

Study Guide
MICROBIAL DIVERSITY
ToL 9

ToL 9 focuses on algal evolution and the early evolutionary origins of land plants. This is a long and detailed chapter; please read all of it, but rest assured that the information on this study guide is the only information from the chapter for which you will be held responsible.

1. What genomic trait do chloroplasts share with mitochondria?
2. How can we explain the fact that plastids typically express more proteins than the size of the plastid genome would suggest?
3. Note that the text refers to plastids as having arisen from 'cyanobacteria.' You know the true story – that plastids shared a common ancestor with the Prochlorophytes within the phylum Cyanobacteria.
4. Examine Fig. 9.1. What are the two important lineages of organisms that have plastids thanks to primary endosymbiosis?

A. B.

A third group, the Glaucocystophyta, is very poorly known and is not critical for this class.

How many membranes do the chloroplasts in these organisms have?

Now, look at the Euglenophytes (Euglenoids), Dinoflagellates, Apicomplexans, Haptophytes, and Heterokonts (remember, Heterokonts = Stramenopiles). Ignore the Cryptophytes (Cryptomonads) for now. These lineages all underwent a secondary endosymbiosis event. For the following, how many membranes are present on the chloroplasts, are nucleomorphs present, and are mitochondria present? What chlorophylls are present (see the figure and the legend).

Lineage	# membranes on chloroplast	which chlorophylls?	nucleomorph	mitochondrion
Euglenophytes				
Dinoflagellates				
Apicomplexa				
Haptophytes				
Heterokonts (aka Stramenopiles)				

* Put a star next to a lineage thought to be closely related to Stramenopiles (see course notes). Make notes in the left margin to indicate the number of flagella typical of cells in each lineage.

5. On page 125, left column, check out the information on sea slugs and the probable steps involved in the capture of symbiotic plastids. Describe this process clearly.

6. True or false: cryptomonads (= Cryptophytes) appear to have captured a red algal cell as part of their process of secondary symbiosis.

7. Why are the Heterokonts sometimes called Stramenopiles?

8. Why do we believe that Apicomplexans and dinoflagellates arose from a common ancestor with a plastid?

9. What are the major morphological growth forms of the green algae?

10. What lineage of green algae is thought to be the closest living relatives of land plants? In what environment are land plants thought to have arisen?