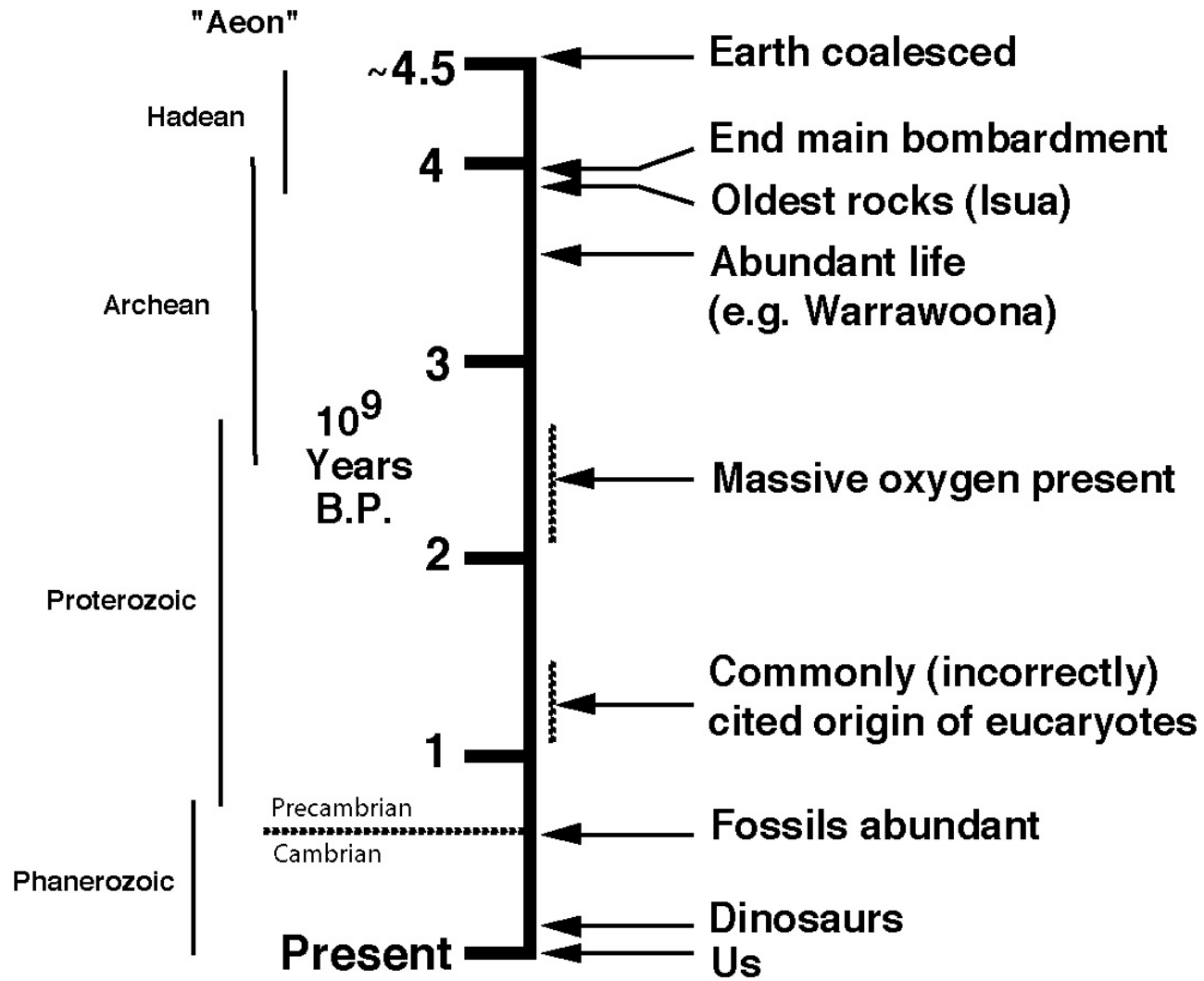
