All life on Earth is bacterial or derives, by symbiogenesis, from communities of bacteria. A century of evolutionary theory without symbiogenesis is enough. [The SCI® indicates that this book has been cited in more than 340 publications.]

Symbiosis itself is merely protracted physical association of organisms who are members of different species. Symbiogenesis is the resulting evolutionary change that occurs by permanent integration of symbionts. That symbiogenesis formed new species was argued by I.E. Wallin (1883-1969), an American, and by at least three Russians: K.S. Merezhkovsky (1855-1921), B.M. Kozo-Polyansky (1890-1957) and A. S. Famintsyn (1835-1918), yet it is still ignored in today’s evolutionary literature. By the early Proterozoic eon (two billion years ago) different types of bacteria became so literally incorporated that they emerged as new kinds of larger individuals at more complex levels of organization. The appearance of eukaryotic cell organization from fermenting, motile, and eventually respiring and photosynthetic components of the microcosm provides principles of evolution within the framework of the fact that all life on Earth forms one complex interacting system with physical continuity through space and time.

Two major changes distinguish SCE2 from SCE (1981): the evidence that undulipodia preceded mitochondria and the discovery of kinetosome-centriole DNA. The [9(2)+2] microtubule systems are motility structures surprisingly constant in width, at 0.25 um, and usually 5-10 um long. [Although they are quite uniform in width in all cells, they can vary from fewer than one to greater than 3,000 µm (= 3 mm) in length.] Familiar by their confusing names, these motility structures of eukaryotes are always underlain by kinetosomes. They include sperm tails; oviduct, tracheal and sensory cilia; ciliate cilia; gill cilia of molluscs; the eukaryotic “flagella” of trypanosomes, euglenids, and other swimming algae. The evolutionary homology is indisputable: the [9(2)+2] axoneme structure invariably forms from a [9(3)+0] kinetosome, a structure that often develops from a mitotic centriole. The generic term for the membrane-covered kinetosome-axoneme is undulipodium.
My book describes many independently-studied structures that are really modified undulipodia: olfactory cilia and the auditory kinocilium in mammals, rods and cones of some retinas, balance-organ cilia, insect mechanoreceptors, the haptonema of pyrimesiophytes and the clumped bundles of cnenophore (comb jelly) undulipodia (the "macro-cilia") are all outgrowths from $[9(3)+0]$ kinetosomes. The symbiotic acquisition of the undulipodium (prior to mitochondria) implies that the first eukaryotes were motile undulipodiate anaerobes, whose descendants include *Gard/da* (and other diplomonads), *Trichomonas* (and other parabasalids), retortamonads, and probably microsporidians. Acquisition of eubacterial motility symbionts into a *Thermoplasma-toke* archaebacterial host to form the first protists is reconstructed. The thorny issue of the origin of undulipodia is illuminated by the discovery of kinetosome-centriole DNA by Rockefeller University scientists. The kinetosome-DNA has been presented as a progress report because (unlike the definitive proof that both mitochondria and plastids are of symbiotic origin from O$_2$-respiring and phototrophic bacteria, respectively) the kinetosome-centriole work is not complete. The kinetosome-centriole DNA is the major component of the undulipodium, which is still impressive. The discovery of kinetosome-centriole DNA, of morphogenesis in free-living spirochetes (Spirrospymylocos), of mitochondrial and other relevant genetics, and of an expanded excellent prePhanerozoic fossil record establish eukaryosis as one of many examples of the importance of symbiosis in evolution. Symbiogenesis, even in the larger animals and plants, the relevance of an "RNA world" connecting prebiotic chemistry and the first cells, the concept of autopoiesis and new support for the Gaia hypothesis are also reviewed in *SCE2*.

I have tried to resist the confusing pressures to fragment and technologize from which we all suffer in today's information glut. The work itself plunges ahead against the disdain, dismissal and ignorance of specialists and rejection by granting agencies. *SCE2* was written to bypass these keepers of the gates of truth and to engage the minds of those students and teachers, evolutionists and microbiologists, geologists and ecologists who love the field more than the laboratory and refuse to apologize for their direct sensory interest in the natural world and its history.

I thank NASA Life Sciences, NSF-SGER programs and especially the Losnbsyre Foundation for support of my work.