Modeling the dark universes

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Abstract

The search for dark matter has lately been extended to assume a dark segment of the universe that contains mutually interacting particles, supposed to interact with white matter only through the gravity force. This article presents a concept analysis that shows how string theory can model different segments of the cosmos in order to match measurements of dark matter and dark energy.

***Keywords*: D**ark matter, dark energy, string theory, brane world, scale of observation, quantum waves.

1. Introduction

The lack of a simple dark matter explanation has opened up for a variety of hypothesis including complex dark matter particles and even dark atoms having dark forces that act solely between different dark particles such as laid out by Lincoln and Dobrescu [1]. Expressions like the dark space and the dark segment of the cosmos are used, portraying that dark matter particles could exist that interact with each other, but have no interaction with white matter except through gravity. This scenario has come very close to a (string theory) brane world where white matter is found in one brane and dark matter and dark energy reside in other branes. Below is presented an analysis to see how string theory, including brane theory and supersymmetry, can be used for modeling both the white and the dark segments of the cosmos.

2. Analysis

String scientists have suggested that our universe is a 3-dimensional brane [2]. Dark spaces could also be such 3-branes being parallel to the physical universe. If we have two dark 3-branes, one having dark matter particles and the other having dark energy particles, this will confirm to measurements. String theory says that only gravity can act across brane boundaries. The only measured influence from dark matter/energy is from the gravity force. The graviton, the provider of the gravity force, is the only known particle that is modeled by a closed string, which enables it to wander across brane boundaries. Particles other than gravitons, in each brane, are modeled as open strings. They have both ends connected to that specific brane and cannot therefore collide or interact with particles from other branes by joining ends for a short while.

The three different branes/universes suggested must all be around us and accessible anywhere, but anyway separated. That can mathematically be expressed by having different open dimensions, also meaning that distance in the dark universes cannot be measured by physical length. Three parallel 3-branes having different dimensions make up a nine dimensional cosmos, which holds the total number of spatial dimensions required by the string theory. Strings have to vibrate into nine different dimensions. We do not need to curl up and compactify dimensions such as is assumed in the normal interpretation of string theory. The different ways of curling up the extra dimensions, that give an almost infinite number of solutions, can now be disregarded, and a single solution is left. Please observe that the multiverse proposed here is different from earlier proposals of multiverses such as explained by Brian Greene [3]. Earlier proposals portray multiple independent and complete universes while this model proposes one complete cosmos, which is separated into several mutually dependent universes/branes with different functions. This seems to be a new interpretation of the brane functionality and a description of cosmic functionality that has not been proposed before. This is obviously a strange worldview for most physicists. However, after several critical reviews by physicists, no scientific objection remains and papers have been published [4, 5]. This interpretation of the string theory seems to solve some outstanding problems in theoretical physics and cosmology. The option of modeling a nonphysical part of cosmos will also have an impact on the ongoing discussion of the mind-brain relationship (MBR) recently discussed by Moreira-Almeida and S. de Freitas Araujo [6].

Supersymmetry says that all known elementary particles have supersymmetric siblings. These siblings have never been found in particle detectors. They could be found in the dark matter universe, undetectable by existing particle detectors. The projection of cosmic size dark matter objects into the physical universe could cause what we have measured as celestial dark matter objects. Normal size dark matter objects have so small masses that they cannot be detected by present day technology. Because of supersymmetry, the dark matter space has particles that are different from particles in the physical universe. Consequently the laws of physics and measure of distance could also differ.

According to Peter Woit [7], string theory seems to require another set of particles that have not been found. These particles could make up the content of the dark energy universe. This kind of matter must be very different from physical matter and dark matter, since its gravitational influence on the physical universe is through the vacuum. The particles of the dark energy universe might be too complex or too different from physical matter to have a simple spatial projection into the physical universe. Some of the dark energy qualities could be expressed as the space itself. If entities of the dark energy universe are (timeless) quantum waves, there could be a kind of Fourier transformation between the dark energy universe and the physical (time-dependent) universe. A transformation from a quantum wave to a physical representation could give different outcome, depending on the physical arrangement of the measurement. Here is a potential explanation of the particle-wave duality.

Supersymmetry says that a mother particle can break down to a matter particle and a force particle. If the dark energy particle was part of the same mother particle and represents a timeless structure, its projection into the physical space could represent physical distance, which is an essential quality of the vacuum. Dark energy projection into the dark matter universe could represent a different kind of distance, giving some characteristics of the dark matter space. We can conclude that the mother particle could have been pure energy since matter moved by a force across a distance makes energy.

The Big Bang could have been a phase transition where pure energy was cooled down to the point where a section or whole of a pure energy brane broke down to three different parallel branes.

The 11^{th} dimension of string-/M-theory may also have to be interpreted before string theory can match a real cosmos. The 11^{th} dimension is said to be a kind of coupling strength [8]. My suggestion is that the 11^{th} dimension can be interpreted as ‘speed of time’ or the inverse, which is the sampling time of a ‘now’. This dimension introduces an observer and a scale of observation to the string theory. All phenomena that are shorter than the sampling time will avoid observation. Phenomena that last for a few orders of magnitude longer than the sampling time will be the most outstanding. Different values of the speed of time give different views of the cosmos in the same way as a systems engineer has different views on his designed system. One view of an aircraft is aerodynamics and navigation, another is engine and thrust, a third is the man-machine interface and so on. For the lowest speed of time, with a sampling time near the Planck time and a strong coupling, we get a particle view. For a speed of time near infinite and a weak coupling, we get a cosmic view. There seems to be a singularity at infinity. Surprises may turn up as we get further and further away from our human scale of observation. Quantum waves seem to be timeless, independent of normal time. With a much higher speed of time we might see them change, maybe with the variation of some assumed "constants".

This is a concept analysis based on string theory as explained for laypersons by Brian Greene [2, 9]. Some assumptions differ from what is commonly accepted as default.

References

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