Examining Evolution

Understanding the Theory

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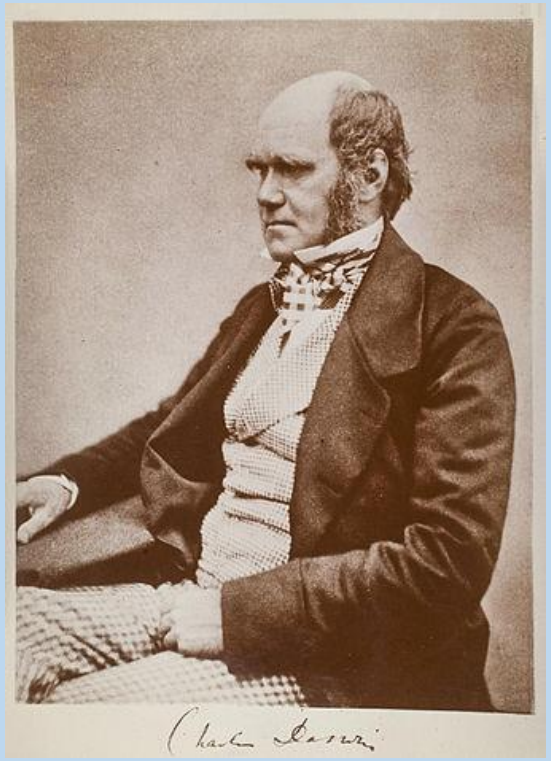
On the Origin of Species



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Origin of Species

- Charles Darwin's most famous work
- His concept was in place in 1838
- Published in 1859
- Debate as to why the delay
- Immediate, dramatic effect
- Ideas quickly spilled over into sociology, psychology and even economics
- Even those not educated in biological sciences were discussing it

Origin of Species – Main Points

- Varieties of species due to artificial selection
- Natural selection must be the mechanism driving evolution

