

Dark Energy and Primordial Energy

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Abstract

Dark energy has been proposed by cosmologists to explain the accelerating expansion and missing energy density of the universe. In this respect, two models have been proposed – cosmological constant and quintessence. The exact values of these models have not been assigned yet and will depend on further data obtained from cosmic observations.

A primordial energy flow in the universe has been conceived in many cultures – Prana in India, Chi in China, Ki in Japan, Ankh in Egypt, etc. The main focus has been to study its impact on human life, and various techniques and practices have been pursued for thousands of years to cure human diseases with proven success. In this article, an analogy has been attempted between dark energy and the primordial energy of ancient culture, such as Prana, Chi, Ki etc.

1.0 Introduction

In late 1920 Edwin Hubble discovered that the universe is expanding and the rate of expansion of a galaxy is linearly proportional to its distance from the observing point, Earth. In 1998, two independent teams of astronomers found that the expansion of the universe is speeding up. The universe is expanding at an accelerating rate. This acceleration started roughly 5 billion years ago. Since this breakthrough discovery, a new theory is emerging that the universe is filled with a uniform sea of dark energy that counts for two-thirds of the cosmic energy density, which is gravitationally repulsive, and does not appear to cluster in galaxies.

The concept of a primordial energy appears to be universal. It is regarded as the primordial life force itself, and is given different names by different cultures (Prana in India, Chi in China, Ankh in Ancient Egypt, Arunquiltha by the Australian Aborigine, Mana in Polynesia, Pneuma in Ancient Greece, Tane in Hawaii, Orenda by the Iroquois, Ki in Japan, etc.). Atma is another Sanskrit word meaning soul. Atma is the Prana in human life. This article explores an analogy between dark energy and primordial energy.

2.0 Dark Energy

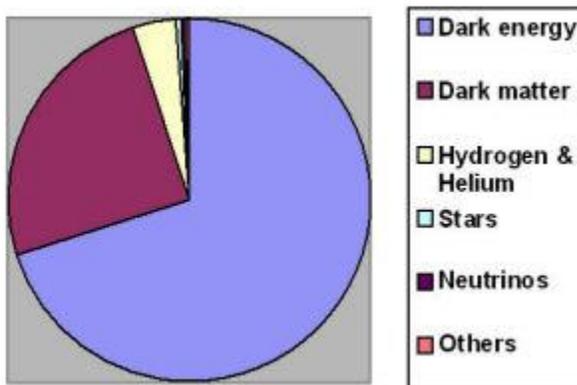
Dark energy is a hypothetical form of energy which permeates the entire universe and has

strong negative pressure. This negative pressure acts in opposition to gravity, and explains the recent observations that the universe is expanding at an accelerating rate. It also accounts for the missing mass in the universe.

Type 1a supernovae provide the most direct evidence of dark energy. As a star burns out, it collapses due to gravity to its small size called a white dwarf. This white dwarf gains mass from a companion star and grows until it reaches the precisely defined Chandrasekhar limit. At this mass, the white dwarf turns into a giant hydrogen bomb and explodes as a type 1a supernova with a characteristic brightness. The observed brightness of the supernovae is measured against their red shifts. The light of the receding distant star and supernova shifts to red due to the Doppler Effect. Measurement of the velocity of the supernova is accomplished by measuring its red shift.

The existence of dark energy also solves the so-called “missing mass” problem.

Measurements of the cosmic microwave background (CMB), most recently by WMAP satellite, indicate that the universe is very close to flat. For the universe to be flat, it must be equal to a certain critical density. The total amount of matter in the universe, as measured by CMB, accounts for only about 30% of the critical density. This implies the existence of dark energy to account for the remaining 70%. The most recent observations by WMAP satellite estimate that the universe is made up of 74% dark energy, 22% dark matter, and 4% ordinary matter as shown in Figure 1. The Wilkinson Microwave Anisotropy Probe (WMAP) is a NASA Explorer mission measuring the temperature of the cosmic background radiation over the full sky with unprecedented accuracy.



Dark matter has been proposed by the scientists to explain the fast spin of the galaxies. The spin of the galaxy is too fast to hold the galaxy together by the gravity of the stars in the galaxy. So there is certain amount of dark matter in each galaxy that holds the galaxy together.

