

Book Review**Review of Harold J. Morowitz's Book:
The Emergence of Everything: How the World Became Complex**

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ABSTRACT

Motowitz's book outlines 28 examples of said emergence, ranging from the making of our nonuniform universe, the emergence of stars and the elements of the periodic table, the solar system, planetary structures, universal metabolism, prokaryotic life, eukaryotic life, multicellular organisms, animals, humans, mind, philosophy and spirituality. You can find this book at Amazon http://www.amazon.com/Emergence-Everything-World-Became-Complex/dp/019513513X/ref=cm_cr-mr-title.

Key Words: Emergence, complex, evolution, competition, cooperation.

At each level of emergence there may be agents that interact with their neighbors, not necessarily Darwinian interaction but some kind of interaction. Agents that find themselves to be successful are then later discovered to be necessary for later steps in the emergence, and their success is found as agents comply to what Morowitz calls a "pruning rule". The Darwinian selection principle, permitting agents to leave the most offspring as they are found to be fittest from natural selection, is such a pruning rule. The Pauli exclusion rule is a second example that Morowitz gives. The exclusion principle restricts the electron cloud that surrounds the natural elements (in our periodic table) in such a way that chemistry and bonding properties emerge from quantum mechanics; properties that are discovered to be necessary for life as we know it.

On page 101 Morowitz writes:

"...in our discussion of the Pauli exclusion principle we dealt with the restriction that no two electrons in a structure can share the same four quantum numbers - presumably four quantum numbers because of the four dimensions in formulating the Schrödinger equation using relativistic quantum mechanics. This principle does not come from dynamics of the problem, but from the symmetry requirements on the solutions.... Because of the non-dynamical feature, several physicists and philosophers of science detect a kind of noetic feature deep in physics"

Morowitz points to this noetic quality in several places. Continuing on pages 101 to 102 he writes on the first recognized example of life-based behavior found in prokaryotes:

".... Somewhere in bacterial evolution, motility appeared. The operative structures are flagella, which rotate, propel the cells. A number of cases were discovered in which cells in a gradient of nutrients swim toward higher concentrations, and in a gradient of toxins swim toward lower concentration. The mechanism is somewhat indirect. Periodically the swimming cells randomly switch directions. In a favorable gradient they change less frequently, and in an unfavorable gradient they change more frequently. They are letting their profits run and cutting their losses. For a population of cells, this leads to a fit behavioral repertoire. The behavior looks causal, but the endpoint looks teleological. It requires sensing the environment, concentration versus time, and responding to the time gradient,

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which is also a space gradient, since the organisms are swimming. I think it is important to look at these hints of cognitive behavior as they appear."

Regarding the mental or noetic aspect of all animal life, on page 138 Morowitz writes:

"... There is currently a reexamination that argues that mental activity is universally distributed through the animal kingdom and perhaps in other taxa down to the unicellular eukaryotes. Psychologist Donald R. Griffen has gathered a great deal of evidence in the book *Animal Minds* and argues for the universality of cognition.... I see the grand dawn of the emergence of reflective thought."

Morowitz describes the Principle of Competitive Exclusion (previously studied by Alfred Lotka, Vito Volterra, and Charles Elton), as a pruning rule that implies "... the impossibility of two species occupying the same niche in a steady-state ecosystem". For Morowitz this principle stems from Darwinian selection, but it has unsavory consequences as it affect social aspects of humanization. He writes of the principle that "... humans, having reflective thought and the power of choice, are not bound to living out a set of mathematical relations". In chapter 26, Morowitz gives accounts on how the Principle of Competitive Exclusion can be studied and used as a tool to avoid the unsavory qualities of ourselves (including prejudices and examples of genocide) that emerge from the principle when we unknowingly back into it.

Morowitz did not notice that the Principle of Competitive Exclusion has a shadow principle, that I will name the Principle of Cooperative Inclusion. Nevertheless, this shadow principle has a noetic quality that Morowitz has grown fond of. It is such a teleological principle that says that hate will destroy itself when it is forced to coexist with the inclusion brought by love. And so my friends we hold onto the angry tension, not by competitive exclusion but by cooperative inclusion. A better world will unfold as hate ranges war with its own angry shadow; the catharsis will expunge our prejudices. You may read about it in my book, *Trinity*.

Morowitz has many kind words for Teilhard de Chardin. On page 175 he writes: "... I see the World Wide Web as a reification of instantiation of the noosphere and consider Teilhard as an even more prescient thinker. Human thought is collective."

References

Harold J. Morowitz, 2002, *The Emergence of Everything: How the World Became Complex*. Oxford University Press, USA.