Decompiculture: Human symbiosis with decomposer organisms

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"Decompiculture" is a term I coined and first used in a 1993 presentation for a symposium on The Termite Symbiont System (Myles, 1995). I also used the term in an interview for Season's Magazine (Carney, 1994). This is the first paper that I have written to more fully define the concept of decompiculture. Decompiculture is the growing or culturing of decomposer organisms by humans. The term is intended to establish a contrast with the term agriculture. Agriculture encompasses the production systems based on the culture of herbaceous plants and herbivore animals. In effect, agriculture is human symbiosis with select organisms of the herb-herbivore-carnivore food chains comprising the live plant food web. Decompiculture, in contrast, human symbiosis with organisms of the decomposer food chains comprising the dead plant-based, or plant cell wall-based detrital food web.

I believe that decompiculture is equivalent in importance to agriculture and perhaps more important in terms of integrating human activities in a sustainable way with the biosphere. I also believe that just as the origin of agriculture initiated the dawn of civilization, decompiculture may now initiate the dawn of a new leap forward in human evolution.

Decompiculture is now happening in minor ways in various scattered projects and activities without people seeing it for what it is - an inevitable and essential process of human symbiosis with the pre-existing organisms which in nature close the biogeochemical carbon, nitrogen, phosphorous and sulfur cycles. Unless the now enormous human population with its unsustainable resource consumption patterns learns how to symbiose with the ancient decomposer communities then it will be impossible to sustain our populations and soil fertility much longer into the future. Sewage treatment, municipal solid waste treatment, industrial solid and liquid wastes, agricultural wastes, agricultural and forest soil fertility are all dependent on decomposition processes.

Our rate of waste production can no longer be adequately dealt with by natural decomposition processes. Land filling is a crisis of urban centres world wide. We need to engineer new bio-decomposition processes. To do this is conceptually simple but will take much greater interaction between ecologists and engineers. Essentially what needs to happen is to match up all the various types of organic wastes with their decomposers. We must learn how to culture a wide variety of bacterial, fungal, and invertebrate organisms in high-density, optimal configurations to achieve rapid, clean, bio-conversion, and bio-detoxification of waste into compost (soil amendment) and useful biomass for biochemicals, feed and food.

Each of the major advances in organization of life on earth have involved symbiotic associations in which more ancient bio-metabolic capabilities were linked with more recent bio-mechanical or bio-social organizations. For example the eukaryotic cell was assembled from prokaryotic elements which became such cell organelles as mitochondria and chloroplasts (endosymbiosis) (Margulis, 1998) . Higher (vascular) plants are usually dependent directly or indirectly on bacterial and fungal symbioses such as nitrogen fixing root and leaf nodules and fungal mycorrhizae. Animals from the simplest nematode worms to humans harbor all kinds of microbial symbionts, especially those in the guts which are essential for digestion, nutrition (intestinal symbiosis) and microbial health.

Agriculture and animal husbandry are really no more than the selective identification of a few key organisms which we have learned to symbiose with, by culturing them. We now need to learn how to grow (culture) a lot of smaller, complex communities of microorganisms and insects, and we need to do this on a big scale if we are to avert the looming ecological crisis which faces the human population on a finite planet. Waste management is not something that can be left to mechanical engineers and chemists. Sewage treatment, composting, manure management, plowing under crop stubble, and site preparation after logging are all examples of the presently haphazard activities which involve crude efforts toward decomposer management.

The major organisms that need to be studied are those of the decomposer and detrital food chains. We have traditionally neglected these organisms as useless within a productive context although they constitute the bulk of biodiversity. Instead our culturing and production systems concentrate on a select number of trees, herbs and herbivore animals. The bacteria, fungi, and insects are mainly looked upon as pests and pathogens which we have diligently attempted to control, if not eradicate.

Some of the essential organisms with which we must now seek to symbiose include the methanogenic archaebacteria, the thermophilic and actinomycete composting bacteria, the wood degrading basidiomycetes and the terrestrial

oligochaete annelid worms, the profoundly important lignocellulose and humus consuming termites, and the enormously diverse coleopteran consumers of moist to dry organic materials, and the hordes of fly maggots that inhabit every form of sodden and anaerobic organic matter. Some key organisms already being cultivated are red wriggler worms, *Ensenia foetida*; and the black soldier fly, *Hermetia illucens*. Red wriggler earth worms are widely used for “vermicomposting” in kitchen compost boxes for vegetative food scraps. Black soldier flies, formerly the most abundant flies in human privies, are now widely used for manure management programs.

Waste management engineers are not going to be able to do this on their own. Highly specialized biological knowledge is necessary. Biologists must identify the key organisms and provide the essential information about the organisms' ecology and physiology. Decompiculture will become a major new applied field in the biological sciences. Within the next hundred years, decompiculture is inevitable.

References

Carney, M. 1994. Home on the range. Seaons, Federation of Ontario Naturalists. 28-34.

Margulis, L. 1998. Symbiotic Planet (A New View of Evolution). Basic Books, Amherst MA.

Myles, T. G. 1995. The ecological importance of termites and the potential utilizaton of termites for the decomposition of lignocellulosic wastes. pp. 50-54. T. Abe (ed.) The Termite-Symbiont System: , Proceedings of Kyoto Symposium , Center for Ecological Research, Kyoto University