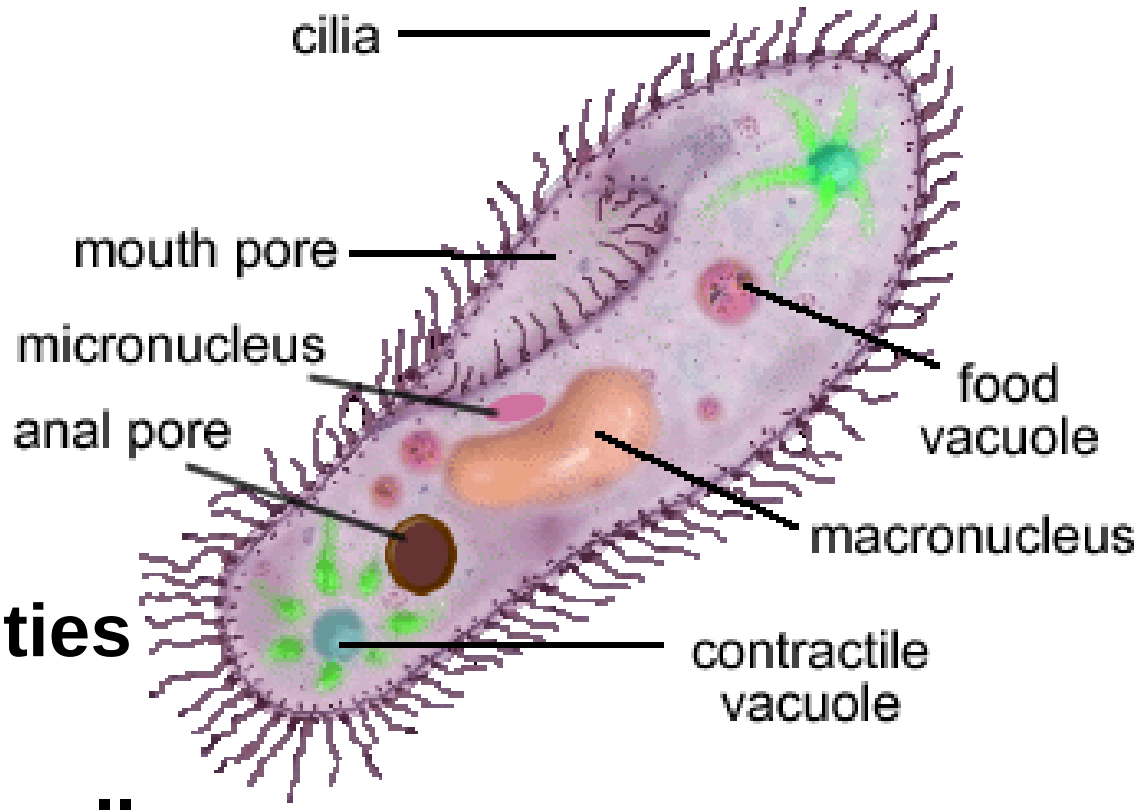


# Ciliates

- **Phylum Ciliophera**
- **Move by hair like cilia on the surface**
- **Unicellular with stiff covering called a pellicle**

