INTRODUCTION

EVOLUTION: A change in the frequency of any allele in a gene pool.

(allele - one of several forms of a gene which can potential occur at a locus)

(gene pool - sum total of every allele which occurs within a single population)

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Evolution cannot take place (is impossible) if ALL conditions of the Castle-Hardy-Weinberg Equilibrium are met:

1. Population (gene pool) > 10,000
2. No emigration or immigration
3. No mutations
4. Random mating

NATURAL SELECTION: Differential reproduction

ADAPTATION: An inherited morphological, physiological, or behavioral trait which increases individual fitness (individual fitness - number of successful offspring produced by an individual)

TAXONOMY - classification based on similarity of appearance

SYSTEMATICS - classification based on genetic relationships (evolving species)

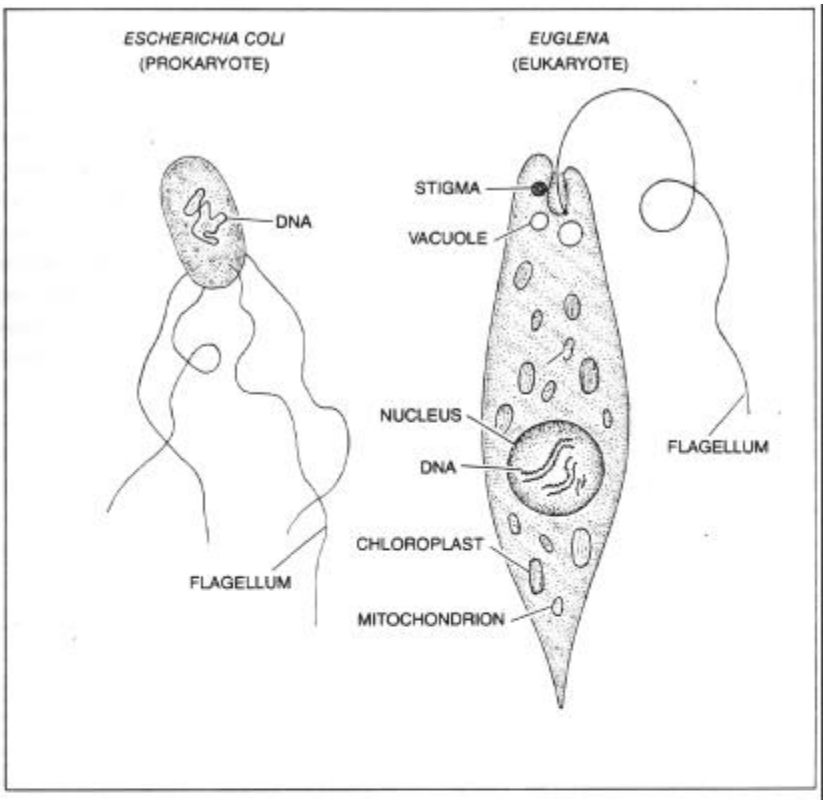
SPECIATION depends on:

- Reproductive Isolating Mechanisms (RIM)
  - Prezygotic
    - Distributional
    - Seasonal
    - Mechanical
    - Behavioral
    - Female tract mortality
  - Postzygotic
    - Embryo dies
    - Hybrid sterile
    - Hybrid non-competitive

