

WSD Independent Study Contract
"Biological Structures and Metaphors"
Spring 2000
Student: E.C. Mare
Evaluator: John Bower, Ph.D.
Credits: 3

Learning Intentions

This course is intended to provide the student without extensive prior biology background with a working vocabulary and conceptual understanding of key biological themes and theories. Particular attention will be given to those theories of recent origin that elucidate the shift away from a biology modeled upon a mechanistic physics and toward the general trend in science to creating systemic, life-centered models. Working with these theories, the student will introduce into her/his thinking and writing living biological metaphors to describe his/her experiencing and perception of the world, to replace mechanistic vocabulary based upon a reductionistic/deterministic physics paradigm. The culmination of the transformation will then be to use this new perspective and ability to experiment with the description and conceptualization of *sustainable* human settlements as *biological* structures; in effect, the student will be asked to create a biology of human settlements.

Learning Goals

- 1) Trace the evolution of cells, as fundamental units of life, leading up to the cooperative symbiotic leap that marked the development of the eukaryote stage.
- 2) Become familiar with the structural components and arrangement of the typical eukaryotic cell.
- 3) Become familiar with metabolic processes within the cell, and between the cell and its environment.
- 4) Gain an overview of recurring themes in structural patterns at the metacellular level, as demonstrated by the ramification of evolution into plants, animals, and fungi.
- 5) Gain an understanding of the processes and configurations that allow cells to form cooperative, symbiotic networks at the metacellular level.
- 6) Explore recent theories of morphogenesis and structural stability.
- 7) Become knowledgeable of the double helix arrangement of the DNA molecule, how it replicates itself, and how genetic diversity can be explained from a post-Darwinian view.

Learning Activities

The student will read:

- 1) *The Lives of the Cell* by Lewis Thomas
- 2) *The New Biology: Discovering the Wisdom in Nature* by Robert Augros & George Stenciu
- 3) *A New Science of Life* by Rupert Sheldrake
- 4) *The Rebirth of Nature* by Rupert Sheldrake
- 5) *On Growth and Form* by D'arcy Thompson
- 6) *Structural Stability and Morphogenesis* by Rene Thom
- 7) *What is Life?* By Lynn Margulis & Dorian Sagan
- 8) *The Five Kingdoms* by Lynn Margulis
- 9) *The Invisible Landscape* by Terence McKenna
- 10) *Life and Pattern of Order* by Thomas Steyaert
- 11) *Biology: Concepts and Connections* a textbook by Campbell, Mitchell, Reece

The student will take detailed notes while reading these books, retaining key elements, language, and ideas that can be used as metaphors and analogies for the structures, patterns, and processes of sustainable human settlements. The student will begin to create a biology of sustainable human settlements based on this new understanding, using the eukaryotic cell as the fundamental model.

Demonstration of Learning

The student will write four 5-page essays exploring the following themes:

- 1) The Ecovillage as a Living Cell
- 2) The Sustainable City as a Metacellular Pattern
- 3) Sustainable Human Settlements as Evolving, Reproducing, Cognizing Unities
- 4) The 21st Century Ecovillage as a Neuron in the Gaian Brain

Evaluation of Learning

- Discussion of the transformation of perception of human settlements from mechanical structures to biological structures
- Critical review of essays