The exact nature of the dark energy is a matter of speculation. Dark energy is very homogeneous, not very dense, and does not interact strongly through any of the fundamental forces other than gravity. Its density is roughly 10^{-29} grams per cubic

centimeter. Dark energy can have such a profound effect on the universe since it uniformly fills otherwise empty space. The leading models of dark energy are cosmological constant and quintessence.

2.1 Cosmological Constant

The cosmological constant, denoted by the Greek letter Λ (Lambda) is a parameter describing the density of the dark energy [1]. Since, energy and mass are related by $E = mc^2$, Einstein's theory of general relativity predicts that it will have gravitational effect.

The cosmological constant has negative pressure equal to its energy density and so causes the expansion of the universe to accelerate. The reason why a cosmological constant has a negative pressure can be explained from classical thermodynamics [2]. The work done by a change in volume dV is equal to $-pdV$, where p is the pressure. But the amount of energy in a box increases when the volume increases, because the energy is equal to rdV , where r is the energy density of the cosmological constant. Therefore, p is negative and, in fact, $p = -r$.

The value of the cosmological constant is an empirical issue which will ultimately be settled by observation. However, it is estimated by cosmologists to be of the order of 10^{-29} grams per cubic centimeter. The cosmological constant was proposed by Einstein to obtain a stable solution of the gravitational field equation in the theory of general relativity that would lead to a static universe. But, later, the observations by Edwin Hubble discovered that the universe is expanding and not static at all. Einstein famously referred to his failure to predict the idea of a dynamic universe, in contrast to a static universe, as his greatest blunder. However, there is renewed interest in the cosmological constant after the recent discoveries of the accelerating universe which leads to a different value for the cosmological constant.

2.2 Quintessence

Quintessence differs from the cosmological constant in that it can vary in space and time [2]. If cosmic acceleration began earlier in the universe, structures such as galaxies would never have had time to form and life, as we know it, would never have had a chance to exist. Quintessence has a tracker behavior, which solves this problem. In this behavior, the quintessence field has a density which closely tracks (but is less than) the radiation density until matter-radiation equality, which triggers quintessence to start behaving as dark energy, eventually dominating the universe.

3.0 Primordial energy

The primordial energy is considered as the vital force of life in different cultures. It is called Prana in India, Chi in China, Ki in Japan etc.

3.1 Prana

Prana is derived from the combination of two Sanskrit words, pra: first unit, na: energy.

Prana is the infinite, the all-pervading energy of the universe. All the forms of the universe are sustained by the energy of Prana. Pranayama is another Sanskrit word which literally means the "ayama," i.e., the expansion or manifestation of Prana. Pranayama is practiced by the control of breath.

Prana is in all things, whether animate or inanimate. It is the energy essence of the air we breathe. In human life, the energy of Prana includes both physical and mental energies sustaining both body and mind. Prana is the force which holds together the elements of the body and assists in the cohesion of the atomic particles of the body. Prana is the cause of all functions of the body and mind. If Prana recedes from any part of the body, that part loses its function. Prana in an individual body is called Atma or soul. At the death of an individual, Atma exits the body and mixes with the Prana of the universe.

In India the chakras were discovered, and the intricate energy system supporting and interconnecting them. Techniques were developed to use that knowledge, e.g., yoga and mudras. Many of these techniques entered into use in other countries as well. Chakras are centers of energy located at the mid-parts of the body. Mudras are positions of the body that have some kind of influence on the energies of the body, or your mood. Mostly the hands and fingers are held in some position, but the whole body may be part of the mudra as well.

Physicians and scientists are discovering brand new health benefits of Yoga everyday. Studies show it can relieve the symptoms of several common and potentially life-threatening illnesses such as arthritis, arteriosclerosis, chronic fatigue, diabetes, AIDS, asthma and obesity. Regular Yoga practice creates mental clarity and calmness, increases body awareness, relieves chronic stress patterns, relaxes the mind, centers attention and sharpens concentration. According to medical scientists, Yoga therapy is successful because of the balance created in the nervous and endocrine systems which directly influences all the other systems and organs of the body. Yoga acts both as a curative and preventive therapy. The very essence of Yoga lies in attaining mental peace, improved concentration powers, a relaxed state of living and harmony in relationships.