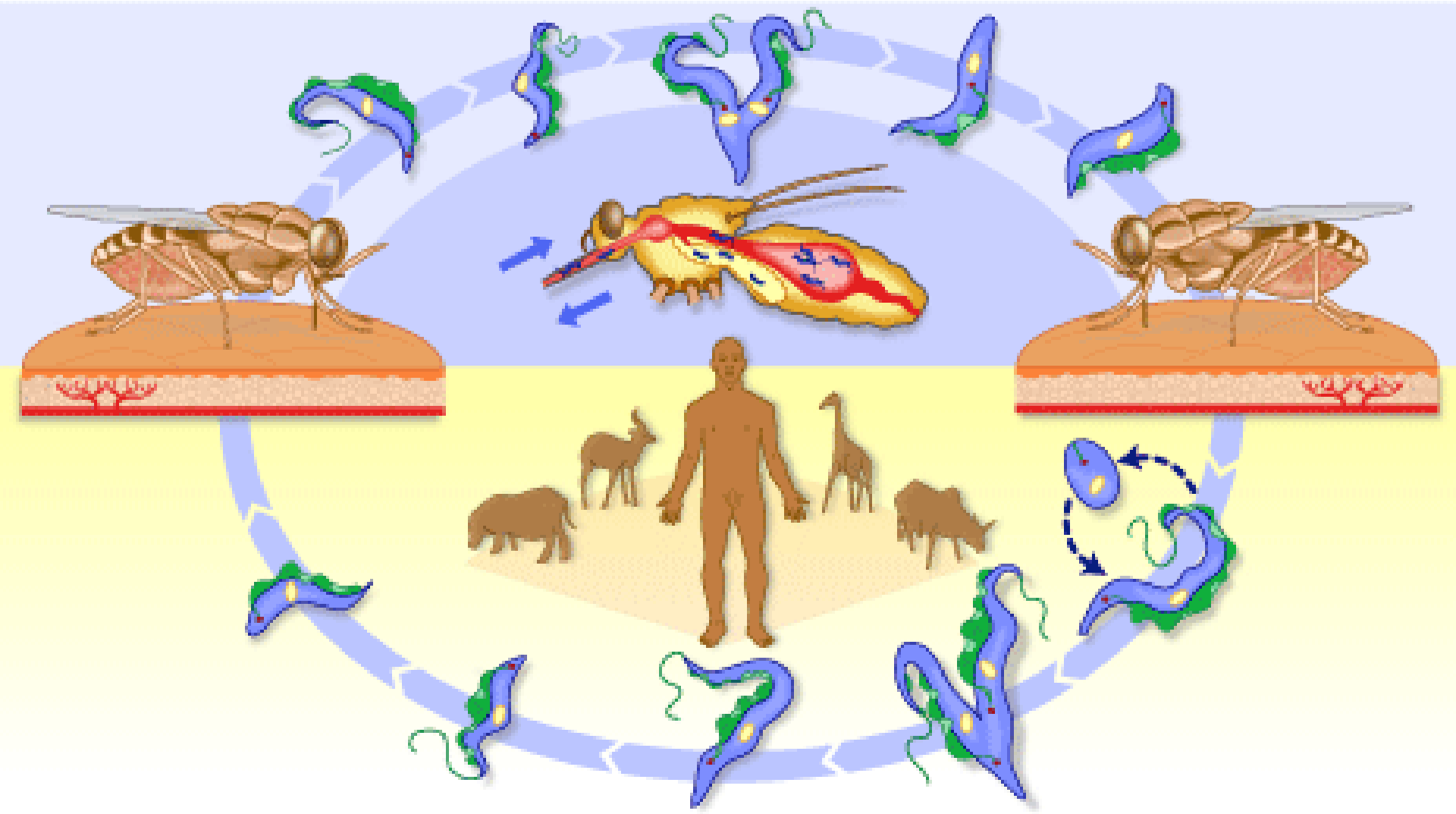
# Example: paramecium

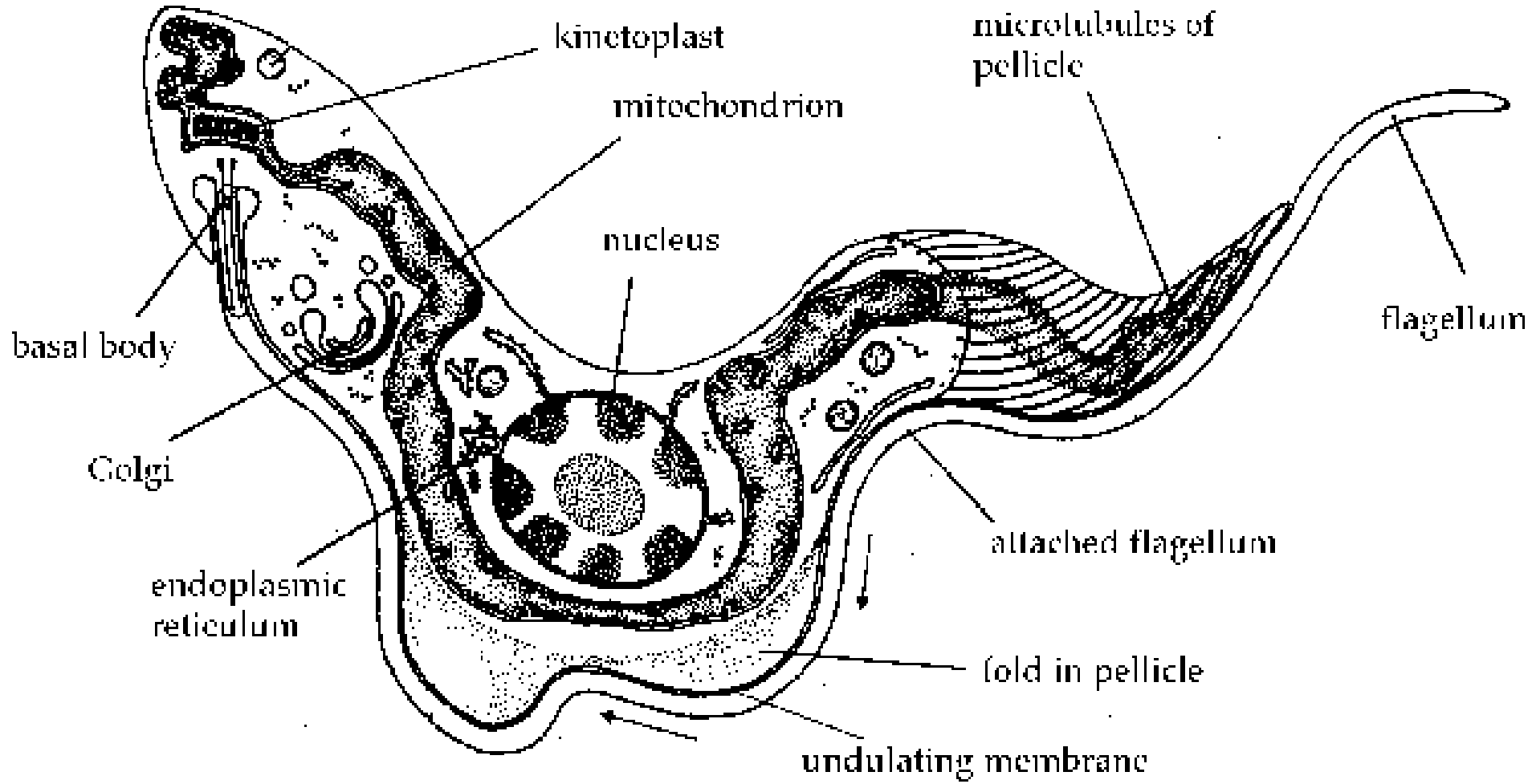
- **Have two nuclei**
- **Micro nucleus – involved in**
- **Reproduction**
- **Macro nucleus – Cells basic activities**
- **Reproduce by Conjugation and cell division**
- **Oral grove to ingest food**



