

## **WEEK 1** IN THE BEGINNING

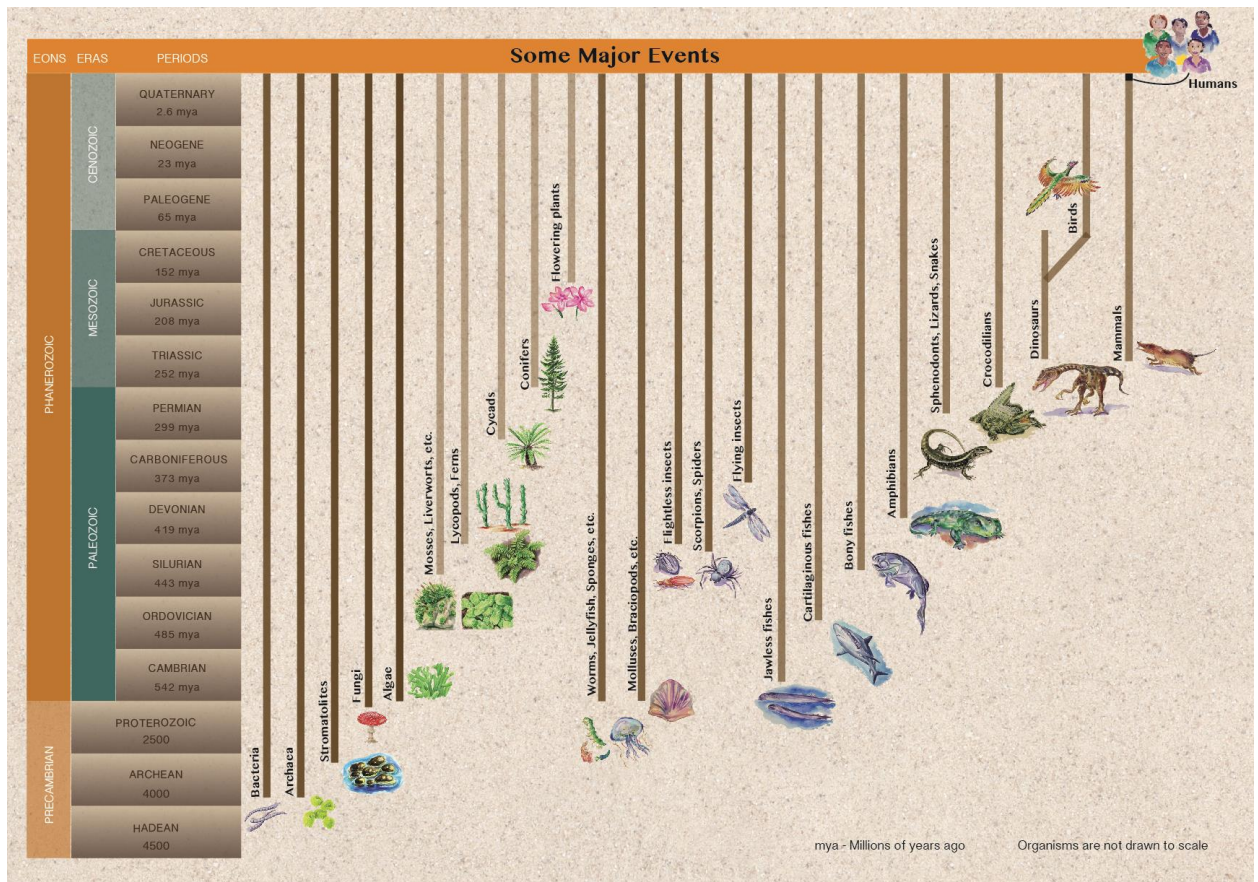
Let's begin in the beginning.

We live on Earth and, as you all probably know, it is the third planet in a solar system on the outer edges of a spiral galaxy in the universe that began billions of years ago. In fact, our planet dates to about 4.5 billion years, but the strange thing is that Earth's first rocks, the earliest rocks, that were laid down are really quite rare. We find some of these in South-western Greenland and in northern parts of Canada and these tend to date around 3.9, 3.8. There's some suggestions that it might be some 4 billion year old rocks. In South Africa, the oldest rocks we have come from the northern part of the country in an area called Barberton, these date to about 3.5 and, in fact, these are really special because they preserve traces of the earliest life-forms on Earth.

Now some of you might know that the preserved remains of traces of organisms are called fossils. I'm not sure how many of you do know that not everything that ever lived is preserved as fossils, there are very special circumstances that are required for fossilization of plants and a different set of circumstances that are required for the preservation of animals.