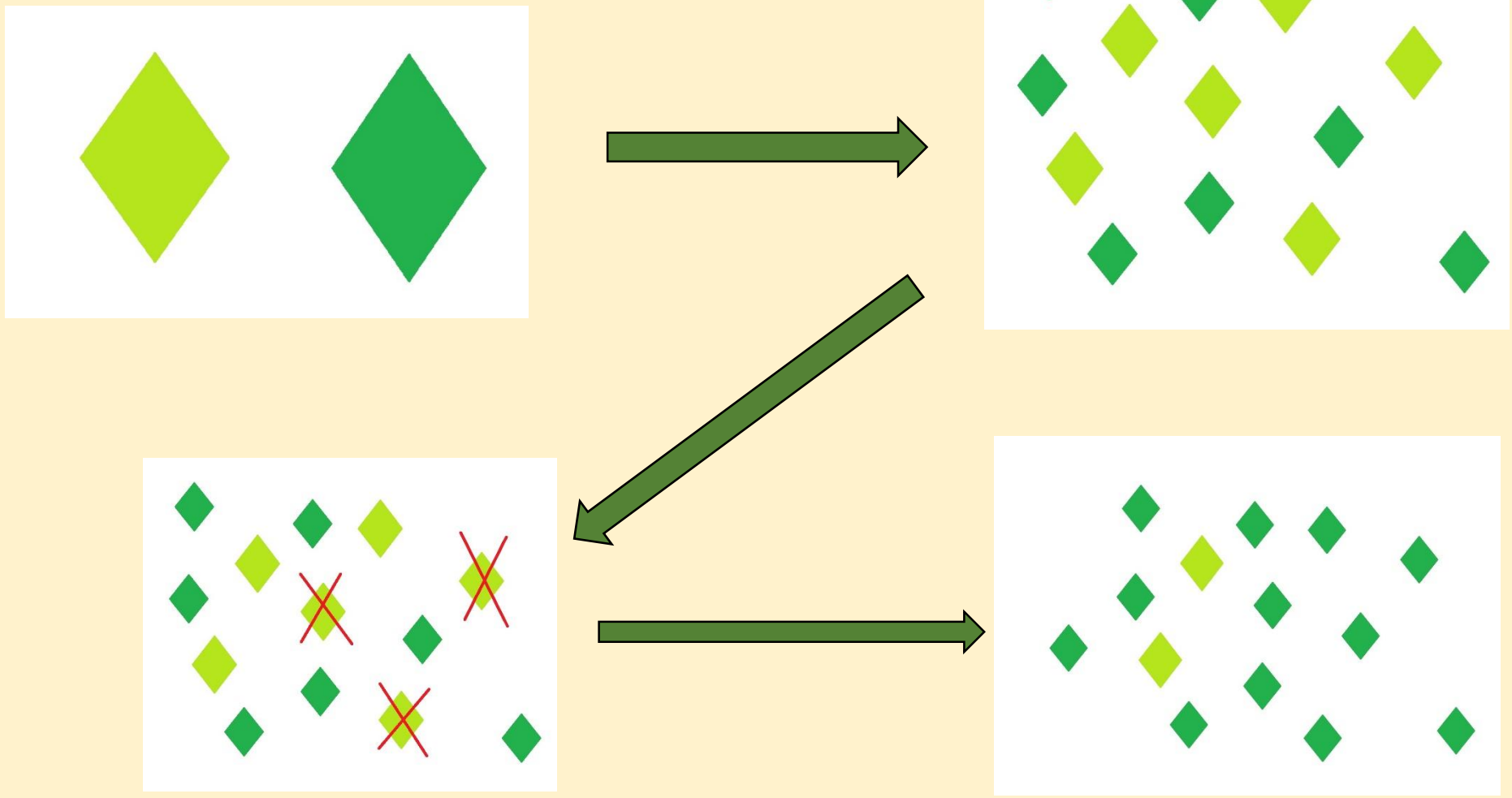
Darwin's Postulates

- Individual variation- individuals in a population differ from one another
- Heritability- differences in organisms can be passed to offspring
- Over reproduction- more individuals are produced than can compete and reproduce
- Selection- individuals do not survive and reproduce by luck or chance; those individuals which are most fit survive and reproduce

Fitness

- The ability of an individual to survive and reproduce
- Dependent on the environment
- A variation in a trait encoded in the genome
- Quantifiable- measured by the number of offspring produced
- Not “Survival of the Fittest” as many think

