

The Space

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In this article, we have analyzed the structure of ice and the behavior of electromagnetic and sound waves in the ice to show that the apparent emptiness is not really empty. The matter exists in imperceptible form as part of all the physical entities.

What is space? Does something substantive but imperceptible exist in the apparently empty space or is it just the vast emptiness in which things happen?

Newtonian space is an infinite emptiness in which things exist. In Newtonian physics, the space is a passive entity.

Einstein changed the concept of the space by suggesting that the space is an active participant in the physical world. Its character determines how things behave.

In the theory of relativity, the space may behave like a fabric, but it is still nothing but emptiness.

The special theory of relativity suggests that the matter can be created from non-material forms of energy and the general theory of relativity proposes that the empty space can be curved and twisted. However, the theory of relativity does not explain how something can emerge from nothing nor does it explain how matter can distort and twist the empty space. Einstein does not explain what he means by non-material forms of energy. It is only an imaginary entity in his theory.

Quantum mechanics brings a decisive change in the concept of the space by suggesting that the space is a physical structure.

However, even quantum mechanics does not answer all the questions pertaining to the nature of the space.

Quantum mechanics assumes that nothing exists between two shells of an atom. In fact, quantum mechanics assumes that almost 99.99% of the volume of an atom is empty. Quantum theory also assumes that the virtual particles emerge from nothingness.

However, we have theories that predict the existence of a material/non-material medium that pervades the universe. This media was popularly known as the ether.

Maxwell suggests that a material medium is required for the propagation of energy because the light cannot travel through the empty space. In his later years, Einstein also felt that a material/non-material medium is required for the propagation of light; therefore, he suggested that the ether might exist and that the existence of the ether does not affect the theory of relativity.

The ether is supposed to pervade the universe, which means that the ether theories suggest that the absolute emptiness does not exist in the universe.

Lorentz suggests, *“Indeed one of the most important of our fundamental assumptions must be that the ether not only occupies all the space between molecules, atoms, or electrons but that it pervades all these particles. We shall add the hypothesis that, though the particles may move, the ether always remains at rest.”*^[1]

James C. Maxwell’s feels the need of a material media to allow transmission of light waves.

Maxwell observes, *“According to the theory of emission, the transmission of energy [of light] is effected by the actual transference of light-corpuscles... According to the theory of undulation, there is a material medium, which fills the space between two bodies, and it is by the action of contiguous parts of this medium that the energy is passed on...”*^[2]

Lorentz agrees, *“I cannot but regard the ether, which can be the seat of an electromagnetic field with its energy and its vibrations, as endowed with a certain degree of substantiality, however different it may be from all ordinary matter.”*^[3]

One can see that Maxwell proposes the existence of an imperceptible material medium whereas Lorentz assumes that a non-material medium pervades the universe.

All attempts to discover the presence of any material/non-material medium that behaves like emptiness failed to yield any results. The nature of empty space continues to be a mystery.

One of the problems in the assumption of the existence of a material medium is that the motion cannot exist in a space that is pervaded by a material medium. Einstein explains the problem. Einstein says, *“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...** I consider it quite possible that physics cannot be based on the field concept, i.e. on continuous structures.*

In that case, nothing remains of my entire castle in the air, gravitation theory included, [and of] the rest of modern physics.”^[4]

The problem is that the material points cannot form a continuous structure irrespective of how small they are. One cannot think of marbles forming a continuous structure irrespective of their size. Obviously, the fabric of cosmos cannot have just one fundamental constituent.

The second problem is that the motion cannot exist in a continuous structure because there will be no space for any entity to move irrespective of how small it is.

There is another major problem concerning nature of the space – nature of the expansion of the space.

Evidences suggest that the space is expanding. The expansion is homogenous and isotropic. The matter in the universe is distributed randomly with the most massive galaxies housing quasars bigger than the Milky-way galaxy residing at the farthest ends of the universe whereas some massive voids are distributed randomly across the universe. These voids include the Böötes void, which alone almost 0.27% of the area of the universe.

Therefore, it is difficult to explain how the expansion can be as homogenous and isotropic as it actually is.

The most logical thing about the expansion of the space we can say is that the expansion must slow down with time, but the universe is actually expanding faster and faster. The big bang theory suggests that there was no space before singularity appeared everywhere simultaneously. The space is expanding from the singularity after the first moment when the singularity appeared from nowhere.

The space and time are the two most fundamental concepts of physics. Unfortunately, there is no clarity on either of these concepts.

We will have to turn to chemistry to resolve these problems concerning nature of the space.

Chemistry has its own emptiness. In chemistry, the behavior of water is considered peculiar but predictable. Most things shrink if cooled; accordingly, cooling of the water also causes contraction, but the water contracts only until its temperature reach 4⁰ Celsius; after that, it expands!

The volume increases by a little over 9% at the freezing point.

