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L. Margulis: FROM MICROBIAL COMMUNITIES TO CELLS

The eukaryotic cell, the unit of structure of protoctists, plants, fungi, and animals, is not at all homologous to prokaryotic cells. Instead the eukaryotic cell is homologous to communities of microorganisms such as those of the sulfuretum. Waste of some members became food of others just as *Desulfuroxonas* and *Chlorobium* or *Prosthecochloris* form symbiotrophies. We are testing the hypothesis that at least four different interacting community members entered the original associations that, when stabilized, led to the emergence of eukaryotic cells. These are: host nucleocytoplasm (*Thermoplasma*-like archaeobacteria), mitochondria (*Paracoccus* or *Bdellovibrio*-like respiring bacteria; the alpha group of bacteria on p. 33), plastids (cyanobacteria) and undulipodia (spirochetes). We have recently found tubulin-like protein in the free-living spirochete *Spirochaeta bajacaliforniensis* and in several other spirochetes. Robert Obar, who has purified the tubulin-like protein, is determining amino acid sequence to see if the spirochete protein is homologous to the tubulin of undulipodial and mitotic spindle microtubules. The symbiotic theory is considered to have been demonstrated for plastids and mitochondria (Gray, 1983). Even if the spirochete aspect of the symbiotic theory fails to be proved the recognition of the microbial community status of eukaryotic cells still leads to the concept that plant and animal development and cell differentiation are aspects of the evolution of co-evolved microbial communities.

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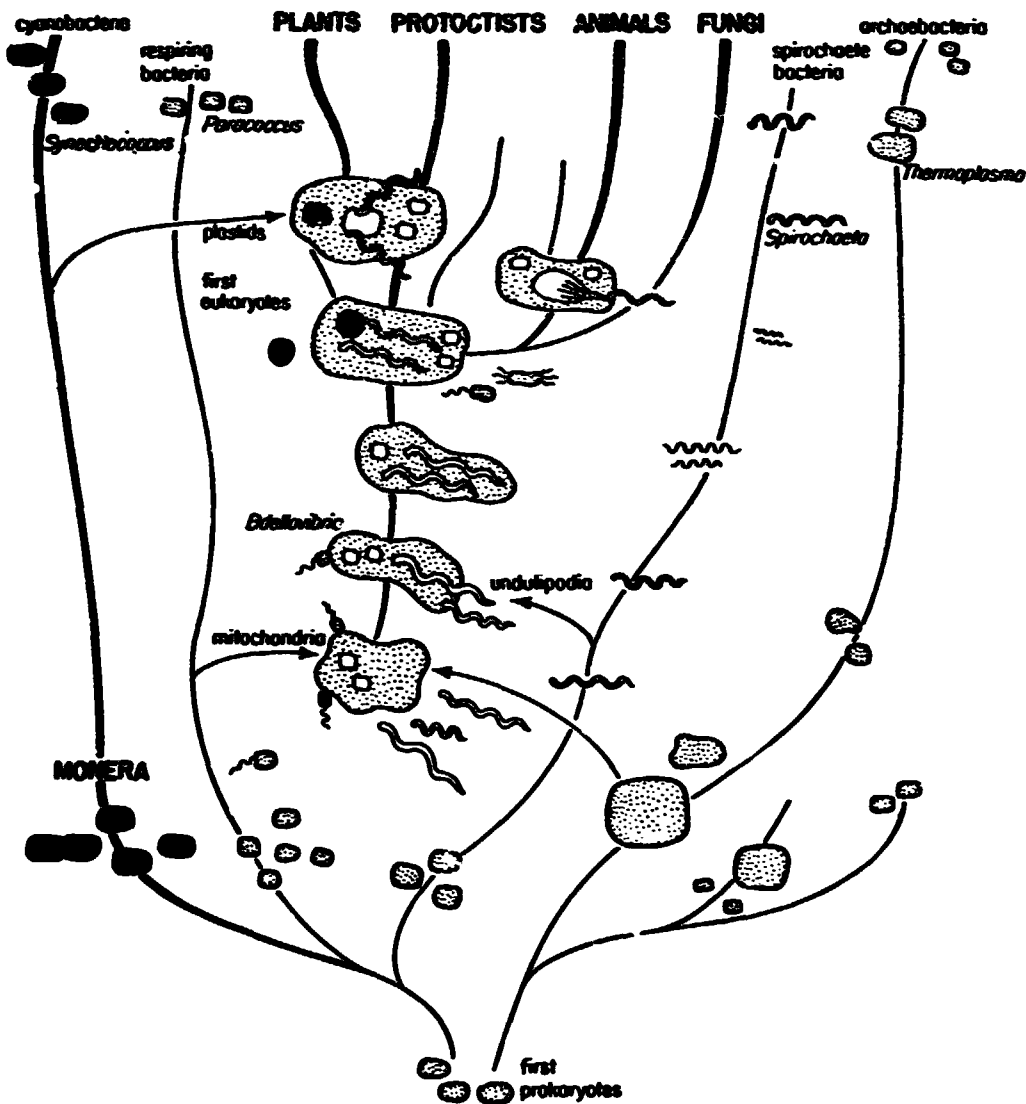


Figure I-19. The emergence of eukaryotic cells from bacterial communities. (from Margulis and Sagan, *Origin of Sex*, Yale University Press, 1985. in press).