RIMs keep gene pools separated, permits genetic divergence

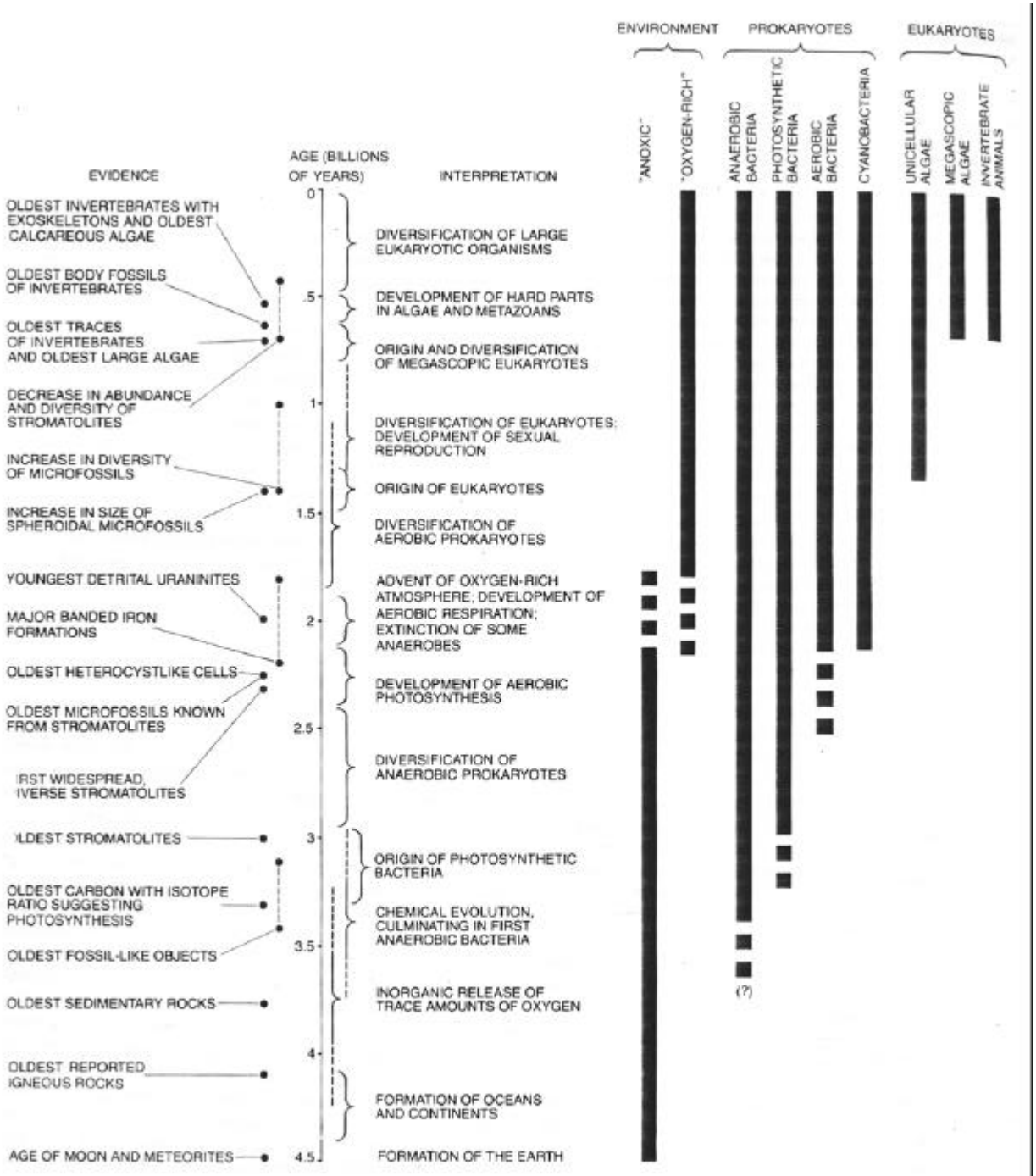
Classification Criteria

- Symmetry
- Digestion site
- Gut openings
- Embryonic
    - Germ layers (diploblastic/triploblastic)
        - Ectoderm (outside)
        - Endoderm (inside)
        - Mesoderm (middle)
    - Cleavage
    - Early differentiation
    - Blastopore
- Coelome
- Organ systems



	PROKARYOTES	EUKARYOTES
ORGANISMS REPRESENTED	BACTERIA AND CYANOBACTERIA	PROTISTS, FUNGI, PLANTS AND ANIMALS
CELL SIZE	SMALL, GENERALLY 1 TO 10 MICROMETERS	LARGE, GENERALLY 10 TO 100 MICROMETERS
METABOLISM AND PHOTOSYNTHESIS	ANAEROBIC OR AEROBIC	AEROBIC
MOTILITY	NONMOTILE OR WITH FLAGELLA MADE OF THE PROTEIN FLAGELLIN	USUALLY MOTILE, CILIA OR FLAGELLA CONSTRUCTED OF MICROTUBULES
CELL WALLS	OF CHARACTERISTIC SUGARS AND PEPTIDES	OF CELLULOSE OR CHITIN, BUT LACKING IN ANIMALS
ORGANELLES	NO MEMBRANE-BOUNDED ORGANELLES	MITOCHONDRIA AND CHLOROPLASTS
GENETIC ORGANIZATION	LOOP OF DNA IN CYTOPLASM	DNA ORGANIZED IN CHROMOSOMES AND BOUNDED BY NUCLEAR MEMBRANE
REPRODUCTION	BY BINARY FISSION	BY MITOSIS OR MEIOSIS
CELLULAR ORGANIZATION	MAINLY UNICELLULAR	MAINLY MULTICELLULAR, WITH DIFFERENTIATION OF CELLS

GREATEST DIVISION among organisms is the one separating cells with nuclei (eukaryotes) from those without nuclei (prokaryotes). The only prokaryotes are bacteria and cyanobacteria, and here they are represented by the bacterium *Escherichia coli* (*top left*). All other organisms are eukaryotes, including higher plants and animals, fungi and protists such as *Euglena* (*top right*). Eukaryotic cells are by far the more complex ones, and some of the organelles they contain, such as mitochondria and chloroplasts, may be derived from prokaryotes that established a symbiotic relationship with the host cell. Prokaryotes vary widely in their tolerance of or requirement for free oxygen, and they are thought to have evolved during a period of fluctuating oxygen. All eukaryotes require oxygen for metabolism and for the synthesis of various substances, and they must have emerged after an atmosphere rich in oxygen became established.



MAJOR EVENTS in Precambrian evolution are presented in chronological sequence based on evidence from the fossil record, from inorganic geology and from comparative studies of the metabolism and biochemistry of modern organisms. Although the conclusions are tentative, it appears that life began more than 3 billion years ago (when the earth was little more than 1 billion years old), that the transition to an oxygen-rich atmosphere took place roughly 2 billion years ago and that eukaryotes appeared by 1.5 billion years ago.

Phylum	*Symmetry*	*Cleavage*	*Body cavity*	*Digestive tract*	*Circulatory system*
Coelenterata	Radial	Determinate	None	Gastrovascular cavity	Absent
Platyhelminthes	Bilateral				
Aschelminthes			Pseudocoelom	Complete, with mouth from blastopore	
Mollusca			Coelom much reduced		Open
Annelida			Coelom		Closed
Arthropoda			Hemocoel (coelom, degenerate)		Open
Echinodermata	Secondarily radial	Indeterminate	Coelom	Complete, with anus from blastopore	A special type: often poorly developed
Hemichordata	Bilateral				Open
Chordata					Closed (except in tunicates)