3.2 Chi or Qi

Chi or Qi (pronounced "Chee" and henceforth spelled "Chi") is the Chinese word used to describe "the natural energy of the Universe". This energy, though called "natural," is spiritual or supernatural, and is part of a metaphysical, not an empirical, belief system. Chi is thought to permeate all things, including the human body.

Theories of traditional Chinese medicine assert that the body has natural patterns of Chi that circulate in channels called meridians [3]. Symptoms of various illnesses are often believed to be the product of disrupted, blocked, or unbalanced Chi movement through the body's meridians, as well as deficiencies or imbalances of Chi in the various organs.

Traditional Chinese medicine often seeks to relieve these imbalances by adjusting the circulation of Chi in the body using a variety of therapeutic techniques. Some of these

techniques include herbal medicines, special diets, physical training regimens (qigong, Tai Chi, and martial arts training), massage to clear blockages, and acupuncture, which uses fine metal needles inserted into the skin to reroute or balance Chi.

Vitalism is a popular philosophy in many cultures. Thus, Chi has its counterpart Ki in Japan.

Although Chi is based on the concept of metaphysical healing, it is believed that negative mental patterns and energies, when left unchecked, can eventually result in physical disease or illness. The reversing of those negative mental patterns and energies into positive ones can in turn lead to actual physical healing. Though western medicine is reluctant to accept the notion of metaphysical healing, there is little doubt about the connection between mind and body. Doctors routinely tell patients to keep spirits high and support visits from family and friends as part of healing. Physicians understand that anything that makes a patient feel better, mentally and emotionally, aids in healing. Many studies show that, in contrast, depression tends to slow healing.

4.0 Analogy between Dark Energy and Primordial Energy

In science, theories are proposed when certain phenomenon is observed. Hence, dark energy has been proposed by the cosmologists to explain the accelerating expansion and missing mass of the universe. Similarly, dark matter has been proposed to explain why the galaxies hold together in spite of their rapid spin. Cosmologists estimate that the acceleration began roughly 5 billion years ago. Before that, it is thought that the expansion was decelerating, due to the attractive influence of dark matter and stars. The density of the dark matter in an expanding universe decreases more quickly than dark energy, and eventually dark energy dominates. When the volume of the universe doubles, the density of dark matter is halved but the density of dark energy is nearly unchanged according to cosmological constant.

Scientists do not know what dark energy consists of, or what is its appearance, its nature and its effect on human life. All they know that this form of unseen and unexplored energy has an antigravity force and explains the accelerating expansion of the universe. If another phenomenon is observed which the current attributes of dark energy can not explain, then these attributes will be modified or altered to explain the new phenomenon and so on, as we have seen with the cosmological constant.

Einstein first proposed it in his General Theory of Relativity to explain the static universe. However, this was abandoned when Hubble discovered the expanding universe. But, after the accelerating expansion of the universe was discovered, cosmological constant has been revived to explain the accelerating expansion of the universe.

Modern science tells us that the human body is not just a physical structure made of molecules, but is composed of an energy field. The biofield is the frontier of frontier of modern science, and the development of new diagnostic and treatment systems. Since dark energy composes 74% of the universe and has antigravity force, it should have an effect on the biofield. But, this area has not been explored by scientists yet. Once, the true nature and

form of the dark energy is known, then we will be able to explore its effect on the human biofield.

In contrast, Prana or Chi or Ki has been proposed by the sages or wise men in various cultures as primordial energy which pervades the whole universe and permeates life. It is eternal and is the creating force of the universe and its life. Most of the work related to this all pervading energy was focused on its effect on human life. As mentioned earlier, the primordial energy is the force which holds together the elements of the body and assists in the cohesion of the atomic particles of the body. Prana is the cause of all functions of the body and mind. It creates the biofield. In the human body, Prana is called Atma. In Chi, it is the energy that flows through the meridians of the body. When that energy flow is hampered, the body becomes ill.

The Earth's strong gravity force is constantly pulling us towards its centre. How do people grow tall acting against the gravity? How do the trees grow so tall acting against the gravity? Why don't we feel that force? When we are standing our head is further away from the earth than our feet. So the gravitational force is stronger on the feet than the head. Why does not the body mass grow more on the feet than the head? The primordial energy in the human body has built the form of the body in such a way that the flow of primordial energy in the body is optimized nullifying the varying effect of gravity on different body parts and making us grow tall. In this respect, it has a similarity to the antigravity force of the dark energy.

