International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET229320

Theoretical Models of Final Theory or Theory of Everything (TOE) in physics

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Article Info
Volume 9, Issue 3
Page Number : 144-147
Publication Issue :
May-June-2022
Article History
Accepted : 05 May 2022
Published: 15 May 2022

ABSTRACT

In this paper we will introduce three theoretical models for building the final theory or theory of everything (TOE) in physics.

Keywords : Theory of everything, Physics, Feynman, Hidden dimensional model, Supersymmetry model, Nonclassical logics model

I. INTRODUCTION

There are some arguments, pro - theory of everything that, a physical theory of everything, will coincide with a philosophical theory of everything. This philosophical worldview attempts to give a complete picture of the world. A physical theory of everything was Einstein's dream. He was trying to obtain a unified theory of gravity and electromagnetism. His goal was to reduce electromagnetism to geometry, just like he did with gravity.

In his Lectures on Physics, Feynman pointed out that it's very easy to write all of physics in a single equation:

$$\square U=0$$

The problem is to define what U is and what □ means. A theory of everything (ToE), final theory, ultimate theory, unified theory, or master theory would:

- Give us such a single equation that Feynman pointed it.
- Unify all the fundamental interactions of nature: gravitation, strong interaction, weak interaction, and electromagnetism.
- Transform elementary particles from one kind into another and also yield a deep understanding of the various different kinds of possible particles.

Now, the essential question arises: What are the theoretical models for building the final theory or theory of everything (TOE) in physics?
The answer which scientists give to the essential

question split them into three great groups:

1. Hidden dimensional model
2. Supersymmetry model
3. Nonclassical logics model

Hidden dimensional model

The first group employed the notion of superspace. They explored the mathematics of space-time symmetry. In such a formulation, along with ordinary space-dimensions, we add some odd dimensions. According to this method in higher dimensional space-time we could build a theory of everything (ToE), our universe is not a 4-dimensional space-time but is a X-dimensional space-time and the extra dimensions are hidden. This method is called Hidden dimensions method. In higher dimensional space-time, for example in 10 (or 11) dimensional space-time, Superstring theory (or M theory) are the candidates for a Theory of Everything.

Hidden dimensions model contains two sub models:

Compactification Model and Extraction Model

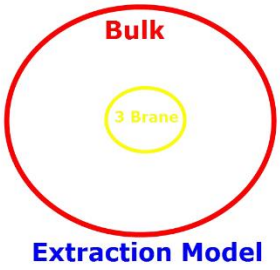
The general models of Compactification lead us to consider that the spacetime is a direct product as follows:

$$M_4 \times X_n$$

where M4 is the four-dimensional noncompact spacetime, and X6 is some six-dimensional compact internal space.

According to Extraction Model: Our four dimensional spacetime is a subspace of some bigger space that we can't see because all matter and forces are constrained to move on our subspace, or brane.

The total space is called the bulk and the subspace or brane on which we would live is called the brane.



Supersymmetry method

The second group employed the notion of supersymmetry. They were trying to add fermions to bosonic string theory. They were working with ordinary space-time with ordinary space dimensions but using an extraordinary operator (super operator) to change the essential properties of particles and transform elementary particles from one kind into another, for example, supercharge operator **Q** would transform bosons into fermions, and vice versa. According to this method supersymmetry provides such an extraordinary operator (super operator) to build a theory of everything (ToE).

A super operator (here a supercharge operator Q) changes the essential properties of particles and transform elementary particles from one kind into another.

$$Q|boson\rangle = |fermion\rangle$$
$$Q|fermion\rangle = |boson\rangle$$

Nonclassical logics models

The third group was trying to construct different models of logical consequence and logical truth. They employed the notion of nonclassical logic or superlogic. According to this method a physical theory of everything does not coincide with our classical logic, to build a theory of everything (ToE) we need a dynamic logic to describe our dynamic universe. In order to build a nonclassical logic there are the following options.

a) Changing the formation rules:

In classical logic, if: A and B are two meaningful and confirmable statements, then: the conjunction of A and B is a meaningful and confirmable statement, but according to Uncertainty and Complementarity Principle, if: A and B are two meaningful and confirmable statements, then: the conjunction of A and B is not a meaningful and confirmable statement. We can compute and test either for A or for B, but we cannot compute and test for the conjunction "A and B" with any desired precision. Example: Heisenberg - Goedel Logic.

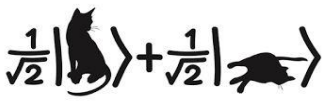
b) Changing the transformation rules:

In this type of logical suggestion is to change, not in the formation rules, but in the transformation rules (rules by which a sentence may be derived from another sentence or set of sentences), for example non-reflexive logic (also known as "Schrödinger logics") rejects or restricts the law of identity.

c) Many-valued logic:

Many-valued logic rejects bivalence, allowing for truth values other than true and false. The most popular forms are three-valued logic, and infinitely-valued logics such as fuzzy logic. In three-valued logic, each statement would have one of three possible values: T (true), F (false), and U (uncertain) and every statement must be true, false, or uncertain.

Logical method constructs different models of logical consequence and logical truth.



II. Conclusion

Despite the other theoretical models for building the final theory or theory of everything (TOE) in physics, Nonclassical logics models, especially, Many-valued logic is very flexible and has many evidences in reality and also is able to solves the quantum well-known paradoxes.

This logical model characterizes the complex and nonlinear processes or thinking of reality in contrast to what may be called "linear" or "mechanical" processes or thinking of reality. Some properties of this logic are as follows:

1. This logic is a dynamic logic, not a static logic.
2. This logic is a Many-valued logic with some changes in formation and transformation rules.
3. The core of this logic is based on duality, complementarity and contradiction.
4. This logic, like Paraconsistent logic, rejects the principle of explosion and is closely related to dialetheism.
5. This logic covers not only "linear" or "mechanical" processes or thinking of reality but also "nonlinear" or "dynamical" processes or thinking of reality.
6. In this model the "Negative" is creative.

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Cite this article as :

Suzan Khalid Hashim, Tabit Elias Basheer, Karim Salehi, "Theoretical Models of Final Theory or Theory of Everything (TOE) in physics", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 3, pp. 144-147, May-June 2022. Available at doi : https://doi.org/10.32628/IJSRSET229320
Journal URL : https://ijsrset.com/IJSRSET229320