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Shaping Lives...
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Algae, Protozoa, Yeasts, Viruses and Fungi

General Characteristics



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Algae - General Characteristics

- **Occur in abundance in oceans, seas, salt and fresh water lakes, ponds, and streams**
- **Small aquatic forms make up a large part of the water called plankton**
- **Phytoplankton is made up of plants and grow where there is sufficient light, moisture, and nutrients**
- **Have a wide range of size and shape, can occur as single cells that are spherical, rod or spindle shaped**
- **Algal cells are eukaryotic with thin and rigid cell wall**



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Euglena - General Characteristics

- Motile algae such as *Euglena* have flexible cell membranes called periplasts
- Cells walls are surrounded by a flexible, gelatinous outer matrix secreted through the cell wall
- Algae contain discrete nucleus, starch grains, oil droplets, vacuoles
- Chlorophyll and other pigments are found in membrane bound organelles known as chloroplasts



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Algae - General Characteristics

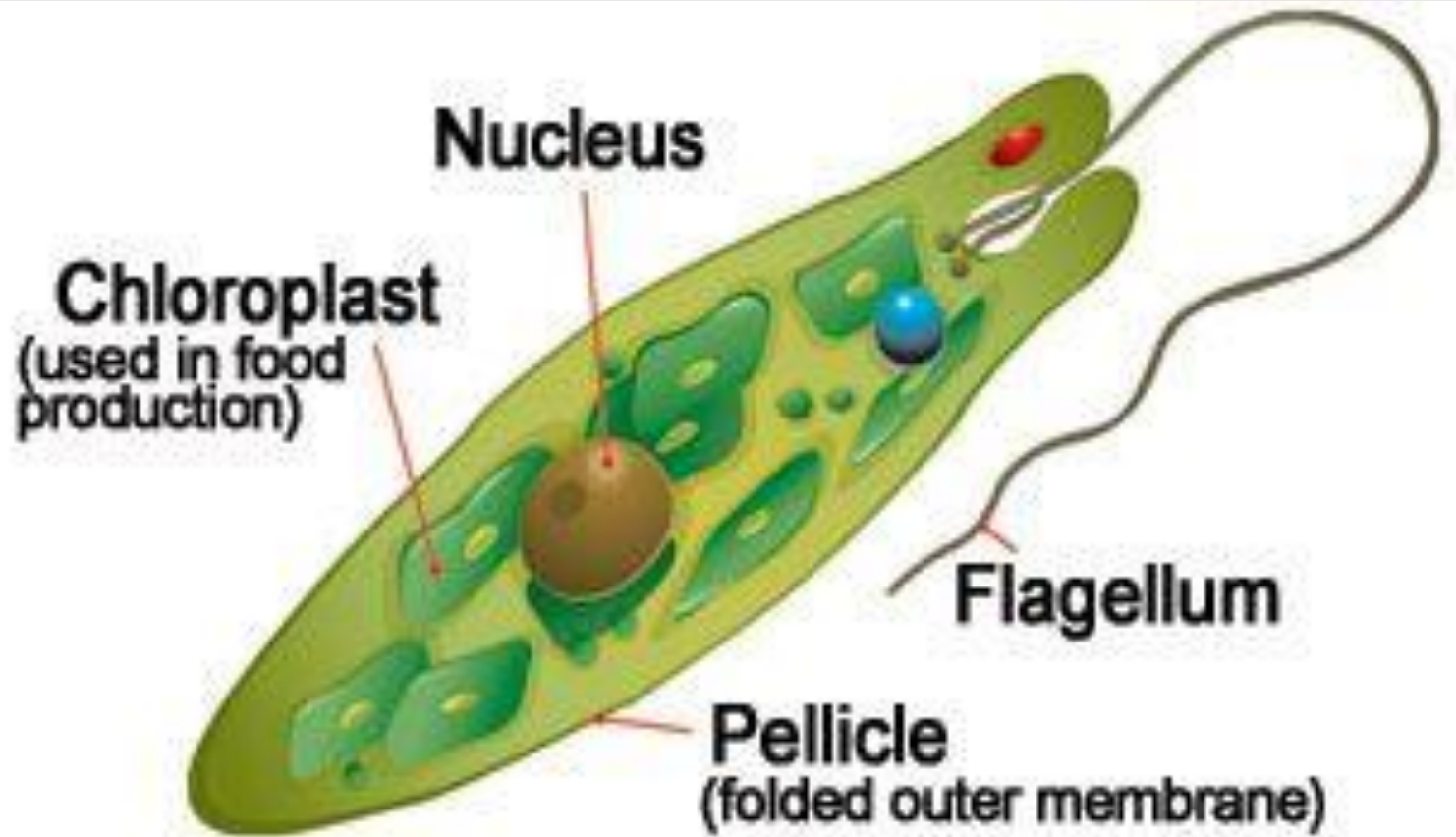
- **Within the chloroplast matrix are found flattened membranous vesicles called thylakoids**
- **Three types of photosynthetic pigments are found in algae: chlorophylls, carotenoids, and biloproteins**
 - **Chlorophylls – a (found in photosynthetic organisms) b, c, d, e (very rare and found only in two genera)**
 - **Carotenoids – lipid soluble (carotenes, xanthophylls)**
 - **Biloproteins (phycobilins) – water soluble, pigment-protein complexes are present**



