

## **MATERIALISTIC VIEWS OF SPACE-TIME AND MASS-ENERGY**

LI ZIFENG\* and WANG ZHAOYUN

*Petroleum Engineering Institute, Yanshan University, Qinhuangdao, Hebei, 066004, China*

*(Received September 18, 2006; In final form May 27, 2007)*

This paper analyzes the unidirectional and symmetrical lapse characters of time and all-direction uniform character of the three-dimensional space. It brings forth the materialistic views of space-time and criticizes the idealistic views of space-time. On the basis of a detailed analysis of mass and energy, this paper reveals that mass is the essence of matter, energy is the nature of the matter world. Mass and energy can't transform from one to the other.

*Keywords:* Materialism, time, space, mass, energy

Since long ago, time, space, quality, and energy have always been some of the important philosophical and scientific issues of study. Along with the development of the society, people have been deepening their understanding about all of these concepts. The abstracted view on space-time and mass-energy by philosophers is affecting the mode of how people think and their views on nature (Zhang, 2005). Developing the materialistic views of space-time and mass-energy, abandoning the corresponding idealistic views of these concepts, and liberating people from the idealism can definitely accelerate the scientific development and promote the human ability of understanding the world and benefiting from the knowledge of nature. This end possesses the obvious and unprecedented practical significance.

### **1. TIME IS UNIDIRECTIONAL AND EVENLY PASSING**

Day comes after night; autumn comes after summer; the moon changes from full to crescent; tides go up and down. ... Nature moves and changes without any end in sight, where one event follows another, a process comes after the previous one. From the primitive man's "start working at sunrise and rest at sunset" to the modern man's working around the clock, from the most elementary mechanical movements, namely mutual position changing between objects, to the human cerebrum's, the highest level thinking activities, they all reflect the matters' nature of changing sequence with the sense of before and after, which is the so-called time.

Confucius once commented, "It passes on just like this, not ceasing a day or night!" Author Eddington said that, "Time is very important for it is passing unceasingly." People are always sighing with emotion: How time flies! The down flowing water currents can stop or dry up, can move in their natural direction or be reversed. However, time cannot stop running. It lapses uninterruptedly and unidirectionally, and cannot be reversed. People cannot slow its pace of moving nor make it speed up.

---

\* Corresponding author. E-mail: [zfli@ysu.edu.cn](mailto:zfli@ysu.edu.cn).

Time can be either used or wasted, but people can neither create nor eliminate time. No one can stop or rush time (Xu, 2005). A millionaire's great wealth could not make him rejuvenated; money cannot prevent any one from dying. Everything moves forward, some in a hurry, some leisurely. Even an atom, a nucleon, or an electron, they also keep on moving, participating, varying and balancing. Ancient Greek Heraclitus also spoke of the similar words: "Everything changes and nothing is constant. No one can step into the identical river twice." There are no two totally identical pieces of leaves, even the same leaf is not the same at different time moments. This is the iron principle of the creator and the highest manifesto of the old man, named Time. Modern cloning technology can merely clone the shape or the manifestation, but it is impossible to make identical duplications. Because time is irreversible, an organism's historical process cannot be duplicated. Galileo had such an opinion that: Time does not shift according to people's subjective desire; time is passing anywhere and everywhere in this universe in similar ways. People once had such feeling that, when one is happy, the time passes quickly; when he is bored to death, then he feels that one day can last as long as a year. However, the clock is still walking as before and time is passing as equably as any other moments. That special feeling is just psycho-generated is human subjective illusion. No matter how regardless people expect that time could be slower or quicker, that can only turn into part of their forever recollections.

Time is so charming that it becomes one of most important research topics of modern physics, such as "the black hole time", "the imaginary number time", "the space and time travel," and so on. These discussions are aiming at explaining the concept of time, and are fantasies and too numerous to cite individually. In the year of 1895, Wells, an English renowned fiction writer, first turned human dream into vivid writings in his novel "Time Machine," while in 1905 Einstein proposed the "Theory of Special Relativity," which theoretically "confirmed" the possibility of the kind of ultra space-time travel. Afterwards opinions on the "space and time tunnel", the fiction movies as well as the fiction novels emerged one after another. Perhaps this kind of time travel is meant that people may revise or change their destiny, return to the past world accompanying the appreciation to the glorious cause together, or go to the future stock market to obtain some useful information and experience the lives that they never felt before. But, people might as well think carefully if someone does realize his return in the space and time travel, he has to deny the parents. But how could he come into the world in the first place? The most renowned grandmother theory has that: what if a person did go back to the past and killed his grandmother, putting aside the moral unforgiveness and injustice of his killing? However, this hypothetical scenario can vividly show time travel is impossible. If people reviewed the history, brought back the present advanced weapons to the past to support the antifascist wars in the 20th century, and eliminated the fascism in its embryonic stage, then the world wars of the 20th century would not have occurred, history would be revised, and the historical today would not be the same as today. So, which today should we belong actually to now? What people must face at the present is to get rid of the concept of idealistic time, prevent us from trapped deeper and deeper in its abyss. We should emancipate our mind and clearly recognize that the object the concept of time describes is the irreversible, forward moving characteristic existing the processes of materials' development and changes. It is a vector with "the irreversible forward looking arrow". It has the absolute nature that it is even, continuous, and the irreversible order of advancement (Ling, 2005)

