ACADEMIA | Letters

# *Five-dimensional universe*

Yoram Har-Lev

## Introduction

Many scientists feel uneasy with quantum theory interpretation and try to forward alternatives. But none of them solve the problems satisfactorily. In my opinion, it is due to their insistence to keep the absurd superposition idea. Indeed, the use of superposition and the Schrodinger equation provides accurate probability predictions. Still, as Christopher A. Fuchs and Asher Peres suggested in their paper: quantum needs no interpretation: "Quantum theory does not describe physical reality. It provides an algorithm for computing probabilities for the macroscopic events (detector clicks) that are the consequences of our experimental interventions. This strict definition of quantum theory is the only interpretation ever needed, whether by experimenters or theorists."

Randell-Sundrum, Polchinski and Strassler, and others presented new alternatives to the quantum interpretation by suggesting that the universe is a five-dimensional world.

But these theories suggest only partial solutions.

This article suggests a possible way to shed light on how our universe functions by assuming that we are in a five-dimension universe (or more) and not a four-dimensional world we perceive.

A five-dimensional universe enables us another degree of freedom to explain the strange phenomena presented by the current physical theories.

The suggestion we live in a five-dimensional universe is more straightforward than Randell-Sundrum's four-dimensional "brane," residing in a five-dimensional universe. However, it forces us to reexamine all current scientific theories tailored to our four-dimensional universe's perception.

*Academia Letters, June 2021* 

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**Citation:** Har-Lev, Y. (2021). Five-dimensional universe. *Academia Letters*, Article 1428.
https://doi.org/10.20935/AL1428.

This short article presents some ideas regarding the existence of a five-dimensional universe and the advantages of investigating the possibility of a unified theory assuming a five-dimensional universe.

## Is the universe five-dimensional?

The idea of the universe being a five-dimensional space is not new. It was introduced by Kaluza. in his 1921 paper. Kaluza established all the mathematical elements: the field equations, the equations of motion, the stress-energy tensor, etc.' His theory extends general relativity to five dimensions and unifies the electromagnetic and relativistic theories.

Philosophers and scientists rejected Kaluza's idea, arguing that it did not comply with human perception of the four-dimensional universe. But although it is convenient to think that things we cannot imagine or perceive do not exist, many experiments contradict this idea. Theories should be verified only by objective measurements and not by our limited senses. Today the existence of a five-dimensional universe is supported by many physicists.

Some of them suggest ways to prove the existence of a five-dimensional universe. Here are some of their claims:

- In the general theory of relativity, Einstein explained gravitational power by distortion of the four-dimensional space due to mass. The four-dimensional space obviously, distorts in the fifth dimension direction. Measuring the light's angle from a distant star was deflected, passing near the sun's mass, showing this star to be located elsewhere, thus proves Einstein's theory. We cannot see or imagine the fifth dimension because of our limited perception, but we can see the consequences of the fifth-dimensional deflection.

- Dr. Arlie O. Petters gave another reason in his research of five-dimensional black holes created in the big bang.

- Physicists like Randell and Sundrum assume that particles' actual size is much bigger than was measured up to now. The measurements in a weak gravity field of the four-dimension present smaller values. They propose to prove a five-dimensional space by colliding particles with high energy. The gravitational force will be the other fundamental forces' size and prove the fifth dimension's existence in such proximity.




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## Fifth-dimension theory potential

Assuming the extra spatial dimension provides an additional degree of freedom, it can solve many unexplained problems and perhaps a unified theory. Here are some problems physicists should try to solve with the aid of the assumption of the existence of a five-dimensional universe:

- Incompatibility of the gravitational force - the hierarchy problem.
- Elimination of the uncertainty principle using the extra degree of freedom.
- Eliminating superposition idea and therefore also the measurement problem.
- Entanglement - separating two entangled electrons in the three spatial dimensions does not necessarily separate them in the fourth spatial dimension. Changing the spin direction of one electron will instantly change the entangled electron's spin direction because they are still adjutants. We can explain this idea by the analogy of two people standing far apart on a flat surface. Both will measure the same atmospheric pressure because they are still at the same height regarding the third dimension, no matter how far we separate them on the plain. Axel Dietrich and Willem Been explained this in their paper: An Extra-Dimensional Approach of Entanglement.
- We can explain gravitational waves as movements in the fifth dimension caused by a sudden change in mass - for example, clashes of two giant stars.
- Tunneling - if there is another spatial dimension, some electrons can move in the fifth dimension where there is no obstacle and can reappear on the other end. More electrons will jump in the fifth dimension direction whenever the energy is higher.
- Dark matter - another spatial dimension can help explain the mystery of dark matter. See Continuum-mediated self-interacting dark matter.




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