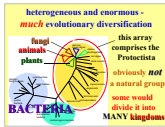


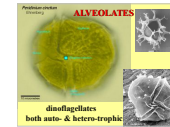
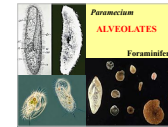


kingdom includes:
eukaryotic micro-organisms & their immediate descendant groups:
 all algae, seaweeds, slime moulds "protozoa", and many others...
 a kingdom **defined by exclusion:**
 those eukaryotes that are not animals (metazoa), plants (embryos) fungi (spores, no cilia)
 (in what kind of group is it? *Natural?*)

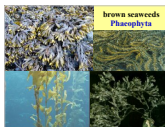
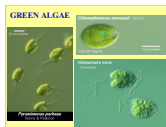
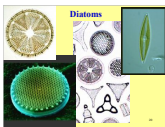
understanding of protocist phylogenic relationships is complex & uncertain
 morphological analysis suggests 80+ distinctive basic types of structure, currently arranged into 40 tentative "lineages"
 Images show a great diversity of morphological complexity, but unclear if "single" forms are "primitive" or "derived"
 likely to take a good while to sort this out



General characteristics
 • mostly unicellular; some colonial, syncytial & multicellular
 • enormous size range: 0.01mm to >20m - 4 powers of 10
 • great cell-structure and life-cycle diversity - perhaps >250,000 species
 • diversity reflected in ~38 "phyla"
 • mostly aerobic - have mitochondria
 • most have cilia at some stage

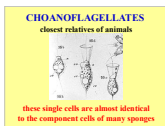


• all aquatic, either fw or marine, in tissues of others, or in water films
 • likely that much diversity is in tropics
 • many are parasitic, on plants and animals, some causing serious diseases
 (dysentery, sleeping sickness, Chagas, malaria, pox, AIDS, grape mildew...)
 • **autotrophic** - phytoplankton, large algae; or heterotrophic; some can switch, absorption & ingestion



NEXT CLASS:
 The Fungi - life by absorption

thanks to these web-sites for images
<http://www.rockefeller.edu/education/galler/galler.html>
<http://www.rockefeller.edu/education/galler/galler.html>
<http://www.rockefeller.edu/education/galler/galler.html>



- all aquatic, either f/w or marine, in tissues of others, or in water films
- likely that much diversity is in tropics
- many are parasitic, on plants and animals, some causing **serious diseases** *dysentery, sleeping sickness, Chagas, malaria, potato blight, grape mildew....*
- **autotrophic** - **phytoplankton**, large algae; or **heterotrophic**; some can switch; **absorption & ingestion**

5

- kingdom includes:
- **eukaryotic micro-organisms & their immediate descendant groups:** all algae, seaweeds, **slime moulds** "protozoa", and many others... a kingdom **defined by exclusion:** those eukaryotes that are **not**
 - **animals** (blastula)
 - **plants** (embryo)
 - **fungi** (spores, no cilia)
- (so what kind of group is it? *Natural?*)

11

Berkeley's way of arranging groups



but much convergence - not natural groups

- understanding of protocist phylogenetic relationships is complex & uncertain
- morphological analysis suggests 80+ distinctive basic types of structure, currently arranged into ~60 tentative 'lineages'
- **lineages show a great diversity of morphological complexity, but unclear if 'simple' forms are 'primitive' or 'degenerate'**
- likely to take a good while to sort this out

11

7

heterogeneous and enormous - **much** evolutionary diversification

fungi
animals
plants

this array comprises the Protista obviously **not** a natural group some would divide it into **MANY** kingdoms

BACTERIA

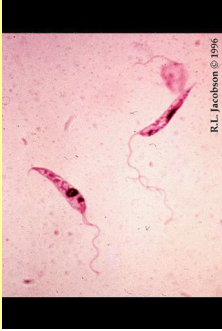
nitrogen-fixing bacteria
cyanobacteria
archaeobacteria
methanogenic bacteria

General characteristics

- mostly unicellular; some colonial, syncytial & multicellular
- enormous size range: ~0.01mm to ~30m - **6 powers of 10**
- great cell-structure and life-cycle diversity
- perhaps >250,000 species
- diversity reflected in ~30 "phyla"
- mostly aerobic – have mitochondria
- most have cilia at some stage

