

The Force of the Collective: An Emerging New Paradigm in Biology

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9-5-06

Individuals don't reproduce alone.

The core activities of selection for mates, the selection of ova and sperm, success in habitats, all require cooperative behavior extending beyond the individuals. In some microbes there are biochemical sensors that provide a feedback loop to regulate their population size. They monitor their resource base, energy, pH and have genetic systems in place to regulate their numbers. Maybe we can insight that the same phenomenon must develop in our society for us to survive.

Selection, one of the prime tenets of evolution, happens from a changing environment impacting a changeable genetic constitution.

Adaptation is a result of selection. Selection is also the result of adaptation.

Rather than having a particular direction as is so usually portrayed for the process of evolution, it is much more common for selection and adaptation to have an oscillating behavior, like a pendulum blowing in the winds of all directions.

Why Evolution

1. 1. Because it provides the most inclusive view of how small changes can have huge effects. (For example: A phosphatase gene of yeast has become the crystalline lens of our eyes).
2. 2. Because the genome (each individual and its species) and the environment continuously interact to give adaptation and selection.
3. 3. Because three groups of microorganisms: viruses, bacteria and archaea, overlooked and unreckoned, are potent forces of biological change.
4. 4. Because it is a step towards a universal biology.

We are coming into an era of immense changes in biology. New

discoveries are making previous views of life obsolete.

Explorations at the molecular biological and evolutionary levels of nature continue to uncover relationships between viruses and all the other forms of life that make evolution a day by day, moment by moment, changing, adapting and selecting reality.

Perhaps the most reasonable approach to these new insights and relationships is to recognize that biology is in the midst of a paradigm shift of large magnitude. It is comparable to the realization, in physics and astronomy, in the 16th century, that we live on a planet that orbits a sun in a galaxy in an immense universe.

It began in the 1960's with the recognition that plant chloroplasts were/are cyanobacteria and that animal mitochondria are relatives of common soil bacteria. Now archaea, microbes distinct from bacteria, are found to convert ammonia to nitrate, on a local and world basis which is a core feeding system for plants, a planetary fertility system newly discovered.

Genomics has found that animals, plants and yeasts all have developed, changed and adapted by doubling their chromosomes, maybe even twice. This is a core activity leading to new species. Hybridization between related species is also a common way that new species arise.

Bacteria and archaea hold the fundamental genic activities of duplicating DNA, copying RNA, making membranes, motility and establishing electro-chemical gradients. The genes and parts of genes are moved, rearranged and integrated into organisms by viruses.

Addition of different kinds of genetic abilities to the core activities of these microbes leads to animals, plants, fungi and the many undescribed, unknown and extinct organisms that live or lived here too.

What we now call animals, plants, and fungi share and overlap one another in the genes they contain. So animals have plant and fungal genes as well as ones from bacteria, archaea and viruses.

In reality animals, plants and fungi are chimaeras, real manifestations of the mythical sphinx which is part cat, part raptor and part human.

So humans are part plant, part fungus, part bacterium and part archaea with at least 45% of the human DNA coding for a viral system used to duplicate and insert genes. Perhaps 1/3rd of our DNA is close kin to animals.

Summaries of genes held by all creatures other than viruses, everything we usually call life, finds that the viruses hold much more genetic diversity than all the other creatures combined. The planetwide distribution of all kinds of genes in viruses distributes the resource base for life in the most common organisms on this world. Widespread distribution of resources for adaptation and selection, biological egalitarianism, is a cornerstone to the

success of life on earth. The human community is just beginning to realize this.

The pseudo-easy era when life was plants, animals and invisibles is over. It has given rise to an unfolding new era where ecology, evo-devo (evolution and development) and molecular biology provide indices of biodiversity, genomic maps of all kinds of creatures and is threading relationships spreading among all organisms.

Organic agriculture, a subset of biological agriculture, will increasingly depend on discoveries in molecular, micro- and genetic biology to develop new food, flower and medicinal fungi and plant cultivars and to increase fertility, nutrition, vigor, productivity and resistance to pollution.