# Flagellates

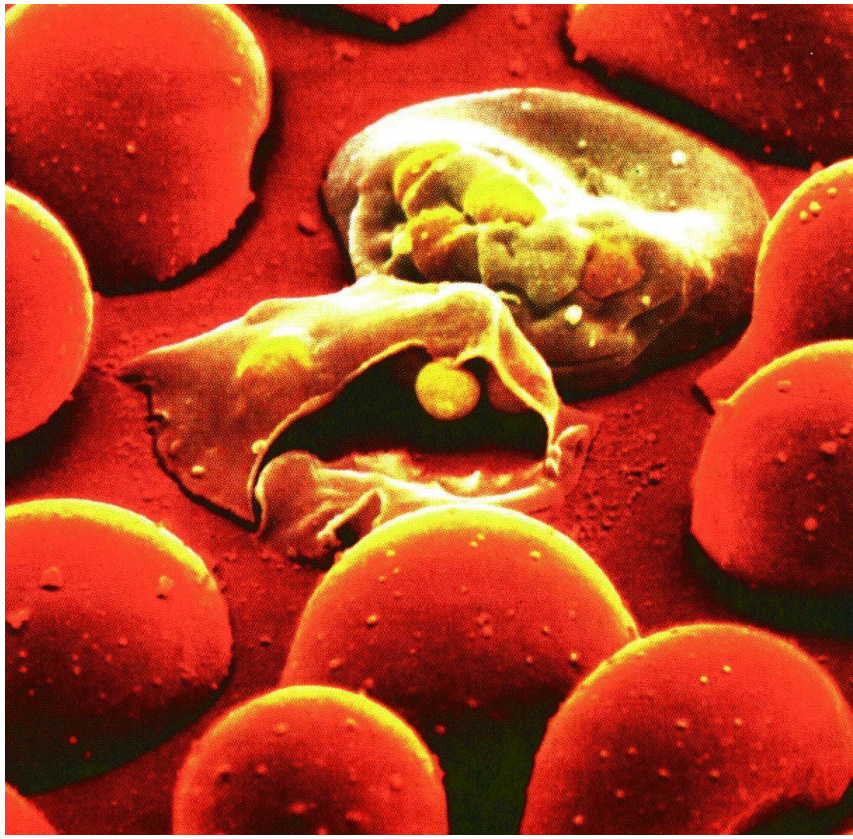
- Phylum Zoomatigina
- Move by flagella
- Some are parasites
  - Trypanosoma- African sleeping sickness transmitted by tsetse fly
- Some are mutualistic
  - Example:  Flagellates in the digestive system of a termite

