NEDWIDEK
5/27/2008

Aim: How did life on earth originate?
Do Now: Describe the setup rationale and implications behind Miller and Urey's experiments in 1953. Oparin's role?

CH_3NH_3 – amino acid
Oparin's role: He proposed the composition
Miller and Urey's role: They used a specialized condenser, mixed ammonia (NH_3), methane (CH_4) and hydrogen (H_2). They added electricity. Water provided the oxygen but NO diatomic O_2 was present.
*Analysis revealed amino acids & organic compounds
-Prebiotic earth was icy/ no oxygen
- Mixing of compounds started assembly of first macromolecules
- Critical elements: Carbon (C)
Hydrogen (H)
Oxygen (O)
Nitrogen (N)

3 major theories of how life originated: 1. Special Creation – God
2. Panspermia – aliens
3. spontaneous generation (nonliving → living)

Geologic BYA (Billions of years ago) timeline
→ 4.57 BYA – solar system emerges / Big Bang
→ 4.56 BYA – earth grows by collision. This opposes theories 1 and 2.
→ 4.4 to 4.5 BYA – earth cools and atmosphere lightens/becomes less dense
→ 4.2 BYA – conditions for prebiotic earth start to emerge; reducing environment/ no oxygen, frequent lightning, rocks, oceans, high temp, HI UV
→ 3.8 BYA – life emerges (as indicated by carbon isotope)

*prokaryotes came before eukaryotes
*Living cells need cell membrane (coacervates – discovered by Fox) and genetics (which first came in the form of RNA: a) info b)catalytic RNA → ribozymes

Cech discovered catalytic RNA's (ribozymes)
Clay – maybe some catalytic properties

Endosymbiotic relationship – eukaryotes emerge as one large prokaryote engulfs another; symbiotic relationship: mitoch.& chloroplast
Heterotroph hypothesis: anaerobic heterotrophs use resources up → autotrophs emerge out of necessity → photosynthesis (from autotrophs) created oxygen → once oxygen got into environ., then aerobic heterotrophs emerged.

3 kinds of prokaryotic forms possible: 1. anaerobic heterotrophs
2. one-celled autotrophs
3. aerobic heterotrophs

Life form timeline cont'd. 3.5 BYA – STROMATOLITES (MICROORGANISMS) FORM
→ 2.5 BYA – oxygen accumulates from photosynthesis by bacteria
→ 1.8 BYA - eukaryotic origins
→ 1.7 BYA – eukaryotic fossils
→ 1 BYA – multicellular organisms
→ 650 million yrs ago – oldest fossils
→ Paleozoic era: 500 million YA – plants and symbiotic fungi
→ Mesozoic era: 65 million YA – dinosaurs extinct (cretaceous)
→ Cenozoic: 100,000 years ago, humans emerge!