Symphony of Matter and Mind

Part two

Theory of Energy Harmony
Mechanism of Fundamental Interactions

Chapter synopsis:

1. The Fundamental Mystery.

On all levels of energy and matter, we observe the same phenomena of interactions leading to attraction, repulsion, or a balanced state. The ancient 'explanation' attributed them to the activities of the gods of creation, destruction and preservation, or to one god responsible for everything. Then came the era of the scientific approach, and physicists began to consider the phenomena as manifestations of electromagnetic, gravitational, or nuclear forces. However, in order for such an approach to differ from a religious one, an explanation of the physical mechanism of the work of such forces is needed. Gradually physicists switched to the concept of interaction to get rid of a religious connotation in the concept of force. Thus, the central question of physics is the mechanism of fundamental interactions.

Mainstream theoretical physics applies the corpuscular model, which can be briefly described as follows: everything complex consists of simple parts; simple parts in their depths consist of the simplest indivisible parts (particles). Consequently, it formulates the question in the following way: how do those particles interact? To put it briefly, the answer is that these particles exchange virtual particles as carriers of interaction. Astonishingly, this return to ancient animism with spirits behind all phenomena of the world is taken as the Standard Model (SM) of elementary particle physics. Moreover, the mechanism itself remains a mystery as saying that elementary particles emit or absorb virtual particles does not solve the issue. It just produces more questions. How do they emit or absorb if they are indivisible material points? How does the exchange at a distance take place? How does this exchange produce the effects of attraction, repulsion, or balanced state?

Many physicists acknowledge the confusion surrounding the concept of a virtual particle. They also ridicule the understanding of exchange as 'tossing of virtual balls between real balls.' Some describe it as 'ripples in the field' that attract or repel just because they are 'particle ripples' and 'anti-particle ripples.' They take it for an explanation while it is just a circular logic fallacy: particles interact in a specific way because they belong to a certain type determined by how they interact. Meanwhile, the explanation is replaced by diagrams of the

trajectories of virtual particles that are described as flying balls, and the physical mechanism remains a fundamental mystery.

The chapter briefly describes the impasse of the standard paradigm and looks for a way out. We get back to the hypothesis about the mechanism of energy interactions and matter formation offered in the previous part of the study. On this foundation, the Theory of Energy Harmony (TEH) as a unifying model of all interactions will be developed in further chapters.

2. Back to Basics.

Our everyday life is filled with electromagnetic interactions but not a single theoretical model has explained what electricity is. Some physicists take the classical Drude model for a sufficient explanation. It considers electrons as balls in a 'pinball machine' of a conductor that usually fly randomly but start to move in a particular direction due to the attraction or repulsion of the negative and positive charges. Even later updates to the model within the Quantum Mechanics and Standard Model have the concept of the type of charge at their foundation. Here is a short description of all such models. What is the electric current? The movement of particles. Why do they move from each other or to each other? They have the same or opposite sign of charge. Why is the charge of such a type? Because it reflects the direction of particle movement. The logical circle is closed. What needs to be explained explains itself.

The classical model is studied in schools. Fancy versions like the hole theory which includes quasiparticles with a positive charge and the band theory which allows or forbids electrons to occupy certain 'seats' in a conducting material are studied in universities. The problem is that each time the practical technology finds new effects of conductivity or types of conductors these models just update the postulated rules of the 'ball game.' This is a total failure of the explanatory and consequently predictive ability of the models.

It is interesting to note that while mainstream theories play with their favorite balls, practical electromagnetic technologies develop using phenomenological descriptions and laws of conductivity that were worked out by Faraday, Maxwell, Ohm, and other classics who thought of electricity as waves of energy propagation. Today, any electrician will say without hesitation that electricity is the movement of charged particles. Meanwhile, all power line technologies are about making the properties of the conductive medium optimal for electromagnetic wave transmission. This is how the corpuscular dogma works: we work with waves but think of phantom particles. In reality, what moves from one point to another in an electric line is the oscillations of energy (waves) but not parts of the material (particles).

What theoretical physics needs is to return to basics, dump all the 'ball' models into the history bin, and start anew from a wave model perspective. This will make the model of electromagnetism not only adequate to the existing practical use of the phenomenon but also provide better predictions for future development of technologies. The chapter starts a paradigm shift concerning electromagnetic interactions and offers a hypothesis that allows us to unify them with the rest of fundamental interactions.