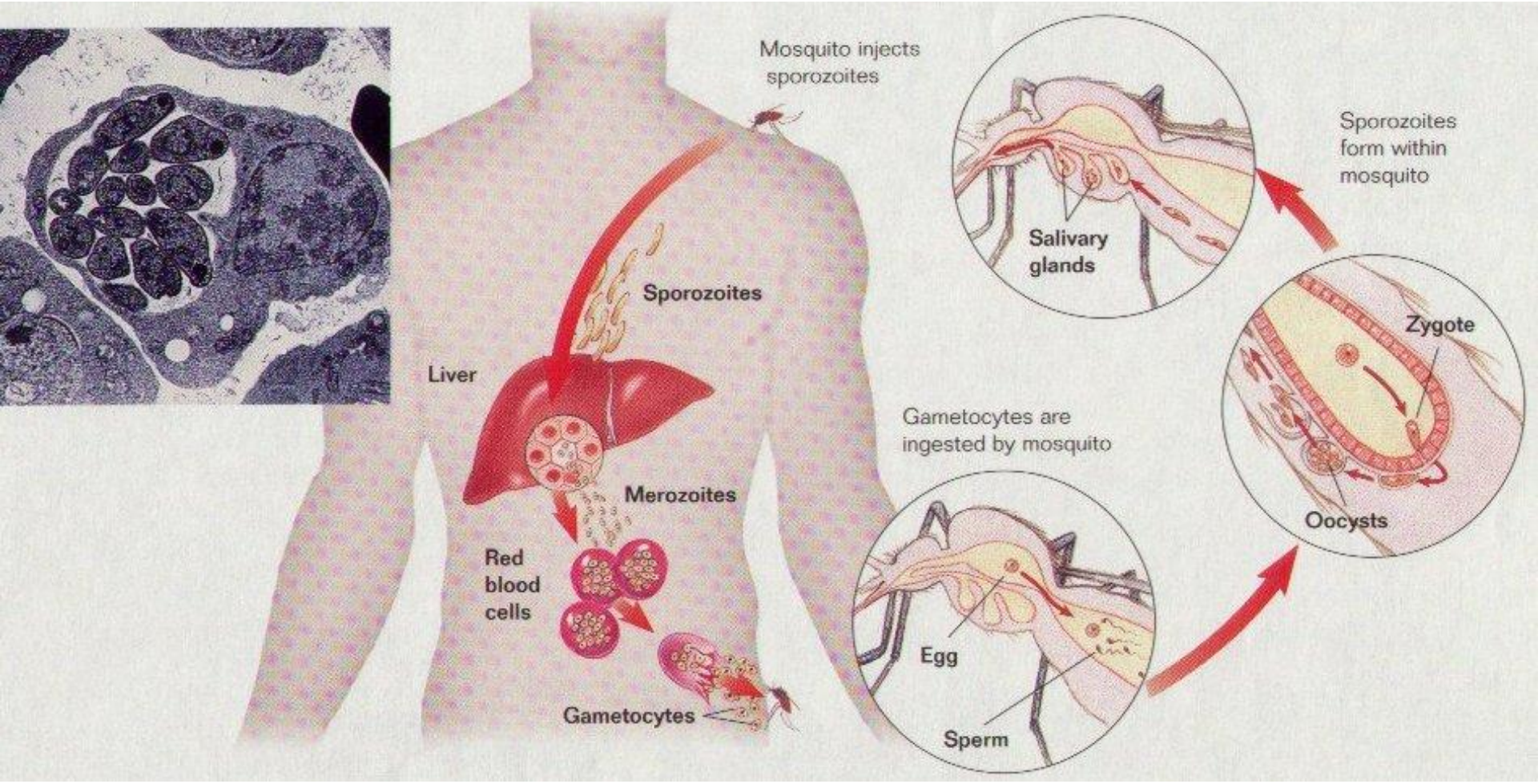



kinetoplast
mitochondrion
nucleus
basal body
Golgi
endoplasmic reticulum
microtubules of pellicle
flagellum
attached flagellum
fold in pellicle
undulating membrane

# Sporozoans

- **Phylum Sporozoa**
- **No means of movement and reproduce by means of a spore like structure**
- **Most are parasitic and some cause disease**
- **Plasmodium causes malaria – transmitted by mosquitoes,**
  - **1 million *Homo sapiens* die /year**

