

The Origins of Symbiosis

Four of the original papers that initiated the concepts we use today



Heinrich Anton De Bary

Schwendener: The Lichens as Parasites of Algae (1869)

The first publication on the symbiotic nature of lichens

van Benedén: Animal Parasites and Messmates (1876)

In which van Benedén published his concepts of mutualism and commensalism

De Bary: The Phenomenon of Symbiosis (1879)

De Bary did not like van Benedén's concepts, and came out with his own more general concept of symbiosis.

Frank: On the Nourishment of Trees Through a Root-symbiosis with Underground Fungi (1885)

The paper that gave us the term mycorrhiza

Except for the van Benedén, which is a long book, all four works are presented complete and unabridged, with study questions for classroom use.



Simon Schwendener

All the original engravings are included. Additional modern illustrations are provided through links on the supporting website, <http://www.mushroomthejournal.com/symbiosis>

van Benedén: The assistance rendered by animals to each other is as varied as that which is found among men. Some receive merely an abode, others nourishment, others again food and shelter.... But if we see, by the side of these paupers, some which render to one another *mutual* services, it would be unflattering to call them all either parasites or messmates (*commensaux*). It would be more just to call these latter kinds *mutualists*, and thus mutuality will take its place by the side of *commensalism* and of parasitism.

de Bary: Parasitism, Mutualism, Lichenism, and so on, are equally valid special cases of that general type of association that I call Symbiosis. If one wants to differentiate these primary categories further, then one might come up with antagonists locked in perpetual combat, or mutualists that each promote the welfare of both symbionts. But upon close examination, one cannot really endorse a sharp distinction between the categories. A sharp distinction is also missing in the other direction, that is between a "strict" symbiosis of connected symbionts with a common household, and the multitudinous relationships of organisms to one another that go under the name of social relations.

Frank: [this paper] concerns the fact that certain trees nourish themselves ...in symbiosis with the mycelium of a fungus, which carries out the function of a wet-nurse and takes over the entire nourishment of the tree from the soil. The whole body is thus neither entirely root nor entirely mushroom. Instead, as in the thallus of the lichens, a combination of two different species forms a single morphologically integrated organ, which can perhaps be suitably called a mushroom-root, or "mycorrhiza".

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