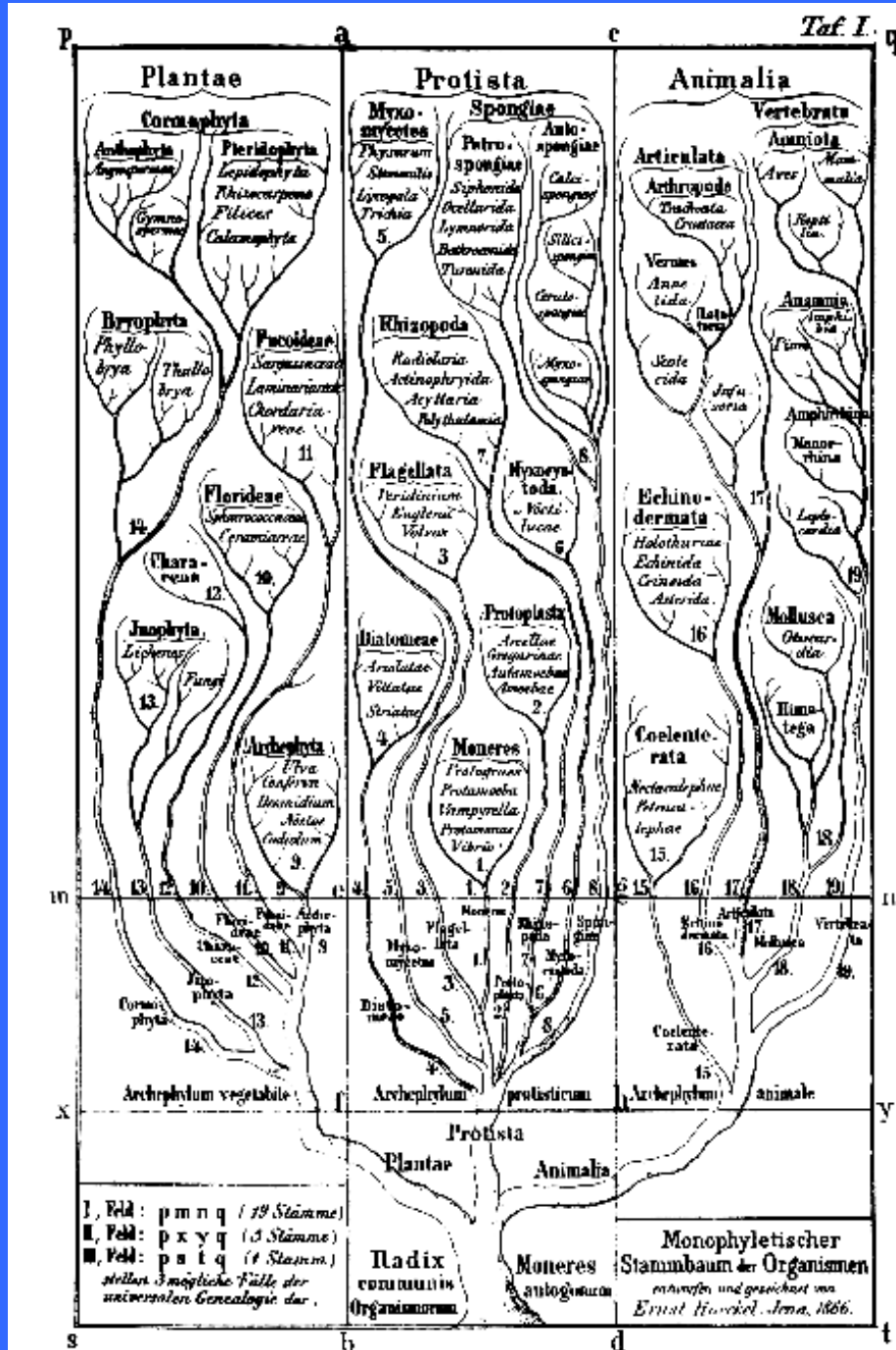


