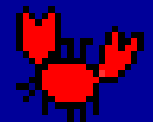


X. Protista

A. Taxonomy

B. Life Cycles

C. Groupings



A. Taxonomy

1. Description

2. Classification

1. Description

- a. Originally- unicellular eukaryotes
(membrane bound nucleus & organelles)**
- b. Present- unicellular eukaryotes & their
immediate multicellular descendents**
- c. Multicellular but lack cellular
differentiation**
- d. Excludes green algae & yeast**

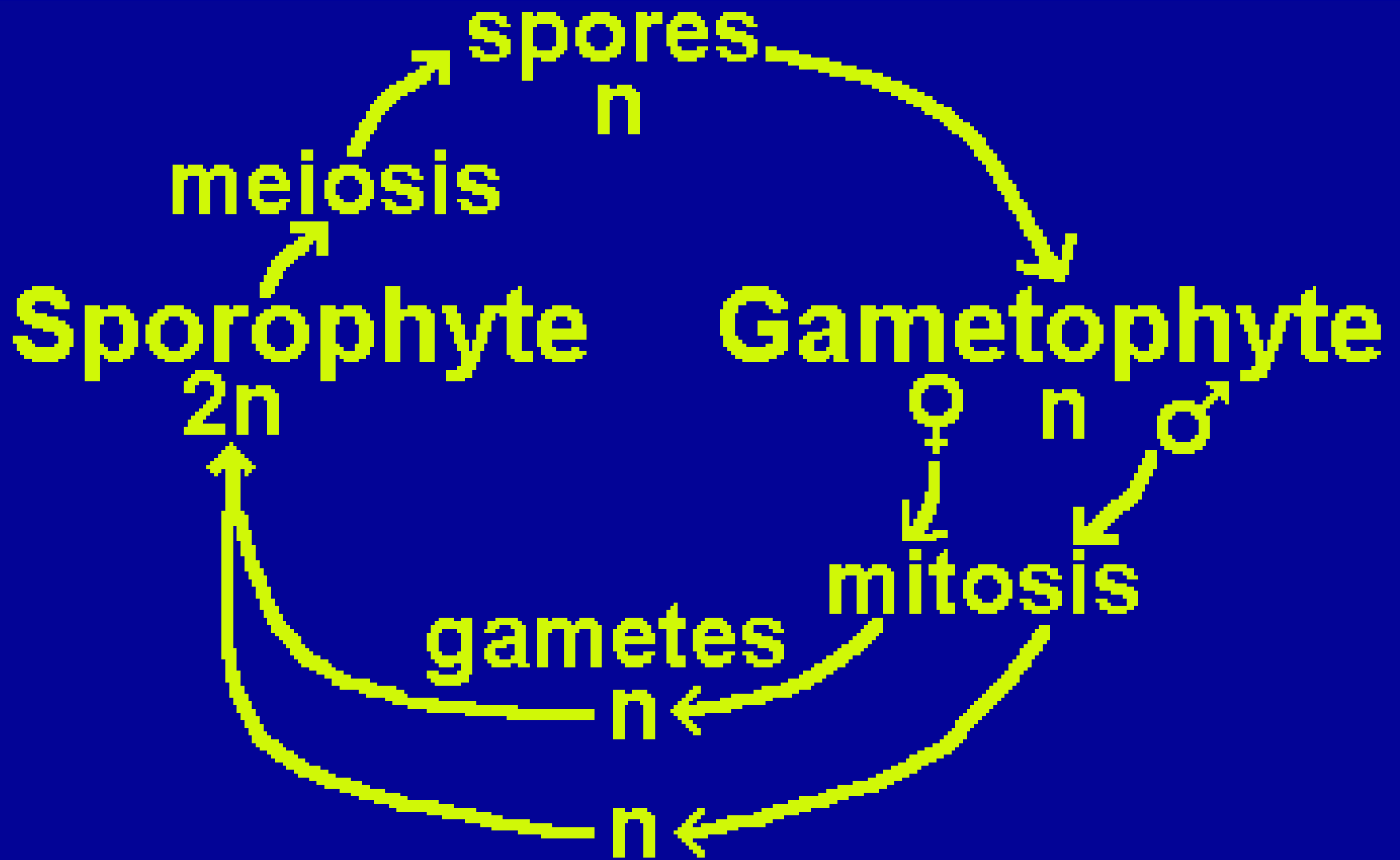
2. Classification

- a. Mitochondrial structure & DNA**
- b. Nutrition- autotrophic, heterotrophic, & saprotrophic**
- c. Locomotion- flagella, cilia, pseudopods, or none**
- d. Reproduction & life cycle**

