

## TOPIC 2 – KINGDOM PROTISTA

BIOL 1030 – SPRING 2008

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### 1. General Characteristics of Protista

- In the past, taxonomists classified all protists in a single kingdom, Protista. We now know Protista is in fact paraphyletic – it is an artificial grouping.
- Some protists are more closely related to plants, fungi, or animals than they are to other protists.
- “Kingdom” Protista is being abandoned.
- *Protist* – convenient term to informally refer to all eukaryotes that are not plants, animals, or fungi.

#### *1.1. Protists are very diverse*

- more structural and functional diversity than any other group of organisms
- unicellular, colonial and multicellular
- very complex at cellular level
- nutritionally diverse –
  - photoautotrophs
  - heterotrophs
  - mixotrophs
- diverse habitats
- diverse life cycles – some asexual, others

#### *1.2 Endosymbiosis has a role in evolution of protists (refer Fig. 28.3)*

- Much of protist diversity is the result of endosymbiosis, a process in which unicellular organisms engulfed other cells that evolved into organelles in the host cell.
- The earliest eukaryotes acquired mitochondria by engulfing alpha proteobacteria.
- Later in eukaryotic history, one lineage of heterotrophic eukaryotes acquired an additional endosymbiont—a photosynthetic cyanobacterium—that evolved into plastids. This lineage gave rise to red and green algae.
- Endosymbiosis gave rise to mitochondria before plastids. How is the hypothesis supported? (Refer Concept 28.1 in Campbell & Reece 7<sup>th</sup> ed.)

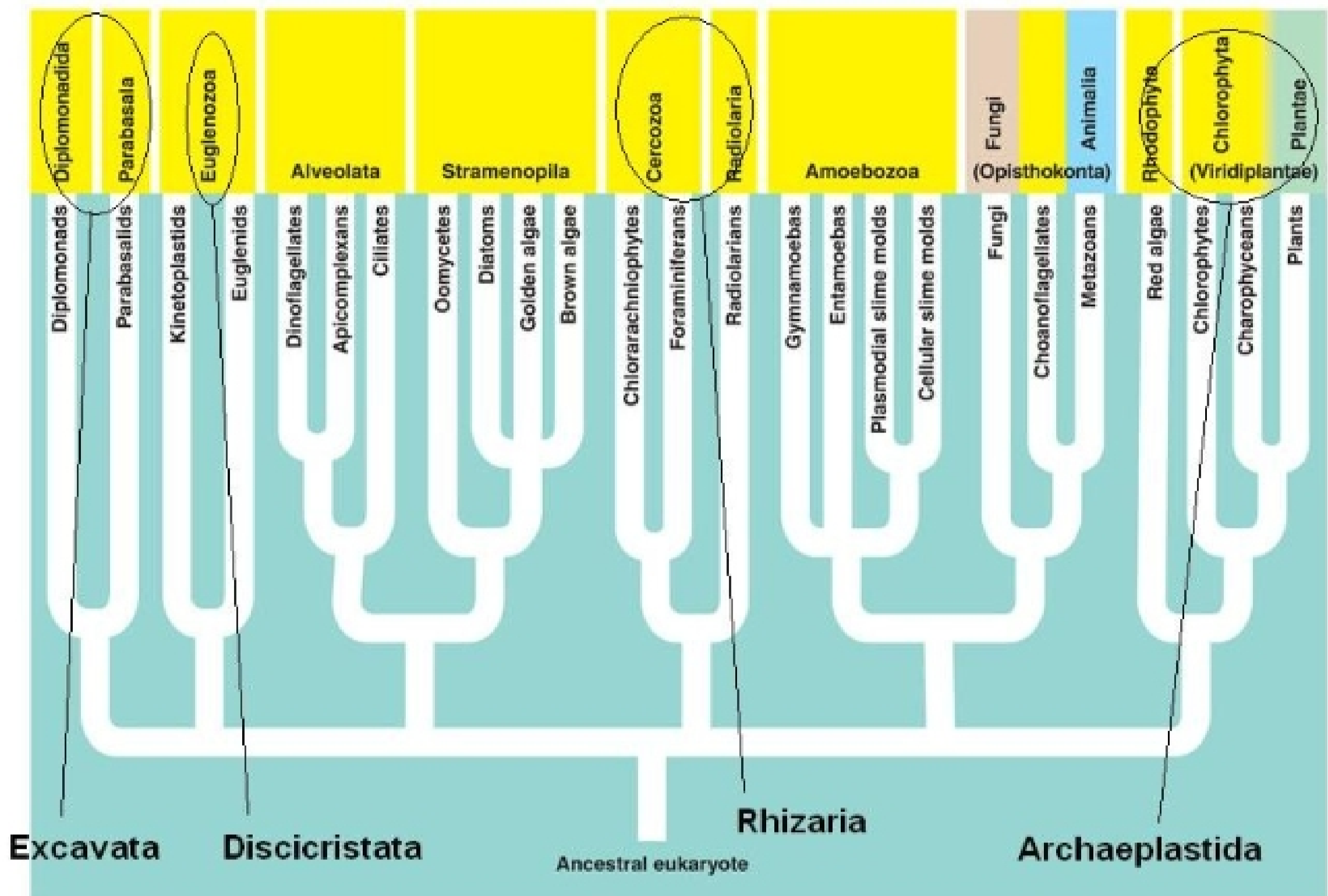
- Secondary endosymbiosis: red and green alga were ingested in the food vacuole of a heterotrophic eukaryote and became endosymbionts themselves.

## **B. Classification and Diversity of Protists**

- Classification is in a state of flux – we use the phyla in the lab manual with some additions and groupings.
- your lab manual leaves out some of the groups that will be covered here
- There appear to be eight major lineages of protists within Eukarya
- this is very similar to the groupings give in your textbook, but updated based on more recent consilience between molecular and morphological evidence
- each lineage contains at least some organisms traditionally placed in kingdom Protista
- these lineages are not generally given a formal taxonomic level; instead they are simply unranked taxons
- (distinct lineages) often called “supergroups”; however, sometimes some of these are called “superphyla” or even kingdoms

The lineages, in order starting with those that appear to be most distantly related to humans:

1. Excavata
2. Discicristata
3. Alveolata
4. Stramenopila
5. Rhizaria
6. Archaeplastida (includes traditional kingdom Plantae)
7. Amoebozoa
8. Opisthokonta (includes traditional kingdoms Fungi and Animalia)



## I. Excavata

A. Features: pronounced “feeding groove”, no functioning mitochondria, although nucleus has some genes derived from mitochondria

B. two major group, **Diplomonads** and **Parabasalids**

### C. Diplomonads

1. “double cell” structure
2. have two equal-sized nuclei and multiple flagella
3. modified mitochondria called **mitosomes**
4. includes *Giardia lamblia*, the organism that causes “hiker’s diarrhea” or giardiasis
  - infects humans and some other animals; found across U.S. in most freshwater
  - causes nausea, cramps, diarrhea

### D. Parabasalids

1. modified mitochondria called **hydrogenosomes** that make hydrogen gas