6. The Hydrodynamic Electromagnetism.

Since the earliest studies of electricity, the hydrodynamic analogy has been the first and most fruitful. The researchers compared it to the flow of water and even called it a special kind of fluid. The mathematical equations that described the interplay of parameters (current, voltage, resistance) of electromagnetic phenomena used the same intuitive analogy. However, problems started when it came to explaining the effects of attraction and repulsion without an understanding of the mechanism of interaction. Thus, the researchers had to use the concept of forces and fields that do this or that in their own unexplainable way. The field equations reflected the observed result and allowed calculations of the effects to be made, so explanation was postponed until better times.

By the end of the 19th century, the tendency to search for particles prevailed, and electricity was declared to be the movement of charged particles called electrons. At the beginning of the 20th century, Einstein declared light to be the flight of particles called photons. Thus, electromagnetic waves as the propagation of energy vibrations in a medium suddenly turned into movement of particles in the void. There is an ambivalence in physics: on the one hand, practical technologies are about continuous processes; on the other hand, theories talk about discrete objects.

It is evident in the analogies used to describe the electromagnetic phenomena. For some of them, the hydrodynamic analogy is used, for others — analogies with balls. The believers in the wave-particle duality oxymoron say that hydrodynamic analogy does not work for the whole scope of phenomena, so the ball analogy must be used. They are satisfied with the logical circle of such a description: charged balls do this or that because they are such and so charged balls. When new phenomena are discovered, they just change the rules of the ball game. When it comes to such phenomena as superconductivity, they even abandon the basic rule that the same type of charges repel and opposites attract. Anything goes to save the model, but the result is that the explanations are not worth a penny and predictions have zero value.

The chapter revives the good old hydrodynamic analogy and shows that it works for all electromagnetic phenomena, including the laws of propagation and interaction. Attraction, repulsion, and balanced states can be explained by the mechanism of interaction of oscillations and waves that is worked out in TEH. Moreover, the model reveals that the same mechanism works in all interactions, including hydrodynamic phenomena that are not considered fundamental. That is why they can be used as an intuitive and vivid analogy for other phenomena where the processes are not available for direct observation. The chapter reminds us about the old experiments in hydrodynamics that have shown a complete analogy to electromagnetism but were ignored by the mainstream for the lack of an explanation. It explains why the classical formulas which describe various interactions with different symbols are identical in essence as they use parameters with the same wave origin. It explains all known electromagnetic phenomena, including those that have not been explained by theories within the paradigms of Quantum Electrodynamics and the Standard Model.

4. The Puzzle of Gravitation.

The previous part of the study already looked at the puzzle of gravity and how physics tried to solve it. To put it short, the Newtonian model provided math descriptions of the observed phenomena to a certain level of accuracy but did not offer any explanation of the mechanism. When the calculations turned out to be insufficiently accurate to describe the new observations, the classical model faced a crisis. It led to the emergence of a new version of the description, which made it possible to calculate complex trajectories with greater accuracy. This purely geometric approach to gravitational interaction was used by Einstein in his General Theory of Relativity (GTR), which is still considered the best explanation of gravity, although it does not explain it at all, but only describes the observed results with tensors of non-Euclidean geometry. GTR postulates that gravity is not an interaction, but a consequence of the curved geometry of space-time fabric, in which all objects in the Universe ride on a 'roller coaster.' This error of objectification when the spatiotemporal parameters of interacting bodies are considered as separate objects 'space' and 'time,' has been around for millennia. Einstein simply combined these phantoms into one.

Even SM with its tendency to come up with a virtual particle for any interaction cannot compete with GTR. Invented within its framework, the phantom graviton without mass and charge is a spirit of a lower order compared to the universal phantom of space-time fabric, which curves the way it wants, causing physical bodies to move. It comes as no surprise that all the attempts to 'marry' two models fail as they speak of different intangible entities. Moreover, modern 'quantum gravity' models that try to incorporate GTR notions into the world of particles come up with new virtual entities. One of the founders of such a model, Lee Smolin, who started his research with a task to make sense of Quantum Mechanics and investigate how particles could emerge from spacetime geometry, had to confess: "Sooner or later, tangled in the web of new snames and naminos, you begin to feel like Sbozo the clown. Or Bozo the clownino. Or swhatever. All we had was a list of hundreds of thousands of distinct theories, each with many free constants. Worst of all, there was not a single prediction made that might be confirmed or falsified by a doable experiment."

