

Identifying fundamental problems in Physics – I

Lack of a Comprehensive and Consistent Field Theory

Sunil Thakur

Sunil.thakur@norlabs.org

www.norlabs.org

The biggest problem with theoretical physics is that it does not have a comprehensive field theory. Space is the physical structure of the universe. Unless we understand the structure, we cannot explain the processes that go on in this structure. Several important questions concerning the space remain unanswered. We do not know anything about the fundamental constituents of space. We do not know whether universe is expanding or contracting. We do not have any consistency in defining the relationships between space, matter, motion, and time. We know information is conserved in the universe but have absolutely no idea about the mechanism that allows information to be conserved. We know that distribution of energy in the space is getting increasingly even but we have not identified the processes that lead to equal distribution of the energy. These are just a few issues that we need to resolve concerning field. I am not considering mass-riddle as a major problem because as we will see shortly, it is not a major problem at all.

Physics allows for emergence of objects but what about systems? System function as one unit and communication within the systems is instantaneous for example, any change in the position of the sun is instantly communicated to all the planets and therefore all planets move with the sun at the same velocity within the Milky-way galaxy. Any change in the position of a planet say Jupiter is instantaneously communicated to all other planets. At present, we treat a system as an object that may have independent existence then the object itself like in case of gravitational force, we assume that all stars of a galaxy must exert gravitational force on all other stars and indeed on all other entities in the universe but then we also assume that galaxy in itself exerts its own gravitational force.

Even general relativity, by its very concept, apparently does not explain and account for the existence of systems. A galaxy is a combination of stars that are gravitationally affected by each other but then everything is supposed to be gravitationally affected by everything else. Galaxy cannot have its own distorted space independent of the distorted space of the stars it is made up of.

Therefore, one of the major issues that we need to resolve is to explain the existence of systems rather than just objects.

Too many important issues concerning a field theory need to be resolved. Unless physics has one comprehensive field theory, it cannot explain either the structural or the functional aspects of the universe.

Let us first start at the macro level and find out whether space is expanding or contracting.

Expansion or contraction of a physical entity mean an increase or decrease in its volume. Volume and mass are not the physical entities per se; they are the properties of a physical entity. An increase or decrease in the volume of a physical entity must be explained through a corresponding increase or decrease in the quantum of physical entity. If the quantum of energy in the universe is neither increasing nor it is decreasing then mass and volume of the universe cannot change.

The density of the universe cannot be same across the space. Like we observe in case of temperature, density in different pockets of the universe can easily be identified through the CMBR anisotropies. Density and temperature are directly proportionate i.e. higher the density, higher will be the temperature and lower the density, lower will be the temperature. This observation can easily be explained through our observations in the black holes and voids. Black holes are the areas of highest density and have maximum temperature in the universe and voids are the areas of very low density and have temperature quite close to absolute zero. In fact, temperature is the function of density or the quantum of matter in a given space. CMBR anisotropies give us clear clues about the density of the matter in different pockets.

Universe must expand in the pockets where density is more than the mean density and must contract where density is less than the mean density of the universe. If first law of thermodynamics is valid then net volume of the universe must remain constant unless we find the zones of absolute vacuum, the zones in which energy does not exist in any form whatsoever. Since we have not discovered any pockets in the universe where absolute vacuum exists therefore we can be quite certain that volume of the universe is constant. Not surprisingly, we get evidences of both the expansion and contraction in the universe. Every physical quantity is conserved in the universe then how is it possible that only volume changes?

We must realize that complex problems can have simple solutions.

Everything physics in this universe is only a form of energy; energy is all that exists in this universe and mass and volume are inherent properties of energy. From where does the mass-riddle appears?

Standard model assumes that fundamental particles of the universe do not have mass. If a physical entity does not have mass then it cannot have volume and if it does not have mass and volume then it cannot have energy because mass and volume are inherent properties of energy. Does energy has particle nature?

Well, Planck suggests that energy is absorbed and emitted in little packets or quanta. These packets obviously must have particle nature as has been demonstrated by Einstein. Now, we need to find out what these packets are made of? Energy may be absorbed and emitted in energy quanta but in what form does energy exist? If anything has mass and volume then it must have particle nature but we will explore this issue shortly after we find out how matter emerges in the space.

Now, let us look at the most important relationships of all – the relationship between space and matter.

Einstein has resolved all the issues pertaining to this relationship in just a few sentences. Einstein suggests,

*“Physical objects are not in space, but these objects are spatially extended. In this way the concept 'empty space' loses its meaning. **The field thus becomes an irreducible element of physical description, irreducible in the same sense as the concept of matter (particles) in the theory of Newton.**”*

*“**According to general relativity, the concept of space detached from any physical content (matter, objects) does not exist.**”*

*“**Since the theory of general relativity implies the representation of physical reality by a continuous field, the concept of particles or material points cannot play a fundamental part, nor can the concept of motion. The particle can only appear as a limited region in space in which the field strength or the energy density are particularly high.**”*

As we all know, as per general relativity, all objects are mere spacetime structures. As per Einstein, matter is distorted space. Once this relationship is established, it is difficult to imagine how Einstein arrived at the idea of matter distorting space. With this basic setup, let us understand the process that creates this confusion.

The duality emerges from the last sentence of Einstein's last quote wherein Einstein suggests that particle emerges as limited region in space in which the field strength or the energy density are particularly high. It is quite apparent from Einstein's observation that even in this observation, he is not suggesting that space and matter are two different entities but at the same time he creates a distinction between the two complementary parts of space – one with high density and another with low density. Space with higher density is perceived by us as matter and space with lower density is perceived by us as space.

The higher density zone has its own complementary zone of low density and this complete space becomes a system. Further density variations can exist within this space as well and therefore this space takes the form of objects at different coordinates. Every distorted space, whether it is just an atom or whether it is a supercluster of galaxies, has

its own complementary distorted space. High density zones are perceived by us as objects and low density zone as space. Both in combination form a system.

However, this model creates a minor theoretical problem. For density variations to exist in the space, it must have two constituents. One constituent must have more volume and less mass than the particle. As suggested by Einstein, *“Every element of the physical reality must have a counterpart in the physical theory.”*

The two particles must have complementary properties and hence one of the most obvious and indisputable features of the universe is complementarity.

Now, we need to explain the relationship of space with time, motion, and we have to explain that allows information to be conserved.

One might wonder why I do not consider mysterious nature of dark matter and dark energy to be one of the biggest theoretical problems associated with the space. Unless a field theory allows for the existence of dark matter and dark energy, it can hardly be considered a serious field theory. Well, we will get our answers shortly.

I haven't given any new proposal. I have just put all the undisputed facts concerning space at one place and numerous theoretical problems have resolved themselves. First law of thermodynamics in itself resolves all the structural issues concerning the structural aspects of the universe and second law of thermodynamics resolves almost and probably all the functional aspects of the universe. In our analysis, we just have to hold on to these laws all the time.
