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Problems of the foundations of physics

Hossein Javadi

Independent researcher and founder of CPH theory, Tehran, Iran

Javadi_hossein@hotmail.com

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Introduction:

When the foundations of science are faced with new problems, only a revolutionary and fundamental theory can solve these problems. Since the middle of the last century, physics has faced unanswered questions. At first, physicists thought they can solve these problems within the framework of existing theories, but this is not the case today. Recently, articles have been published that challenge the foundation of physics. But what are the foundations of physics, which is facing the challenge? To answer this question accurately, it is better to refer to the historical background.

In the late nineteenth century, the wave theory of radiation and Galilean relativity could not solve the problems of physics. In other words, the assumptions of classical mechanics were not consistent with new experiences, these problems were not mathematical problems but merely were physical. Because math is a tool for physics, and math cannot determinate physical formula. In fact, physics dictates its rules to mathematics. Problems today are also physical, not mathematical. For this reason, CPH theory is based on physical assumptions that are inconsistent with new experiences.

Problems of the foundations of physics

1. What do physicists say about the foundation of physics?

Usually, physicists are resisting to questions that challenge the physics foundation. But the advancement of laboratory tools is much faster than theorizing in physics. This has led to a mismatch between experience and theory in physics. This difference is much more pronounced in the microscopic world than in the macroscopic world. In the last century, we have undergone great changes in quantum mechanics, but not in special and general relativity. Over the past century, we have witnessed developments such as the new quantum mechanics, the theory of quantum fields, and the standard table of fundamental particles. But the principles of special and general relativity have not changed.

This means, there is no coordination between valid theories which its effects can be seen in unanswered questions and new challenges in physics. “In the foundations of physics, we have not seen progress since the mid, 1970s when the standard model of particle physics was completed. Ever since then, the theories we use to describe observations have remained unchanged”. (Hossenfelder S. , 2020)

“The major cause of this stagnation is that physics has changed, but physicists have not changed their methods. As physics has progressed, the foundations have become increasingly harder to probe by experiment”. (Hossenfelder S. , 2020)

“The consequence has been that experiments in the foundations of physics past the 1970s have only confirmed the already existing theories. None found evidence of anything beyond what we already know”. (Hossenfelder S. , 2020)

“But theoretical physicists did not learn the lesson and still ignore the philosophy and sociology of science”. (Hossenfelder S. , 2020)

“And so, what we have here in the foundation of physics is a plain failure of the scientific method. All these wrong predictions should have taught physicists that just because they can write down equations for something does not mean this math is a scientifically promising hypothesis. String theory, supersymmetry, multiverses. There’s math for it, alright. Pretty math, even. But that doesn’t mean this math describes reality”. (Hossenfelder S. , 2020)

“Physicists need new methods. Better methods. Methods that are appropriate to the present century”. (Hossenfelder S. , 2020)

2. Inefficient models in new physics articles

New experiments are to find the weaknesses of theories, not to accept the validity of theories. For example, when Andersen discovered the positron, the matter-antimatter theory was confirmed. The problem today is not the correctness of the Dirac equation, but the problem today is to know what the relationship is there between the photon structure and the particle-antiparticle pair. *(Hossein Javadi, 2013)*

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“In the middle of the century, two new forces were discovered deep within the atom (the strong and weak nuclear forces). Finally, in the century's last decades, we got the Standard Model of particle physics - an accounting of all the particles and forces known to exist in our universe. But the new century brought a rough patch. Yes, there have been some remarkable findings, including the 2012 discovery of the Higgs Boson and the discovery of gravitational waves four years later. But those triumphs were based on theories developed decades earlier - a full century earlier in the case of gravitational waves. And new ideas like string theory (which holds that matter is made up of tiny vibrating loops of energy) remain unverified”. (Falk, 2018) "Has the love of "elegant" equations overtaken the desire to describe the real world?" (Falk, 2018)

"Physicists today write a lot of papers, build a lot of (theoretical) models, hold a lot of conferences, cite each other - you have all the trappings of science, for me, physics is all about making successful predictions. And that's been lacking". Says Neil Turok, director of the Perimeter Institute for Theoretical Physics in Waterloo, Canada. (Falk, 2018) "Theoretical physicists used to explain what was observed. Now they try to explain why they can't explain what was not observed. And they're not even good at that”. (Falk, 2018)

3. The solutions to Problems of the foundations of physics

In the late nineteenth century, the Michelson-Molly experiment challenged Galileo's relativity, and phenomena such as the ultraviolet catastrophe and the photoelectric effect challenged the theory of classical radiation. All the physicists' efforts to solve these problems were in vain until the two assumptions of the wave radiation and the absolute reference frame of the ether were revised and replaced by new assumptions. Physicists were not prepared to accept new assumptions and principles, for example, Einstein explained the photoelectric phenomenon using the quantum theory of energy, but the acceptance of this explanation was even opposed by Max Planck, the founder of the quantum theory of energy. In the 1920s, even the old theory of quantum mechanics did not meet the new needs until the new quantum mechanics was formulated.