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Euglena



Algae Cell Diagram



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Protozoa

- Found in all moist habitats (sea, fresh water, soil)
- Size and shape show considerable variation – *Leishmania donovani* (small), *Amoeba proteus* (large)
- Single cells without cell walls
- Intracellular structures consists of cytoplasm separated from the surrounding medium by a cell envelope, nucleus/nuclei
- Cytoplasm is differentiated into ectoplasm (gel like) and endoplasm (fluid and voluminous), other structures include mitochondria, endoplasmic reticulum, Golgi complex, food vacuoles, nuclei



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Protozoa

- **The cell has at least one eukaryotic nucleus with many protozoa having multiple nuclei**
- **Structural elements of the nucleus include chromosomes, nuclear membrane, karyoplasm (nucleoplasm)**
- **Cytoplasm is separated from external environment by cell membrane (plasmalemma) with compound coverings of membranes referred to as pellicle**
- **Many protozoa form resistant cysts at certain times of their life cycle**



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Protozoa

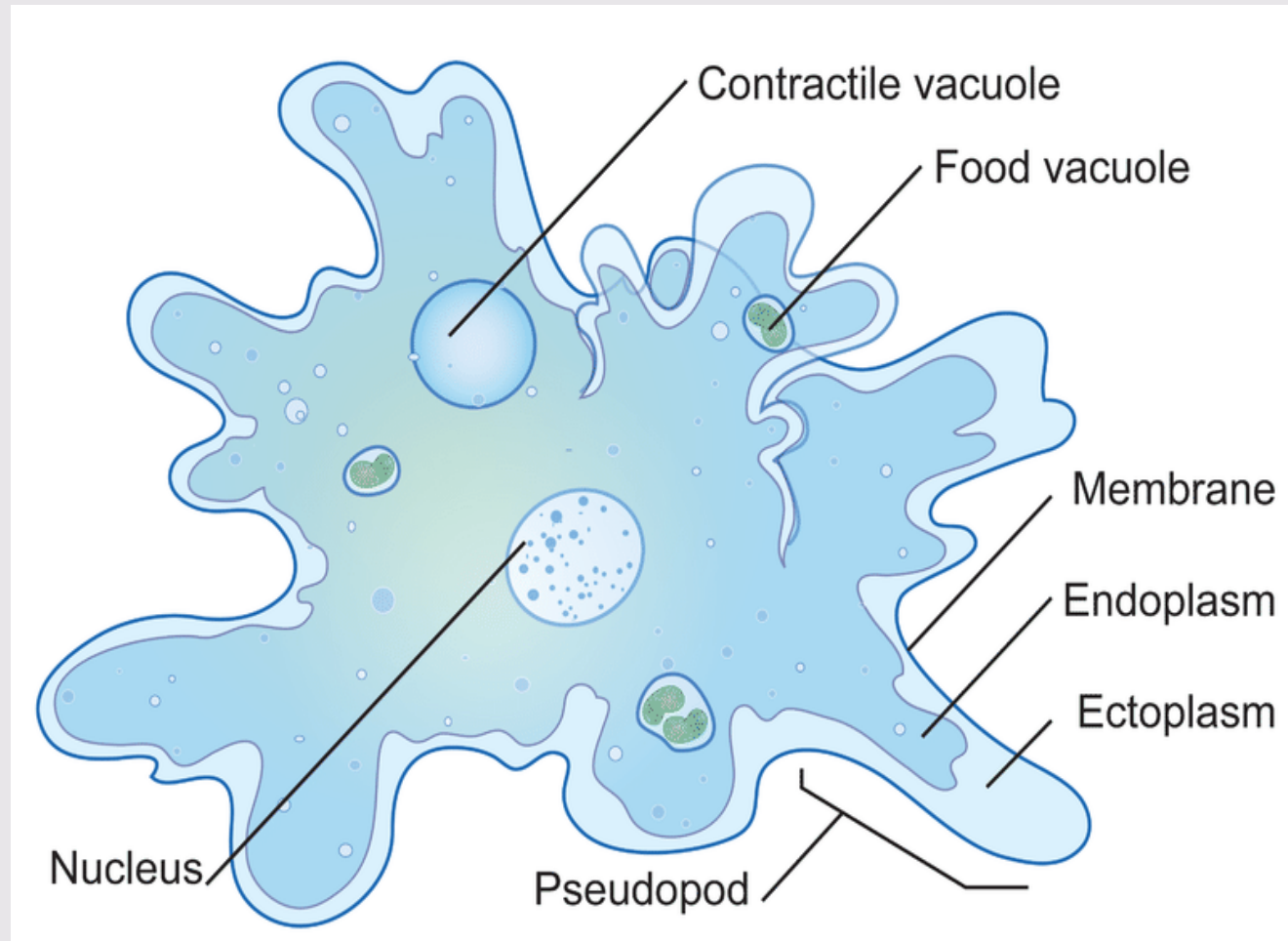
- **Move by three types of specialized organelles: pseudopodia (temporary projection of part of the cytoplasm), flagella (fine filamentous extension of the cell), and cilia (fine short thread like extensions from the cell)**
- **Multiply by asexual reproduction (simple binary fission), multiple fission, budding (motile offspring)**
- **Capacity to regenerate lost parts is characteristic of all protozoa**



