some estimates^3). Further, high salt concentration is destructive to life. The Dead Sea is lifeless because of its salt concentration, not because of lack of water.

The second major problem with the synthesis of polymer chains in the evaporating primordial pond is that as the pond dries out, it exposes organic molecules to ultraviolet radiation which destroys them. How is this problem solved?

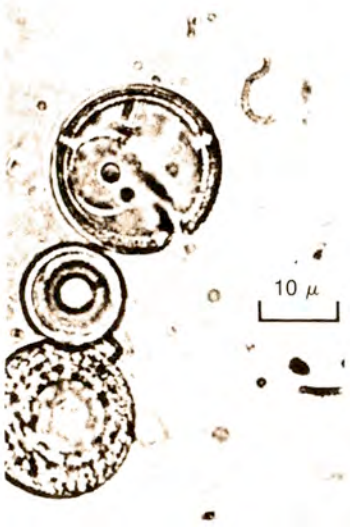
A great deal of thought has been given to clay as the medium for concentration, dehydration, and protection from ultraviolet radiation. Mineral-bearing clays are an attractive medium because they contain many sheets and layered surfaces that absorb organic molecules quite effectively. They also exhibit a degree of selectivity, that is they tend to absorb some molecules more easily than others.

It is also thought that the minerals in clays may have served as inorganic primitive catalysts that selectively speeded up certain reaction rates. The control of the rate of such reactions is highly important in successful polymerization. An Israeli scientist, Aharon Katchalsky, has shown that montmorillonite clays tend to promote the formation of some amino acids into protein-like polypeptide chains. Mineral-bearing clays could have been the templates upon which life was forged and assembled.

But like other mediums for concentration, clay has its limitations, including the fact that materials in clay tend to be subject to ultraviolet degradation. Nevertheless, clay remains a promising area for research.

FIGURE 6.11

Structured proteinoid microspheres. (From *Molecular Evolution and the Origin of Life*, by S. Fox and K. Dose. Copyright © 1972 by W. H. Freeman and Co.)



Stage 5. ***Clumping: microspheres and coacervates***. Assuming that polypeptides and polynucleotides could be produced from scratch in the laboratory, the next problem is that of isolating them into bound cellular units with a chemistry and identity of their own. The problem of isolation and concentration has been approached by Sidney Fox of the University of Miami. Fox has heated dry mixtures of amino acids to moderate temperatures and produced what he calls thermal proteinoids. When heated in a concentrated aqueous solution they have grouped spontaneously into microspheres (see figure 6.11). Under certain conditions they have also been known to bud in a manner similar to bacteria.

The Russian biochemist Alexander Oparin, who originally proposed that life arose spontaneously from the "primordial soup," also produced polymer-rich colloidal droplets in his Moscow laboratory. He found that various combinations of biologic polymers suspended