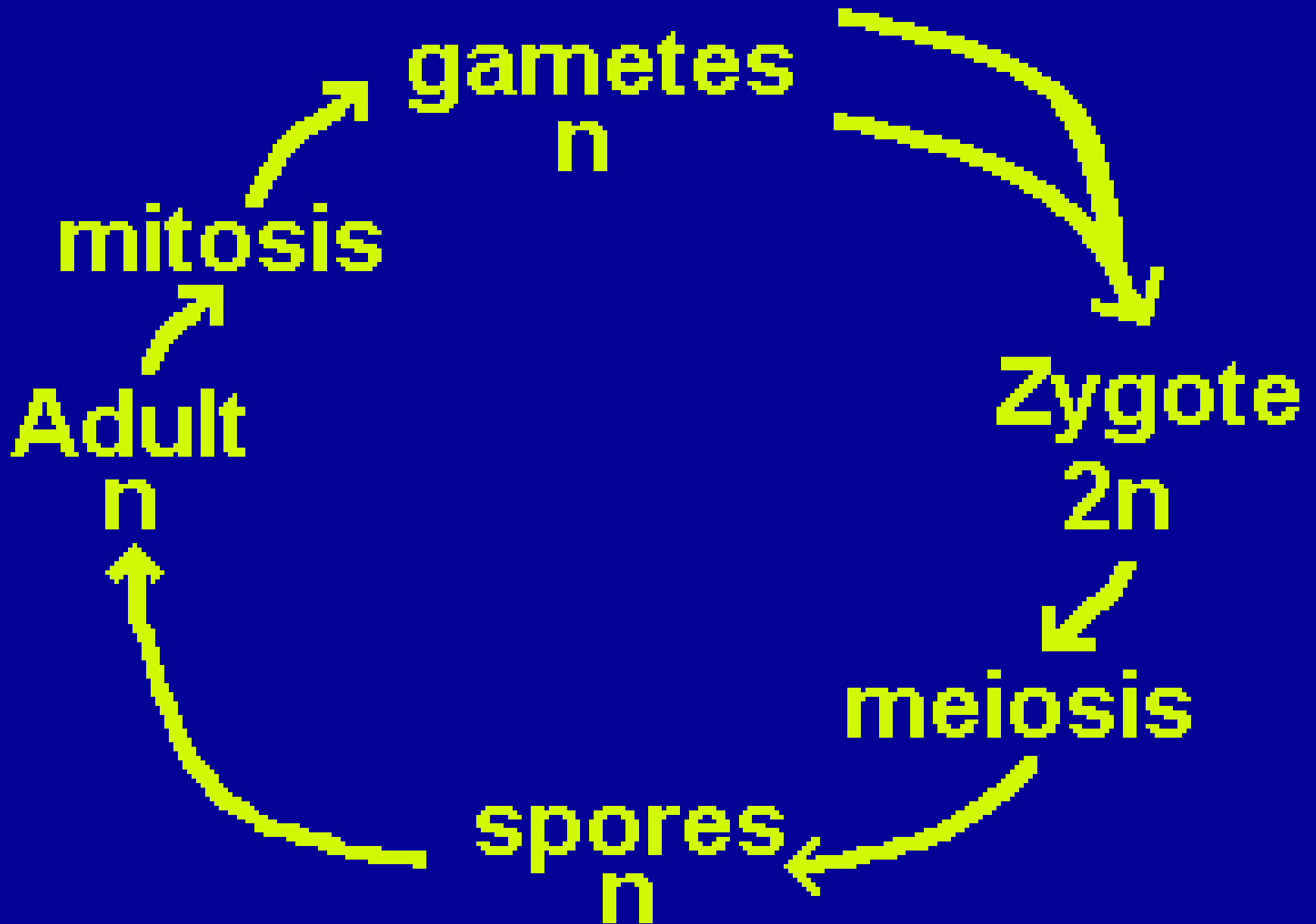
B. Life Cycles

- 1. Alternation of Generations**
- 2. Haplontic**
- 3. Diplontic**
- 4. Gametes**

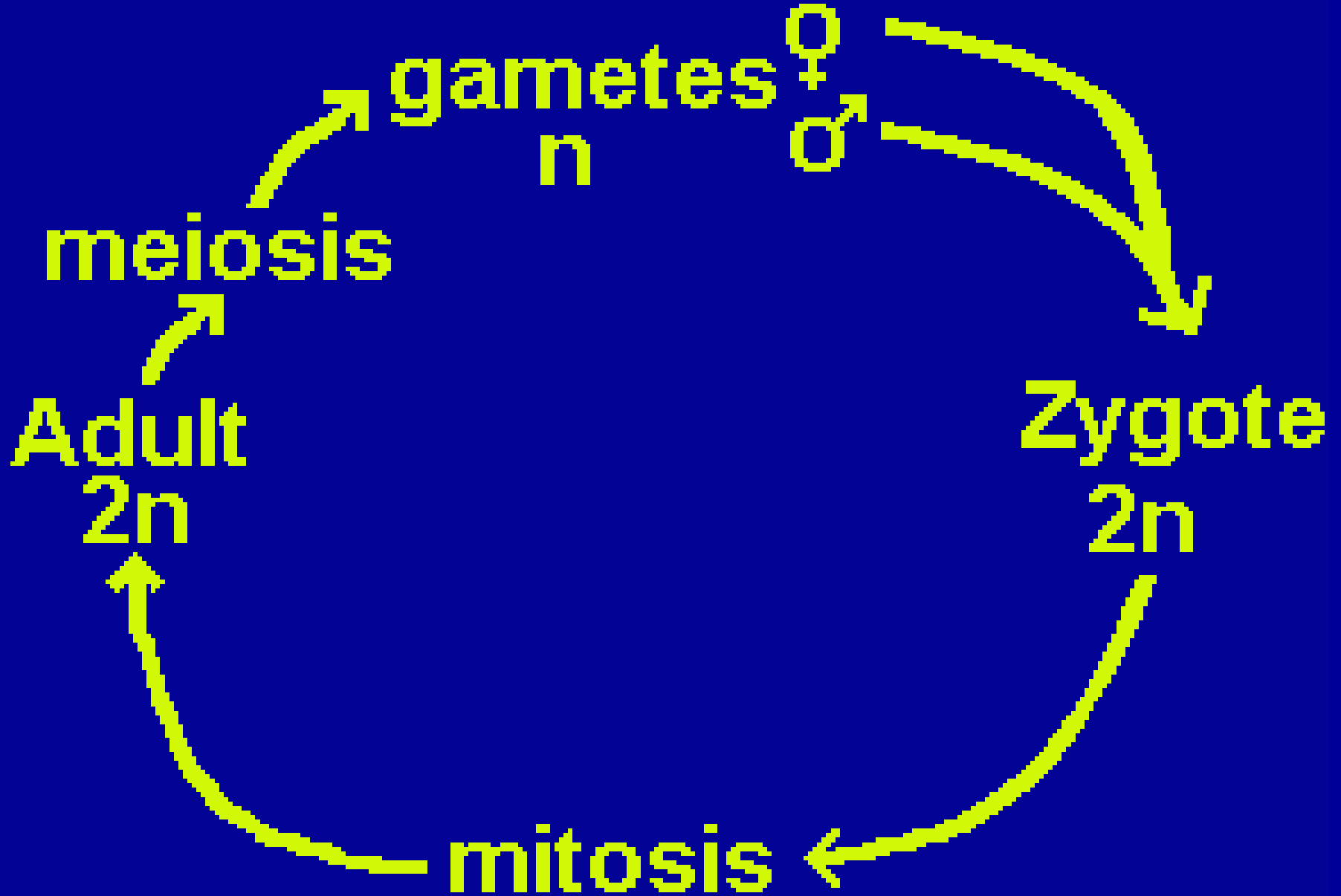
1. Alternation of Generations



2. Haplontic



3. Diplontic



4. Gametes

- a. Isogamy- gametes are neither male or female, no difference in gamete morphology**
- b. Heterogamy- gametes are eggs (female) or sperm cells (male)**

C. Groupings

- 1. Excavata**
- 2. Discicristata**
- 3. Alveolata**
- 4. Stramenopila**
- 5. Cercozoa**
- 6. Amoebozoa**

1. Excavata

- a. Formerly part of Zoomastigophora**
- b. Excavated feeding groove on one side, Flagellated, no cell wall**
- c. No mitochondria or vestigial mitochondria**
- d. Diplomonadida**
- e. Parabasalida**

d. Diplomonadida

- 1.) Binucleate & flagellated**
- 2.) Vestigial nonfunctional mitochondria**
- 3.) Asexual reproduction, meiosis has never been observed**
- 4.) *Giardia lamblia* & *G. intestinalis*-
Hiker's diarrhea**

e. Parabasalida

- 1.) Single nucleus & flagellated**
- 2.) No mitochondria, mitochondrial genes in chromosome**
- 3.) Asexual reproduction, sexual in a few species**
- 4.) *Trichonympha collaris*- lives in guts of termites**
- 5.) *Trichomonas vaginalis***

