

Hypothesis

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Article

Possible Modification of Standard Model Classification of Particles and Fields

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Abstract: Paper attempts to clarify the meanings of key concepts in cosmology, such as matter, energy, mass, and spacetime fibre. It also presents an attempt to prove the existence of spacetime fibre as physical entity, which fills the entire Universe, based on the experimental effects it manifests. Furthermore, the paper hypothesizes that matter consists of three fundamental components (states): energy, mass, and spacetime fibre, forming another triplet in the Standard Model classification.

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1. Introduction

The Standard Model of Particle and Fields was developed in the mid of 1970s as a theoretical framework to describe and classify known elementary particles and to unify the fundamental forces of the Universe. While the Standard Model has successfully predicted many experimental results in particle physics, it has failed to unify all four fundamental interactions. In particular, it does not incorporate gravity alongside the other three fundamental forces: electromagnetic, weak, and strong.

Table 1 presents the Standard Model classification of all six known quarks—'up,' 'charm,' 'top,' 'down,' 'strange,' and 'bottom'—as well as the six leptons: electron, muon, tau, electron neutrino, muon neutrino, and tau neutrino. As shown in the table, these fundamental particles (fermions) are grouped into three generations [1]. The last column in Table 1 lists the corresponding force carrier bosons associated with each particle.

Table 1

quarks generations			bosons
I	II	III	
u	c	d	γ
d	s	b	g
leptons generations			
e	μ	τ	W^\pm
ν_e	ν_μ	ν_τ	Z^0

Excluding gravitation, the remaining fundamental interactions also can be grouped into three 'families'. Table 2 presents this classification, listing the three fundamental interactions along with their corresponding force-carrying bosons.

Table 2

interactions			boson
I	II	III	
<i>strong</i>	<i>weak</i>	<i>elektromagnetic</i>	g, W, Z, γ

What we can immediately observe is that all families of fundamental particles and fundamental interactions (excluding gravity) are grouped into triplets! So far, the Standard Model has been unable to explain this phenomenon.

2. The Hypothesis

In physics, as well as in other sciences, we generally encounter two kinds of entities: purely logical and mathematical constructs, which exist only in our consciousness, and material entities that physically exist in the Universe, occupying space. Here, we will focus only on the latter.

Before formulating the main hypothesis, it is necessary to refine certain concepts and definitions used in cosmology. These include terms such as matter, mass, energy, and spacetime fibre.

1. **Matter** is everything that fills space (spacetime)—both that which has mass and is visible, as well as that which is invisible but exhibits experimentally observable and measurable effects. Matter consists of three fundamental components (or states) that occupy the entire space: energy, mass, and spacetime fibre.

2. **Energy** is an invisible form of matter associated with mass, as described by Einstein's equation $E = mc^2$. During the earliest stage of the Universe (the Planck Epoch), energy was the first and only form of matter. It can transform into mass and vice versa, strictly following this equation. The primary (though not the only) carriers of energy are electromagnetic waves and massive bodies in motion. The effects of this form of matter are experimentally observable.

3. **Mass** is a portion of matter contained within a well-defined volume of space. It is observable (visible) and possesses various physical properties and parameters that can be measured experimentally. Objects with mass interact with one another through the gravitational force, which is always attractive, extends to infinity, and cannot be shielded. This implies that there is no region in the Universe where this force does not exist, nor can such a region be created.

4. **Spacetime Fibre**, the third form of matter, is not visible but produces experimentally observable effects, such as gravitational waves and matter waves (de Broglie waves). The spacetime fibre might be built of black matter since its existence many independent astrophysical observations strongly suggest.

Gravitational waves are waves generated by rotating or vibrating objects with mass within the spacetime fibre. They propagate spherically around rotating massive bodies or their systems [2].

Matter waves are waves excited in the same fibre by bodies moving through it in translational motion.

Both types of waves appear to be of the same nature—that is, they are vibrations (disturbances) of the spacetime fibre. The existence of these experimentally observable waves confirms the real presence of spacetime fibre filling the entire geometric spacetime, as only physically existing real entities can produce such effects in experiments.

Einstein's spacetime, by itself, is a purely logical-mathematical construct and would not be capable of generating any experimentally observable phenomena. The presence of matter waves and gravitational waves provides evidence that Einstein's spacetime is filled with a physically existing real fibre.

The above definitions of matter, mass, energy, and spacetime fibre are proposed as a way to refine these concepts for the purposes of cosmology.

Let us now recall a hypothetical scenario of events from the very beginning of the Universe, specifically from the so-called Planck Epoch (the period from zero to 10^{-43} seconds) and immediately after it. The accepted hypothetical scenario for this period states that at the very beginning, there was only an enormous concentration of energy (extremely high temperature and pressure). None of the known laws of physics existed during this time.

Just after the Planck Epoch, between 10^{-43} and 10^{-36} seconds, gravity emerged as a separate interaction, and the earliest elementary particles and antiparticles were created simultaneously. This marks the moment when mass and spacetime fibre appeared as a new form of matter. A summarized

brief scenario of these events can be found in the work "The Physics of the Universe" in the section "Big Bang Timeline" [3].

Here, we see that gravity and the earliest elementary particles appeared simultaneously. According to Einstein's hypothesis, the gravitational force arises from disturbances in the structure of spacetime fibre (its curvature or vibrations in the form of waves). If this is the case, then vibrating or rotating atomic nuclei, as well as atoms, should also generate gravitational waves (microgravitational waves) [4].

All of the above considerations suggest that spacetime fibre is likely the third fundamental state of matter, together with energy and mass, and could form a separate triplet in the Standard Model classification of particles and interactions.

Table 3

"states of matter"			boson
I	II	III	
<i>Energy</i>	<i>mass</i>	<i>"spacetime fabric"</i>	<i>H</i>

This is illustrated in Table 3. It is important to note that the "states of matter" proposed here also form a triplet! (There is a loose similarity to what we observe in everyday life, i.e., the three fundamental states of substances - gaseous, liquid and solid.)

The Higgs boson, which creates mass, immediately generates gravitation as the curvature of spacetime fibre around it. Mass and gravitation are inseparably linked to each other.

3. Conclusions

Here, it is necessary to elaborate and accept a precise definition of the word "matter." This definition should state that matter is a concept consisting of three components: energy, mass (objects having mass), and "spacetime fibre" as its three fundamental states occupying the entire space.

The proposed hypothesis aligns with these assumptions. This is the case where the Standard Model classification can be naturally extended toward cosmology.

If the hypothesis of spacetime fibre is correct, it could open a new way for understanding the Universe and open new directions for studying it. By analysing precisely various types of nuclear diffractions, we may uncover some physical properties of microgravitational waves and also gain insights into some properties of spacetime fibre itself.

References

1. M E Peskin *Concepts of Elementary Particle Physics*, Clarendon Press, Oxford U.K. (2017), 277.
2. LIGO Scientific Collaboration, VIRGO Collaboration, *Phys. Rev. Lett.* 116, 241103 (2016) <https://doi.org/10.1103/PhysRevLett.116.241103>.
3. <https://www.physicsoftheuniverse.com/>
4. H. Wojciechowski, <https://doi.org/10.20944/preprints202407.1773.v2>.

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