

# **Humanism for Secondary School Pupils**

**S4 – 6**



## **2. LIFE BEGINS**

# LIFE BEGINS

No one knows how or when life began on earth - only that it did!

Soft tissue leaves no fossils so we can only guess.

Evidence of the early appearance of life comes from very ancient rocks in Greenland where the ratio of carbon isotopes in the rock suggests that some form of life was present 3.85 billion years ago.

(Google and other search engines provide access to a wonderful range of images. At various points throughout this text it is suggested that you refer to Google Images (GI). (Click on "images" and enter the subject under discussion.))



## What are the basic necessities for life?

### A. Synthesis of monomers

All living cells contain simple molecules like sugars and amino acids. So the first problem is to determine how they came into existence.

The early atmosphere was very different from the one we know today. It contained no oxygen but instead several gases including methane, carbon dioxide and hydrogen sulphide. Without the protective ozone layer which today shields us from radiation from the sun and subjected to electrical discharges in the form of lightning it has been shown that small organic molecules could form spontaneously. These would fall in rain and thus the early ocean would become a warm soup of all the chemicals needed for life to get started.

The next step – the formation of large molecules from these basic building blocks - is more problematic. Starch and cellulose are made from long chains of sugar joined together and proteins are formed in the same way from amino acids but these molecules do not join together of their own accord.

### B. Polymerisation

This is the name given to the process by which these simple sugars are joined together to form long chains, which are starch molecules. (GI) Long chains of amino acids form protein molecules. (GI)

Dr. Cairns-Smith of Glasgow University suggested that this could have happened in the following way: Crystals can grow spontaneously in a solution and he has suggested that the organic molecules may have adhered to small silicate crystals present in the clay on the early rocks and been brought together as the crystals grew.

## Further research

There are many other theories including:

1. Deep sea black smokers
2. Radioactive beach theory

### 3. Extraterrestrial source

Can you find out more about any of these? Why not write a summary of approximately 500 words and send it to us? You'll find the email address at the end of this document.

#### **C. Catalysis**

All the chemical reactions that take place in solution and at room temperature require a catalyst to make them happen. In living cells today, the catalysts are large protein molecules, but small inorganic ions can catalyse reactions and may have done so in the earliest life forms.

#### **D. Energy source**

Today all plant and animal cells use organic molecules like sugar as a source of energy, but some simple microbial forms can use inorganic chemicals like hydrogen sulphide in an atmosphere devoid of oxygen. This could have been the method used by the earliest life forms.

#### **E. Replicator**

The large molecules of DNA and RNA are the replicators in all cells today but clearly there must have been a simpler precursor to these complex molecules. We can only guess at what it was. (GI)

#### **Summary**

We are still unravelling the mysteries of the origins of life on this planet. It may seem as if chance played a large part. Those who argue that an intelligent designer must have been responsible point out that it would take an extraordinarily long time for all these reactions to come about by chance. They are correct; it did.

After 2 billion years the most complex life form present was a simple bacterial cell. If an intelligent designer was responsible, what took him so long?

(GI bacterial cell)

## **ADVENT OF MORE COMPLEX CELLS**

It is thought that these came about when one small cell entered into a larger cell and remained there carrying out some of its life functions. This resulted in a cell with its DNA enclosed in a membrane rather than floating freely in the cytoplasm. Gradually several other bacterial cells took up residence in this larger cell until the complex cell that we know today was formed. (GI eukaryote cell)

## **DIVERGENCE OF PLANTS AND ANIMALS**

Some of these cells incorporated microbial cells, which were able to trap sunlight and use it to form food (photosynthesis). These became plants while the rest were animals.



Both showed a propensity to join together to form large collections called tissue and eventually to specialise into organs.

Over the next several million years, there occurred a great proliferation of plant and animal species mostly unknown to us today because they nearly all disappeared in some great catastrophe, the cause of which we can only guess at. We know of their existence only because their fossils were discovered almost 100 years ago buried in The Burgess Shale – a mountain in the Canadian Rockies. Here are some of the strange life forms reconstructed by scientists from the flattened fossil remains: (GI Organisms from the Burgess Shale.)

After this cataclysmic event, many new life forms evolved adopting new innovative designs. Some developed a backbone and internal skeleton – the vertebrates had arrived. Fish, amphibians and reptiles proliferated, their designs ever improving their chance of survival. The reptiles, with dry skin to prevent the loss of body fluid, and embryos, growing in a personal pool contained in a hard-shelled egg, were the most successful. They proliferated and, enjoying a plentiful supply of food and suffering no predation, grew to huge dimensions. The age of the dinosaurs had arrived. (GI dinosaurs)



From about 350 million years ago (MYA) when the dinosaurs first appeared, they spread all over the earth, evolving into many diverse forms, both plant-eating and animal-eating and dominated the planet. Their destroyer came from outer space.

About 65 MYA a large meteorite crashed into the Gulf of Mexico just off the Yucatan Peninsula forming the Chicxulub crater. It caused immense forest fires destroying the food of the dinosaurs so they died. Most plants and animals became extinct at this time but not all...

Deep underground lived some very small animals that had been forced into a subterranean existence to avoid being eaten by the dinosaurs. Now they emerged from their burrows, blinking in the bright sunshine and looked around at an empty planet devoid of large life forms and just waiting to be colonised. Unlike the dinosaurs, these animals were covered in fur that kept their body temperature considerably above their that of their surroundings and they carried their young as developing embryos inside their body until ready to live an independent existence. They were the mammals.

## THE AGE OF THE MAMMALS

The mammals were one of the most successful classes of animal ever to evolve. They colonised the land and the sea, leaving the air to the only remaining dinosaurs, which evolved into the birds.

### Further Research

Can you find out how many “mass extinctions” have occurred on earth and the possible explanations for their occurrence?