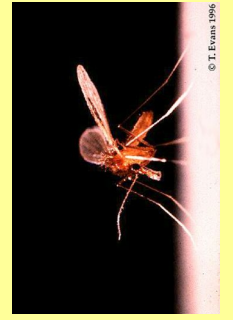
11

4



R.L. Jacobson © 1996

Leishmania
another trypanosome
produces many forms
of ulcers & lesions

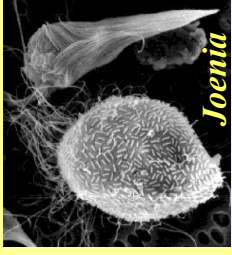


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"PRIMITIVE" GROUPS



Joenia

a symbiotic form
living in the guts
of termites

8



Euglena

a photosynthetic
free-living form

Rhizopod amoebas



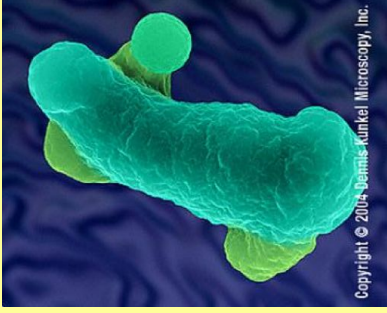
free-living on bacteria
or pathogens on fish & shellfish

11



skin
lesions

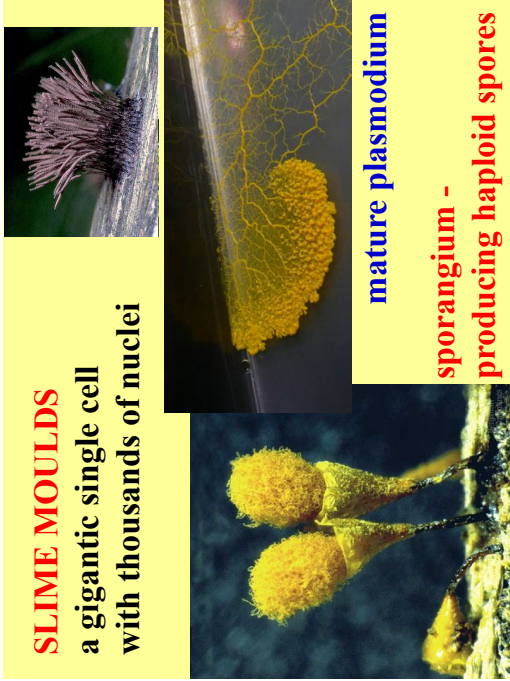
Entamoeba histolytica



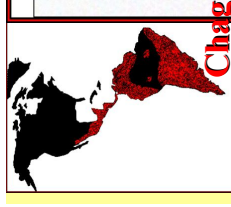
Copyright © 2004, Dennis Kunkel Microscopy, Inc.

SLIME MOULDS

a gigantic single cell
with thousands of nuclei



mature plasmodium
sporangium -
producing haploid spores



Trypanosoma cruzi



trypanostigote
Rhodnius



Amplificado por el Instituto de Diagnóstico y Referencia Epidemiológicos de la Secretaría de Salud, México




Glossina



trypanostigotes
(by P.M. Peppas and S.M. Ward)

