

Representing Life: Graphical Models for the Fundamental Concepts of Biology

Systematic Grouping of Basic Concepts in Biology

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| <p>Organism Biology Life Organization Self-organization Individual Whole Environment Disease</p> | <p>Development Developmental Biology Growth Morphogenesis Life-history Metamorphosis Alternation of generations Aging Death</p> | <p>Evolution Evolutionary Biology Phylogeny Homology Adaptation Mutation Modification Recombination Polymorphism Selection Progress Fossil</p> |
| <p>Function Physiology Analogy Organ Metabolism Regulation Regeneration Self-preservation</p> | <p>Behaviour Ethology Instinct Learning Need Perception Nutrition Predation Parasitism Protection Communication Sociality Play Hypobiosis</p> | <p>Ecosystem Ecology Biotope Community Niche Symbiosis Competition Coexistence Diversity Biosphere</p> |
| <p>Form Morphology Information Hierarchy Cell Tissue</p> | <p>Reproduction Genetics Gene Population Genotype/Phenotype Sex Display Fertilization Parental care</p> | <p>Culture Cultural Studies Man Emotion Intelligence Consciousness Values Artificial Life</p> |
| <p>Type Taxonomy Life-form Species Virus Bacterium Protist Plant Fungus Animal</p> | | |

Graphical models for the fundamental concepts of biology. An arrow that links two items signifies a causal influence and a dependency: the item to which the arrow points depends in its existence on the item at its starting point. An arrow underneath the items indicates a temporal succession.

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| <p>Organism <i>Interdependence of parts. Every part (organ) depends for its functioning on the presence of the other parts.</i></p> | | <p>Behaviour <i>Regulating the impact of the environment. The effect of the environment depends on the organism's activity.</i></p> |
| <p>Function <i>Element in a system of interdependent processes.</i></p> | | <p>Reproduction <i>Multiplying the organization, with or without the interplay of a digital phase (genotype).</i></p> |
| <p>Form <i>Inner and outer structure of organisms.</i></p> | | <p>Evolution <i>Differential reproduction of forms. The appearance of a mutation to a new form results in a comparative advantage of this variant.</i></p> |
| <p>Type <i>Radically distinct body plans of organisms.</i></p> | | <p>Ecosystem <i>Interdependence of organisms of different types. Each organism plays a special functional role.</i></p> |
| <p>Development <i>Growth and differentiation of organisms.</i></p> | | <p>Culture <i>Designing the world without feedback. Organismic actions that do not necessarily aim at self-preservation or reproduction.</i></p> |