## 2. SPACE IS THREE-DIMENSIONAL AND ISOTROPIC

People got to know the space initially from the volumes that concrete material objects hold. For instance, the static object has certain sized volume, so people say that it holds certain space. The space is just like a vessel that consists of length, height and width. It can not only hold all kinds of things, but also allow the things to move into it. It is exactly the things' movement that further reveals the spatial idiosyncrasy. Therefore, space is the extended reflection of matters' motion and one of the forms of material existence. Each matter takes up a spatial position. Space is a place where matter exists and changes. Natural space is the space that is filled up with moving and changing matter and celestial bodies. Space is not material and does not belong to the class of matter. It is matter that takes up space.

Then why is space three-dimensional?

The archaic Chinese explained that, "The east, west, north, south, up and down are called 'yu', the passage through the ages is called 'zhou'." That is to say, "yu" represents space while "zhou" represents time. What's more, this definition has already indicated that in the whole world, "yu" has front and back, left and right, and up and down, the three dimensions, while "zhou" (the same as "long", time) has only one dimension from past to the future.

It's a common sense that a partial rectangular space can be measured by its length, width and height. But ascertaining a point in space must use three independent coordinates (for example the Cartesian coordinates X, Y, Z). Biological analysis points out that in any advanced organism, the mutual contact among the massive amount of cells must be done through the nerve fibers. If space had only two dimensions, then each organism could only have a two-dimensional configuration, so its nerves would have to interpenetrate themselves as in the streets in a city. At the intersection, different nerves penetrate each other. Therefore, if the third dimension did not exist, one nerve fiber could not be above or under the other. As a result, each nerve excitation would cause mutual interference. That is why there exist a lot of highly developed organisms with non-interpenetrating nerve channels. And, such existence is only possible in at least the three dimensional space. In the three-dimensional space, no matter how many points are given, people can establish non-crossing communications between any two of the points. Then, why can't people live in a higher dimensional space than three? In 1917, Ehrenfest conducted some deep research on this question and started to seek the answer from physical system dynamics. It is confirmed that, when the space dimension is higher than three, that is, in a four- or higher-dimensional space, there cannot be a stable solar system, stable planetary orbits, or the stable atomic conditions. Only in the three-dimensional space can people have enjoyed the solar system, atoms, the molecules, as well as all kinds of the animals and plants, and could people exist. In other words, the real space people live in could only be three-dimensional (Luo, 1984)

In mathematics, each multi-dimensional variable can be called a multi-dimensional space. In physics, there are one-dimensional spaces (lines), two-dimensional spaces (surfaces), and three-dimensional spaces (cubes); but there is not any physical space of more than three-dimensional. Multi-dimensional space in mathematics cannot be transplanted directly to physics. But only when the number of dimension is fewer than or equal to 3 (time not included), a correspondence exists.

The space is isotropic and only isotropic. It can help people recognize an object's concrete shape, size and position. If we assume that the space is not isotropic, then all the things in the world will not have their stable existent forms and there will not be cubes or spheres. Seeing a person in one angle is different of that as seeing from another angle. So, each person would have innumerable faces and appearances, and he could naturally play the trick of face-off.

### **3. TIME AND SPACE ARE ELEMENTARY QUANTITIES USED IN DESCRIBING THE PHYSICAL WORLD**

Human existence and their activities, whatever phenomenon and process people observe from far and near, all appear and develop in time and space. Since human has consciousness, in the course of recognizing and changing the world, they began to describe their activities and the objective world in which they lived in terms of time and space. F. Engels once pointed out that, "The elementary existence forms are space and time. Any existence beyond time and space is extremely absurd." When talking about space and time, natural dialectics says that, "If these two forms of existence leave the carrying matter, there then is nothing left. All is the empty idea and abstraction that exist in people's minds." This statement indicates that time and space are closely related to the material world.

People use time and space to describe movement. From the rotations of the heavenly bodies, to the launch of spaceship, to the ups and downs of tides, to a train's movement on its rails, to the molecular movement, and so on, all materials are in motion. There is nothing absolutely stationary in the universe. Movement is closely connected to time and space. It is nonsense to talk about movement without time and space. We can say that it is just because of the descriptions of time and space that abstract and blurred movements are turned into those that are vivid and concrete, and that complexity becomes simple. Thus, human understanding of the nature is enhanced and brought to a higher level.

