

31. The limits of evolution

Up to now our understanding of evolution was based on visual observations. We could see that old organisms were primitive and with time new more sophisticated organism appeared. Eventually nature produced man with his superior brain.

Looking at this evidence it is not surprising that any intelligent person could not deny that it is evolution which is responsible for the development of life on Earth. Or is it not?

The weakest part of evolution is the effect of mutations. We know from the medical field that mutations are very dangerous, but this does not stop people thinking that they are driving evolution. Our common sense tells us that to repair a car you must not hit it blindly with a hammer, but this is what mutations do. Mutations at anyone of hundreds of gene points can damage a gene. However, normally an improvement can take place if the mutation happened at one specific point.

Up to now we believed that mutations can deliver thousands of small improvements. Since nobody has done any calculations, it was assumed that they can. Now a detailed sequencing of genomes shows that this would be impossible.

So what can evolution do?

What have we learnt about evolution so far? I try to separate the facts from unsubstantiated beliefs. I accept facts supported by genetic analysis of the evolutionary processes.

We know for sure that evolution can progress as a result of genes being damaged by mutations. This was shown in the case of Darwin's finches and polar bears. These examples showed that the damaged genes helped animals to adapt to the new environment.

We know that bacteria are resistant to antibiotics as a result of one or two beneficial mutations. Therefore in large populations evolution can modify genomes to protect organisms against medication.

The main question remains if evolution can make large changes to animals.

Let us look into the evolution of fish in three lakes in Africa where African cichlids, known for their bright colors, live. Lake Victoria is only 17 thousand years old (because it dried out in the past), lake Malawi is a few million years old, and lake Tanganyika is about 10 million years old. Despite the difference in their ages, each of these lakes contain about 1500 species of cichlids. In lake Victoria cichlids species evolved very rapidly, which was acclaimed as a proof of evolution. However, in the other much older lakes, the number of species is the same.

To understand the limits of evolution we have to look at the world of the Animal Kingdom. The animals are classified into 6 groups: Phylum, Class, Order, Family, Genus, and Species. In the

Animal Kingdom there are about 108 Classes, 6000 Families and approximately 8 million (up to a billion extinct) species. The large number of species indicates that they can arise very quickly. It is believed that many thousands of new species are generated every year.

There is good evidence showing that new species could be generated very fast. The fastest known changes, only taking several hundred generations, have already been observed in some insects. New research has shown that sockeye salmon evolved in Lake Washington (near Seattle, US) into a new species in fewer than 13 generations. The arising of 1500 species of cichlids in Lake Victoria within 17,000 years proves that species can be formed very quickly.

A different situation arises when we look at the animal Families. The number of Families is very constant. Investigations have shown that in the old African lakes the number of Families of fish has not changed in over 10 million years. If we look at finches on the Galapagos Islands there were no new Families arising during the last two million years. It looks that the mechanism of generation of new Families is very different from the mechanism generating new species and we are unable to observe it.

The conclusion is that mutations can generate new species very quickly. However, the genetic analysis shows that the differences between the species are very small, maybe caused by a few mutations. However there is no evidence showing that mutations can generate new Families or higher groups of animals.