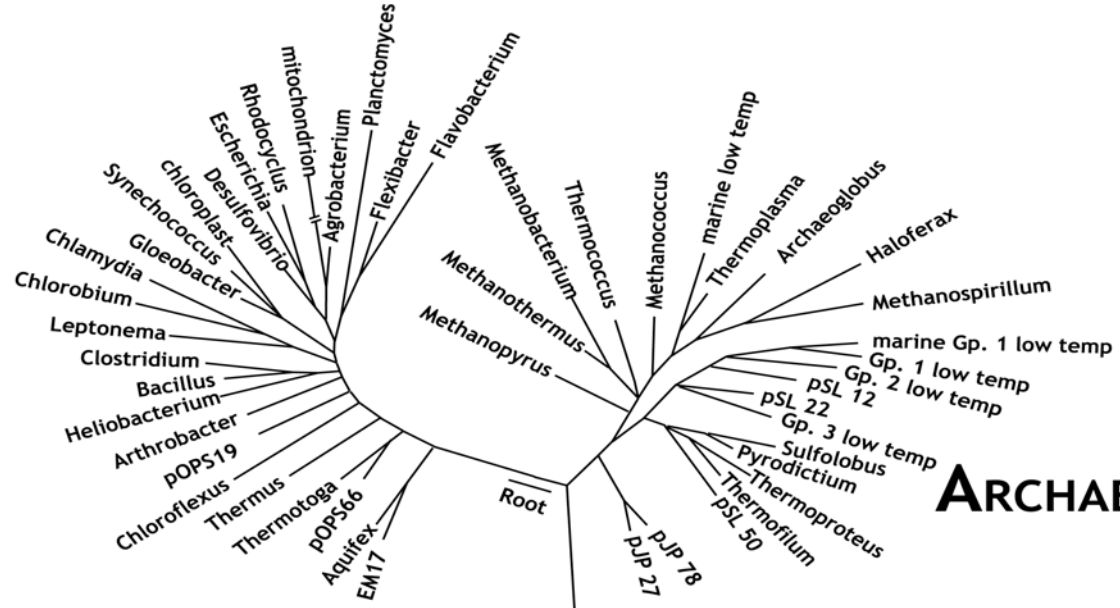
Timeline - Life on Earth





Haeckel, 1866

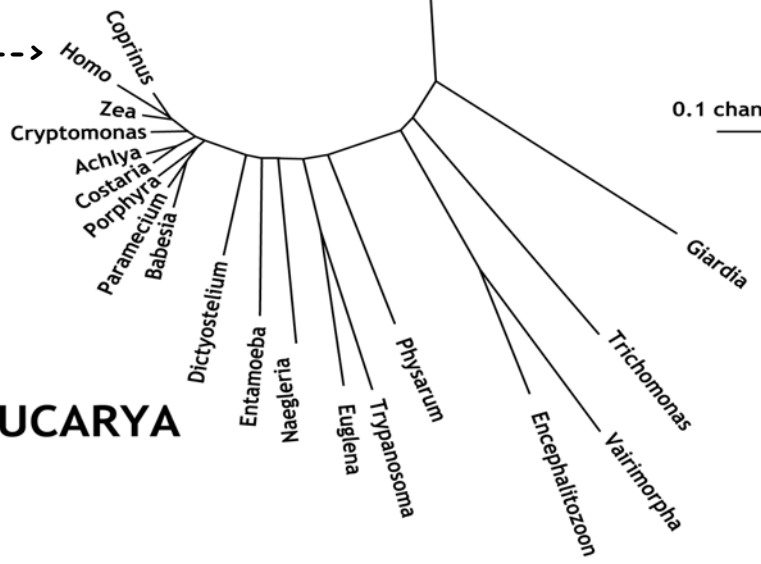
BACTERIA



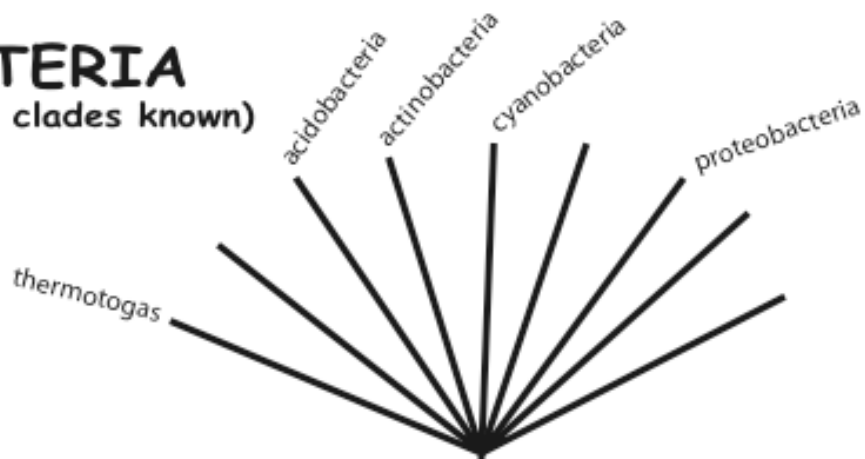
ARCHAEA

You are here -->

EUCARYA



BACTERIA
(~ 80 main clades known)

