

How Did Life Begin?

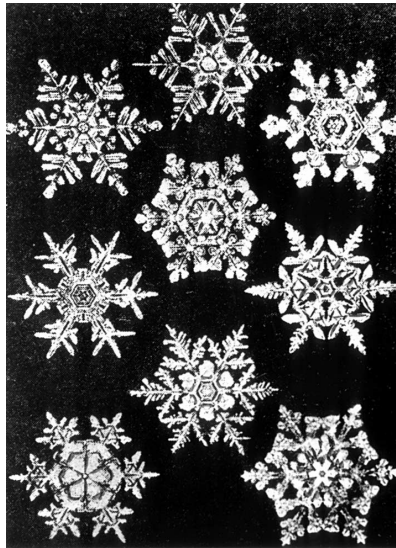
Sometimes when we are reading about the human body or watching a documentary about the tropical rainforest, we are amazed at life's complexity. At these times we may wonder how life began and why we are here. In this book I
5 will propose answers to these and many other difficult questions. Although these answers are often only guesses, it is hoped that they will start you thinking about the new understandings about life and culture that have come from recent research. This book begins with one of the most fundamental
10 questions of our existence: how did life begin?

Religions often say that life began with a supernatural creation. For example, the Bible tells us that the world was created by God in seven days, and the first people were Adam and Eve. However, few scientists believe this. Instead,
15 biologists suggest that Darwin was correct in saying that life has continued to evolve from one species to another. As we go back into time, we find that species get simpler and simpler. Life on Earth that existed earlier than one billion (1,000,000,000) years ago consisted of no more than a single
20 cell. Still, a single cell is incredibly sophisticated. If we continue to travel back further in time, we find that life consisted of even simpler species such as bacteria.

The reason why it is believed that life evolved from a common ancestor is that all life uses the same type of DNA.
25 The DNA on Earth carries instructions to produce 20 differ-

ent amino acids, which are the building blocks of protein. But why always the same 20 amino acids? Why not 8, 16, or 100 different amino acids? No one has the answer to this. However, because all life now, from bacteria to bananas to bears, is based on the same DNA, scientists believe we all ⁵ came from the same ancestor, perhaps over three billion years ago.

We still haven't tried to answer the main question of this chapter: how did life begin? We mentioned bacteria as an early form of life, but even bacteria have quite complex ¹⁰ DNA, so there must be some simpler form of life. One theory about how life begins is through self-assembly. A good example of this is the snowflake. A snowflake is not alive, yet it forms a pattern naturally. When the Earth was young and covered in hot water, the conditions may have been good for certain chemicals to form together naturally. Somehow, starting with this natural grouping of chemicals, life was able to begin. Although researchers have tried to recreate these same conditions in the laboratory, no one has been able to find the special ingredient or process which sparks life. Does this mean that something supernatural, such as God, is needed to



Snowflakes: Examples of self assembly

start life? Perhaps not. We just need a deeper understanding about chemical properties and life processes. Once life began, however, it is clear that evolutionary processes took over and resulted in the great diversity of life we now have on our
5 planet.

Another question that remains about life on Earth is whether it is unique. We have learned that if certain conditions exist, life may begin naturally. Surely in our enormous universe, which has more stars and planets than there are
10 grains of sand on every beach and desert in the world, there must be another planet or moon with these same conditions. On the other hand, in over four billion years of our planet's existence, only one type of life has formed. Our very specialized form of life, which is made up of twenty amino acids
15 put together in an incredibly complex arrangement, may mean that life is very rare. In such a long period of time, why haven't other forms of life appeared? Perhaps they have, but we have seen no evidence of them.

Another theory suggests that life began elsewhere and
20 then came to Earth. This does not mean that little green-colored space beings came to Earth long ago. Instead, it means that bacteria-like life may have traveled here on a comet, or inside of a rock that originated on Mars. In 1996, one such rock was found and scientists are still debating
25 whether the tiny shapes they found in this rock held ancient life.

In the end, the simple truth is that we do not know the answer to many of our questions about life. We notice all around us that there are laws of physics and chemistry. An

apple falls off a tree because of gravity. Water freezes below zero degrees. Yet, life seems to go against these laws. When we stand up, we defy gravity. When we go outside on a cold winter day, we do not freeze solid. We realize that there is something that is special about life. Could this mean that ⁵ there are some laws of the universe that we do not yet understand? Are there laws that naturally lead to life? If so, the universe must be full of life. If not, perhaps the life that developed on our planet is unique and we are completely alone. Whichever the case, we are very fortunate to live at a ¹⁰ time when we understand enough to ask these kinds of questions.