5.) *Trichomonas vaginalis*

a.) STD

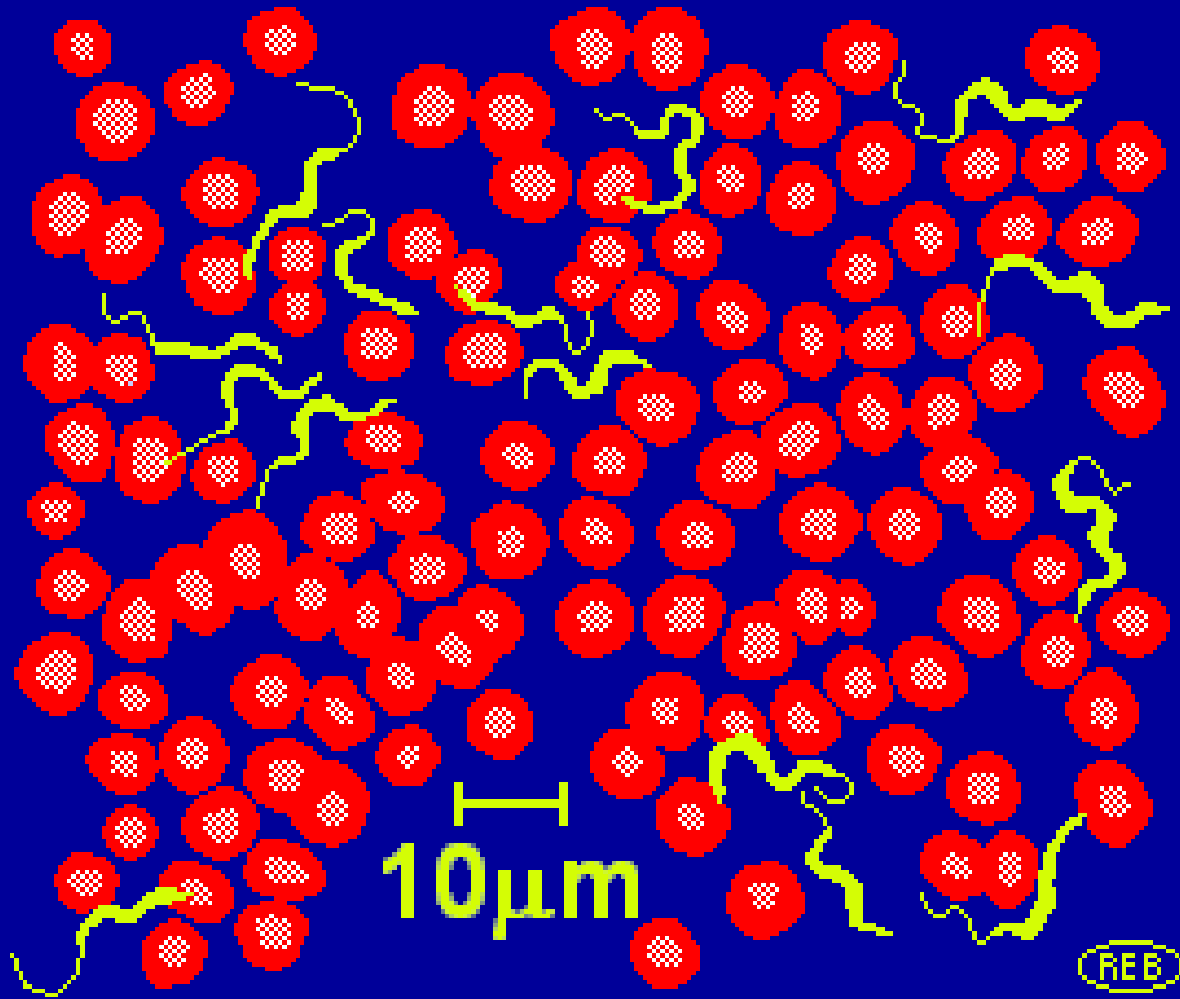
b.) Vagina & urethra of females

c.) Urethra, prostate, & seminal vesicles of males

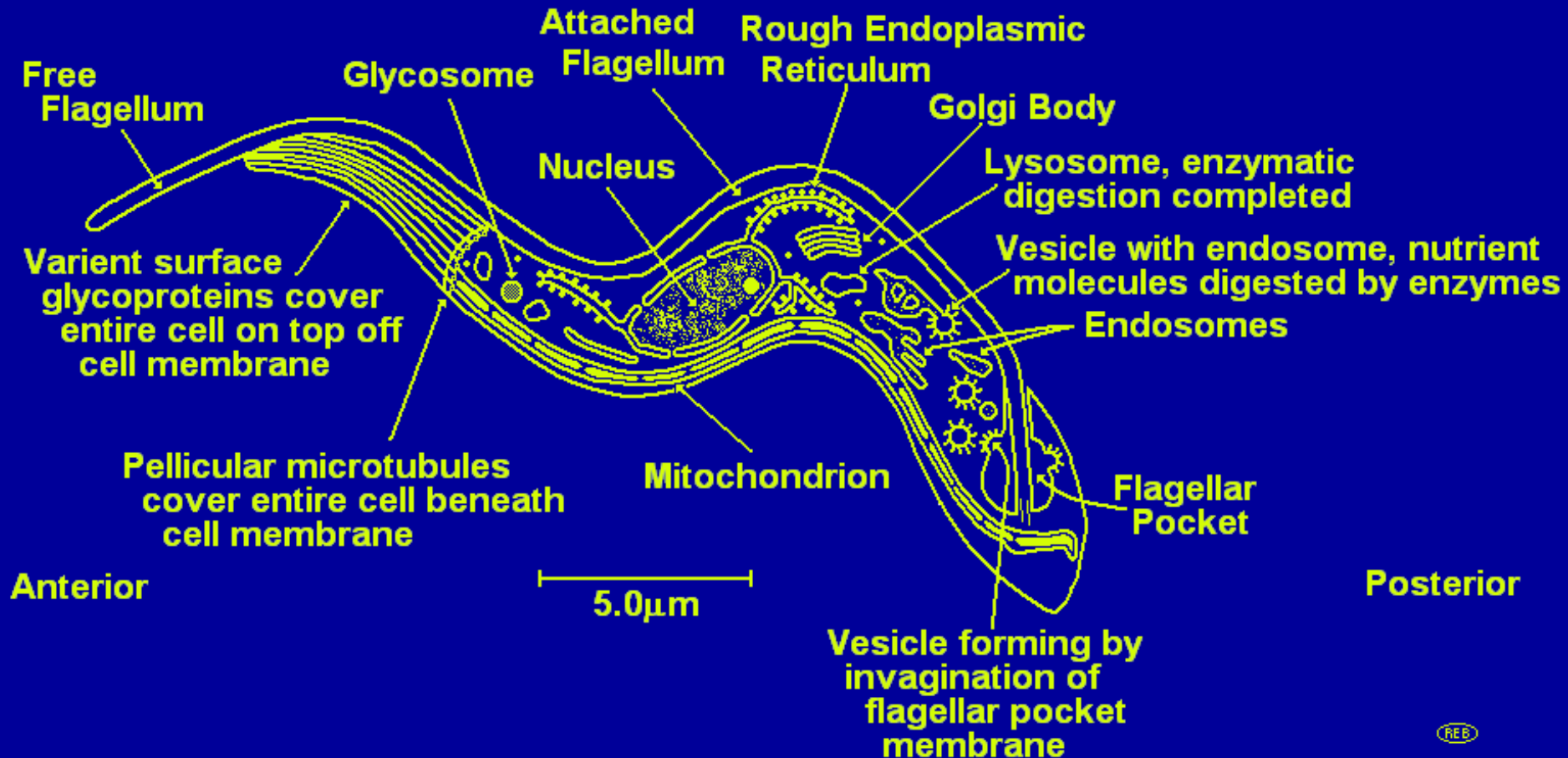
2. Discicristata

- a. Disc shaped cristae in mitochondria**
- b. *Trypanosoma brucei*- sleeping sickness, tsetse fly, ungulates & humans (Zoomastigophora)**
- c. Euglenida**