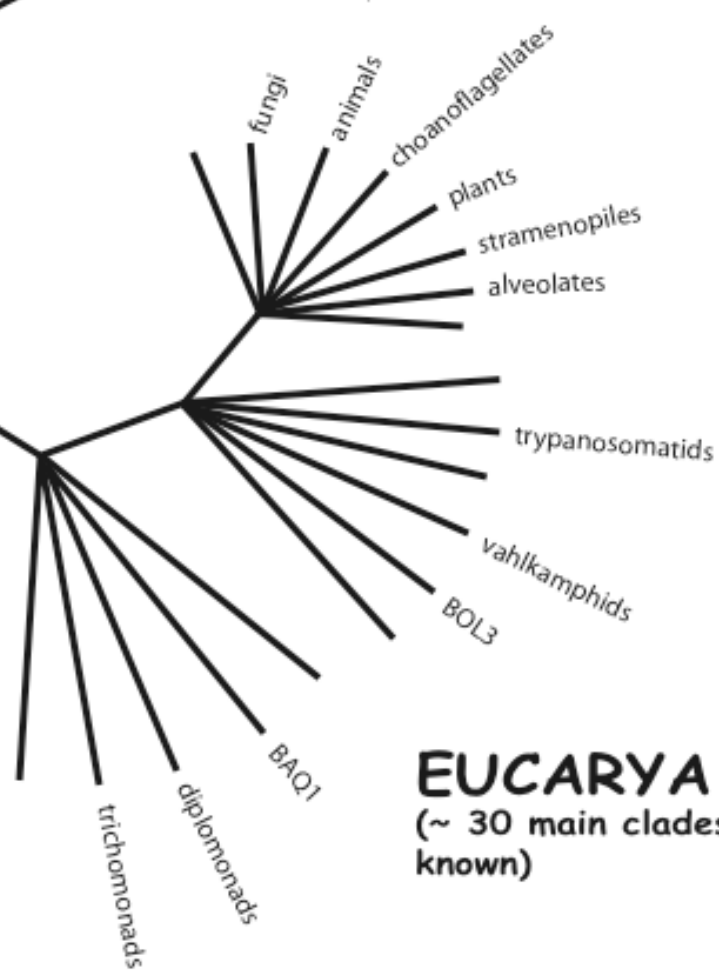


Origin I

ARCHAEA
(two major clades,
several/many deep
subclades)



sequence change



EUCARYA
(~ 30 main clades
known)

