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Quantum Mechanics predicts evolutionary biology

J.S. Torday

Department of Pediatrics, Harbor-UCLA Medical Center, 1224 W.Carson Street, Torrance, CA 90502, United States

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A B S T R A C T

Nowhere are the shortcomings of conventional descriptive biology more evident than in the literature on Quantum Biology. In the on-going effort to apply Quantum Mechanics to evolutionary biology, merging Quantum Mechanics with the fundamentals of evolution as the First Principles of Physiology-namely negentropy, chemiosmosis and homeostasis-offers an authentic opportunity to understand how and why physics constitutes the basic principles of biology. Negentropy and chemiosmosis confer determinism on the unicell, whereas homeostasis constitutes Free Will because it offers a probabilistic range of physiologic set points. Similarly, on this basis several principles of Quantum Mechanics also apply directly to biology. The Pauli Exclusion Principle is both deterministic and probabilistic, whereas non-localization and the Heisenberg Uncertainty Principle are both probabilistic, providing the long-sought after ontologic and causal continuum from physics to biology and evolution as the holistic integration recognized as consciousness for the first time.

Contents

1. Introduction

Nowhere are the shortcomings of descriptive biology more evident than in the literature on “Quantum Biology” in the on-going effort to apply Quantum Mechanics (QM) to evolutionary biology (Sia et al., 2014). All of these endeavors have entailed the direct application of the principles of QM to the overt physiologic properties of biology as the product of evolution, rather than to the latter's ontologic origins and epistemologic causal mechanisms (Torday and Rehan, 2012). It is analagous with trying to understand the internal combustion engine of an automobile by applying physics to the wheels or transmission. However, as will be shown, the application of QM to the origin and causation of evolution at the cellular-molecular level reveals its mechanistic principles and offers the authentic opportunity to understand how and why physics constitutes the basics of biology (Torday and Miller, 2016a).

E-mail address: jtorday@ucla.edu.

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2. Lipid control of calcium homeostasis as the history of vertebrates: a key to reductionist Quantum Mechanical approach

Reducing biology to QM offers complementary insights to the cellular-molecular level of biology (Torday and Rehan, 2012). In that vein, it has previously been shown (Fig. 1) that the direction and magnitude of genetic change can be seen as reciprocating internal and external responses to major stresses in the environment (Torday and Rehan, 2011). Throughout, these changes in genetics are in service to the epistatic balancing selection for calcium and lipid homeostasis (Torday and Rehan, 2012). Selection pressure for this mechanism began with the rise in carbon dioxide in the atmosphere (Berner, 1990), causing acidification of the oceans by the carbonic acid formed leaching calcium from the rock (Mitchell et al., 2010). Calcium is biologically toxic at high levels, so calcium channels appear to have evolved to regulate intracellular calcium (Case et al., 2007). Subsequently, the rise in atmospheric oxygen over the course of the Phanerozoic Era caused endoplasmic reticulum stress, causing calcium leak into the cytoplasm. In response, the cells formed or acquired peroxisomes, which utilize lipids to neutralize the deleterious effects of increased cytosolic intracellular calcium (De Duve, 1969). The predictive power of the Quantum Mechanical approach is expressed by the entraining of intracellular calcium, followed by its control through cell-cell interactions mediated by the coordinated effects of soluble growth factors and their receptors, perpetually referencing the First Principles of Physiology (Torday and Rehan, 2012).

