

Zero-Totality: From Fermions to Chemical Reactions and DNA to Dinosaurs

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Abstract. This paper will present arguments that zero-totality and duality concepts, introduced in *Zero to Infinity: The Foundations of Physics (ZtI)* by Peter Rowlands in 2007, apply to complex living organisms higher up the biological scale. Fermions aggregate to become bosons and then proceed to higher levels. Physical and biological systems self-aggregate through the dipole-dipole van der Waals force and originate in a harmonic oscillator phenomenon called *zitterbewegung*. It is in the foundational nilpotent Dirac equation derived in ZtI that zero-totality and duality systems manifest themselves. Chemical reactions also satisfy a zero-totality condition when the reverse rate equals the forward rate. As chemical equilibrium is achieved the Gibbs free energy must drop to zero. In Chapter 19 of ZtI Rowlands teams up with Vanessa Hill to demonstrate that DNA behaves according to the same rules, called the nilpotent universal computational rewrite system (NURCS), which govern fermionic behavior. The physicist and biologist derive credible links between the 64 amino acid triplets and the 64 units of the Dirac algebra. Described as ‘Nature’s Code’ Rowlands and Hill argue that hydrogen bonding, a classic dipole-dipole force in which the strands of DNA interact, execute in a fashion similar to the real-virtual fermionic interaction. They are also subject to harmonic oscillations as their links continually break and re-form. The four bases space, time, mass, and charge are paired with the four nitrogenous DNA bases found in the DNA purines adenine (A) and guanine (G) and in the pyrimidines thymine (T) and cytosine (C). The A-T pairing acts as a ‘driver’ in the same way that nonconserved space-time acts as a source of continuous variation. Thymine initiates change when it is replaced by uracil (U) in RNA. The C-G pairing, on the other hand, is analogous to the discrete mass-charge relationship. Quantum coherence and entanglement are central to diverse biological processes such as photosynthesis and avian navigation which can also be modelled within a zero-totality and duality framework. Quantum researchers have shown that entanglement between the electron clouds of nucleic acids in DNA occurs and question whether the four bases are truly logically independent units. Evolutionary developmental biology is another area in which the zero-totality framework appears to be relevant where evidence of inverted morphological structures in the insect and avian worlds has been observed.

Keywords: zero-totality, duality, fermions, DNA, inverted evolutionary structures, *zitterbewegung*