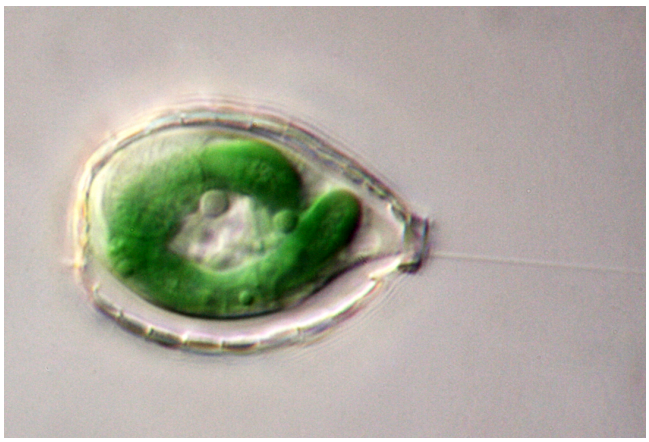
Evolution of Plastides

Plastides originated of an ancestral endosymbiosisof cyanobacteria with heterotrophic eukaryotes.

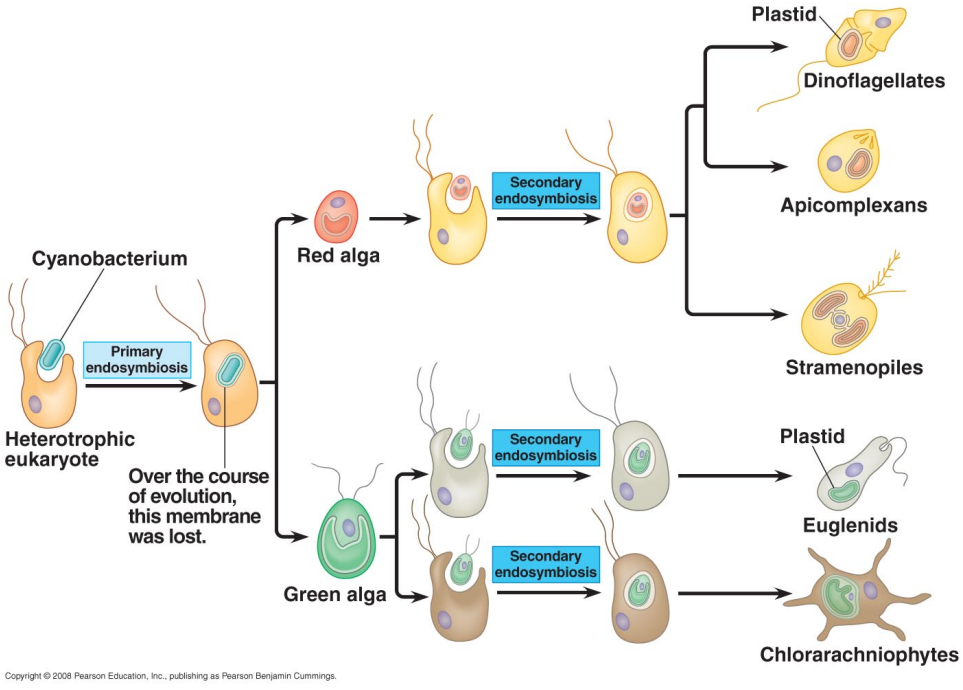


Freshwater amoeba *Paulinella cromatophora*

Large parts of the endosymbiont genome were subsequently transferred to the nuclear genome of the host, resulting in an obligate endosymbiosis. Even today plastides possess their own, highly reduced genome, based on the cyanobacterial genome. Red algae, green algae and a small algae group, the Glaucocystaceae, originate from a primary endosymbiosis.

Other phototrophic eukaryotes such as dinoflagellates, diatoms, euglenozoans and brown algae originated from a secondary endosymbioses, here a red algae or a green algae acted as partner in this symbiosis.

The freshwater amoeba *Paulinella chromatophora* is an eukaryotic protist that possesses two plastid-like organelles in contrary to other closely relates Amoeba species. Please analyze using a molecular data set of genes present in both, cyanobacteria and plastids, whether the phototsynthetic organelles of this species originate from a new, primary endosymbiosis (additional uptake of a cyanobacterium), or whether a red or green algae forms a symbiosis with *Paulinella* (secondary endosymbiosis).



Remember that you analyse the organelles of *Paulinella,* not nuclear sequences.

What kind of phylogenetic relationship would you expect from either scenario?

Compare the hypotheses by analyzing the data accordingly. For this, find an appropriate model of nucleotide sunstitution and perform a ML analysis with raxmlGUI (including a bootstrap analysis).

Data: Concatenated sequences of chloroplast and bacterial genes for ribosomal RNA (rRNA) and transfer RNA (tRNA): small subunit rRNA, tRNA-Ile, tRNA-Ala, and large subunit rRNA:

Paulinella_endosymbiosis.mase

Abbreviations in the data:

CYA: cyanobacteria

RPL: rhodoplast, plastides of the red algae (ancestral)

CPL: chloroplast, plastides of the green algae (ancestral)

OUT_BACT: outgroup taxa of the bacteria

-- OliverVoigt - 21 Nov 2012