3. Quantum Mechanics and origins and causation in biologic evolution

There is a consensus that the Laws of Physics determine all of the Natural Sciences (Birks, 1962), begging the question as to how physics has determined the principles of biology. A number of physicists have attempted to solve this riddle (Prigogine and Stengers, 1984; Polanyi, 1968; Schrodinger, 1944) but have failed, Prigogine, Stengers and Polanyi all concluding that biology is just too complicated. More recently, it has been claimed that life is actually simple (Torday, 2016a; Davies and Walker, 2016); we complicate it (Barrow and Tipler, 1988) from our narcissistic, self-serving perspective by reasoning after the fact (Bohm, 1980). Alternatively, it has been argued that there are homologies (in the sense of having common origins) between physics and biology. It is hypothesized that those homologies are due to their common origins in the explosion of the Singularity, otherwise referred to as the Big Bang (Singh, 2005). After all, Smolin (1997) has effectively argued that stellar evolution and Black Holes came about through Darwinian-like mechanisms. It is feasible that in the aftermath of the Big Bang, based on Newton's Third Law of Motion, an ‘equal and opposite reaction’ was met by self-referential self-organization, given that the only existing paradigm at the time was the Singularity. It was on that basis that chemistry (Valance, 2017) and biology (Torday and Miller, 2016a) may have come about. Although it can be argued that we cannot know the origins, initial conditions and causal mechanisms of evolution involved because we were not present when it happened, there are ways in which we can hypothesize how and why it occurred that are scientifically testable and refutable (Popper, 1963). Elsewhere, it has been argued that since lipids were critically important in the evolution of eukaryotes (Torday and Rehan, 2012), that they likely played a vital role in the origins and initial conditions of life based on the premise that evolution is pre-adaptive, or exaptive, or cooptional (Gould and Vrba, 1982) (Fig. 2). Lipids immersed in water may well have formed the basis for life since they accompanied the frozen snowball asteroids that formed the Earth's oceans (Deamer, 2017), and physicochemically spontaneously form micelles when immersed in water (Hamley, 2007), exhibiting hysteresis as molecular ‘memory’, able to recall their shape and size, which is necessary for evolution (Torday and Miller, 2016b). In the process of forming life, the lipid membranes that delimited the internal and external environments generated an ambiguity that became the nidus of life (Torday and Miller, 2017). Under these conditions, several homologs of Quantum Mechanics apply-namely the Pauli Exclusion Principle, non-localization, the Heisenberg Uncertainty

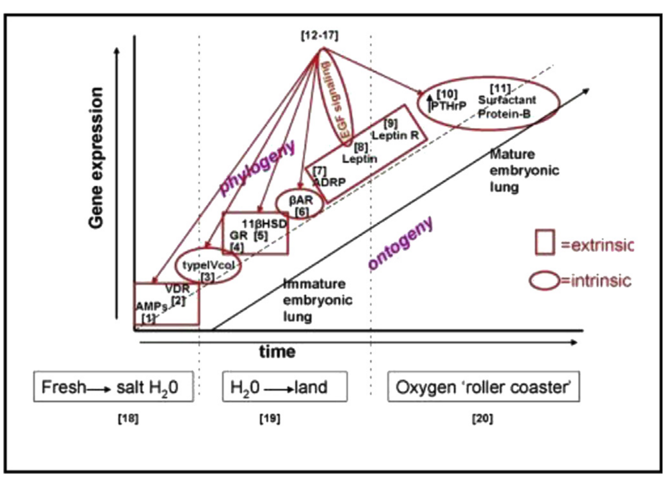

Fig. 1. Reciprocating extrinsic and intrinsic selection pressures for the genes of lung phylogeny and ontogeny. The effects of the extrinsic factors (salinity, land nutrients, and oxygen on the x-axis) on genes that determine the phylogeny and ontogeny of the mammalian lung alternate sequentially with the intrinsic genetic factors (y-axis), highlighted by the squares and circles, respectively. Steps 1–11 appear in the sequence they appear during phylogeny and ontogeny: (1) AMPs; (2) VDR; (3) type IV collagen; (4) GR; (5) 11bHSD; (6)bAR; (7)ADRP; (8) leptin; (9) leptin receptor; (10) PTHrP; and (11) SP-B. Steps 12–17 represent the pleiotropic effects of leptin on the EGF in oval signaling pathways integrating steps 1–6, 10, and 11. Steps 18–20 are major geologic epochs that have “driven” intrinsic lung evolution. (taken from Torday and Rehan, 2011).

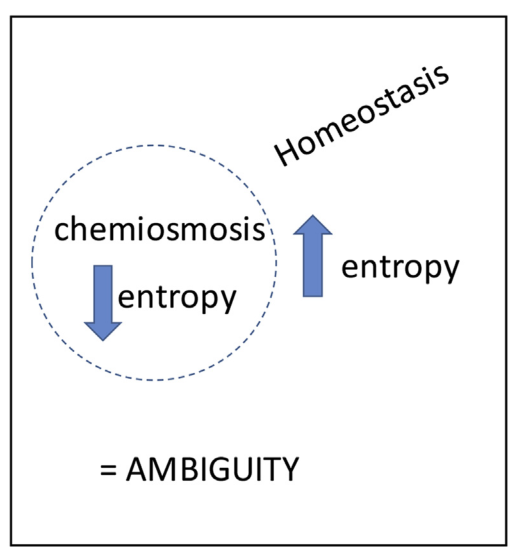

Fig. 2. Origins of Life. Lipids immersed in water formed micelles that delimited the internal and external ‘environments, allowing for negative entropy fueled by chemiosmosis within the cell, governed by homeostasis. The differential internal negative and external positive entropies generated the ambiguity of life.

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