

Symphony of Matter and Mind

Part one

Music of Matter Mechanism of Material Structures Formation

Chapter synopsis:

1. Certain Uncertainty of Physics.

The chapter is dedicated to the history of attempts to overcome the contradictions of the corpuscular model of matter. The strange behavior of matter, which did not want to abide by the rules of the model, was taken by the supporters of Quantum Mechanics (QM) for the uncertainty of matter itself and not their description of matter. Thus, physical regularities of interactions were attributed to the probabilistic uncertainty (so-called Copenhagen interpretation) and physics turned into statistics. The crucial problem of revealing the mechanism that lies behind the observed material structures and interactions was substituted for mathematical descriptions of trajectories of virtual particles flying in the void. This is what the current Standard Model (SM) of particle physics is all about. Thus, theoretical physics became a system of beliefs about phantoms postulated by the model. Believers were ordered not to think, but to shut up and calculate the wonderful quantum properties of virtual entities. The author of the book does not belong to those who follow the belief and suggests that we should think about the fundamental question of interaction mechanism. He calls for a return to physics as a science of matter and energy.

2. Relationalism vs. Absolutism.

Current mainstream theories of physics use relativity principles that are based on the notion of space and time as some overarching framework for all things and events. Whether they consider it to be fixed (Newtonian relativity) or curving (Einsteinian relativity), they depend on this background as its metrics determine the result of calculations. The outcome depends upon what variables are put 'by hand' to conform with observations. What they call predictions of these theories are in fact post hoc descriptions. Thus, leading theories do not have a real explanatory and predictive power. There is another major problem: the explanations are based on the belief in an intangible entity that cannot be confirmed or refuted empirically. This chapter shows the origin of the logical fallacy of objectification, which led to the creation of an imaginary object (the fabric of space-time) from a real process (spatial and temporal

measurements). It also introduces an alternative background-independent relativity principle that resolves the contradictions and takes the notions of space and time back to the realm of science.

3. Emptiness in Theoretical Physics.

This chapter touches upon the fundamental question behind all aspects of modeling energy interactions: what is the medium for the propagation of interactions at a distance? The SM postulates that virtual particles are the carriers of fundamental interactions. The General Theory of Relativity (GTR) postulates that the observed gravitational phenomena result from the curvatures of space-time fabric which is here, there, and everywhere and curves as it wishes. It's the same old problem: if there is no idea about the material mechanism of physical interactions, then the models come up with all sorts of intangible forces and essentially turn into dogmatic belief systems, even though they are called physical theories.

On top of it all, both models are based upon Albert Einstein's postulate about the existence of emptiness without any physical properties where these intangible entities operate as carriers of fundamental interactions. Thus, physics has turned into fairy tales about spirits flying according to SM or curving according to GTR in the void. As is often the case in science, when choosing a path at the fork, a decision is made to go one way, and with the movement, we forget that there is an alternative. A return to another route does not occur until all the dead-end of the chosen path becomes apparent. The chapter points out the impasse and brings common sense back to physics: any physical interaction at a distance needs a physical intermediary.

4. Wave vs. Particle

This chapter discusses the concept of wave-particle duality which is based on the idea that a particle can act as a wave. It involves paradoxes such as the wavelength of an indivisible particle and its interference with itself. One of the founding fathers of SM, Richard Feynman called it "the mysterious behavior in its most strange form which is impossible, absolutely impossible, to explain in any classical way." To overcome the contradictions, the model distances from physical meaning and relies on the 'non-classical' interpretation of physical waves in the medium as waves of the probability of particle flight in emptiness.

However, this 'compromise' has not resolved the fundamental issues. Physical sense suggests that a particle is an object and a wave is a process. Logic suggests that if we confuse processes and objects, we commit a category error. Common sense suggests that something is wrong with the model and we should look for another solution. The first step towards breaking the deadlock is to accept the simple idea that there are no elementary particles as indivisible material points. There are no 'bricks' of the Universe postulated by the corpuscular model of the world. Particle physics has been in search of its own phantoms for ages and keeps on

‘finding’ more and more of them. The ‘particle zoo’ is overcrowded. But the fact is that all the experiments that are interpreted as confirmations of particles’ existence are just discrete measurements of continuous energy oscillations and waves. The basic objectification fallacy comes from thinking that quantum is a particle (object) while it is just a point of quantization (the process of measuring continuous phenomena by discrete finite values).

Thus, there is no wave-particle duality, since there are no particles. This simple step gets rid of all the oxymorons and paradoxes of the old model. But the next step is not so easy. We have to unravel the physical mechanism of wave interaction which can explain all the experimental results that SM describes using imaginary entities that behave inexplicably. This chapter tells how we can solve the riddle in the classical, that is, the physical way.

5. Physical Meaning: Lost and Found

This chapter describes how the wave function equation, which was originally used to describe oscillatory phenomena in a physical medium, became a description of the probability of virtual particles in emptiness. This investigation helps us understand how physical meaning has disappeared from theories of physics. From this point on, the book aims to find and return physical meaning to physics. Feynman once wrote: “The next great era of awakening of human intellect may well produce a method of understanding the qualitative content of equations.” Perhaps, this great era of intellectual awakening has finally arrived.

