

in water will join together spontaneously into polymer-rich colloidal droplets called *coacervates*.

The major problem with both the Fox and Oparin experiments is that they don't represent the "real" world. Fox starts with dried and concentrated powders of amino acids. Oparin starts with biologic polymers and adds biologic enzymes for stabilization. How would these have occurred in the "real" world? Further, neither experiment has come anywhere even remotely near to producing life, only objects that are similar or analogous to some aspects of life. Nevertheless, the experiments are useful in demonstrating natural properties of substances. They suggest possible pathways for the original grouping of substances if properly dried and prepared and then placed in water.

Stage 6. Completed Components: proteins, enzymes, and nucleic acid. As we have proceeded through the stages in the hypothetical origins of life, we have encountered many problems and we have found laboratory solutions to only a few of these. Imaginative and wishful thinking has supplied speculative solutions to some of the other problems. But the simple fact remains that no prebiotic proteins, enzymes, or nucleic acids have been produced under simulated primordial conditions. Why not?

To understand perhaps the central problem involved in building proteins, enzymes, and nucleic acids we need to examine Table 6.2 on page 92, the critical components of life. The magnitude of the problem of stage 6 becomes apparent. We see that we must have all three components to make life: proteins for structural materials; enzymes to assemble the components, in effect as tools; and genes, nucleic acid (DNA and RNA), for blueprints and direction. There are four very basic problems involved.

The first problem is that we need to assemble the amino acids into proteins so that we can have structural material. The problem is that the tools (the enzymes) we need to use for assembly are composed of the same structural material we are trying to make. To use an analogy, you can't make steel (the structural material) without tools which are also made of steel.

The second major problem involves the construction of the nucleic acid (DNA) -- the blueprints. The paradox is that DNA cannot be assembled without specific enzymes (the right tools), and the enzymes can't be made or at least duplicated without DNA (blueprints). Until there is DNA, there can be no biological duplication