

Origins of animals

1) Origins of life

- a) Cells are the basic unit of life, and cell theory tells us that all existing cells come from other cells. This asks the question where did the first cell come from?
 - i) This is heavily debated but has led to many testable hypotheses
 - (1) **Panspermia** proposes that meteors or cosmic dust may have brought many complicated organic compounds to earth that formed the first cells and kick started life.
 - (a) This does not mean we are all decedents of little green in men from mars, but in the vast cosmos there is found all the known elements formed from stars, and in a universe as vast as ours it's not impossible to imagine a set of situations that would allow these elements to combine and form more complex molecules.
 - (2) Life originated on earth
 - (a) Early earth would have been a horrible place to live. Remnants from the forming of the solar system were everywhere constantly slamming into earth. This kept the surface molten. Once the bombardment stopped the temperature cooled.
 - (b) The early atmosphere would have contained carbon dioxide, nitrogen, water vapor, hydrogen gas, hydrogen sulfide, ammonia, and methane.
 - (3) Organic molecules in early earth
 - (a) A classic experiment called the **Miller-Urey experiment** attempted to replicate the early earth oceans. By doing this they effectively showed that with enough time essential amino acids form and these go on to build adenine, one of the bases found in DNA and RNA.
 - (i) Though this experiment has come under scrutiny and its validity is debatable, however what it does show is that the conditions and building blocks were possible in early earth
 - (b) So it's shown that the building blocks were possible, but they need a place to replicate and hold them together
 - (i) As it turns out certain types of clay were present and these clay type types formed microscopic vesicles when mixed with water. These vesicles would resemble modern day cell membranes.

2) Origins of animals

- a) With the beginning of life about 3.5 billion years ago.
- b) The first living organisms were single celled bacteria. These bacteria produced oxygen from the abundant carbon dioxide. As the atmosphere changed many species would have gone extinct but the ones who could survive in an oxygen rich atmosphere would have survived to reproduce.
- c) About 1.8 billion years ago the first eukaryotes formed in the fossil record. Because eukaryote means "true nucleus" they had to have membranes.
 - i) Those membranes most likely formed from the folding of plasma membrane.

- ii) More complex structures like mitochondria are believed to have formed from an **endosymbiosis relationship** (living in close association). Eventually the eukaryotic cell would engulf the prokaryotic energetic cells. These would become the mitochondria.
- iii) Similarly chloroplasts were most likely engulfed photosynthetic bacteria.
- iv) The mitochondria, chloroplast, and centrioles contain their own DNA which is remarkable similar to bacteria DNA leading further evidence to this theory.