b. *Trypanosoma brucei*



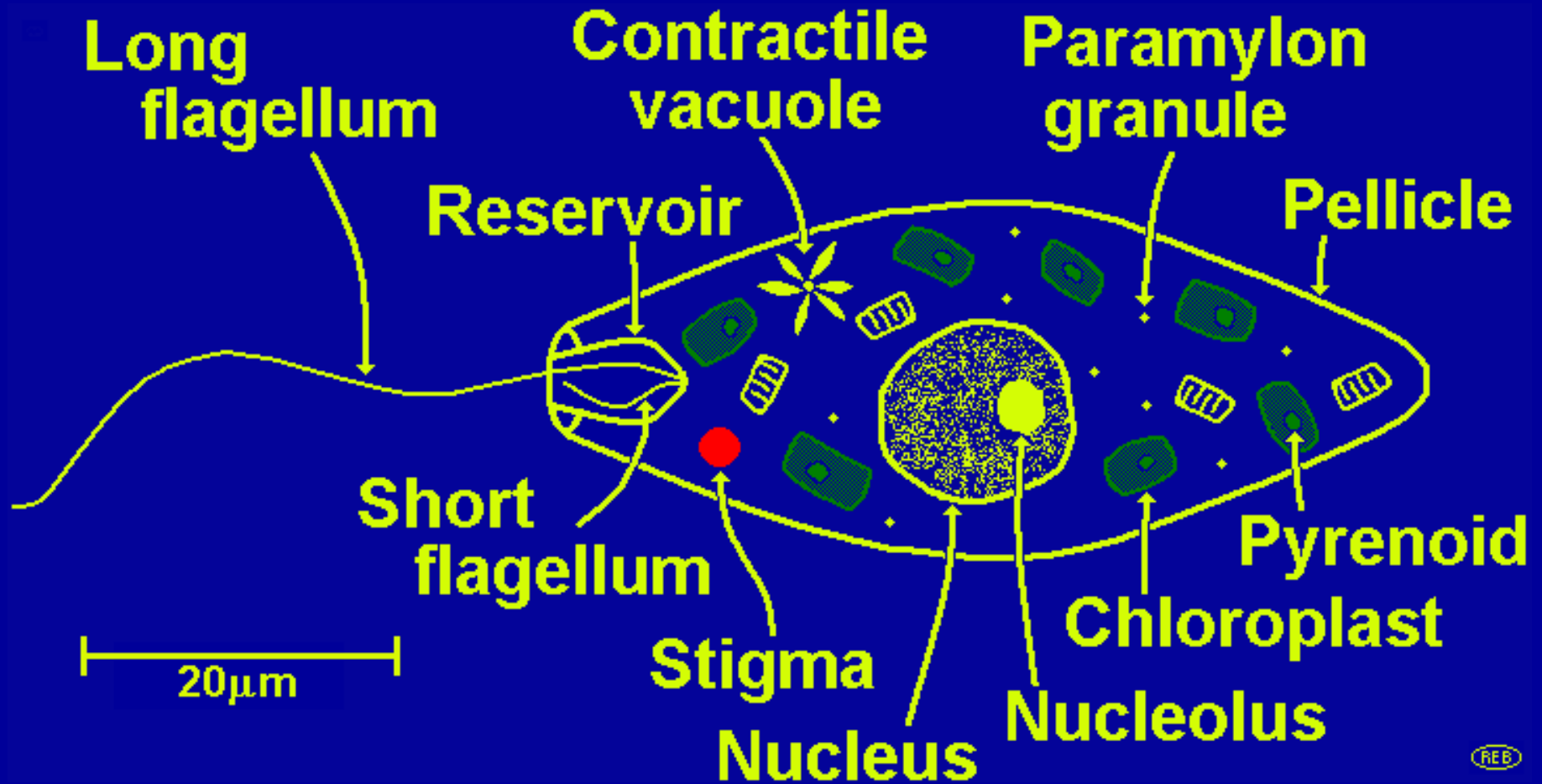
b. *Trypanosoma sp.*



c. Euglenida (Euglenophyta)

- 1.) 1/3 autotrophic with chloroplasts, 2/3 heterotrophic by ingestion or absorption**
- 2.) Without light, lose chloroplasts & turn heterotrophic**
- 3.) Unicellular, 10-500 μ m, freshwater**
- 4.) Flagellated, eyespot, contractile vacuole, pellicle**
- 5.) Longitudinal binary fission, sexual not observed**