Trypanosomes
Sleeping sickness



RED TIDES - masses of dinoflagellates


17

RHODOPHYTA

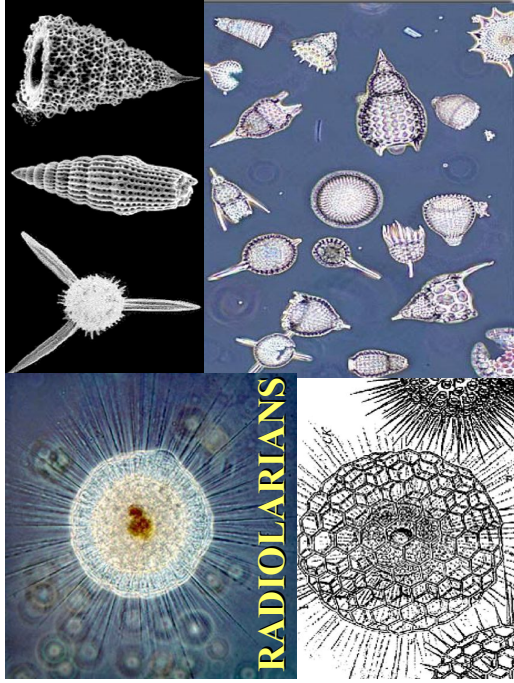


"Red Algae" - dulce

11



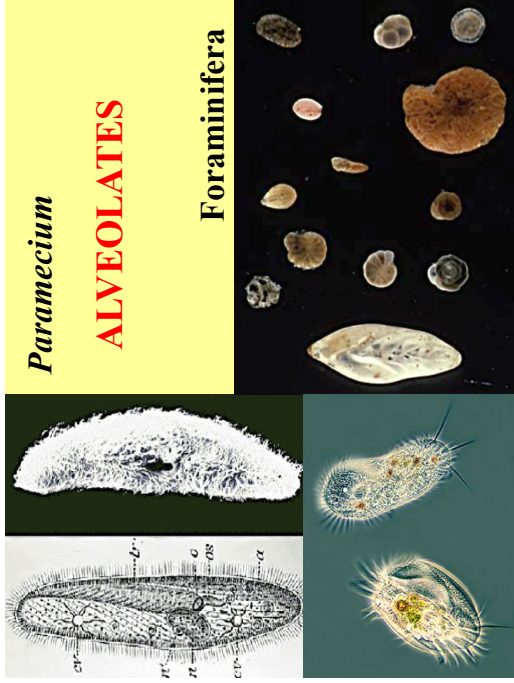
RADIOLARIANS



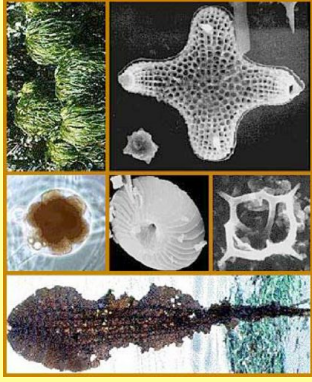
Paramecium

ALVEOLATES

Foraminifera



CHROMISTA - brown and green algae



11

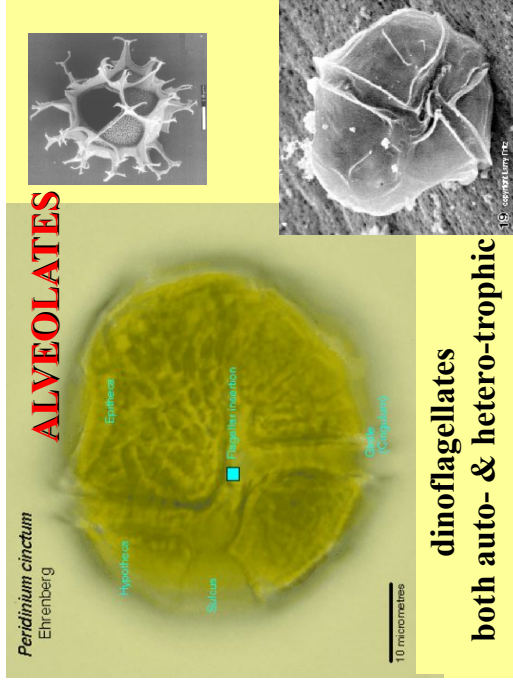
Peridinium cinctum
Ehrenberg

ALVEOLATES

Hyposphaere
Epithemae
Sphaerocystae
Pigment granules
Glycocalyx

10 micrometres

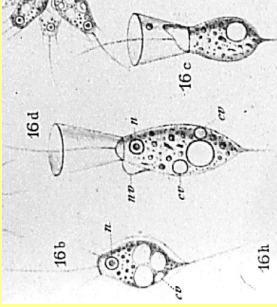
dinoflagellates
both auto- & hetero-trophic



