

There are twenty kinds of amino acids found in biological proteins today. One of the interesting sidelights of laboratory experiments has been the production of numerous types of amino acids that are not part of present biological systems. Why the particular twenty amino acids are the only ones used to form proteins is unknown.

Another interesting aspect of the chemical synthesis of amino acids in the laboratory is that an equal number of what are known as left-handed and right-handed molecules are produced. Yet proteins in all living systems use only left-handed molecules, or to use a hardware analogy, a left-threaded system of nuts and bolts for linkages. Right-handed threads on a bolt will not fit into a nut with left-handed threading. In the same way, the two systems of molecules are incompatible for building chains of amino acids. Yet the molecular components of both systems are produced in equal numbers in the laboratory.

There are two implications to these observations. One is that life arose only once. For if life had arisen many times we would expect to find right-handed systems in proteins as well as left-handed ones. The second implication is that some selective force or mechanism was involved in the selection of the standard twenty amino acids used to construct proteins in existence today.

ORGANIC COMPOUNDS AND THE DEFINITION OF LIFE

The difference between organic and inorganic compounds is basically a chemical distinction. An organic compound is one in which the element carbon is directly united with hydrogen or nitrogen. Organic compounds are the chemical materials of which living things are composed. Of themselves, they are not life. Methane (CH₄) is an organic compound. It is obviously not life nor is it living.

There are several important characteristics of life such as the capacity to respond to outside

stimuli and spontaneous movement (locomotion). However, for an object to be alive, it must have at least two key characteristics. First, it must have *metabolism* -- it must exhibit internal chemical activity whereby nutrients are utilized for growth, repair, and maintenance. Second, it must have *reproductive capability* -- it must be able to produce new individuals like itself. If an object possesses both these capabilities, it will probably be judged to be alive

Table 6.1