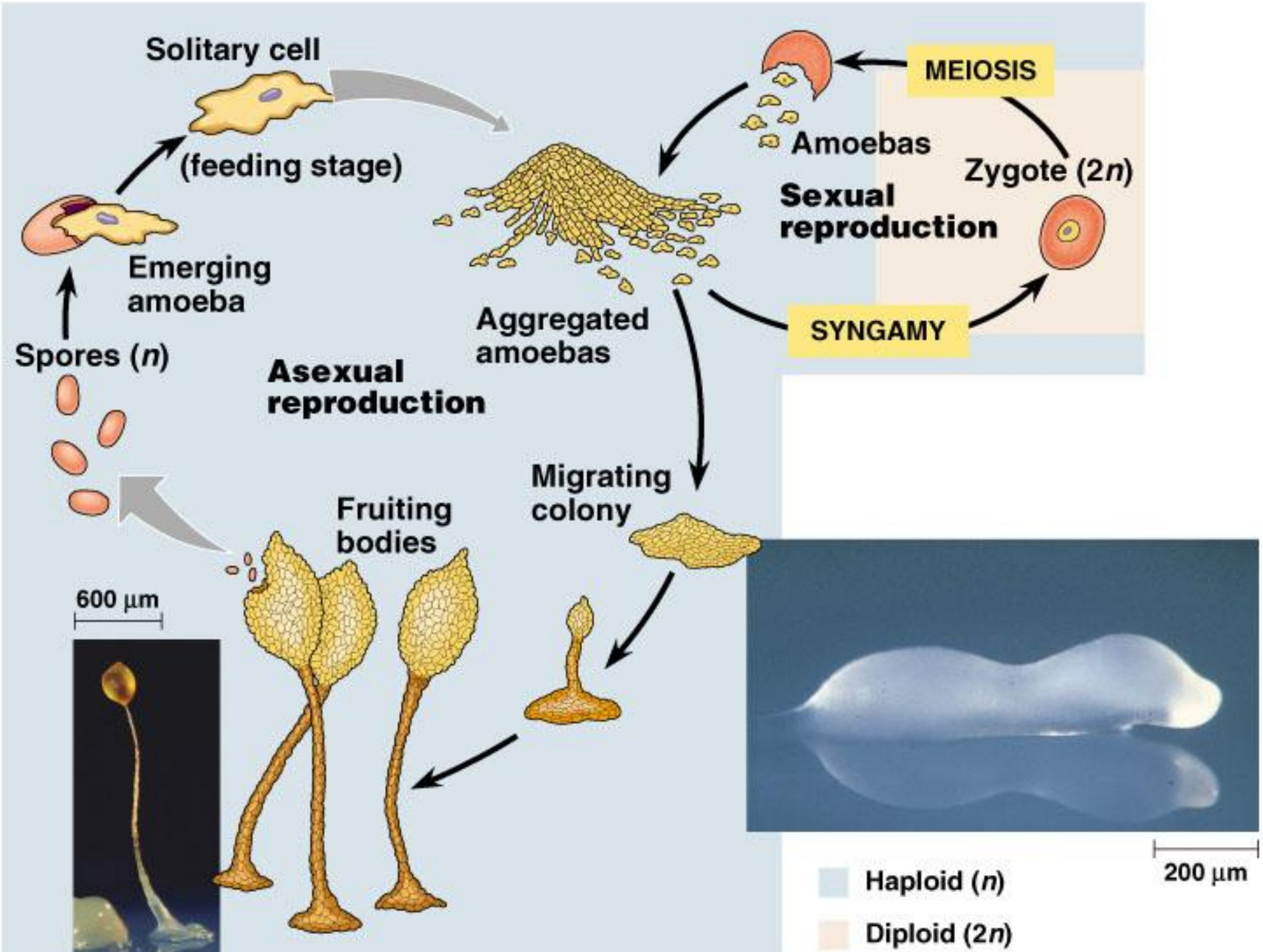



Mosquito injects sporozoites
Sporozoites
Liver
Merozoites
Red blood cells
Gametocytes
Gametocytes are ingested by mosquito
Egg
Sperm
Oocysts
Zygote
Sporozoites form within mosquito
Salivary glands

# Fungus like protists – Phylum Myxomycota

# Slime molds

- have a unique life cycle
- Plasmodium – slimy yellowish mass takes in food by phagocytosis as it oozes
- Fruiting bodies develop when food or moisture decrease
- Produce spores by mitosis
- Swarm cells develop from spores
  - These cells are flagellated
- Swarm cells fuse and begin plasmodium stage
- Fruiting bodies like fungi, plasmodium and swarm cells are like protozoa


Solitary cell
(feeding stage)
Emerging amoeba
Spores (n)
Asexual reproduction
Fruiting bodies
Migrating colony
Aggregated amoebas
Amoebas
MEIOSIS
Zygote (2n)
Sexual reproduction
SYNGAMY
600 µm
200 µm
Haploid (n)
Diploid (2n)

# Quiz

1. How are protozoa classified?
2. How are algal protist classified?

***Matching:***

| | | |
|---|---|---|
| _____1. | Amoeba | a. euglenophyta |
| _____2. | Golden Algae (diatom) | b. chrysophyta |
| _____3. | Euglena | c. rhizopoda |
| _____4. | Paramecium | d. ciliophora |
| _____5. | Green Algae | e. zygomycota |
| _____6. | slime mold | f. myxomycota |
| _____ 7. | Red Algae | g. rhodophyta |
| | | h. chlorophyta |