Except for proposing that all forms of the universe are sustained by the primordial energy, the sages have not gone into details of the actual mechanism of this function. However, much more detailed exploration has been done in this regard on its effect on human life.

Practices such as Yoga, Pranayam, Acupuncture, Tai Chi, Reiki, Qigong and therapeutic touch have been practiced for thousands of years with significant benefit. All these practices are based on balancing and boosting the flow of the energy in the body with significant proven successes. Scientists, although still skeptical, are slowly accepting the benefit of these practices.

We are constantly taking in the primordial energy (Prana, Chi etc.) from the universe around us by breathing. We are interacting with the objects, people and other life forms around us with activity based on the primordial energy. In this respect, this energy exhibits in forms of both matter and energy. This is based on the concept of duality of matter and wave similar to the theory of quantum mechanics. Our every activity has the duality of matter and wave functions. Physical activity like moving, walking, working etc is related to the matter function; sensual activity like seeing, hearing, feeling, etc. is related to the wave function. Seeing has the wavelength of light, hearing has the wavelength of sound and so on. In any activity, the matter function follows the wave function and vice versa. When we see a car coming, we move. Seeing is the wave function and moving is the matter function. Thus it is similar to the theory of quantum mechanics with the duality of matter and wave.

Current research on dark energy by the cosmologists is primarily focused on explaining the

accelerating expansion of the universe and deriving a value of the cosmological constant. It might be awhile before we understand the form of the dark energy. Its effect on human life and the mechanism of that interaction may be an unsolved mystery for a long time. On the other hand, the control and boosting of the primordial energy in human life has been practiced for a long time with proven benefit. But, the actual form and composition of primordial energy has not been researched or analyzed.

We all know the effect of gravity. Newton's theory stipulates that all of space is filled with an invisible gravitational field extending from every massive object of the universe. Einstein's theory maintains that the fabric of space time is warped because of every massive object of the universe. Earth is deflected from a straight line path by the space time curvature created by the Sun. The extent of the deflection is large enough to cause our planet to circle or orbit the Sun. But, what we don't know is how the gravitational force look or what it consists of. Similarly, we know the effect of primordial energy on human life, but we do not know its form or constituents.

As the current research work on dark energy by the cosmologists continues, we will find out more about its function and form. Similarly, as the scientists are researching on the biofield and its relation to practices like Yoga, Pranayam, Acupuncture, Reiki, Tai Chi, Qigong and therapeutic touch, we will find out more about Prana, Chi or Ki. As the research work on both dark energy and primordial energy continues to find out their forms and nature, it may lead us to the origin and creation of the universe. Also, it may not be absurd to assume that dark energy and primordial energy are one and same thing.

Conclusion

From the discussion presented above, dark energy and primordial energy have the following similarities and attributes.

1. Dark energy density does not change although the universe is expanding at an accelerated rate. Similarly, primordial energy is constant in the universe.
2. Dark energy has an antigravity force which makes the universe expand acting against the gravity of the galaxies. Similarly, primordial energy has an antigravity force which makes the universe grow and expand. Also, primordial energy (Prana, Chi, Ki etc.) in human and biological life forms the prime source of energy and makes these life forms grow and sustain.
3. The exact form and nature of dark energy is not known yet. Currently cosmologists are concentrating on finding out its effect on the universe rather than its effect on life forms. The exact form and nature of primordial energy is not known. All the work so far has been to explore its effect on human life.

4. Energy and matter are of dual nature as given by Einstein's famous equation, $E = mc^2$, where E = energy, m = mass, and c = velocity of light. Hence, dark energy must have its form of matter. Primordial energy is the source of the creation of the universe and all life forms, and the source of energy.

5. Primordial energy is the cause of all functions of the body and mind. Our activity has the dual role of matter and wave. We see due to light waves, and move due to momentum of the body. But this activity is triggered by the primordial energy. Every activity inside the body has this dual role of matter and wave. Primordial energy is the source of biofield, which is a new branch of science currently being pursued. So far, no such research work is being carried out on dark energy.

6. Ongoing research work on dark energy and Prana, Chi, Ki, etc. may lead us to understand the origin and creation of the universe. It may not be absurd to assume that dark energy and primordial energy may be one and same thing.

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