c. *Euglena sp.*



3. Alveolata

a. Alveoli (small sacs) just under plasma membrane

b. Ciliata

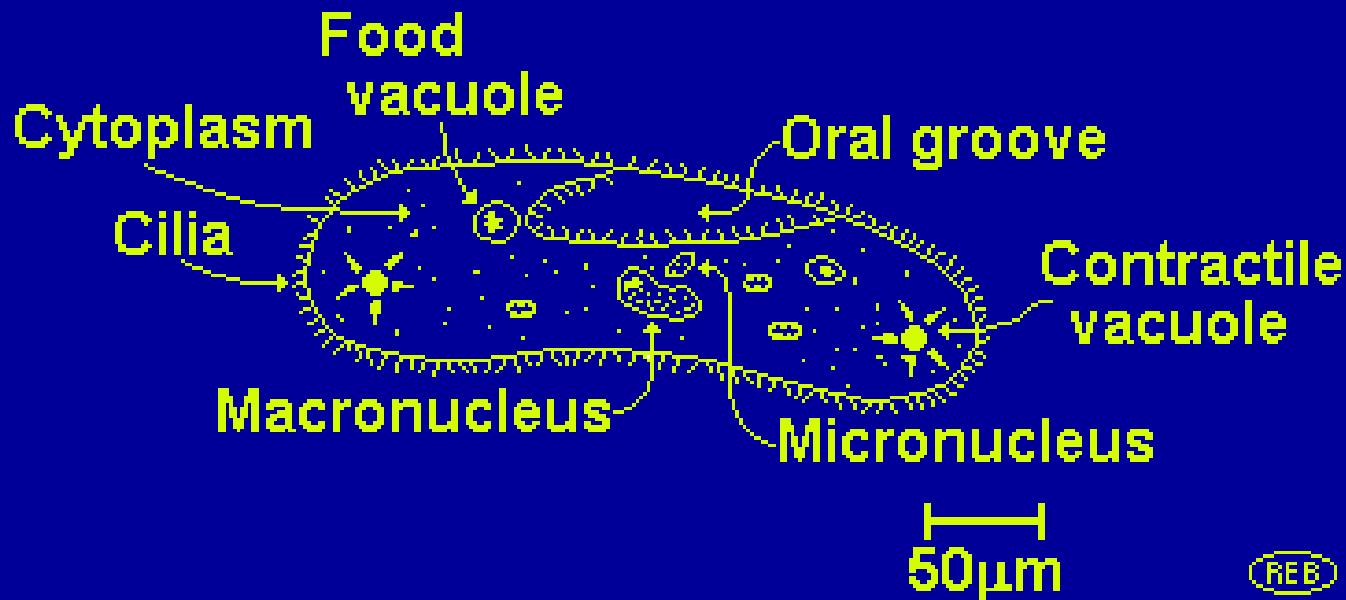
c. Dinoflagellata

d. Apicomplexa

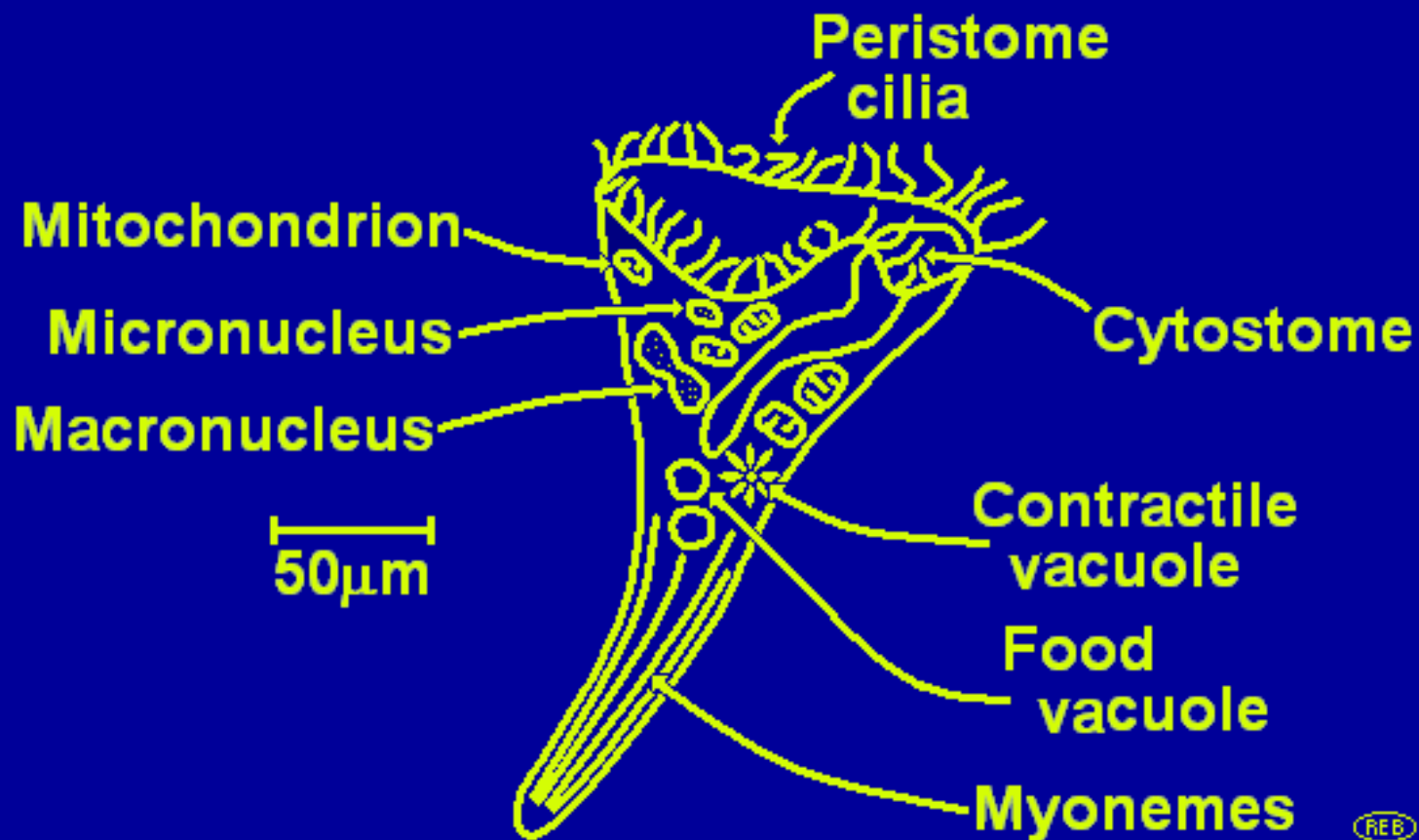
b. Ciliata (Ciliophora)

- 1.) Ciliated pellicle, cilia- tiny hairs**
- 2.) Trichocysts- discharge long, barbed threads, capture prey, defense**
- 3.) Oral groove, food vacuole, anal pore, macronucleus, & micronucleus**
- 4.) Transverse binary fission or sexual, exchange micronuclei**
- 5.) *Paramecium, Didinia, Suctoria, Stentor***

5.) *Paramecium caudatum*



5.) *Stentor roeseli*



c. Dinoflagellata- whirling whips

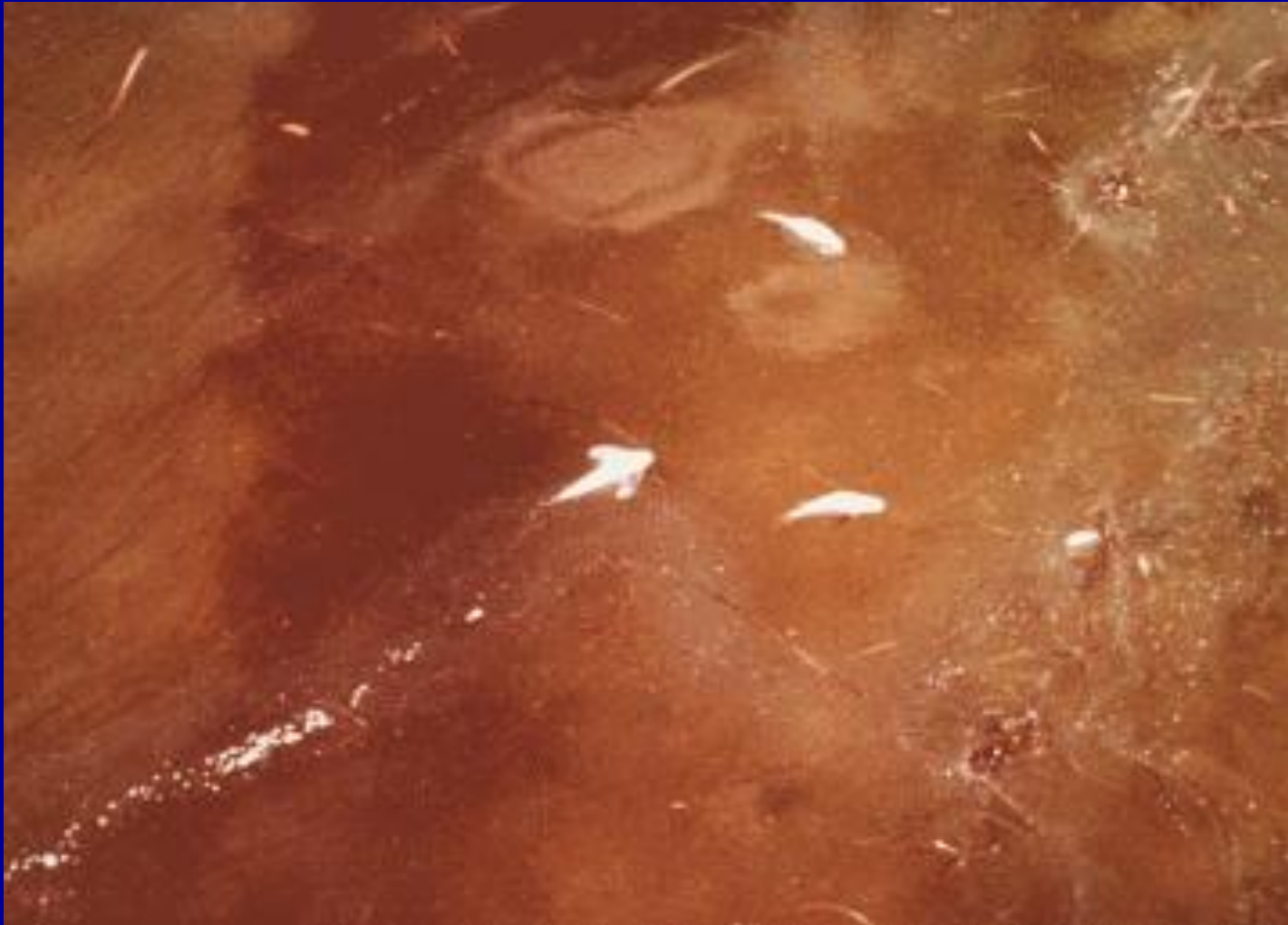
- 1.) Formerly Pyrophyta- fire algae, $\frac{1}{2}$ autotrophic & $\frac{1}{2}$ heterotrophic**
- 2.) Marine unicellular biflagellates, many with cellulose plates**
- 3.) Binary fission; Under stress haploid adults produce haploid gametes by mitosis, gametes fuse and form planozygote, planozygote forms haploid individuals by meiosis**
- 4.) Dinoflagellate examples**