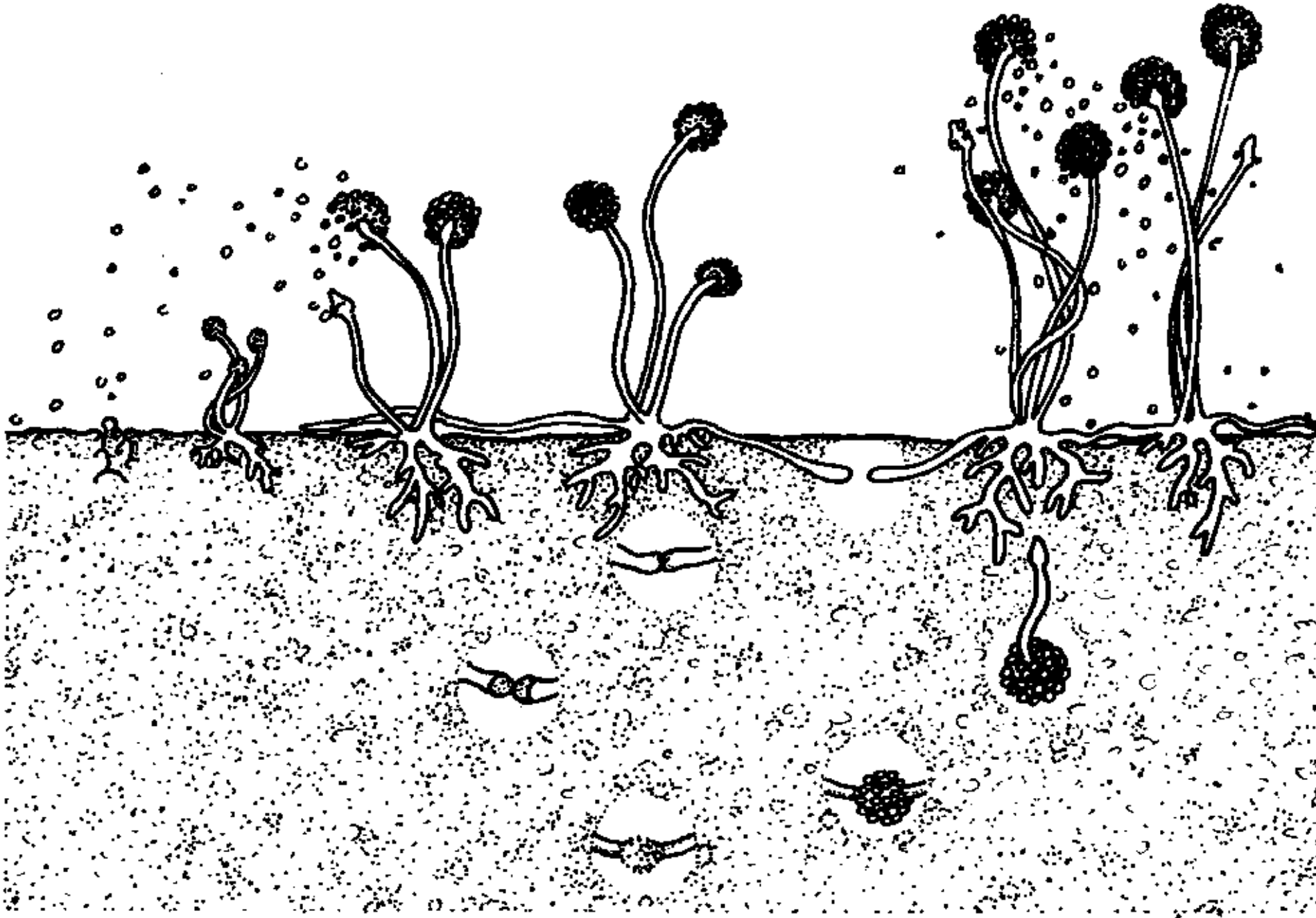

Kingdom Fungi
D. Redecker, 2000

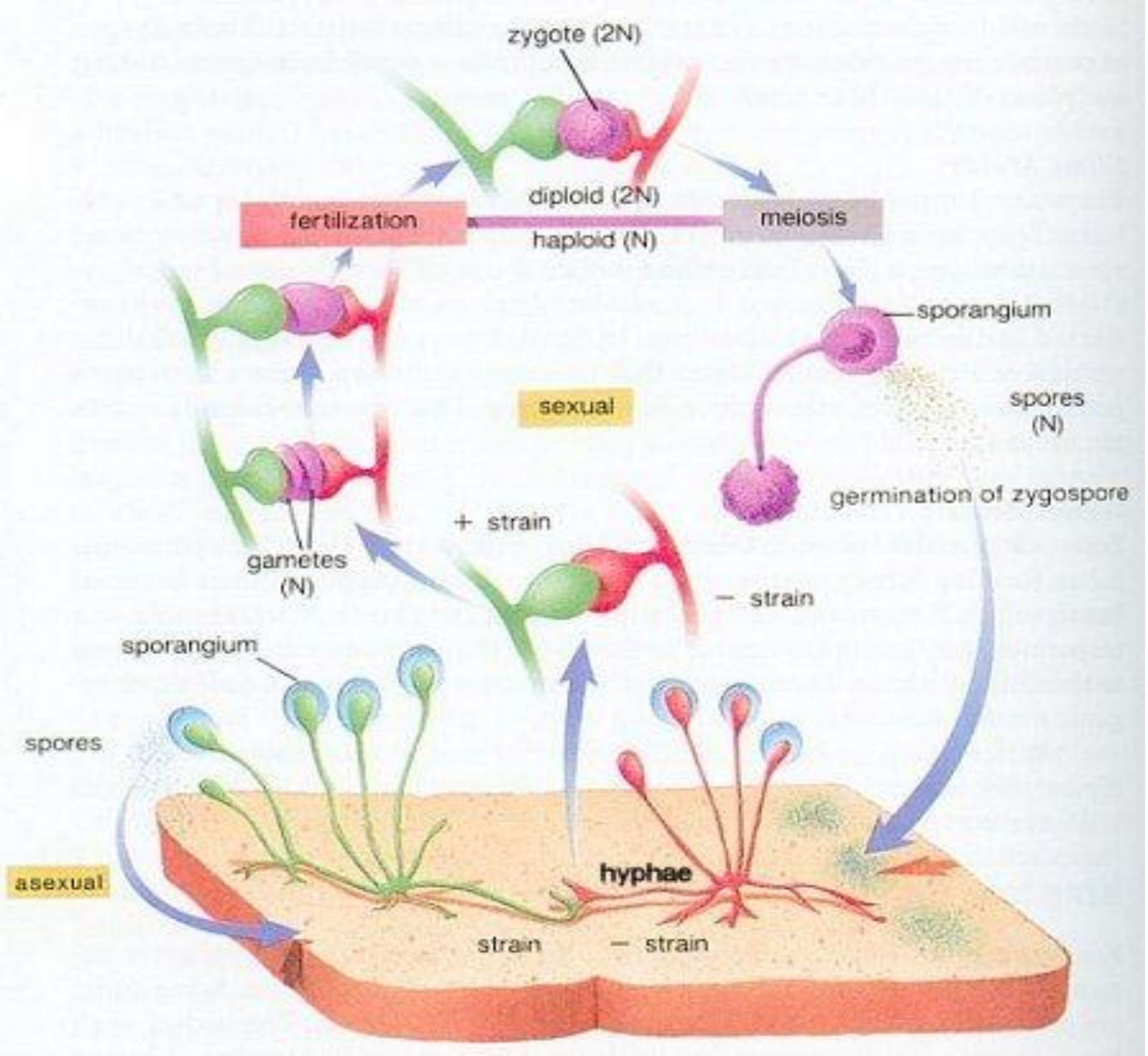
# Characteristics

- Sessile
- Heterotrophic – parasite or saprophyte
- Most have stalk called hyphae
  - A mass of hyphae together is called mycelium
- Reproduce by spores *
- Cell wall made of chitin
- Named on basis of spore producing structures*
- Fungi Phyla – mycota* means fungus