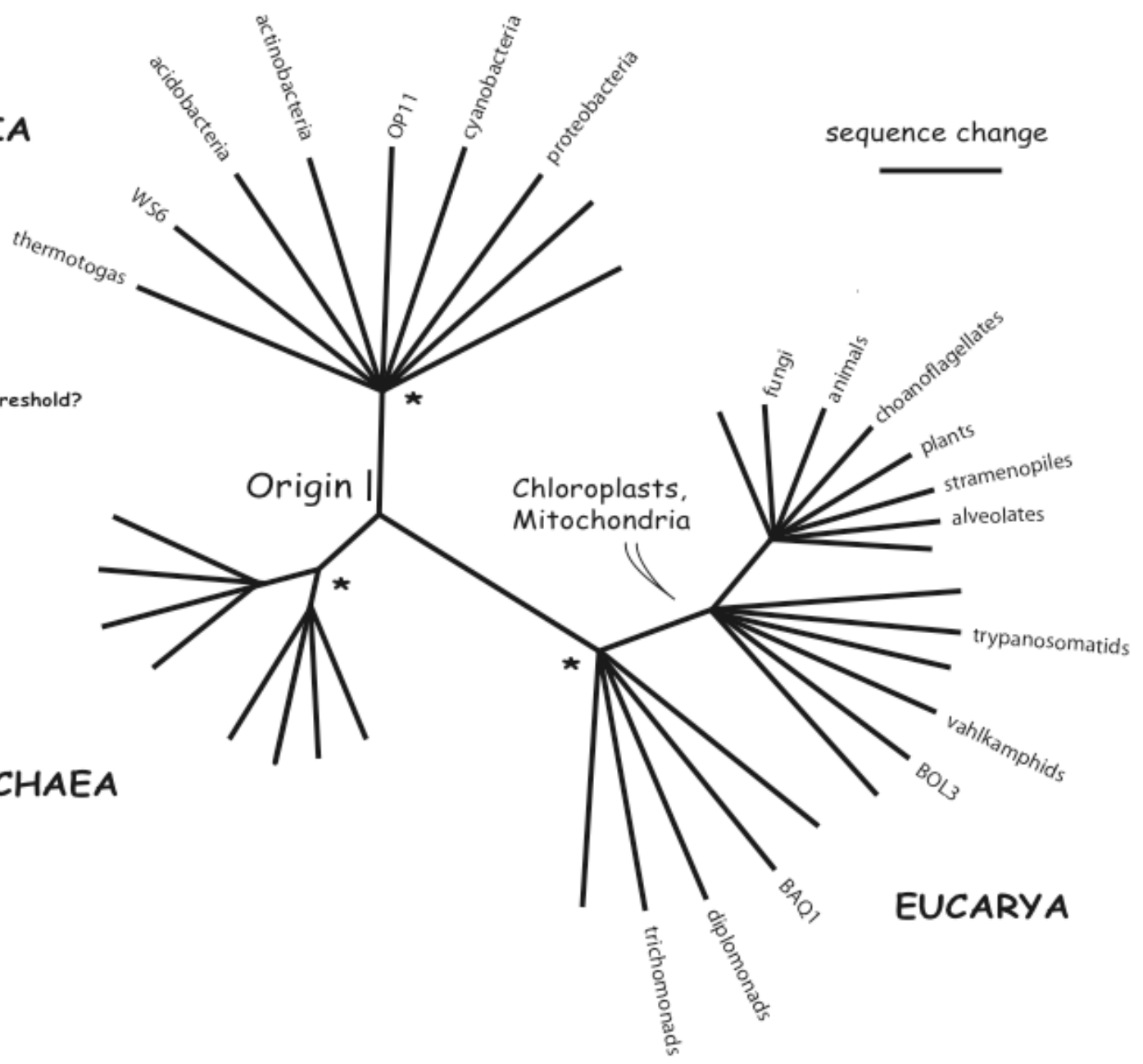
BACTERIA

*
Darwinian Threshold?