19. www.fishbase.org

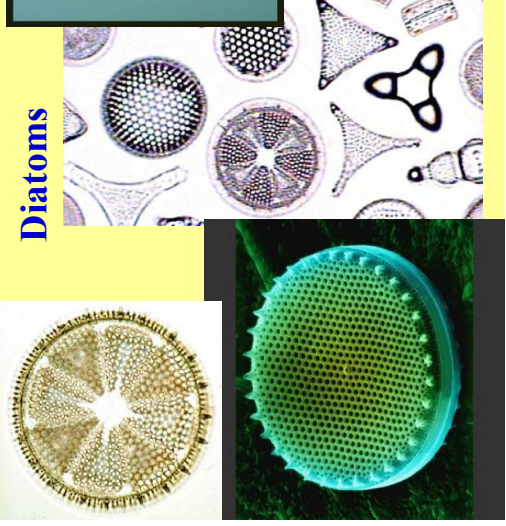
CHOANOFLAGELLATES

closest relatives of animals



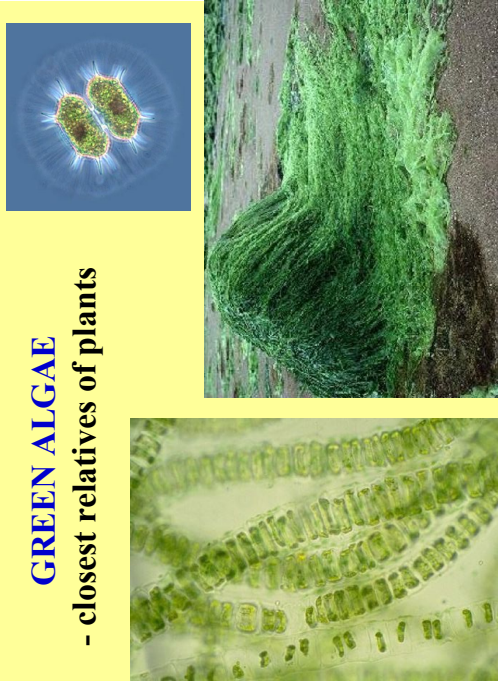
these single cells are almost identical to the component cells of many sponges

Diatoms

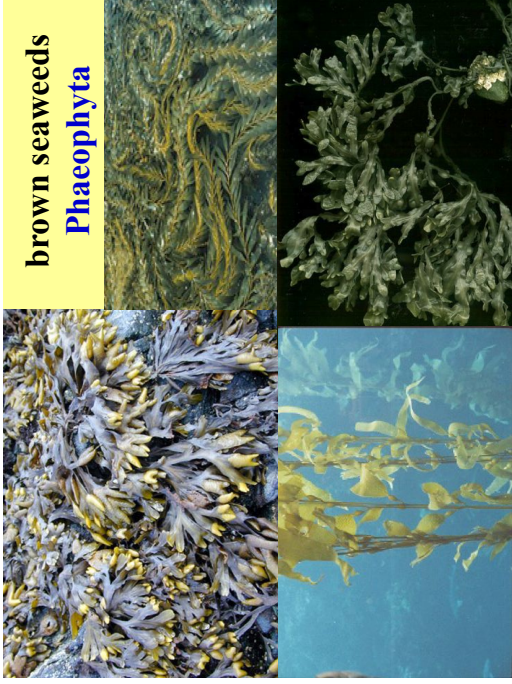


GREEN ALGAE

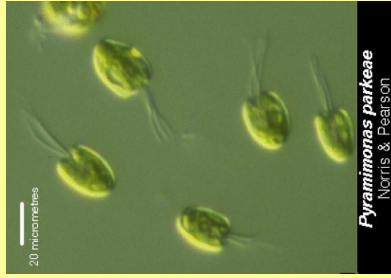
- closest relatives of plants



brown seaweeds Phaeophyta



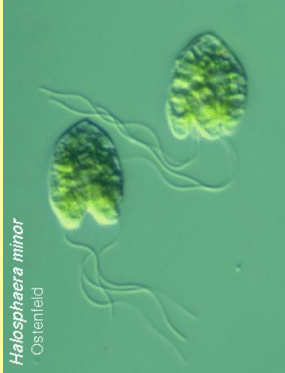
GREEN ALGAE



Chlamydomonas moewusii Gerloff

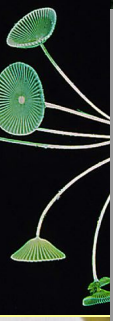


Habrophaera minor Ostlefeld

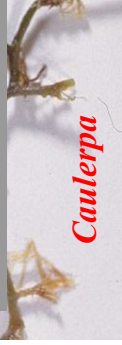


highly differentiated;
yet a single cell

Acetabularia



**collectively, brown & green algae,
diatoms etc. are responsible for
most primary productivity
in marine systems**



Caulerpa



11

27

NEXT CLASS:

The Fungi - life by absorption

**thanks to these web-sites
for images**

<http://megasun.bch.umontreal.ca/protists/gallery.html>

<http://www.ucmp.berkeley.edu/help/taxaform.html>

<http://www.micscape.simplenet.com/mag/wimsmall/smal13.html>

11

28