# Zygote fungi –

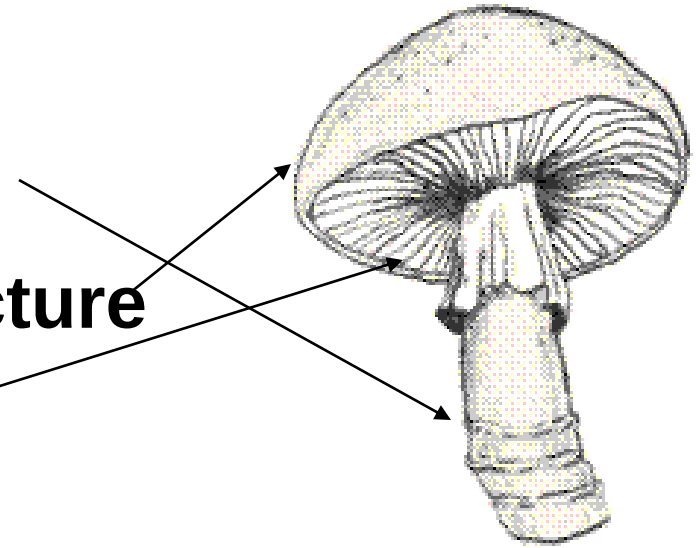
- **Phylum Zygomycota**
- **Hyphae can fuse to form a zygote**
- **Also called sporangium fungi because their spores are produced in the sporangia on tip of hyphae**
- **Stolons – hyphae that spread along the food source**
- **Rhizoids – anchor the food source and produce enzymes that break down substrate**
- **Both saprophytes and parasites in this phylum**
- **Bread mold fit into this phylum**