4.) **Dinoflagellate Examples**

- a.) ***Gymnodinium***- red tides, blooms that cause fish kills, eating clams or oysters from a red tide can cause paralysis
- b.) ***Noctiluca scintillans***- bioluminescent
- c.) ***Symbiodinium***- symbiontes in cnidarians, especially corals

a.) Red Tide

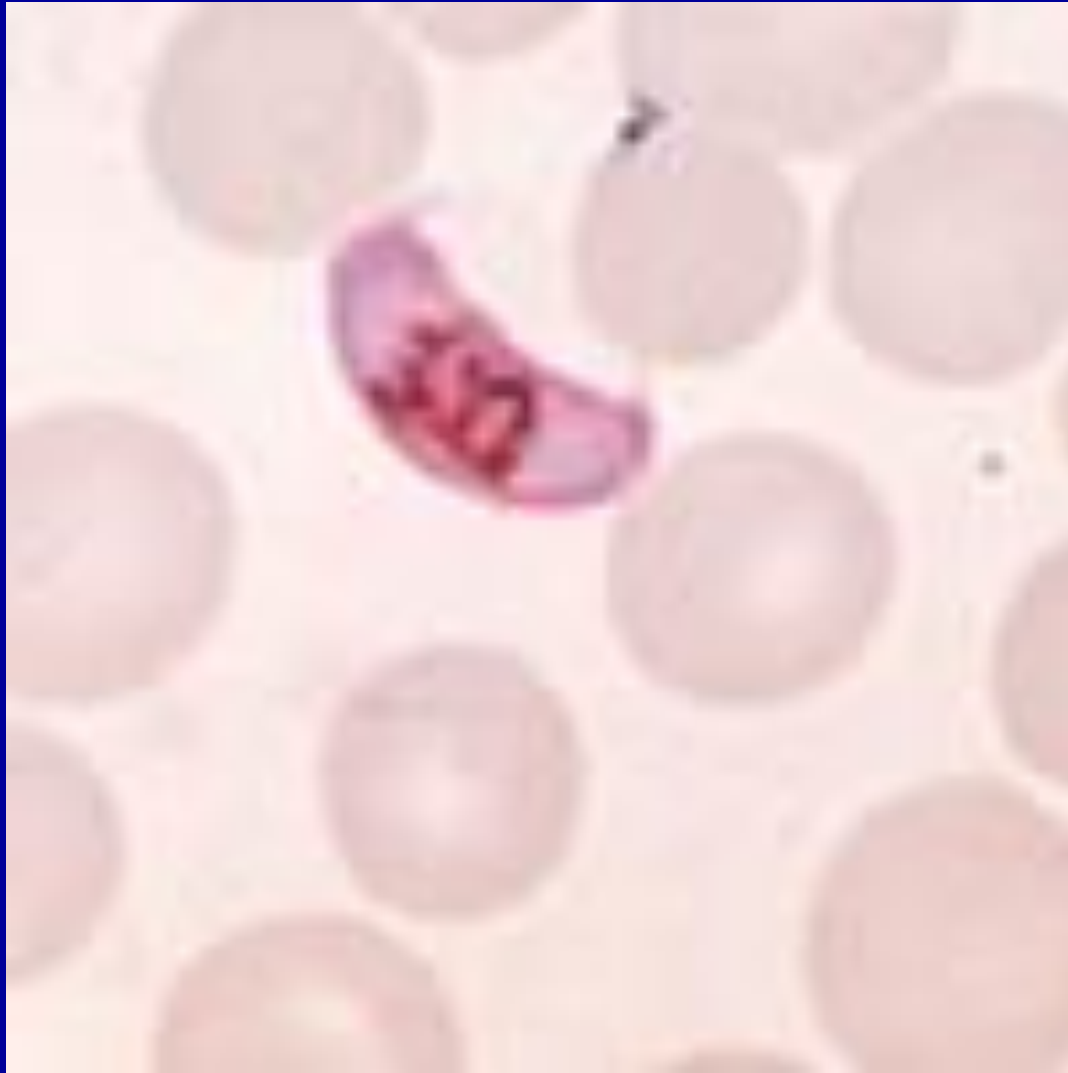
Gymnodinium breve off Florida coast



d. Apicomplexa (Sporozoa)

- 1.) Nonmotile parasites of animals, spores**
- 2.) *Pneumocystis carinii*- pneumonia, AIDS patients**
- 3.) *Plasmodium vivax* & *P. falciparum*- malaria, *Anopheles sp.*, worldwide killer, resistance, Sickle Cell Anemia**

3.) *Plasmodium faliparium*



http://malaria.wellcome.ac.uk/doc_WTD023865.html

4. Stramenopila (Heterokonta)

a. All have “haired” flagella at some point of their life cycle

b. Oomycota

c. Chrysophyta (Golden algae)

d. Phaeophyta (Brown algae)

b. Oomycota

- 1.) Formerly a fungal division**
- 2.) Filamentous & saprotrophic like fungi, but diplontic with cells walls of cellulose**
- 3.) *Saprolegnia*- water molds parasitize fish**
- 4.) Terrestrial members parasitize insects & plants; *Phytophthora infestans*- potato blight**