ARCHAEA

sequence change
—————

EUCARYA

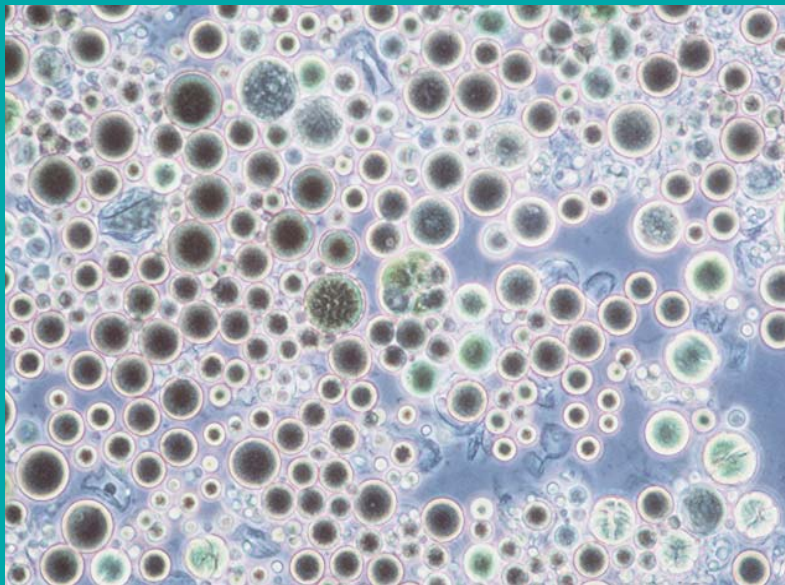


Banded iron - ~ 1.5 by



Banded iron - 3.83 by





--> and biology

Three ways to make "O₂" -- More properly Fe₂O₃

-Biological

- Fe⁺² -> Fe⁺³ photosynthesis
- Oxygenic photosynthesis

-Geochemical

- Serpentinization: Fe⁺² + H₂O -> Fe⁺³ + H₂

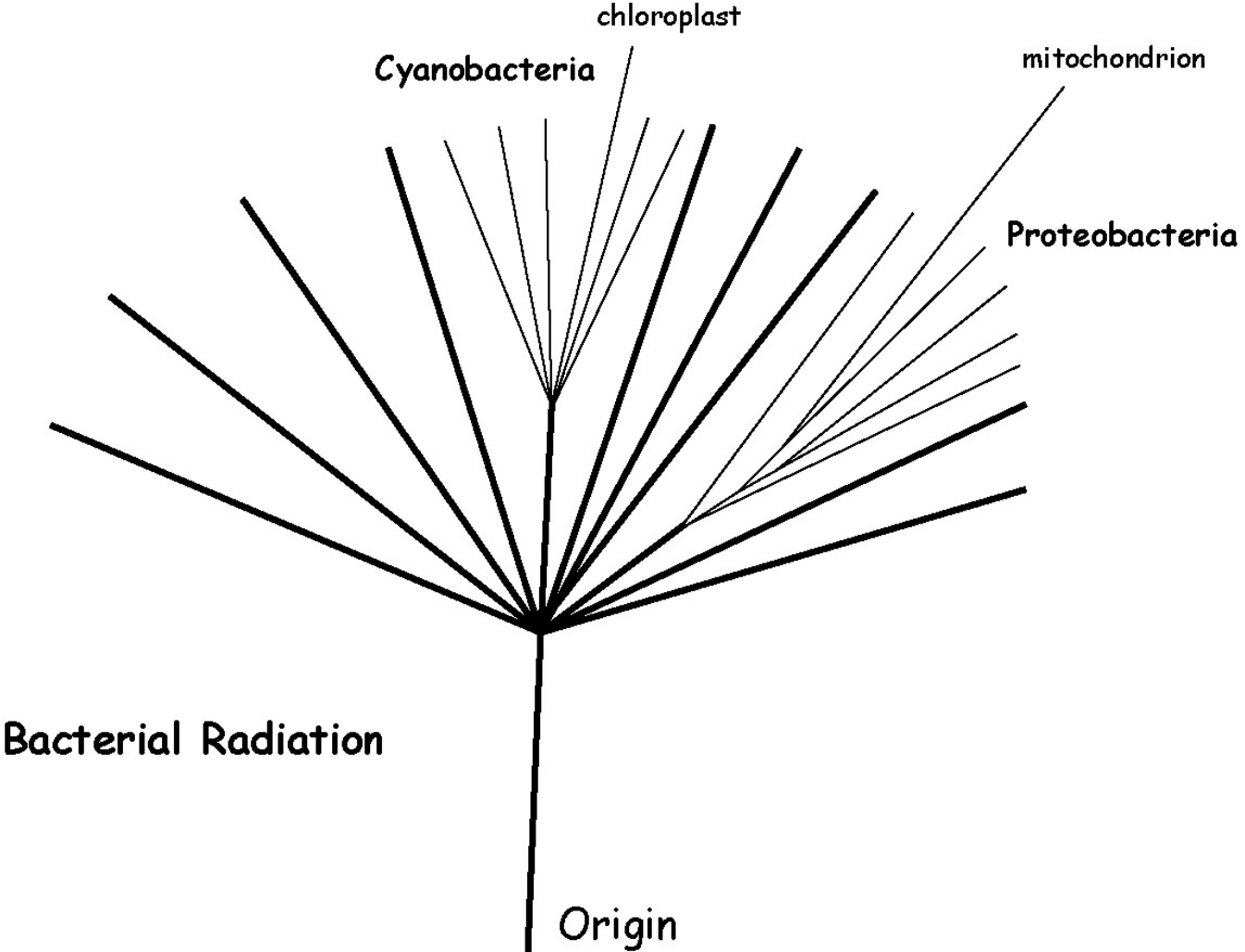


— 1 cm.

~3.5 gy old



But if that Fe_2O_3 is from cyanobacteria,
then ...



The modern kind of eucaryotic cell,
complete with chloroplast (and probably
mitochondrion) was in-place by 3.8-3.5
billion years ago

!