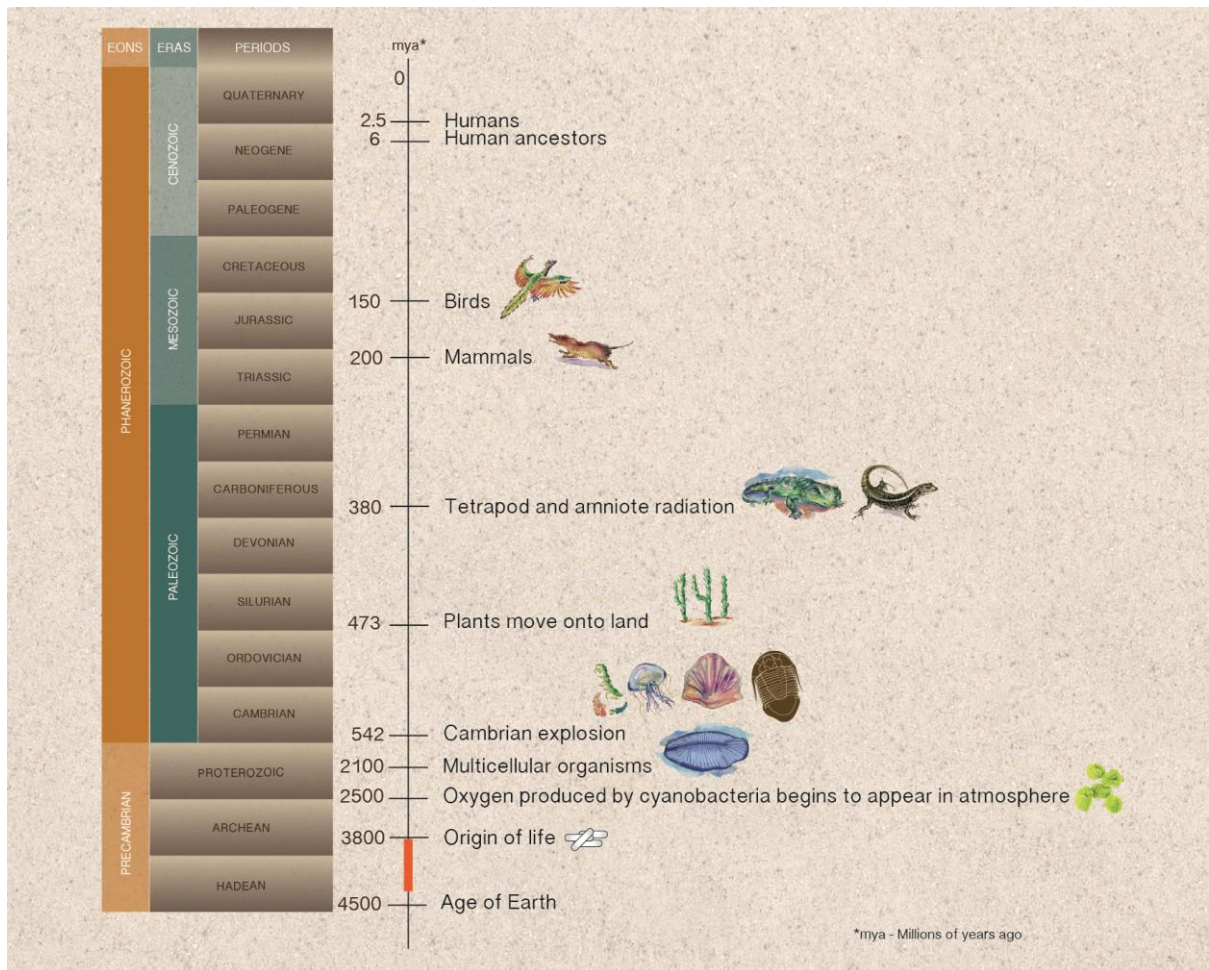
Soft-bodied organisms are rarely preserved, that's why much of the fossil record is made up of hard parts of animals, their shells, their skeletons and their teeth. So most of what we know comes from the hard parts of organisms that lived before.

Despite the gaps in the fossil record we have an incredible fossil record where we can track how life progressed over time. We know that it began 3.8 billion years and from this fossil record we are able to understand when different life forms evolved, we can see how they diversified and also when they became extinct.



In almost every case when we see this incredible biodiversity around us we should realize that all of them, all the animals and plants, are really endpoints of long evolutionary histories. Many of them have had side branches or kind of relatives that had gone extinct and their lineages are represented today. It is quite humbling for us to realize that all the biodiversity around us is really a very small fraction of the total biodiversity that once existed. There are several major episodes in the evolution of life on Earth. The first of these, I guess, is the very origin of life.

The development of multi-cellular organisms is another one. We see this happening at about 2.1 billion years. The next big step in the evolution of life on Earth is this major diversification that happened in the Cambrian about 542 million years ago.



Thereafter, we see the movement on to land as very significant. First, plants make this move about 473 million years ago and then animals move onto land about 380 million years ago. The very, very important step in the evolution of vertebrates is the development of reptiles and they become the amniotes which later, we'll see, give rise to the mammals as well as to birds, and this happens about 350 million years ago. So the actual origin of life is probably one of life's biggest mysteries. It is possible that life may have formed originally within the oceans but there's also another hypothesis that suggests that life may have come in from outer space, and this idea has gained momentum because we know that there are many meteorites that have been found where there are a suite of amino acids on them. So, amino acids, as you may know are the building blocks of proteins, and they are coded for by DNA. And DNA, of course, is the self-replicating molecule that developed during the first stages of life. So, once we have DNA Darwinian evolution can occur and through this process we see this incredible diversity of life that we no on our planet today.



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