

Symphony of Matter and Mind

Part three

Music of Life

Physics and Technology of Living Matter

Chapter synopsis:

1. What is Life?

The first chapter focuses on the question of how living matter differs from the inanimate. Many have tried to answer and, most often, the answer was reduced to the idea that living matter differs by the presence of a soul, which was defined as a special and separate from matter entity. This idea originates from a fundamental mistake of objectification: taking the physical process inside matter for a non-physical object. This error has several reasons, but the chapter focuses on one of them: the lack of a physically plausible explanation. Without an idea about a physical mechanism, we inevitably create the illusion of an answer, using non-material entities that we have invented to fill the explanatory gaps.

The chapter also asks another related question: is living matter special or it can be described based on mechanisms operating in the rest of matter? Biophysics has been looking for special physical laws for life for many years. Perhaps, this is a search for something that does not exist. The chapter proposes a simple idea: living matter uses what is available: the mechanism of energy interactions and the formation of structures that is universal for all forms of matter. Thus, this volume starts a theory about life, based on the Theory of Energy Harmony (TEH) developed in the previous volumes.

2. The Quintessence of Life.

Based on TEH, this chapter tackles fundamental questions that are considered the main riddles of biology. How do the four elements of non-living matter form the basic structures of living matter? What is the physical mechanism that binds them into biochemical molecules? The proposed model proceeds from the assumption that there are no special biophysical laws and the mechanism of energy interactions is universal for all types of matter. The chapter takes the reader step by step to show how hydrogen, carbon, nitrogen and oxygen form the quartet of life by using this mechanism as the quintessence of molecular bonds.

3. The Attractor of Life.

The chapter takes the reader into the inner universe of the complex dynamical system that we call a living organism. As long as this system remains a unified structure of interacting elements, it has a phase portrait as a space of parameters located within a stable attractor. The chapter offers a description of the attractor trajectory of a normally functioning living system and an initial hypothesis about the criteria for assessment of a pathological state.

4. Oscillations of Life.

Proceeding from the notion of a living organism as a self-organizing system of interacting and energy-exchanging self-sustained oscillators the chapter describes the main types of oscillations and modes of their interaction that characterize the integral state and adaptive functioning of such a system.

5. Biological Rhythms.

The chapter examines the dynamics of vital intra- and intercellular processes down to the fine details of ion fluxes from the point of view of the proposed model.

6. The Harmony of Life.

The chapter proposes the hypothesis of the main parameters that determine the state of a living system. Despite the variety of internal processes carrying different functions and a massive number of elements with distinct traits, the interaction mechanism is fundamentally uniform. The integrated state of a living system results from using this physical mechanism of harmony as a way of efficient energy exchange between system elements. The chapter proposes a method of systemic analysis according to the corresponding physical criteria of internal harmony.

7. Evolution of the Mind.

Many processes are going on in any living system. One of them, perhaps the most complex one, remains the biggest mystery. We call this process the Mind. It regulates the internal state of the system and behavior, which allows an organism to adapt to environmental conditions and function purposefully, maintaining its integrity under a variety of conditions and their changes. As living systems became more complex, the complexity of the control process increased. The chapter offers a general outline of the evolution of the Mind from a physiological and psychological perspective paving the way for bridging them with a physical model that will be described in detail in further volumes of the series.

8. Definition of the Mind.

For any scientific study to be purposeful, it is necessary to determine the object of study. Usually, the object is the phenomenon of the material world at which research is aimed. What happens when it comes to studies of the mind? Macmillan Dictionary of Psychology, which claims “to cover all the technical terms that a psychologist is likely to encounter, including terms from neurophysiology, neuroanatomy, neurobiology, neurochemistry, ethology, sociobiology, linguistics, artificial intelligence, sociology, anthropology, statistics and philosophy” states: “Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is, what it does, or why it has evolved. Nothing worth reading has been written on it.”

The science named “knowledge of the mind” (from Greek psyche-logos) cannot define the central object of its research and the main technical term. This is an admission of failure. Could it be that the reason is the lack of a technical approach to this concept? The chapter tries to change this long tradition and gives a strictly technical definition of the mind that will be the foundation of the Teleological Transduction Theory worked out in the following parts of the study. They will specify down to the finest details what it is, why it has evolved, what and how it does. The author hopes it will be worth reading.