The chapter describes in detail this sad clownery that theoretical physics has become, in order to illustrate the following fact. Despite the complex mathematics that describes the omnipotence of invented virtual entities, neither GTR nor SM can explain the physical mechanism that lies behind the observed interactions and existing structures. Gravity is not an illusion caused by curves in the phantom fabric of space-time. It is also not about the emission and absorption of virtual gravitons by real objects for their interaction in the void. Gravitational phenomena are the result of physical interaction in an energy environment, which leads to attraction, repulsion and an equilibrium state, depending on the parameters of the interacting elements themselves and the environment. The chapter returns to the hypothesis about the celestial harmony offered in the previous part of the study, which allows further steps for incorporating gravitation into the unified model of TEH.

5. Solving the Puzzle.

When looked upon from the classical model perspective, the puzzle of the 'force of attraction' contains several paradoxes. If it is an external force acting upon things, it cannot be an interaction of these things. But all the equations describe the interaction of bodies and include their parameters. The equations also contain the distance parameter but the model does not describe any environment that could mediate this interaction at a distance. The model looks at gravitation as a mysterious propagation of some intangible force in the void. One more paradox is that all other fundamental interactions are two-way but gravitation, as the name suggests, is one-way. Why then the Universe does not collapse in a gravitational singularity?

Einstein tried to solve these paradoxes. He declared that gravitation was not an interaction of material bodies but an action of a transcendent entity called space-time fabric. Thus, his model speaks of an omnipotent external force, and his equations do not contain the parameters of the interacting bodies. The distance parameter is not included in his equations either. The question of interaction at a distance does not even apply to the model, as the fabric is also omnipresent. It curves how it wants and where it wishes. GTR is not a theory of gravitation as the mainstream calls it but a mathematical description of these curves that does not include any physical parameters.

To avoid the problem of a gravitational collapse that is not observed in reality, Einstein introduced into his equation an arbitrary variable called 'cosmological constant' (lambda) to stabilize the curves of space-time fabric. His followers took this math trick for a real thing and began to play with different values of lambda. Upon this game with an arbitrarily inserted term rests the Standard Cosmological Model with its infinite and zero values of gravity leading to all sorts of ideas about the Universe appearing out of nowhere and expanding into nowhere, big bangs that create everything and black holes that swallow everything. Meanwhile, galaxies, stars, and planets keep on moving in their orbits waiting for us to solve their puzzle. It cannot be solved if we avoid the question of the physical mechanism behind the observed dynamics.

The chapter proposes a model of gravitational interaction based on the TEH hypothesis of a universal mechanism that does not lead to any paradoxes. It shows why classical equations (for example, Newton's and Coulomb's laws) describing various interactions are identical, although they use different symbols. It returns physical meaning to them and explains the processes leading to the ratios of physical parameters expressed in them. It also explains why they do not work for nonlinear processes with many parameters and for systems with many bodies. The mathematics used to describe the proposed mechanism allows it to avoid the disadvantages of classical models. The new model does not include any virtual entities or arbitrary variables. It has self-consistent simple mathematical solutions that describe attraction, repulsion and balanced states of interacting elements, which depend on the parameters of these elements and the energy environment between them.

6. The Nuclear Muddle.

From the macro level of gravitational phenomena, we descend to the micro level of basic forms of matter. Within the SM framework, nuclear reactions are interpreted as particle collisions accompanied by the emission or absorption of virtual particles carrying energy. The result is described as a change in the balance of the 'balls' flying in the void over distances that are enormous compared to their size. The question of how these virtual entities transmit real energy in the void without any physical substantiality remains outside the scope of the model. SM is only good at producing equations in which the number of virtual particles and their properties are adjusted to the actual result. Each time a new empirical observation arises, the model inevitably comes up with a new virtual particle, changes the rules for the old ones, or applies a math trick of renormalization that hides inconsistencies under the rug. The illusion is created that the model's descriptions work, but the fact is that they contain arbitrarily introduced parameters and do not have any self-consistent structure. Thus, the model does not have explanatory and predictive power. It is a total failure of theoretical physics.

Meanwhile, actual nuclear technologies are based on interactions of physical waves as continuous energy processes in the medium and not flight of discrete virtual messengers of energy in the void. When an experiment produces results that do not correspond to the predictions of SM, a practical researcher has a choice to either declare a discovery of a new particle and get a guaranteed Nobel prize or to take these discrete measurements of a continuum for what they are and be ignored by the mainstream. Every time a theoretical physicist learns about such a discovery, he has a choice to either insert this new beast of the particle zoo into a fancy equation that is guaranteed to get a Nobel Prize or think about the physical mechanism underlying the observed and be ignored by the mainstream, which is marching under the slogan 'shut up and calculate.'