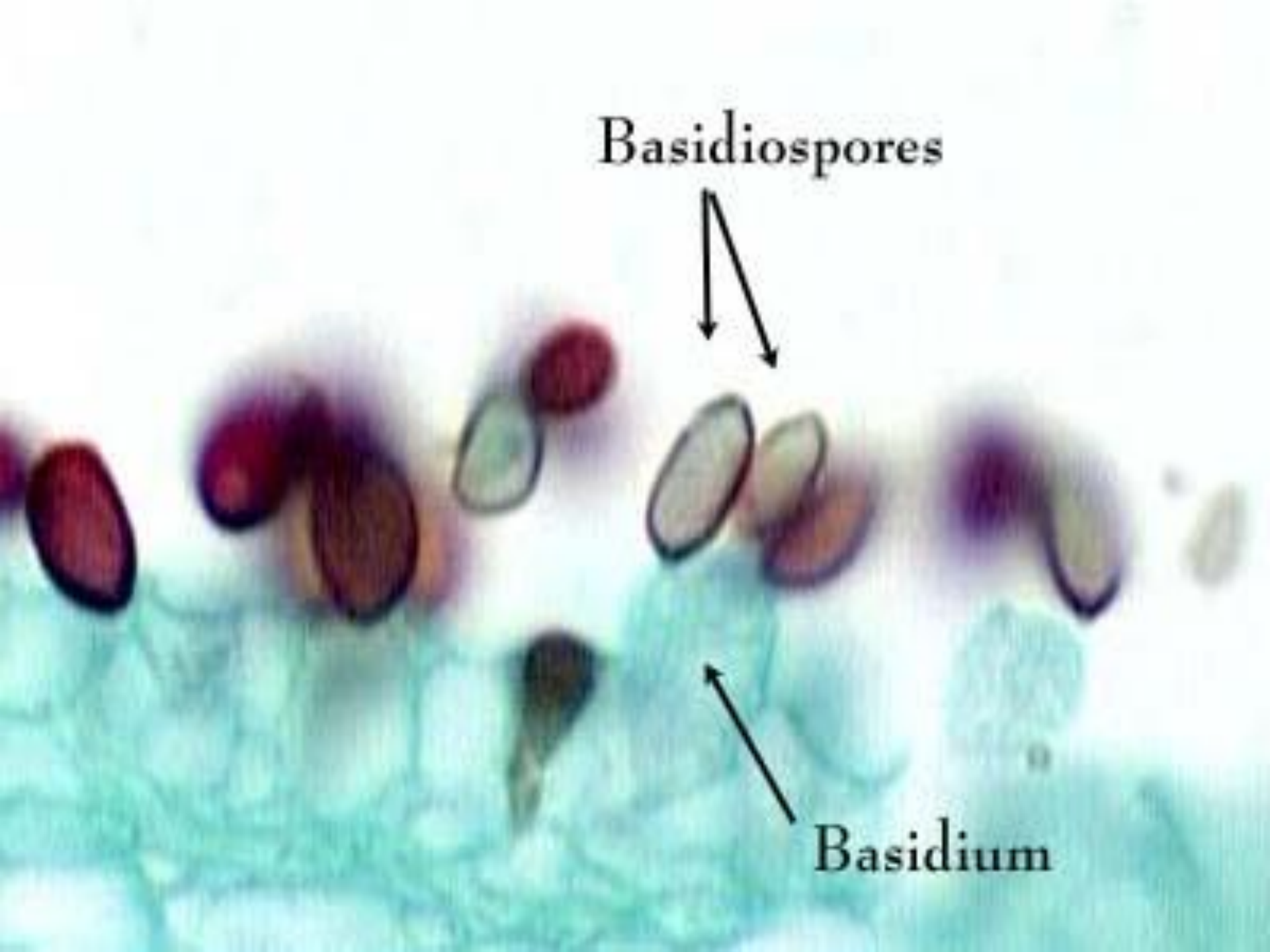



zygote (2N)
diploid (2N)
fertilization
meiosis
haploid (N)
sporangium
sexual
spores
(N)
germination of zygospore
+ strain
gametes
(N)
− strain
sporangium
spores
asexual
hyphae
strain
− strain

# Club Fungi

- **Phylum Basidiomycota**
- **Spore producing structure is club shaped and called basidia (club)**
- **Club fungi include shelf fungi. Rusts, smuts, puffballs and mushrooms**
- **Mushroom**
  - **Stipe – stalk – mycelium**
  - **Cap – umbrella like structure**
  - **Gills – basidia within**




Basidiospores
Basidium

# Sac Fungi

- **phylum Ascomycota**
- **Ascus – sac like spore producing structure**
- **Group includes, yeasts, penecillium, powdery mildews, morels, Dutch elm disease**

# Lichens

- **Combination of fungi and algae**
- **Algae are the producers and fungi provide protection and moisture**
- **Can live in places where neither Fungi or alga can live**
- **Mutualistic relationship**

# Ch 15 Lab

- Draw and label the following micro organisms
  - Bacteria
  - Diatoms
  - Amoeba
  - Paramecium
  - Bluegreen algae
  - Euglena
  - Mixed green algae (desmids)