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# Superstring Theory and Other Dimensions

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***Abstract*—** String theory or string theory is a group of modern ideas about the structure of the universe based on complex mathematical equations. The basic structure of the elemental particles, of electrons, protons, neutrons and quarks, is a ring of energy that makes them in a state of permanent instability according to different frequencies, and these strings oscillate and determine the nature and properties of larger particles such as the proton, neutron and electron, the most important point in This theory takes into account all the forces of nature: gravity, electromagnetism and nuclear forces, uniting them into one force and one theory, called the M-Theory.

***Keywords*—** String theory – Superstring Theory – Big Bang – Gravity – Electromagnetism – Nuclear forces

## I. INTRODUCTION

The theory aims to describe matter as different states of vibration of a fundamental string. This theory attempts to combine quantum mechanics, which explains the fundamental forces acting in the world of the small (weak nuclear force, electromagnetic force, strong nuclear force) and the general theory of relativity. Which explains the force of gravity in the world of major sins within one theory, which says that the universe is a world with ten or eleven dimensions, unlike the four dimensions that we feel and that there are 6 or 7 other dimensions, in addition to the three dimensions of our world with time, imperceptible and involving itself. As for this new theory, it believes that the universe is composed of 26 dimensions, which were later reduced to ten dimensions. To illustrate this idea, some people use the example of a water spray hose. When you look at the hose from afar, you only see a zigzag line. But if you examine it closely, you will see that it is a body in three dimensions, as the new dimensions wrap themselves in a very small part.

Based on the superstring theory, the universe in which we live is not alone, but there are many universes connected to each other, and scientists believe that these universes are overlapping, and each universe has its own laws, meaning that one space in our world may be occupied by more than one body, but from different worlds, According to this

 

theory, the universe is nothing but a symphony of super vibrating strings. The universe is a musical instrument. It is possible to know the universe and what is formed through our knowledge of strings and their tones. The universe acts on the pattern of playing strings.

## II. WHAT IS STRING THEORY?

American physicist Alan Guth (born 1947) says that since the universe was born out of nothing and since nothingness extends into infinite spaces, then it is expected that infinite universes will arise in different parts of nothingness. As for the American cosmologist and physicist Martin Rees (born in 1942), he says: Since there are many different worlds, then a world like ours is expected. He gives an example of this. If we enter a clothing store where there are clothes of many different sizes, then it is not surprising that we find a dress of our size. So it is not surprising that there is a world like ours because there are many different worlds.

The strong nuclear force is responsible for binding neutrons to protons in the nucleus of an atom. As it is known, the nucleus is positively charged, and it is therefore scrambling if left alone by the action of the electric force, ripping the knots of the nucleus, and here the strong force intervenes to overcome the mentioned forces and bring the protons closer to each other, in an attempt to reunite the nucleus and to create a kind of delicate balance between it and the repulsive electric force (which seeking to explode the nucleus). When the strong nuclear force is unleashed, catastrophic results arise. For example, when the uranium nucleus is intentionally split in an atomic bomb, huge amounts of energy trapped inside the nucleus are released in the form of a horrific nuclear explosion. A nuclear bomb releases a million times more energy than dynamite, and this is clearly confirmed by the fact that the strong force can generate energy beyond the energy of chemical explosives, which are governed by the electromagnetic force. The strong force also explains why the stars shine because the star is nothing but a huge nuclear furnace in which the strong force is released from the nucleus. If the sun's energy was caused by burning coal instead of nuclear fuel, the sun would only emit a small part of its light and it would quickly melt into ash. Without the sun, the earth would cool down, and all life forms would become extinct on it.

The weak nuclear force, which is the force that controls the decay of elementary particles within an atom and is responsible for the activity of heavy atoms with unstable radiation. Some nuclei, such as the uranium nucleus, which contain 92 protons, have huge masses that lead to their spontaneous decay and release of small fragments and residues in what we call radioactivity. The nuclei in these elements are simply unstable nuclei and tend to disintegration, so there must be another weak force to control the radioactivity and be responsible for the decomposition of heavy nuclei. This is the weak force that is ephemeral and fading to the extent that we do not feel it directly in our lives, but we feel its indirect effects. When we place a Geiger counter near a piece of uranium, we hear a crackling that measures the radioactivity of the nuclei

 

caused by the action of the weak force. The liberated energy can be used by the weak force to generate heat as well. For example, the intense heat in the earth's interior was caused by a particle from the decomposition of radioactive elements deep in the earth's core. This enormous heat, in turn, explodes in the form of volcanoes if it reaches the surface of the earth. Likewise, the heat produced in the core of a nuclear reactor, which can generate enough electrical energy to light an entire city, is also due to the effect of the weak force.