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Protozoan Cell Structure





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Viruses

- Viruses are not cells**
- Infectious particles consisting of a nucleic acid enclosed in a protein coat or membranous envelope**
- The capsid is the protein shell/coat enclosing the genome**
- Capsids are built by a large number of protein subunits called capsomeres**
- Most complex capsids are found in viruses that infect bacteria – bacteriophages or phages**
- A complete virus particle is called virion**



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Viruses

- The smallest genomes exhibiting greatest variation**
- Some are DNA whereas others are RNA**
- Can be double (ds) or single stranded (ss)**
- Most dsDNA genomes contain only a single molecule (monopartite)**



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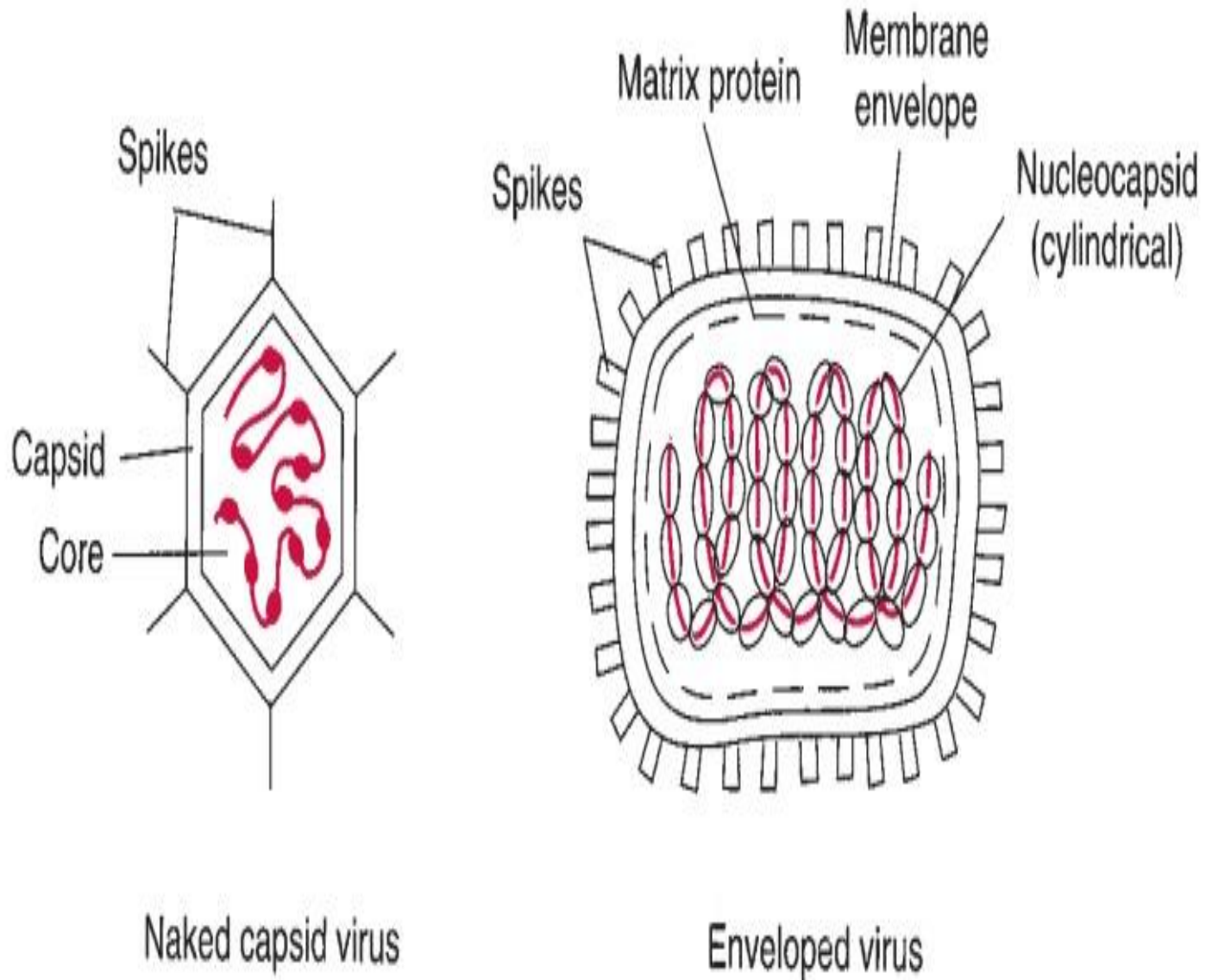