Therefore, time and space are the fundamental quantities used in describing the physical world that does not change according to human wills (Shi, 2005; Wang, 2005; Davis, 2002; Guan, 2005; Ridley, 2002)

#### **4. MASS IS THE ESSENCE OF THE MATERIAL WORLD, ENERGY AN ATTRIBUTE OF MATERIALS' STATE**

The concept of mass is derived from people's experience of life. For example, an iron hammer contains more iron than a small nail does; a wooden boat uses more wood than a wooden chair, and so on. The concept of mass is the matter that is deduced from the object. Also the mass of an object does not change with the changes in the object's shape, condition and position. In 1687, Newton in his book, *Philosophiae Naturalis Principia Mathematica*, defined mass as the matter's density times its volume. The more atoms an object holds, the more its mass is. But in modern times, people are apt to use such concepts as inertia mass and gravitational mass. The inertia mass is used to describe an object's inertia. The heavier an object's mass is, the bigger its inertia is; inversely, the lighter a mass the smaller the inertia. The gravitational mass is used to measure the gravitational field an object produces and the effect that other gravitational field put on it. Inertia mass and gravitational mass present two different attributes of an object, respectively. However, they are closely related. Lab experiments indicate that: there is always a positive correlation between the material inertia mass and the gravitational mass, namely the bigger an object's inertia is, the stronger the gravitational field it produces. They do not have any relationship with the object's make-up, its components and structure. At present, many physicists hold the belief that inertia and gravity, two different basic kinds of attributes of materials, are manifestations of identical essence in different aspects. In other words, the object's inertia and gravity originate from object's identical essential – the mass. Therefore, mass is the essence of the whole material world.

The concept of energy is used to represent an object's working ability. It is an attribute of materials' status. Energy takes many forms, like kinetic energy, potential energy, heat energy, chemical energy, electromagnetic energy, atomic energy, and so on. In nature, energy keeps transforming from one object to another, or from one form to another form. In each transformation, an object loses energy, while another object obtains the energy. Potential energy reduces and kinetic energy increases; chemical energy reduces, and heat energy increases; atomic energy reduces, and kinetic energy and potential energy increase. One party loses energy; another increases its level of energy undoubtedly. The total energy is invariant. This is the conservation and transformation of the energy theorem.

Mass is mass and energy is energy. Mass and energy cannot transform between each other. In the world, there is no energy that can be separated from mass, nor mass separated from energy. Any form's energy transfer  $\Delta E$  must be accompanied by a corresponding mass transport  $\Delta m$ . When a negative electron meets a positron, they disappear and transform into a pair of photon. With this kind of atomic energy release, the photon shift together with its mass and energy. The less the mass of an atom which released the energy, the less its energy; the more energy matter receives, the more its mass. The process an atom emits the atomic energy is just like a gun that fires bullets. The bullets shifted together with its mass and energy. The entire process complies with the law of conservation of mass and the law of conservation of energy, respectively. Mass and energy do not transform mutually into each other.

#### **5. CONCLUSIONS**

In summary, people should establish the materialistic views of space-time and mass-energy, clearly recognize that time is unidirectional and cannot flow backwards. We should also abandon the fantasy that time can flow backwards. The space is three-dimensional, isotropic, and there are no four - dimensional or any higher-dimensional spaces that materially exist. Both time and space are objective. Time is not a function of space, and space is not a function of time. So, they cannot be mixed up

together. They are fundamental quantities used to describe the material world, and do not change as soon as they are defined. Mass is one of the materials' essential attributes. It is the quantity an object contains. There is nothing in the world whose mass is zero. As long as it is a matter, its mass must be more than zero. Energy is a status attribute of materials' motion. The material energy takes many forms of existence. Under desirable conditions, energy may transform mutually between the different forms, but the total amount of energy is invariant. Mass and energy cannot transform mutually.

## Reference

- Zhang, J. Q., (2005) Historical attention and expectations on the time-space view. *Theoretical Exploration*, no. 3, pp.21 – 23.
- Xu, S. Z., (2005) On space and time (II). *Invention and innovation*, no. 1, pp.30 – 32.
- Ling, Z., (2005) Discussion on concept of new time. *World Science*, no. 5, pp. 44 – 45.
- Luo, W. Y., (translating). (1984) Why is the space three dimensional?. *Physical Knowledge*, no.3, pp. 8.
- Shi, Z. J., (2005) Dialogue to vacuum. *Matter Regularity (Supplement)*, no. 8
- Wang, G. H., (2005) Persisting in the scientific truth and telling the truth. *The Beijing Theory of Relativity Session the 3<sup>rd</sup> Annual Meeting*, Beijing.
- Davies, P., (2002) *On Time*. Jilin People's Publishing Agency, Changchun.
- Guan, H., (2005) *Space*. Qinghua University Publishing House, Beijing.
- Ridley, B. K., (2002) *On Time, Space and Universe*. Hunan Science and Technology Publishing House, Li Yongyi, Changsha.