Here is how one of the few physicists who decided not to shut up, Lee Smolin, described the workings of the mainstream: "You work on it even though you know it's not the real thing. Meanwhile the company is charming and the food is good." For a person who is far from physics, this will sound like 'a bolt from the blue,' since there is a myth in the mass consciousness that nuclear technologies are based on physicists' understanding of the processes. For those who know the real state of affairs, such a confession of a physicist is a statement of the fact that leading theories have nothing to do with reality. Theoretical physics is muddled by its own phantoms and practical physics has to go through the dangerous path of trial and error in the dark due to the lack of a model of fundamental energy interactions.

The chapter not only describes the muddle but also begins to look for the way out. TEH provides a new perspective for purposeful practical research based on the model of the universal mechanism of energy interactions that works on all levels of energy and matter, including the nuclear ones. The chapter exposes to the light of a new model the experiments from the early days of radioactivity studies at the end of the 19th century to modern research on controlled nuclear fusion that could solve the energy problems of humankind.

7. The Way out of the Muddle.

The proposed model means a cardinal paradigm shift. This sounds grandiose, but when looked at with hindsight it may even seem trivial as the proposed mechanism is literally before our eyes as its manifestations are everywhere. The only problem is that the mainstream has the blinkers of dogmas on its eyes. The research that studies this mechanism is on the sidelines. Even physicists who suspect that it is a universal mechanism do not enter the mainstream area of interest in fundamental interactions as if it is taboo. We cannot say that these researchers follow some strict order not to apply the idea to fundamental interactions. The reason why they don't is that it cannot be applied to discrete objects in the void as it speaks about processes in an energy environment. It does not apply to SM beliefs in magical transformations of particles that appear out of nowhere and annihilate into nowhere as this mechanism speaks about energy interactions with physical causality. So, the only way to make a paradigm shift and return physical meaning to physical theories is to forget about the dogmas of the corpuscular model of the world.

Albert Einstein wrote in 1910: "The only way to arrive at a satisfactory theory is to give up the notion of a medium filling all the space. This is the first step to be taken." From this first step into nothing, all beliefs in supernatural mechanisms that could magically transfer energy across the void followed. After a century of fairy tales that theoretical physics has turned into, we must make the step that is exactly the opposite. The only way to arrive at a satisfactory theory is to give up the notion of empty space. Nature keeps on stubbornly producing evidence that speaks of the continuous nature of the fundamental processes but mainstream keeps on stubbornly repeating mantras about discrete objects flying in the void and zealously defending the meaningless dogmas. They know that it is not the real thing but the food is good and prizes keep on falling into their hands from the horn of plenty.

The main argument against the existence of this all-encompassing energy environment is that we do not see it. It is a strange argument as many energy processes that are not available for direct observation are considered by the same people as real and existing. For example, the air of the atmosphere was thought to be empty for ages but now we know about its physical substantiality. If some ranges of the environment's signals are not processed by us yet, it does not mean that it is an "empty space without any physical quantities" as Einstein postulated. If we widen our range of signal processing it may become available for observation. This assumption does not contradict physical meaning and causality. Canceling the idea of emptiness is not a negation but an affirmation.

Taking this first step, the chapter gives a range of empirical tests that confirm that fundamental interactions are about waves in a medium filling all the space. It goes from studies by classics to modern research. TEH offers an explanation for all patterns and ratios of parameters observed in these studies which is adequate to reality, mathematically consistent, and has predictive power. The idea of the physical mechanism is the "Ariadne's thread" that helps us get out of the maze of theoretical physics muddle.

8. The Harmonization of Chaos.

This chapter is devoted to the previous studies of the proposed mechanism, thus showing that the new theory is not a ‘heaven-sent’ revelation but has a long history and is grounded on empirical research, theoretical modeling, intuitive and mathematical descriptions made by generations of scientists. It just takes their ideas a little further, thus overcoming the pathological state of disintegration and segregation of various fields of study.

The Theory of Energy Harmony claims to combine all phenomena of energy interactions into a coherent model by looking at them as processes in a continuous oscillatory energy environment with various levels where parameter details differ, but regularities are the same as they are manifestations of the universal physical mechanism. It gives an answer to the question of how laws of harmony create order from chaos. This harmonization of our views on reality may lead to harmonious interaction with this reality.

The chapter also contains bridges to the following volumes that will take us from non-living to living matter, starting from the general levels of description and going down to the finest physical and technological details on how living systems form, function, develop and adapt to the world in which they exist.