How Life Erased the Evidence of it's beginning

Earth is roughly 4.7 billion years old with its crust becoming stable by 3.9 billion years ago. By some estimates, life appeared around 1 billion years later: 3.6-3.7 billion years ago.

While our current atmosphere is contains about 20% oxygen diatomically bound as O_2 (O=O) which breaks down or reduces organic molecules quickly. The ancient atmosphere was very different in that it was slightly reducing – most oxygen being bound to carbon as CO_2 (O-C-O.) Thus, any complex organic molecules formed as a result of normal geothermal and electro-atmospheric chemical processes stayed around for much longer that they would today.

3.6 billion years ago: Life first appears as anaerobic, Heterotrophic bacteria.

Anaerobic meaning "does not require free oxygen" and in fact, even today oxygen is toxic to some anaerobes. Heterotrophic meaning the organism does not have the ability to make its own food. Thus, the next probable step in the evolution of anaerobes was to develop a mechanism to fix CO_2. Adding hydrogen (from an early abundance of molecular hydrogen and hydrogen sulfide [H-S-H]) to this fixed carbon dioxide provided the building blocks of complex organic molecules.

2.5 billion years ago: Photosynthesis in simple cellular organisms begins with its by-product of free oxygen.

Organisms that have the ability to make their own food from available chemical and energy sources are called autotrophics. The first autotrophs were likely chemoautotrophs that received their energy from the still-volcanically active earth's crust in and around deep-sea vents. As the earth cooled some, and the general composition of the atmosphere was changing the most stable and abundant energy source was light radiation from the sun. Hence, the huge success of photoautotrophs, or organisms that makes their food from light.

2.2 billion years ago: Now, with the success and rapid spread of photoautotrophs (namely a green bacteria called cyanobacteria.) came a rapid buildup of toxic free oxygen as a byproduct of photosynthesis. Single celled organisms adapt to an increasingly oxygen rich environment learning how to metabolize it using aerobic respiration and H_2O as the hydrogen donor to for complex organic molecules. Aerobic respiration is much more efficient than anaerobic respiration allowing cells to grow large with the future potential of multicellular organisms.

1.5 billion years ago: First eukaryotic cells appear.

From the above we can make several important inferences: One, is that life develops from simple organisms to complex and two, that environment sets the stage for the development of life and that life alters its environment. The latter statement is important in answering the question of the missing "intermediates" between life and none-life: Why is there no empirical evidence of simple self-replicating molecules and why does life not continue to become manifest in such a nutrient rich world of today? The answer is very simple; it's a function of time and of life itself.

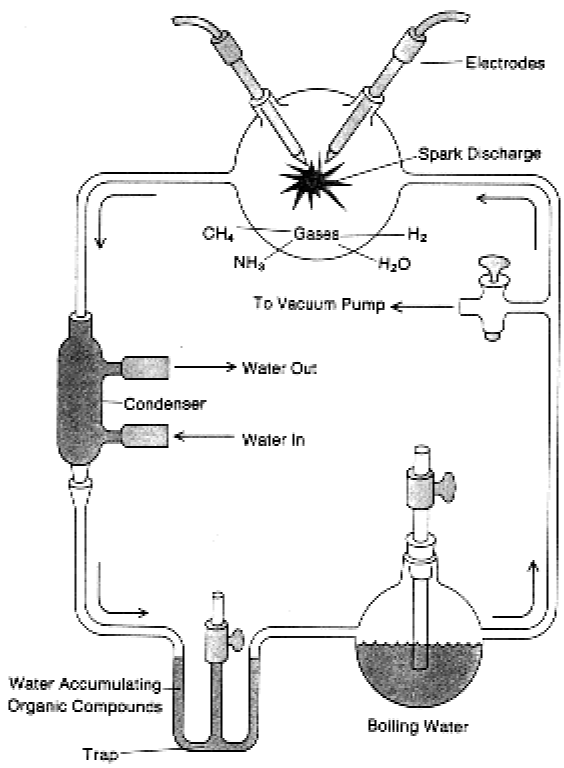
Life is now omnipresent in one form or another in the earth's atmosphere, surface and subsurface. Niche-competition is great and all complex organic molecules are gobbled up as an easy food source by existing organisms and cannot exist for very long at all. Given that life must have taken millions of years to develop, it developed in total isolation from interference from life itself!\

Life from Non-life

At some point we must define what life is as opposed to what life is not. We can begin by asserting life is a collection of complex organic molecules that possess a few certain properties that more-or-less wold have needed to evolve simultaneously beginning with the formation of complex organic molecules:

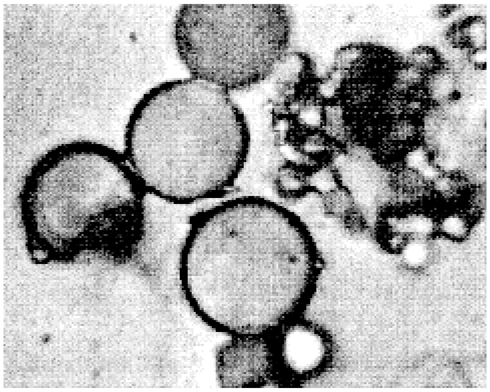
Compartmentalization is important to keep the necessary proteins for life in close proximity. A mechanism for protein synthesis needed for the formation of information storage for self-replication (DNA is the information or genetic material, but it requires proteins to replicate.)

The simple, but profound experiment of Miller-Urey (1953) showed that amino acids can be formed from simple componets such as methane [CH4,] ammonia [NH3,] hydrogen and water when exposed to an energy source such as heat and an electric spark.



Later, in the 1970' s, Sidney Fox showed that by heating certain proteins, compartmentalized balls called microspheres form spontaneously. He created them by taking Miller's amino acids (created as in the above experiment) and then, by heating them in conjunction with aspartic and glutamic acids (also created through similar experiments) and was able to polymerize them into proteinoid microspheres.

Under a microscope, one can image the microspheres as resembling primitive cells.



Virtually all biologists now agree that bacterial cells cannot form from nonliving chemicals in one step. If life arises from nonliving chemicals, there must be intermediate forms, "precellular life." Of the various theories of precellular life, the most popular contender today is "the RNA world."

RNA has the ability to act as both genes and enzymes. This property could offer a way around the "chicken-and-egg" problem. (Genes require enzymes; enzymes require genes.) Furthermore, RNA can be transcribed into DNA, in reverse of the normal process of transcription. These facts are reasons to consider that the RNA world could be the original pathway to cells.The first stage of evolution proceeds, then, by RNA molecules performing the catalytic activities necessary to assemble themselves from a nucleotide soup. The RNA molecules evolve in self-replicating patterns, using recombination and mutation to explore new niches. ... they then develop an entire range of enzymic activities. At the next stage, RNA molecules began to synthesize proteins, first by developing RNA adaptor molecules that can bind activated amino acids and then by arranging them according to an RNA template using other RNA molecules such as the RNA core of the ribosome. This process would make the first proteins, which would simply be better enzymes than their RNA counterparts. ... These protein enzymes are ... built up of mini-elements of structure.

> Finally, DNA appeared on the scene, the ultimate holder of information copied from the genetic RNA molecules by reverse transcription. ... RNA is then relegated to the intermediate role it has today—no longer the center of the stage, displaced by DNA and the more effective protein enzymes.