Chemistry suggests that all the water molecules stay close to each other and move even closer until the temperature reaches 4⁰ Celsius. Further cooling of the water causes the formation of small groups by water molecules. Chemistry suggests that the space between molecules within the groups reduces but the space between the groups increases; therefore, the overall volume of the water increases because of the creation of empty space between groups of molecules.

However, light can propagate through an ice cube/slab. This feature rules out the possibility that the absolute emptiness is created in the ice. The Refractive index of water and ice is 1.33 and 1.31 respectively, which suggests that the light travels *in the expanded volume* at its velocity in the vacuum, but as is evident, no vacuum is created within the ice.

The light not only propagates through all parts of the ice; it actually propagates at a uniform velocity throughout the ice. The propagation of sound through the ice also shows that emptiness does not exist in ice. The sound cannot propagate through the vacuum, but it propagates through the ice at a uniform velocity. They have discovered 15 different types of ice, and interestingly, the sound travels at different velocities in different types of ice.

It means that the structure of the ice is uniform. In other words, the expansion of water is uniform, which is not what the chemistry suggests. The expansion is homogenous and isotropic despite the fact that the distribution of matter in the ice is not uniform.

The only change that occurs at 4° Celsius in the process of the formation of the ice is that the water molecules form bonds and the water expands instead of contracting.

There appears to be an obvious causal relationship between these two factors.

The water molecules cease to behave as individual entities as a consequence of the formation of bonds. A further drop in the temperature causes a more equitable distribution of the groups of ice. Thus, the formation of bonds creates greater symmetry in the structure of the ice.

An important feature of the different types of the ice is that the more equitable the distribution of matter, the greater is the expansion. In other words, the increase in the volume depends on the way the matter is distributed in the universe.

This analysis of the process of formation of ice conclusively proves that Chemistry's assumption that the formation of ice creates empty space between the groups of water molecules is incorrect.

Evidently, the ordinary matter may exist in imperceptible form. Therefore, there is no obvious relationship between the perceptible mass (matter) and volume in a system. Therefore, we need the concept of optical density.

The concept of entropy may help us identify the factor that causes perceptible matter to convert into the imperceptible matter.

In classical physics, the disorder literally means disorder. It is supposed to be about the mess. In other words, the entropy is making the universe increasingly messier. However, analysis of the behavior of ice presents a completely opposite picture. It shows that the disorder is about the more orderly distribution of the contents of the universe.

Boltzmann was first to associate entropy with disorder, but Boltzmann's idea of entropy is about freedom enjoyed by the contents of a system in motion. Boltzmann argues that more ways the contents of a system could move internally, more disorderly the system is.

Richard Feynman describes the concept as follows, “*Suppose we divide the space into little volume elements. If we have black and white molecules, how many ways could we distribute them among the volume elements so that white is on one side, and black is on the other?*

On the other hand, how many ways could we distribute them with no restriction on which goes where? Clearly, there are many more ways to arrange them in the latter case. We measure "disorder" by the number of ways that the insides can be arranged so that from the outside it looks the same.”^[5]

If contents of a system are distributed equitably then, it appears more orderly, not messy.

Another way of looking at the same state is that more equitably the contents of a system are distributed in a system, more disorderly the system is. We can say that the energy tends to spontaneously disperse from being localized to becoming spread out *more uniformly*.

The analysis of the process of formation shows that the matter may exist in imperceptible form. The imperceptible matter does not interact with perceptible matter; therefore, the velocity of light increases in the ice. Therefore, we can say that the particles moving an ice cube enjoy greater freedom.

The expansion of the ice without any change in its contents creates the illusion of creation of empty space in the ice because the matter in it becomes more pervious.

This concept is not different from Boltzmann’s concept.

This analysis explains how motion can exist in a continuous structure without the creation of any empty space. It also resolves the problem of material points forming a continuous structure.

The particle physics can only start from the point the standard model predicts the emergence of particles at different energy levels. The mass is an inherent property of one of the particles, but it may or may not manifest in physical form. Therefore, Higgs mechanism is redundant.

We finally have the evidence of the existence of a material medium that behaves like empty space. The nature of this material medium is substantively different from the nature of the vacuum. This medium is ether or dark matter. Obviously, the ether/dark matter is an integral part of all the systems.

The light may travel in ether at its velocity in the vacuum but the ether or dark matter is fundamentally different from the vacuum because the ether allows transmission of sound. The ether fills the space between the constituents of a system. The vacuum indicates the temporary absence of perceptible matter in a region.

Expansion of ice confirms this observation.

Evidently, the ether does not pervade the universe nor it is a non-material medium. The ether exists without manifesting its existence physically and allows transmission of light and sound.

The vacuum can be created artificially. As already mentioned, the vacuum is a temporary state.

The space is created because of the increase in the entropy. It is a permanent state.

The ether manifests the properties of the matter it is part of, but the space and even the vacuum does not manifest properties of any particular form of matter.

Obviously, ether can be converted back into the same matter from which it has been created, but the vacuum cannot be converted back into matter.

The entropy creates the space. The space or the vacuum exists as a distinctly identifiable region.