There were deficiencies in Newton's system for explaining the force of gravity. One of them is that the system used to say that the gravitational force is instantaneous, that is, as if there is a rope connecting the Earth to the sun, so the gravitational force does not need a period of time to transfer, and that gravity works only on the huge range, such as planets, stars and galaxies, and this force becomes non-existent in small molecules and within atoms. And although gravity seems to be the most obvious force, it is considered very very weak compared to other forces. For example, we can use a magnet to lift a nail from the surface of the Earth. We note here that this tiny magnet has overcome the resulting gravity from this planet. huge. But Einstein saw otherwise, and that the speed of light is the maximum speed in this universe, so gravity cannot be faster than light, so Einstein gave a more accurate explanation for this gravity, which is that the mass makes a curvature in space and this causes other bodies to roll (attraction) to The mass is on this slope, and this discovery was an introduction to the idea of unifying the forces in this world under one force that governs this universe, but Einstein died before he achieved that.

This theory sees matter consisting of strings, i.e. open rings, and the end of the ring sticks to a membrane or space called bran, which is the universe in which we live, except that the rings that are not attached to the brane are like the theoretical particle Gravitron, which is believed to be the carrier of the force of gravity, it can move away from the bran to go to bran other.

## III. UNITE THE FOUR FORCES

The great goal of physics is to find a theory or a single mathematical relationship with which the four forces become special cases of a single force termed as the super force. Physicists have not been able to unify these two theories completely and satisfactorily. Modern physics is based on two main pillars. The first is Albert Einstein's general theory of relativity, which gives us the theoretical framework for understanding the world in its largest dimensions: stars, galaxies, galaxy clusters, and even beyond the long term of the universe itself. As for the second pillar, it is quantum mechanics, which provides us with the theoretical framework for understanding the world in its smallest dimensions: molecules, atoms, and even sub-atomic particles such as electrons and quarks. Although the predictions preached by each of these two theories have been proven correct, the theoretical means in research have led in an unacceptable way. The argument leads to an uncomfortable conclusion at the same time that general

 

relativity and quantum mechanics deny each other so that only one of them must be right. Thus, the two theories that underlie the tremendous advances in physics over the past 100 years are incompatible.

General relativity sees the universe as a convex spatio-temporal continuum due to the presence of masses as large as the sun; It explains gravity well. As for quantum theory, it is generally concerned with small objects, such as particles, whose convexity into space-time is ignorant of its tiniestness. Gradually the dominant view of forces is an exchange of particles between interacting objects: two electrons repel (electromagnetic interaction) because they exchange messenger photons, not because they antagonize. This view was generalized to the rest of the forces, and it was assumed that gravity flows through the exchange of particles called gravitons. The weak interaction is carried out by W ± and Z particles, while the strong interaction is by exchanging gluons between quarks, the particles that are supposed to make up protons and neutrons. Thus, the project of uniting forces, from this perspective, became synonymous with the search for the basic components of matter.

The first attempt to unify these four forces in the modern era was the attempt to unify the electromagnetic force and the weak nuclear force under the name of the electroweak force. The monotheism was just a mathematical calculation and they deduced a new particle bearing this unifying force and called it z-particle. But the main problem with this unification was the predictions that the two forces would not unite except under very enormous thermal energies, even higher than the temperature of the bottom of the largest stars in the universe. Such heat existed in the period of the Big Bang, but it has been proven that this high thermal energy can actually be produced by colliding a proton molecule with an anti-proton molecule, which led to the emergence of a very huge energy similar to what was the heat of the Big Bang.

After proving the possibility of merging the electromagnetic force and the weak nuclear force, the mathematical predictions continued that if time was returned more back to the beginning of the universe, the temperature would become much more intense, and then the strong nuclear force would also melt due to this heat and unite with the weak nuclear and electromagnetism to be one force and a name The molecule that carries this force is a boson called the X boson. But this molecule has not yet been discovered. In order to unite these four forces, scientists hope to arrive at a set of mathematical symmetries called gauge symmetry, which cannot be described in simple words. Standard symmetry is related to the idea of the calibrator (a level switch or the value of the quantity) and a sentence is characterized by a standard symmetry if the physical nature of the sentence does not change as a result of a transformation of this type, and to clarify the idea some use the example of train travel. We felt a trace of his movement; but if the train turns on a zigzag, we will feel a force that varies from one point to another according to the speed and curvature of the line. If we perform a standard transformation on the effect of rotation by introducing a gravitational field that compensates for the changes from

 

one point to another, we again feel as if the train is stationary despite its rotation, and thus we have made the laws of physics unchanged for local standard transformations related to distance.