Natural Selection



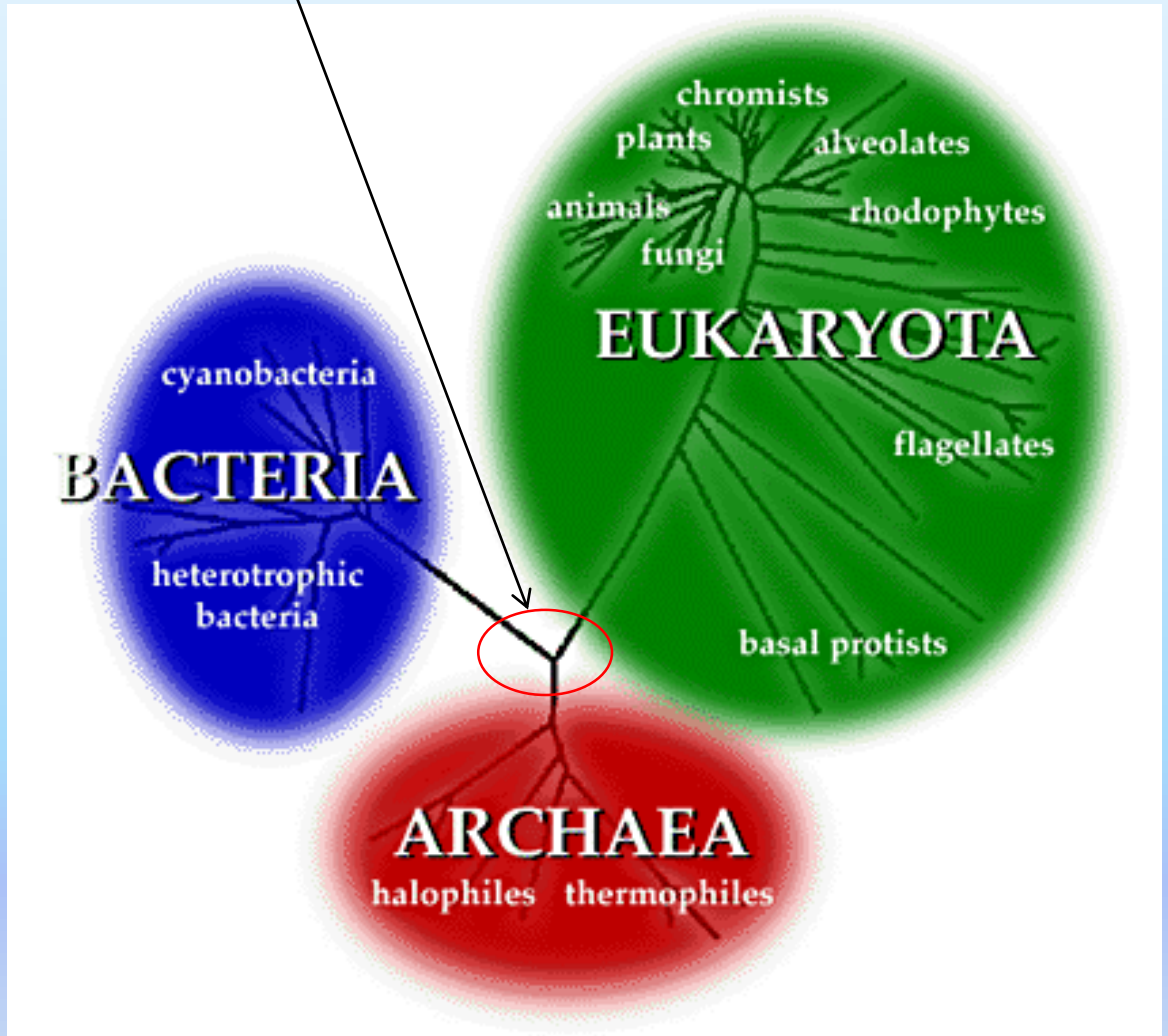
Process of Selection

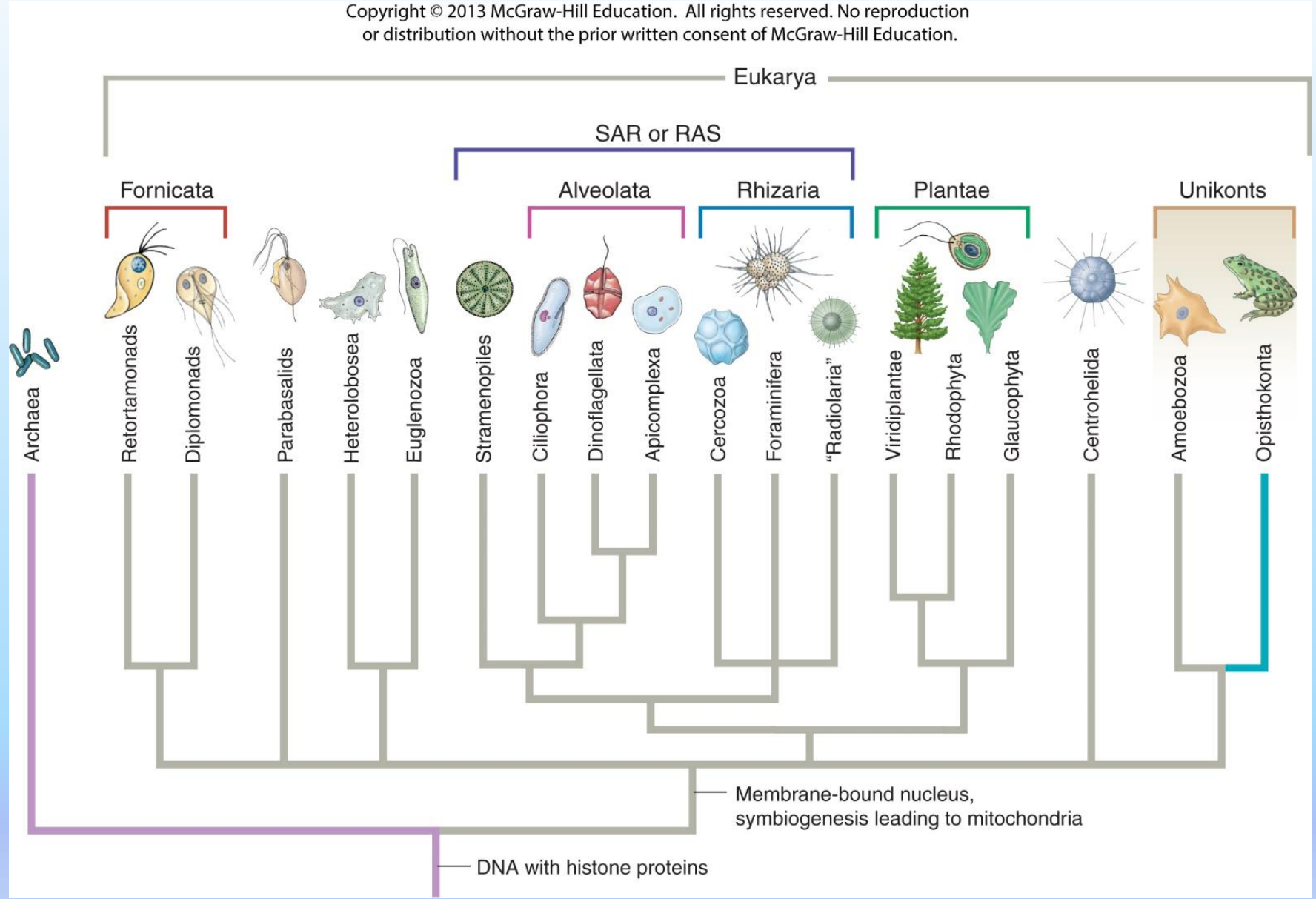
- Selection pressures act on the individual
- Selection pressures select for a trait
- Selection is blind to the genetics, but the genetics is what is passed on
- The result is a change in the gene pool = evolution
  - Genetics of the entire population
  - Favorable gene is more abundant
  - Less favorable genes are less abundant
- Given enough generations, traits can become “fixed” or “lost” in the population
- Individuals don’t evolve, the population evolves