FIGURE Schematic drawing of two basic types of virions.



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DNA Viruses

- Typically classified as ‘small’ or ‘large’ genomes
- Use nearly all of the DNA for encoding proteins
- Gene clustering is a feature of small genome viruses
- Small genomes use host DNA polymerase for replication
- Large genomes encode a DNA polymerase for replication



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RNA Viruses

- Encode limited number of proteins**
- Some ssRNA viruses use RNA to encode genes and are referred to as positive-strand ssRNA genomes**
- Often encoded protein is RNA-dependent RNA polymerase**
- Monopartite ssRNA viruses encode a single polyprotein which is further broken down into small molecules**



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Viruses - Infectivity

- Are obligate intracellular parasites
- Can reproduce only within a host cell
- Lack the enzymes necessary for metabolism and ribosomes for protein synthesis
- Can infect only a limited range of host cells - host range
- Identify host cells by a “lock and key” fit



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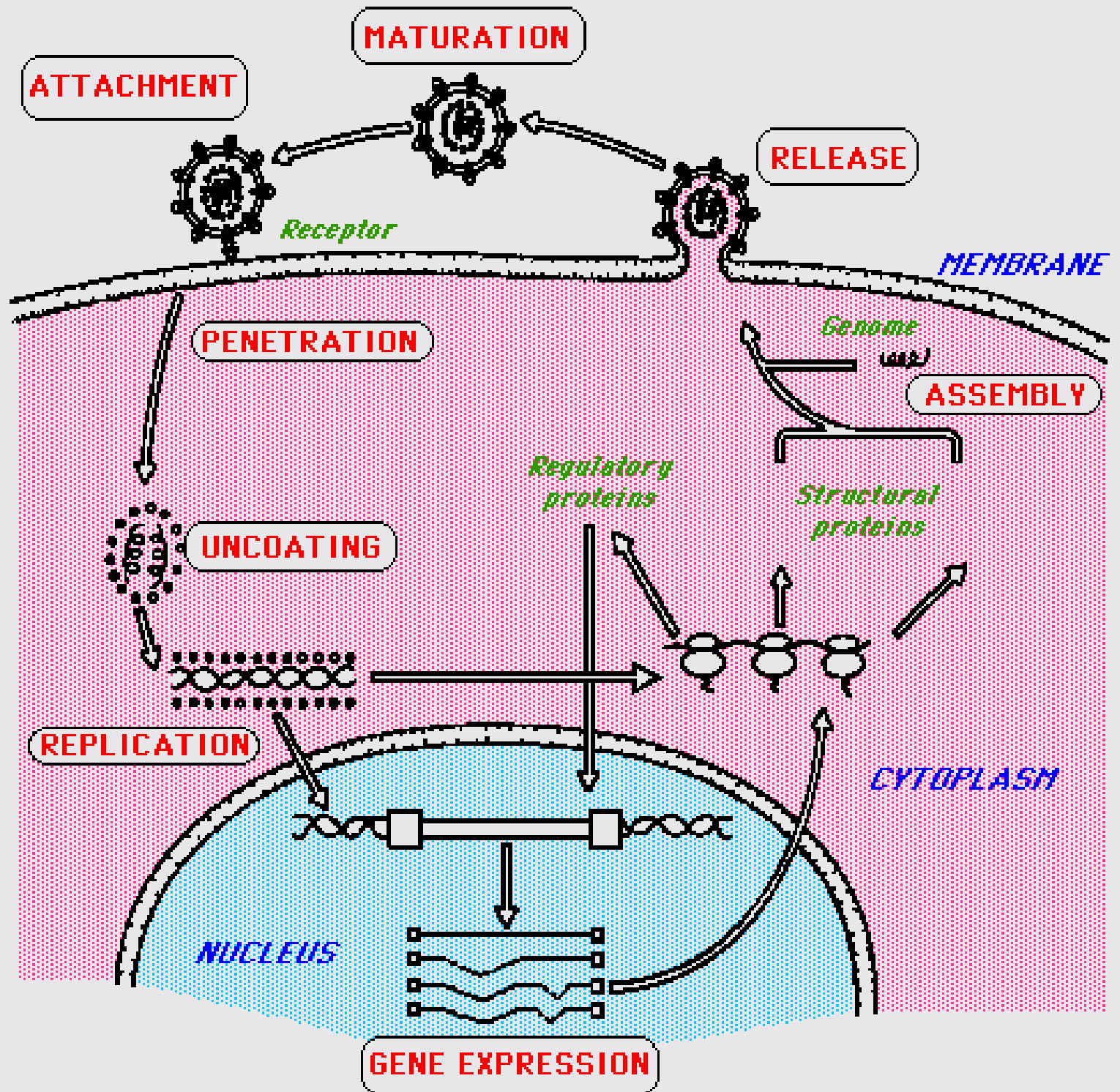
Reproduction

- ❑ Inside the host the viral genome programs the cell to copy nucleic acid and produce proteins
- ❑ Host provides nucleotides, ribosomes, tRNAs, amino acids, ATP, and other components
- ❑ DNA viruses use the DNA polymerase of the host cell and RNA viruses use virus-encoded polymerases that use RNA as template
- ❑ The nucleic acid and capsomeres assemble into viral particles and exit the host cell



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Fungi – General Characteristics

- Fungi are eukaryotic chemoorganotrophic organisms that have no chlorophyll
- The thallus consists of filaments that are commonly branched
- Thallus consists of two parts – mycelium (complex of several filaments called hyphae) spores
- There are three types of hyphae – nonseptate (coenocytic), septate with uninucleate cells and septate with multinucleate cells
- Some fungi are dimorphic



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Fungi

- **Reproduction: Asexual** – also called somatic or vegetative reproduction
 - Fission of somatic cells giving rise to two similar daughter cells
 - Budding of somatic cells – small outgrowth of parental cell developing into a new individual
 - Fragmentation of the hyphal cells, with each fragment becoming a new organism
 - Spore formation



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Molds – Asexual spores

- Sporangiospores – single celled spores formed in sporangia at the end of special hyphae
- Conidiospores – small, single celled conidia formed at the tip of hypha
- Oidia – single celled spores formed by disjoining of hyphal cells
- Chlamydospores – thick walled single celled spores formed from the cells of vegetative hypha
- Blastospores – spores formed by budding