The state of order/disorder depends on the amount of the ether in the system. The space and the vacuum weigh nothing, but ether has weight; therefore, it interacts gravitationally with the ordinary matter without manifesting itself physically. This is the fundamental property of the dark matter.

The ether is the normal matter that exists in non-physical and imperceptible form.

A change in the state of order/disorder is reversible, but a change in the entropy is irreversible because it causes a permanent change in the structure of a system. The motion can exist in a continuous structure because the space behaves as if it is empty. The absolute emptiness does not exist in the physical world.

As already explained, we need the concept of optical density because of the presence of the ether.

In the analysis of the behavior of the ice, we had noted that the weight of the water does not change even if it converts into the ice but it is still lighter than the water because of the presence of the ether.

At present, there is no clarity on the concept of the weight. Therefore, we must reexamine the concept of the weight.

The ice is lighter than water because it has less weight than water. The mass may exist in imperceptible form, but if it is part of the normal matter then, it may convert into either the mass or the energy.

The hydrogen atom has most of its mass in the imperceptible form, but it generates lots of energy because its imperceptible mass or the ether converts into energy. Therefore, a hydrogen atom has the smallest nucleus, but it has to be the largest atom.

The weight has to be redefined as the amount of perceptible mass per unit volume.

The lightness and heaviness, the hotness and coldness are relative, not absolute phenomenon. Something may appear hot to one entity if it transfers thermal energy to that entity. At the same time, it may appear cold to another entity if it receives thermal energy from that entity.

The temperature has to be redefined as the rate at which an entity loses thermal energy to another entity. Obviously, even temperature is a relative phenomenon.

The space has a temperature. Nothingness cannot have any temperature.

The universe has not lost all but 4% mass in any matter-antimatter collision. The matter is being lost from the universe because any entity that has temperature loses masses through the blackbody radiation.

Any material medium (even if it exists in the non-physical form) that has temperature radiates energy in the form of blackbody radiation.

CMBR is not the relic of the big bang. The space is a material medium; therefore, it also vibrates at a constant frequency, which is the frequency of the CMBR.

Atoms of even normal elements are losing mass constantly.

To the utter surprise of physicists, a dozen copies of the one-kilogram prototypes are losing mass.

The loss of mass could be detected because the prototypes kept in the same set of controlled physical conditions are losing mass at different rates. Physicists have found a convenient solution to even this problem. It is rather naïve on our part to believe that we can create something that will last for an eternity. The fact is that all the physical entities lose mass constantly.

The reason for variations in the mass is that the physical entities may react differently to the same set of conditions. We have already discussed this feature of the physical entities in one of the documentaries.

As already explained, all entities that have temperature lose mass through blackbody radiation.

A one-kilogram prototype is an object, not a system; therefore, unpredictability in the behavior of the constituents makes the behavior of the whole unpredictable.

We have also shown that the expansion of ice is homogenous and isotropic therefore the electromagnetic and sound waves travel at a constant velocity in the ice.

An increase in the entropy also causes homogenous and isotropic expansion. The homogeneity of the universe and uniform expansion confirms our observation that the expansion is being caused by greater equilibrium in the universe.

This also explains why the density of the vacuum energy is constant despite the expansion of the space.

We have explained that the more equitable the distribution of the matter in the ice, the greater is the expansion.

The amount of matter in the universe is reducing, but the rate at which universe is expanding is increasing because the matter in the universe is being distributed more and more equitably.

The super massive galaxies in the farthest part are merging with each other. The merger of the black holes of galaxies ultimately leads to a situation that such black holes collapse in the form of quasars and lose their mass in the purest form of electromagnetic radiation. This matter is

irreversibly lost from the perceptible universe. The universe is losing perceptible matter at an increasing rate; therefore, the expansion is accelerating.

The virtual particles do not appear from nothingness. The space is a material medium. These particles make up the imperceptible but material space.

The material space vibrates at its own unique frequency. The variations in the frequency result in the emergence of real, not virtual particles. Appearance and disappearance of these particles do not cause a violation of the first law of thermodynamics because the irreducible element of the physical reality is a non-physical entity.

The universe emerges as a physical structure only because the virtual particles do not appear and disappear uniformly. The resulting variations gradually lead to the formation of massive clouds resulting in the formation of galaxies with most of the mass accumulated at the center in the form of a black hole. New galaxies are emerging in voids through this process.

Now, let us move to the next theoretical problem concerning the nature of the space.

Quantum mechanics suggests that the vacuum contains infinite energy, but in reality, the vacuum appears to have only negligible fraction of the predicted amount.

We have already explained the process that creates the dark energy and also the process that is causing the uniform expansion of the space. The expansion of the space is only an effect of the creation of dark energy. Therefore, the amount of the energy is just precise to cause the observed rate of expansion of the space.

Quantum mechanics predicts that the microscopic activity in the space generates energy. The fact is that the space is not empty; it has enough energy to generate the microscopic activity observed by quantum mechanics.

References:

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