In the last century, physicists have been trying to combine quantum mechanics with general relativity, but have unsuccess. Why didn't they succeed? Where are the drawbacks? To find the answer to this question, we must note that classical mechanics works well for large objects. But large objects are also made of quantum particles. So we can generalize our understanding of large objects to quantum particles. In other words, ignoring the classical mechanics in the unity of theories was not right and we should try to combine classical mechanics, general relativity, and quantum mechanics. And this is far beyond the standard model of fundamental particles. Since the introduction of relativity and quantum mechanics, it has been generally accepted that the description of quantum mechanics is more fundamental, and the theory of relativity must be modified accordingly. Two physicists, Andrzej Dragan from the University of Warsaw and Artur Ekert of the University of Oxford published a paper entitled "The Principle of Quantum Relativity" and they showed that the strange behavior of particles, which is explained in quantum mechanics, can be explained in the context of the theory of special relativity. *(Andrzej Dragan, 2020)* From this experiment, we conclude that the world of physics is not limited to observable phenomena and quantum particles. On the sub quantum scale, where particles produce fields, speeds exceed the speed of light. There, the interaction between real space-time and virtual space-time takes place, and without using the principle of uncertainty, we can explain the strange phenomena of the quantum world using relativity. This is exactly what was done years ago in CPH theory. *(H. Javadi, 2014)*

Today, scientists want to know why galaxies are moving away from each other, and at the same time, they want to know why, as the distance between neutrons and protons in the nucleus of an atom changes, so does the behavior of forces, sometimes becomes attraction and sometimes repulsion. In CPH theory, there is a close relationship between the acceleration of the universe and the strong interaction in the nucleus of the atom. A new look at open challenges in physics, chapter 1 of (Javadi, 2020)

In the standard model, particles are assumed to be point-like and unstructured. Each particle has at least one field (gravitational field). This assumption prevents explaining or trying to better understand the relationship between particles and their fields.

In quantum mechanics, quantum field theory is formulated to explain quantum fields. Each field has its own particle, a particle that carries the properties of the field. Quantum field theory cannot explain the properties of these particles and the mechanism of particle exchange.

By limiting the speed to the speed of light c and accepting relativistic mass at the beginning of the 20th century, there was only one way to assume that the rest mass of the photon is zero. If a particle's photon is not completely massless, it cannot move at exactly the speed of light, c, in a vacuum. A massless photon is only an assumption and has no empirical support. Laboratory and physical astronomy observations of the last century in physics are inconsistent with the assumption of massless photons. For this reason, physics nowadays faces problems and unanswered questions, these problems can be resolved when we assume photons have mass and structure. Old assumptions and new experiences, chapter 2 of (Javadi, 2020)

Art Hobson, professor of physics at the University of Arkansas, published a lengthy paper in 2013 showing that all of our assumptions about particles are wrong, in essence, there is no particle in the universe and everything is made of field. *(Hobson, 2013)* If everything is a field, what relation is there between the three quantities of mass, energy, and force (exchange particles in quantum mechanics)?

What are the constituent elements of fields? In other words, what are the properties of the components of these fields that can expand or condense?

How can dense fields produce thinner fields? For example, how do charged particles produce their own dependent electric fields, and how do all particles produce their own dependent gravitational field? With this new approach (that only fields exist) how can we explain all the fundamental forces and mechanisms of their production? In other words, instead of trying to unify forces, by explaining how forces are produced, can the similarities and differences of fundamental forces be recognized and explained? Foundations of CPH Theory, chapter 3 of (Javadi, 2020)

In modern physics, around fundamental particles, including charged particles, it is assumed that there is the electric and gravitational field. But it is not clear how the fundamental particles produce these fields. In modern physics, there is no explanation as to why two positively charged particles repel each other in long distances (relative to the radius of the atom' nucleus) but attract each other in short distances.

How can quantum interactions be explained by the laws of classical mechanics?

Classical physics is consistent with our intuitive understanding that quantum mechanics is not. Along with quantum operators, we can model quantum concepts and apply the laws of classical mechanics with visual assumptions. We have three valid theories, classical mechanics, quantum mechanics, and relativity, which two quantities determine the boundary between them, one is speed and the other is the size if we generalize the speed amount from relativity to the structure of particles, one of the boundaries is removed, and if we explain quantum interactions using classical rules, then the second boundary is also removed.

We know intuitively that there are fields, including electric and gravitational fields. In quantum field theory, each field has its own corresponding particle. For example, the carrier of the electromagnetic force is the virtual photon. If we want to use the rules of classical mechanics, there are two types of positive and negative virtual photons that the interaction between charged particles can be reduced to the interaction between positive and negative virtual photons and explained by Newton's laws. That is, we should explain the interaction between fields. Can this approach be justified by empirical observations and validated theories? There is an easier way. We just need to get our principles and explanations from confirmed phenomena and experiments. Later, using the results, we answer questions that modern physics cannot answer. To begin, we review the equation and the Dirac Sea.

In addition, a very important and significant point in the discussion of fundamental interactions is that quarks can participate in four gravity, electromagnetic, weak, and strong nuclear interactions. Using the structure of fundamental particles, we can define the birthplace of the fundamental forces and explain the reason for the production of strong and weak nuclear forces, the reason for the spontaneously broken symmetry, and the emergence of the four fundamental forces. Birthplace of fundamental forces, chapter 4 of (Javadi, 2020)

There are many problems with astrophysics, including the acceleration of the universe and the explanation within black holes that Newtonian gravitational law and general relativity cannot solve. When we define the structure of fundamental particles, we come to a new definition of acceleration that we can use to define acceleration with a new approach and use it to explain the inside of a black hole and the reason for the relativistic jets of supermassive black holes. The new answer to the old problems of physics, chapter 5 of *(Javadi, 2020)* this is a summary of what is stated in this book The biggest open challenges of physics, and solutions, A new approach to quantum gravity and the unification of forces. I leave the final judgment to the dear readers.

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