The main goal is to unify all the previous forces with gravity. The best candidate theory now is the "superstring" theory, which looks for a supersymmetry (a hypothetical symmetry between bosons and fermions, each fermion has a super-isotope that is a boson and vice versa) that solves the problem. This theory assumes that our world consists of at least ten dimensions: the three spatial dimensions and the temporal dimension, in addition to six new dimensions that we do not see because they are intrinsic (that is, they are very small, only felt by the particles, which allows their identity to be unified). As for the only building block of the universe, it is the “string”, which we can say, in an oversimplified way, that the different particles constitute different “vibrations” of it.

## IV. STRING MODEL

According to this string theory, the contents of the universe are not particles, but very fine, one-dimensional threads like rubber bands of infinitesimal precision, oscillating forward and backward. This theory says that strings are microscopic, microscopic components that make up the tiny particles from which atoms are formed. If this is true, then all forms of matter, starting with our bodies and ending with distant stars, are essentially made of strings. No one has seen these strings because they are the most stray strings that you can see or notice. According to the superstring theory, our world seems to be made of point particles because our measuring instruments are so primitive and simple that you cannot feel these tiny strings. The length of the string, as the proponents of this theory claim, is a hundred billion billion times smaller than the nucleus of an atom. This image is a continuation of the old idea introduced by Murray Gell-Mann and Kazuhiko Nishijima in 1961 that neutrons and protons are made of quarks. Where the superstring theory added that these quarks must be held together by some force, so the picture was that strings were a description of the force that holds the quarks together, like a pluck of rubber. One can imagine that the quarks are bound at the ends of these strings.

The theory states that the string (the basic structural unit of the elemental particles of electrons, protons, neutrons and quarks) is likely to be a closed circular thread and is also likely to be an open thread with two ends. With regard to the three electromagnetic forces, the strong nuclear force and the weak nuclear force, the string is open and with two ends “attached” to the membrane of the universe. As for the gravitational force, the string is a circular string that has no end to connect to this universe, but has the freedom to enter and exit this universe. To clarify, when the magnet attracts the nail from the surface of the earth, the particles that attract the nail to the magnet are fixed on the membrane of the universe. As for the counter force, which is the force of gravity, its particles enter and leave this universe because they are not connected to the membrane, but there is no practical proof for this statement, because these strings are infinitely small and it is impossible to see them, so the only

 

way to test this theory is to search for the predictions of this theory.

Superstring theory is supposed to understand all the early events when the universe began and the Big Bang, where Stephen Hawking believes that the enormous heat of the Big Bang leads to the absence of differences between time and space, and time becomes a space dimension, meaning that time "deflates" in Hawking's words. Hawking relied on imaginary numbers and applied them to the concept of time, at which point time will lose its basic character in its constant flow in one direction (the future), or the so-called arrow of time, and this imaginary time will point in the opposite directions. Hawking imagined that time regresses in special circumstances: this happens, he said, when the currently determined universe stops growing and begins to shrink. In 2002 Hawking wrote his book, The Universe in a Walnut Shell, in which he says that the universe began in the form of a flattened sphere in parts, resembling a walnut shell in size and shape, and that black holes are no longer completely black, but rather they radiate and evaporate to vanish, and where the universe arises from the seed of its size and shape Like a nut.

According to the American scientist Brian Greene (born in 1963) in his book The Elegant Universe (2000) it is in very short flashes of time (about one ten millionth of trillions, trillions, trillionths of a second) and a very short space distance (about one of billion trillion trillionth of a centimeter), distorts the perturbations of quantum mechanics, space and time to such an extent that the traditional notion of left, right, back, forward, up, down, before and after becomes meaningless. The formulation of a completely new natural law will compel scientists to abandon the space-time matrix they have been dealing with for centuries, in exchange for a world devoid of space and time.

Believers in this theory believe that there is a possibility of the essence emerging from extra-dimensional physics more than the usual three dimensions of space and they rely here on string theory, which predicts the existence of ten dimensions, four of which are our three known dimensions plus time. The remaining six should be hidden. Another alternative is the development of string theory, by adding another dimension to the ten, so that the number of dimensions becomes eleven. And all this after resorting to mathematics to find a hypothetical solution to the coordination between the general theory of relativity about gravity, and the theory of quantum mechanics, which deals with parts of the atom.

## V. CONCLUSION

String theory has gone through different stages, from a small moving chord that has been divided into a closed chord that can turn into an open chord and a closed chord that cannot be turned into an open chord. Then another division began as to whether the string is particles that transmit force, which are called bosons, or if the string is the particles that make up matter, which are called fermions. Fermions, every fermion

 

has a super isotope that is a boson and vice versa. The number of other cosmic dimensions varies according to these divisions, and the following is an illustrative list of hypothetical dimensions.

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