c. Chrysophyta- golden algae

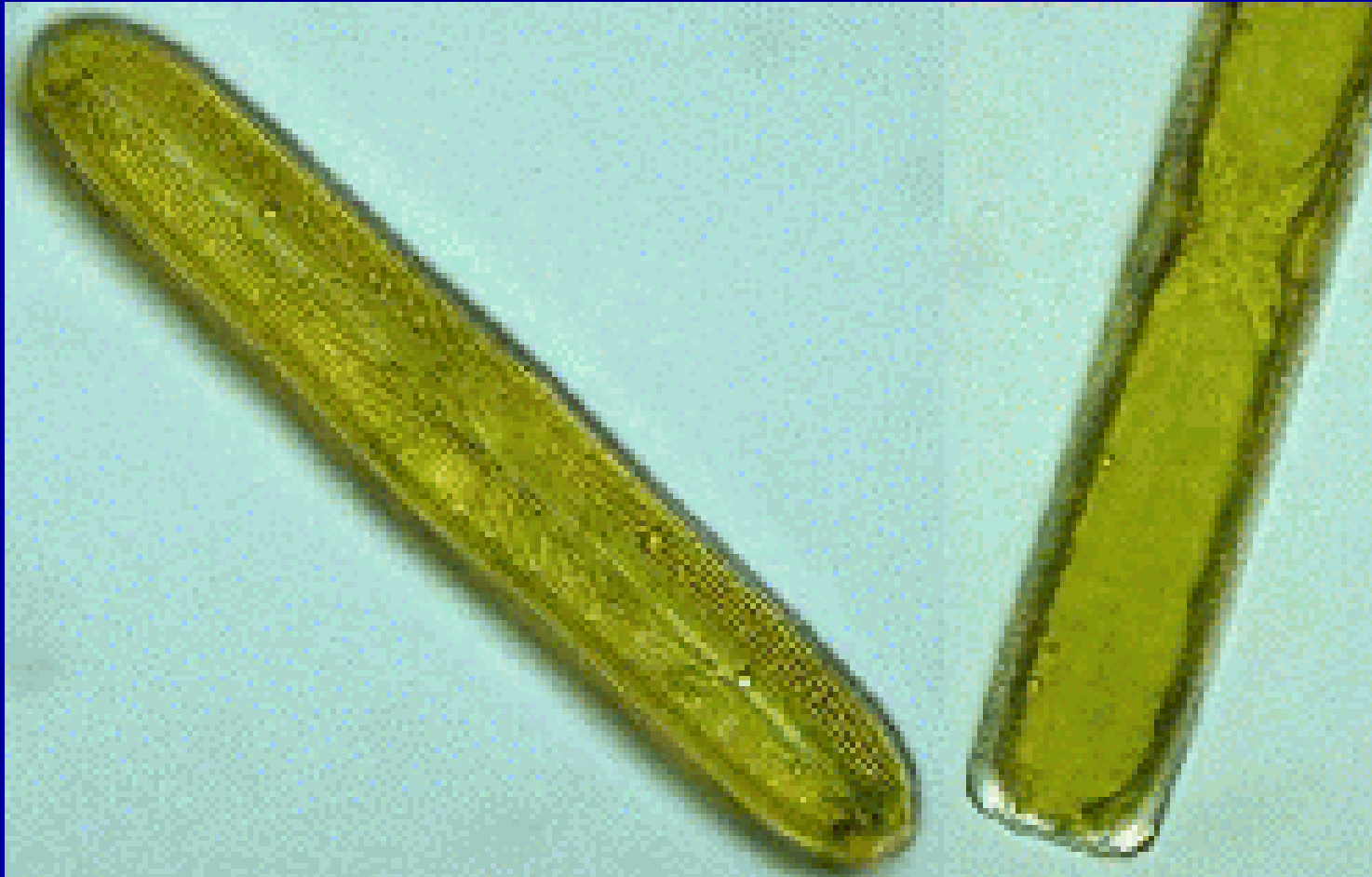
- 1.) Chlorophylls a & c and fucoxanthin**
- 2.) Freshwater & marine unicellular, diatoms**
- 3.) Cell walls of cellulose with outer layer of SiO_2 (silica), diatomaceous earth**
- 4.) Shrinking binary fission or diplontic**
- 5.) Most numerous unicellular algae, major O_2 producer**

c. Diatoms- silica shells



c. Pennate Type Diatom-

Pinnularia sp.



c. Centric Type Diatom- *Coscinodiscus* sp.



d. Phaeophyta- brown algae

- 1.) Chlorophylls a & c and fucoxanthin**
- 2.) Simple filaments to 50-100m in cooler marine environments, cell walls of cellulose**
- 3.) Most have alternation of generation, but *Fucus sp* are diplontic**
- 4.) Harvested for kelp & algin**
- 5.) *Sargassum, Laminaria, & Fucus***