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Molds

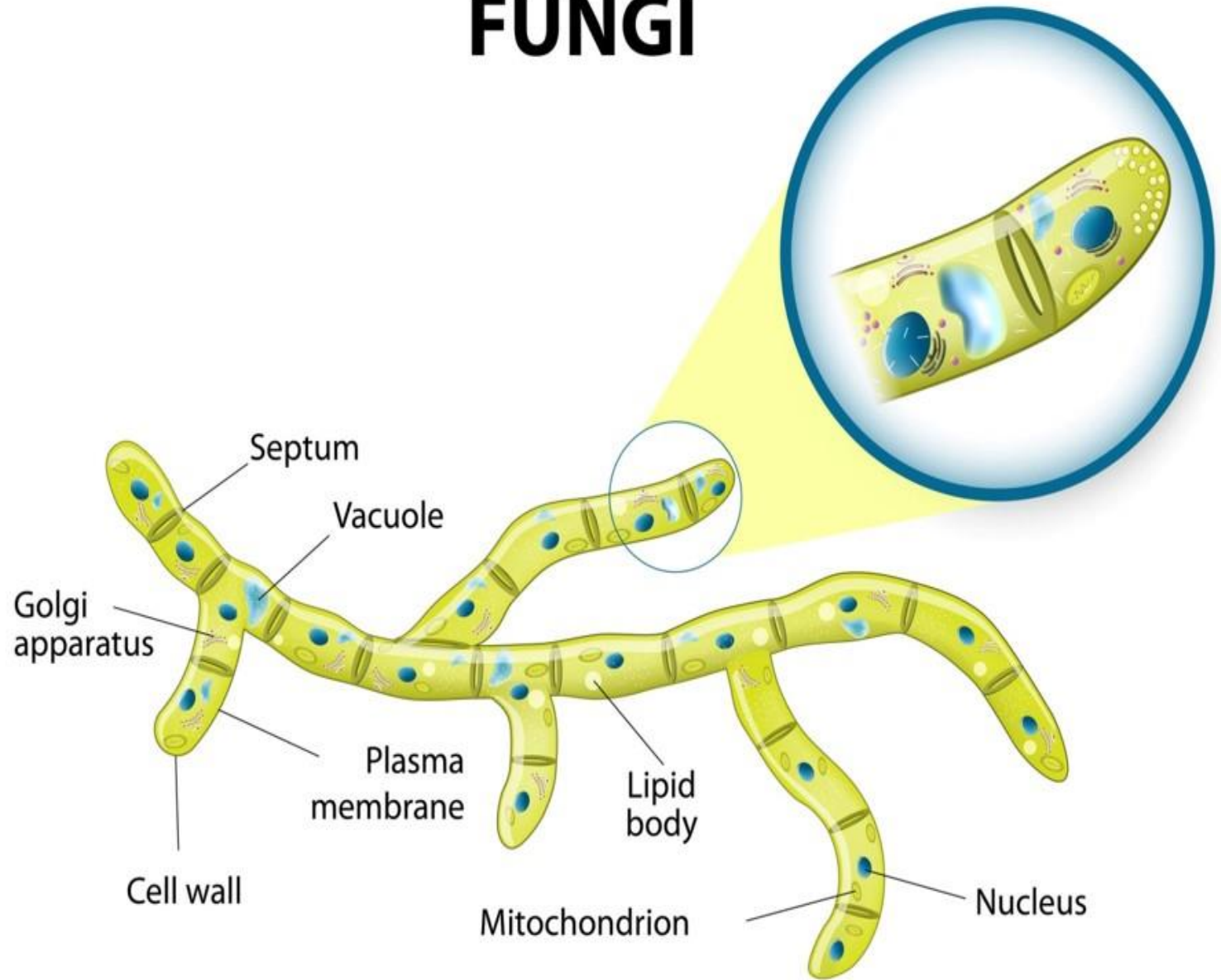
- Sexual reproduction is by fusion of the compatible nuclei of two parent cells
- Sexual spores produced by fusion of two nuclei occur less frequently
 - Ascospores – single celled spores (8) produced in ascus
 - Basidiospores – single celled spores borne on club-shaped structure called a basidium
 - Zygosporangia – large thick walled spores formed when the tips of two compatible hyphae combine
 - Oospores – formed within a special female structure, the oogonium



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FUNGI





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Yeasts – General Characterisitcs

- Yeasts are usually unicellular, larger than most bacteria
- Vary considerably in size, commonly egg shape, but some are elongated and some spherical
- Have no flagella or other organs of locomotion
- Consists of a protoplast contained in a cell wall (thick)
- Numerous granules and vacuoles are found



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Yeasts – General Characterisitcs

- Reproduction is by budding, by fission, or by a combination of these two processes
 - **Budding** – cell wall softens at one point and protoplasm bulges out
 - **Fission** – similar to bacteria but unlike bacteria they develop a cross wall
 - **Sexual Reproduction** – reproduce by intracellular spore formation



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YEAST CELL

