

Incomplete Nature: How Mind Emerged from Matter by Terrence W. Deacon.
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For anthropologist Terrence Deacon, present day science is incomplete. It does not include human feeling, attitude, hope, value, and purpose, for which he coined the term *ententional*. His revolutionary proposal is to include the concept of absence in science, just as the inclusion of zero as a placeholder or symbol in the middle ages led to the Arabic number system that we find so useful today. Absence is pregnant with potential, as is the void within a glass container. It has the potential to be full.

The concept of absence (or difference) is part of information science, to which Deacon's book devotes a chapter. Information is difference that makes a difference. In the binary number system used in modern computers, information is encoded as something (one) or nothing (zero).

Deacon raises the philosophical question, "How can something not physically there (*entention*) be the cause of anything?" The book develops his "efficacy of absence," so that *ententions* become an integral part of science.

Absence is an integral part of Deacon's concept of emergence, which explains how the first cell came from dumb matter by natural processes. In the conventional understanding of emergence, primitive cells emerged with novel properties that are *greater* than the sum of their interacting parts. In Deacon's view, novel properties can be *less* than the sum of their parts. For him "*less is more.*" *Absence* is a constraint which limits each part's infinite number of possibilities to the function that contributes to the whole. Deacon's three stages leading to the emergence of the first living cell from dumb matter are:

1. THERMODYNAMICS or CHAOS: atoms and molecules of water, methane, ammonia, carbon dioxide, etc. moving randomly from thermal fluctuations in a primordial soup.
2. MORPHODYNAMICS or FORM: [Morphology, or form, meaning structure, is generally regarded as being static. I therefore find morphodynamics to be a confusing term.]. This is the emergence of self-organizing form or "order for free," and the *absence* of dynamical variety. For example, diamond crystals found in the earth have carbon atoms with an orderly cubic structure. At high temperatures and pressures, diamonds

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emerge from the self-organization of clusters of carbon atoms in the earth. Man-made diamonds are made by using the same high temperatures and pressures.

Morphodynamics also includes stable processes, like the flow of a river. The overall shape or the river's form remains the same even though each water molecule is continually flowing downstream. In autocatalytic chemical processes, the output products feed stably back into the input. These are the precursors of life.

The building blocks of long life-forming proteins chains are amino acids. The 1953 Miller and Urey experiment showed how they could have emerged. Miller and Urey subjected a mixture of water, hydrogen, methane, and ammonia—all of which were present shortly after the earth was formed—to an electrical spark, which simulated lightning. After one week they identified the formation of amino acids. Primordial amino acids could also have come from interstellar dust, meteorites, and comets. Long polymers are also formed in gaseous planets like Jupiter.

3. TELEODYNAMICS: (*telos* = purpose, goal) Similar to the formation of diamonds in the earth's crust, living cells emerged under the right conditions from amino acids, proteins, and autocatalytic processes in the primordial soup. The vital purpose (*telos*) of a cell is to eat and to avoid its *absence* (from being eaten) as well as to reproduce. The behavior and development of cells is constrained by *absence*. Each part is constrained to a function which serves the whole. To survive, a cell must move away from areas where food is *absent* to those where it is *present*.

Contrary to Deacon's naturalistic description of the emergence of the first cell, the intelligent design movement does not believe that Darwinian evolution can account for the origin of life, although variations and natural selection could be a mechanism for small changes. Biochemistry Professor Michael Behe, Lehigh University, PA has claimed that the first cell was so irreducibly complex that it required an "intelligent designer" to assemble all the necessary micro-machines. Deacon notes that the "intelligent designer" could be a homunculus, the little man or agent in my head. This is not modern science, which is based on natural laws and processes.

Deacon develops an emergent theory of energy and work. He applies the emergent steps of thermodynamics, morphodynamics, and teleodynamics to the playing of a flute. Thermodynamics represents the energy that the player expends in blowing the flue. Morphodynamics is the vibrational patterns of the standing waves of sound within the instrument. Teleodynamics is the meaning and purpose for which the flute is played. Is the music played for practice or the uplifting and inspiring of an audience?

Deacon emphasizes the historical evolutionary emergence of human mind and consciousness from simpler organisms over the materialistic reductionism of the nerve firings of the synapses." Single cells have sentience, the ability to respond to their environment, but not consciousness. Mind and conscious emerge from the gigantic number of nerve firings in complex organisms, but cannot be reduced to them. Deacon states, "The title of this book is slightly

misleading. Mind does not emerge exactly from matter but from constraints on matter." Can Deacon's concept of absence be extended to give some assurance of immortality after the death and absence of the brain?

I believe an alternate title to this book could be "Incomplete Science: The Power of Nothing." The symbolic representation of nothing or "zero" gave birth to the modern Arabic number system. Similarly the symbol i as representation of the square root of minus one led to the complex number system and the complex graphical plane that has been so useful in mathematics and engineering. Deacon's use of symbol is an appropriate sequel to his book *The Symbolic Species: The Co-evolution of Language and the Brain*.

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