5.) *Fucus distichous*

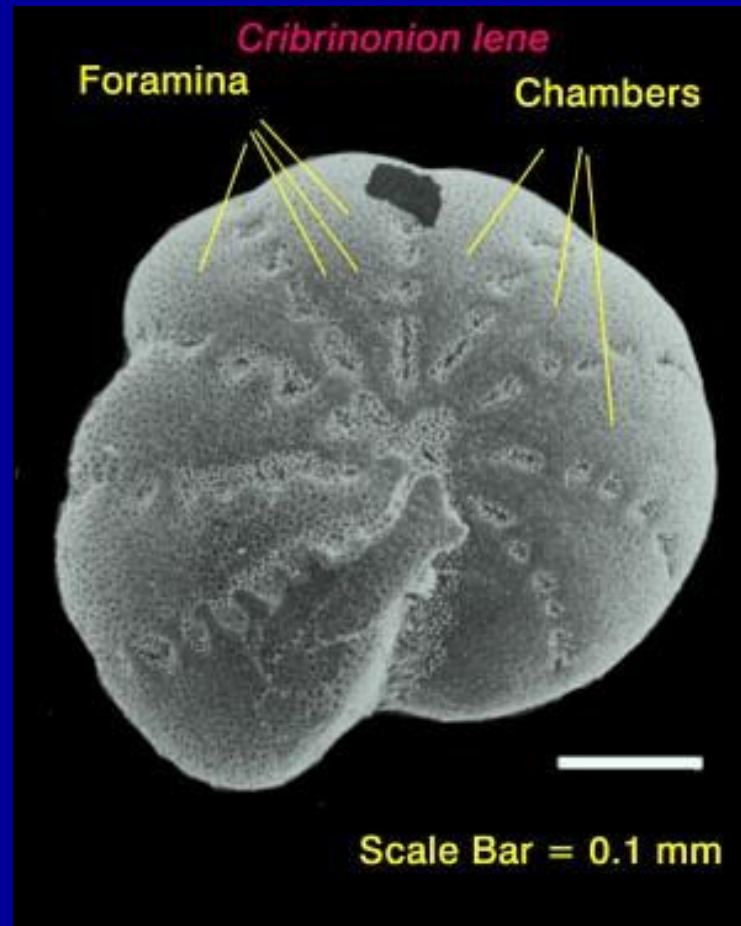


www.ucmp.berkeley.edu/chromista/phaeophyta.html

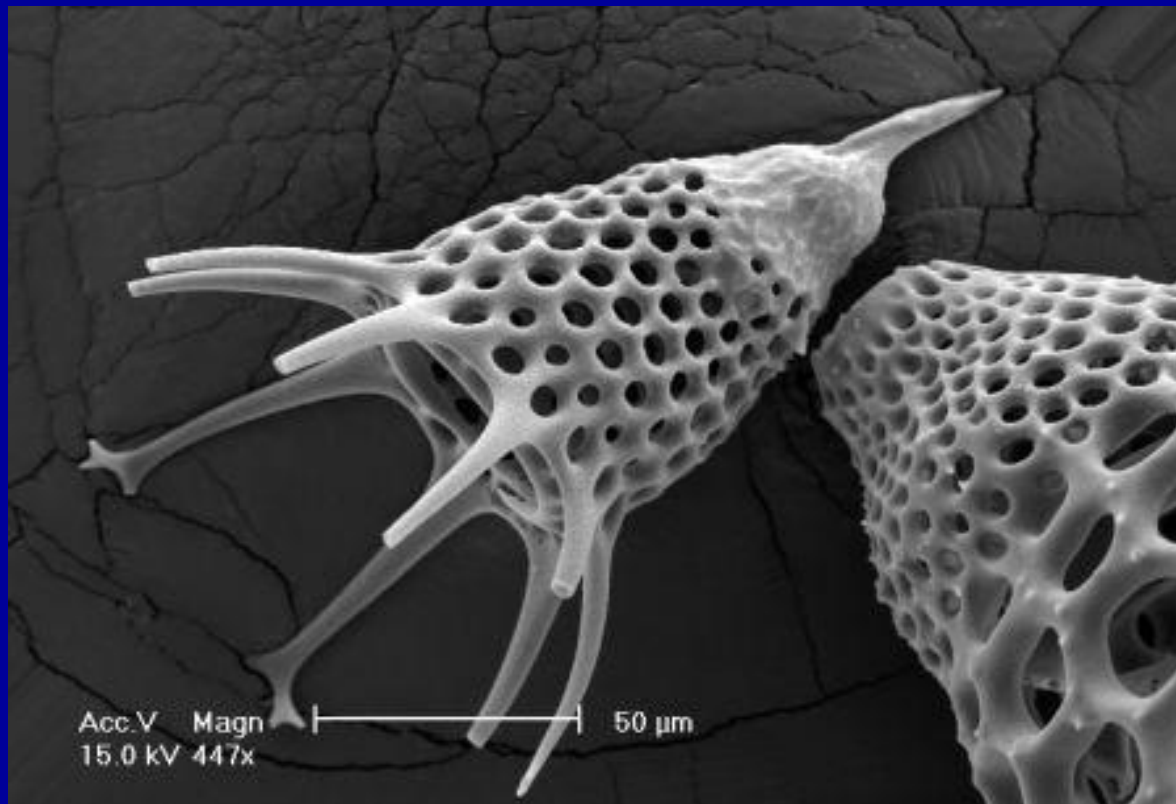
5. Cercozoa

- a. Formerly Sarcodina or Rhizopoda
- b. Unicellular with filose pseudopods
(thread-like cytoplasmic extensions)
- c. Phagocytosis of prey: bacteria,
algae, or other protists
- d. Asexual budding, sexual not
observed
- e. Many with shells

1.) Foraminiferans- CaCO_3 (limestone) shells



2.) Radiolarians- SiO_2 shells, indicators for petroleum



uos.anu.edu.au/calendar/day17.html

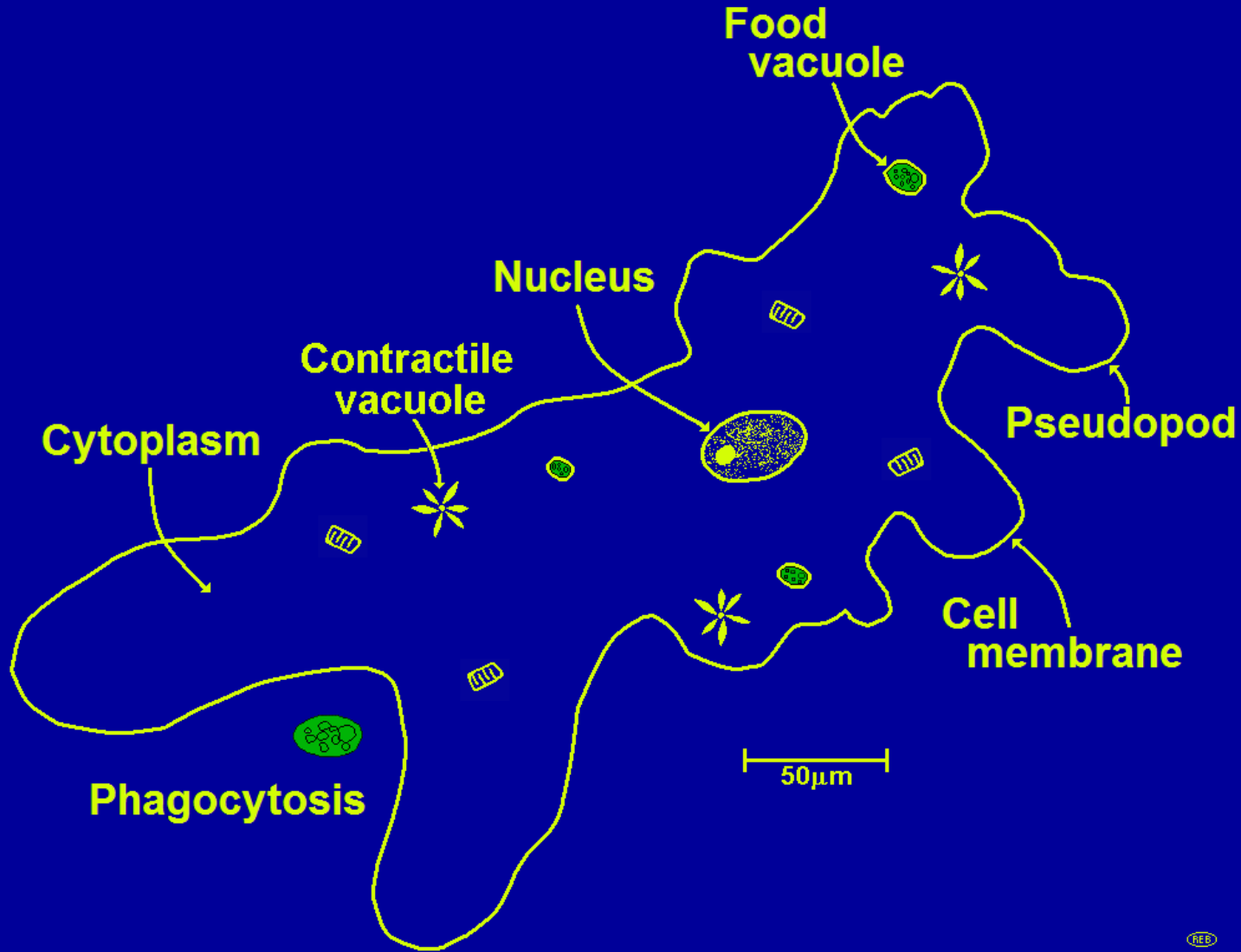
6. Amoebozoa

- a. Lack shells, engulf prey**
- b. Amoebae (Lobose Amoebae)**
- c. Myxogastriada (Plasmodial Slime Molds)**
- d. Myxamoebae (Cellular Slime Molds)**

b. Amoebae

- 1.) Formerly Sarcodina or Rhizopoda**
- 2.) Unicellular with lobose pseudopods, phagocytosis**
- 3.) Binary fission, sexual never observed**
- 4.) *Entamoeba histolytica*- amoebic dysentery, liver & brain damage, death**
- 5.) *Amoeba proteus*- free-living, cosmopolitan**

5.) *Amoeba proteus*



c. Myxogastriada (PSM)

- 1.) Formerly Gymnomycota in Fungi, alternatively Plasmodial Slime Molds**
- 2.) Produce haploid spores like fungi but phagocytosis, not saprotrophic**
- 3.) Plasmodium- diploid multinucleated cytoplasmic mass covered by slime layer**
- 4.) Binary fission & under stress, diploid cells form sporangium & haploid spores by meiosis, spores form gametes by mitosis, gametes fuse to form a diploid zygote**

d. Myxamoebae (CSM)

- 1.) Formerly Gymnomycota in Fungi, alternatively Cellular Slime Molds**
- 2.) Produce haploid spores like fungi but phagocytosis, not saprotrophic**
- 3.) Pseudoplasmodium- amoeboid haploid cells aggregate and form a sporangium**
- 4.) Binary fission & under stress, haploid cells form sporangium and fuse to form a zygote, zygotic meiosis produces haploid spores**