Observations About Natural Selection

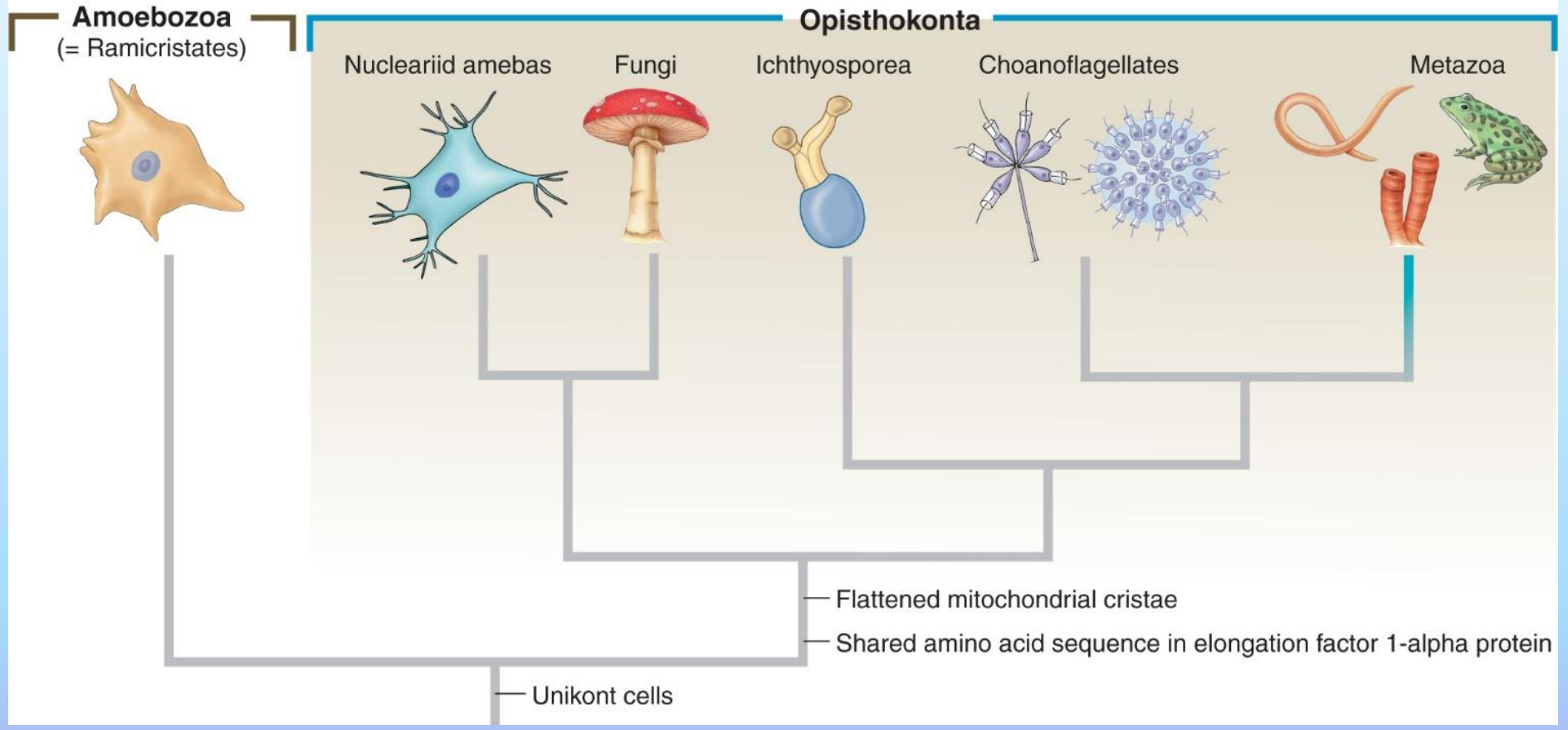
- Not directed
- Not “purpose-driven” – natural selection does not select for a trait that may become useful later on
- Only acts on traits that are heritable
- Results in a change in the population’s gene pool

LUCA


chromists
plants
alveolates
animals
rhodophytes
fungi
EUKARYOTA
flagellates
basal protists
cyanobacteria
BACTERIA
heterotrophic
bacteria
ARCHAEA
halophiles
thermophiles



http://tolweb.org/tree/



The Theory of Evolution is Evolving

- Punctuated Equilibrium
- Evolutionary Development
- Horizontal Gene Transfer
- “Jumping Genes” and transposons