6. Energy Relay Race.

The classical principle of mass-energy equivalence, derived empirically, states that mass is a form of energy and that all matter has intrinsic energy. The full version of the equivalence equation includes energy, velocity, momentum and mass as interrelated variables. The truncated version offered in the 19th century looked like $E=mc^2$ and was interpreted as the equation of energy in bodies and energy transferred by light. In both cases, the speed of light was the equivalence coefficient. However, it is just a phenomenological description that does not explain how energy can turn into mass.

In the 20th century, Einstein took this short version and introduced a fundamental change to it. He postulated that the speed of light is not just a coefficient but a universal constant. In his model, light was the flight of particles (later called photons) through the void at the utmost and constant speed that does not depend on anything. Thus, a variable turned into an absolute upon which all other variables depend. Physical sense dictates that energy determines the speed. But the Einsteinian version flips normal causality and says that speed determines energy. This basic contradiction to physical meaning leads to further internal contradictions and discrepancies with reality. If we input even minimal values of mass into the equation energy grows exponentially to infinity. To avoid this awkwardness, the model postulates that photons are massless particles. But according to the same formula, if the mass value is zero, then so is

the energy. However, light possesses enormous energy. Reality also insists that the mass of bodies decreases when they emit radiation and increases when they receive energy. How can massless particles transfer mass? We should also not forget that Einstein's model postulates that photons fly in empty space without any physical parameters. The only way out of all these contradictions was to declare photons special kind of entities that can do anything even if contradicts any physical meaning and causality. Thus, a physical theory turned into a system of beliefs in miracles performed by incorporeal angels of light flying in the void.

The current model of light within SM has inherited all the above contradictions but added a wave-particle duality oxymoron to them. Physical sense dictates that waves are the propagation of vibrations in a medium not a flight of bodies in the void. SM postulates that electromagnetic waves can be both. Other waves are physical and require a material environment to propagate in, but these are immaterial and obey the immaterial laws corresponding to their rank. Such 'explanations' cover up a simple fact: contrary to the popular belief that the equation $E=mc^2$ is the greatest achievement of theoretical physics, it has no physical meaning. The energy-mass equivalence principle was drowned in a swamp of dogmas that pretended to be explanations while they explained nothing. The most important question remained unanswered: if energy and mass are equivalent, then what mechanism converts energy into mass and, conversely, converts energy concentrated in matter into radiation?

The chapter offers a new version of the wave theory of light without any duality. The proposed mathematical model contains only wave parameters without any meaningless infinities and zeros. To return the physical meaning to the energy-mass equivalence, the new model proceeds from the laws of wave propagation as an energy relay race in an energy environment. Thus, it prepares an answer to the main question about the formation of matter.

7. Harmony Function.

The all-encompassing energy environment is not only an 'arena' for energy relay race but a 'production site.' The emergence of matter comes from this energy. But it is not enough to say that matter is a form of energy. We need to uncover the mechanism that produces the observed material structures. This question is fundamental to physics as a science about matter and energy. The explanatory and predictive power of the answer determines the success of any theory.

The chapter begins a journey into a new model of the formation of matter structures and fundamental interactions. It formulates the main question in the following way: what is the mechanism that creates harmony out of chaos? Half the battle is to ask the right question. Surprisingly, when asked in this manner, the question contains the answer. Harmony is the mechanism. This may seem like a metaphor that takes away from physics. However, the musical terminology used in the model is not a metaphor, but a physical analogy. The chapter describes step by step the physics of musical harmony and how it creates order from vibrations of energy with different frequencies and phase trajectories. It also contains basic tools for the

mathematical description of this mechanism. Using this foundation, the model begins to describe how the mechanism of harmony works at the macrocosmic levels of matter.

8. The Musical Model of the Atom.

From the harmony of the macrocosm, the model takes a step towards the microcosm of the basic structures of matter. The proposed mechanism explains how the fundamental “tones” of matter form and how they combine into complex harmonies of the “music” of matter, which we call atoms, molecules, elements, substances, compounds, etc. The model also reveals the secret of the octave periodicity of chemical elements without using SM tales about flights and transformations of virtual particles. The mechanism is strictly about the physical interaction of vibrations and waves in an energy environment. It fills the existing atomic alphabet with physical content and explains the integer ratios observed in all stable structures. Postulated but not explained within SM, quantum numbers acquire physical meaning as patterns of energy interactions that create harmony out of chaos.

Theoretical physicist, Herman Weyl predicted a century ago: “I am bold enough to believe that the whole of physical phenomena may be derived from one single universal world-law of the greatest mathematical simplicity.” Perhaps, it is time for the prediction to come true. The proposed theory combines various manifestations of energy interactions and patterns of the emergence of material forms into a self-consistent model based on the idea of a universal physical mechanism of harmony that can be described with the greatest mathematical simplicity. The name of the model is the Theory of Energy Harmony. The name is not metaphorical but speaks directly about the described physical mechanism. This model will be developed further in the next volume of the “Symphony of Matter and Mind” series.