Hypothesis

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Possible Modification of Standard Model Classification of Particles and Fields

Henryk Wojciechowski *

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Article

Possible Modification of Standard Model Classification of Particles and Fields

Henryk Wojciechowski

The Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences, Radzikowskiego 152, 31-342 Kraków, Poland; henryk.wojciechowski@ifj.edu.pl or henryk.wojciechowski@onet.eu

Abstract

Paper attempts to clarify the meanings of key concepts in cosmology, such as matter, energy, mass, and hypothetical spacetime fabric. It also presents an attempt to prove the existence of spacetime fabric as physical entity that 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 fabric, forming another triplet in the Standard Model classification.

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1. Introduction

The Standard Model of Particles and Fields was developed in the mid-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 has not been able to unify gravity with 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—and the six leptons—electron, muon, tau, electron neutrino, muon neutrino, and tau neutrino grouped into generations. Each of these particles interacts through corresponding force carrier—photon, gluon, W, and Z bosons. This classification reveals a triplet structure that appears consistently among fundamental particles and their interactions [1].

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 strong, weak, and electromagnetic can also 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			Bosons
I	II	III	
strong	*weak*	*elektromagnetic*	g,W,Z,γ

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What we can immediately observe is that all families of fundamental particles and fundamental interactions (excluding gravity) can be 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 deal with two kinds of entities: purely logical and mathematical constructions which exist only in our consciousness and physically real entities, which exist independently in the Universe and manifest themselves through measurable effects. This distinction is essential for clarifying the ontological foundations of cosmology.

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, spacetime and hypothetical spacetime fabric.

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 hypothetical spacetime fabric.

2. **Mass** represents a localized concentration of matter within a finite region of space. It is directly observable and measurable, characterized by many of its physical properties the main of them are inertia and gravitation. Bodies with mass interact through the gravitational force, which is universal, always attractive, extends to infinity and is unshieldable. Therefore, no region of the Universe is free from gravitational force.

3. **Energy** is an invisible form of matter associated with mass by the Einstein 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. Its existence is verified experimentally through electromagnetic radiation, particle motion, and manifestations of all dynamical processes.

4. **Spacetime** is a four parameter reference frame proposed by Einstein to provide more precise orientation within the Universe. Spacetime frame is a typical mathematical construction, which as such, belong to the first group of entities those existing only in our consciousness. Being purely mathematical construction the spacetime frame is unable to generate any experimentally observable phenomena.

5. **Spacetime fabric**, is postulated as the third of fundamental states of matter: a physically real, though invisible, continuum being that fills all the space. Unlike the purely mathematical spacetime frame, the spacetime fabric is a primary physical entity a material whose dynamical deformations are manifested as gravitational and matter waves. The observation of gravitational waves (LIGO, 2016) [2] and matter waves (de Broglie, 1924) [3] confirms existence of a real entity possessing elasticity and possibly kind of "viscosity" probably responsible for the effect of inertia in massive bodies. Only physically existing entities can produce such effects; therefore, the spacetime fabric must be acknowledged as ontologically real. The open question is what substance is the basis of that fibre - black matter, spacetime fibre or other. There is no question that this substance must be real being.

From this follows a logical axiom: **If an experimentally observable effect exists, the physical real entity responsible for it must also exist.**

Accordingly, the existence of spacetime fabric does not require theoretical derivation or prediction; it is directly implied by the reality of the effects it produces. The fabric thus represents a primary being of the Universe, existing from its earliest state and underlying all other manifestations of matter and energy. Any physical theory of cosmology must therefore accept its existence and adapt to it.

The three forms of matter—energy, mass, and spacetime fabric—can thus be viewed as a natural triplet, analogous to the triplet structure observed in the Standard Model of particles and interactions.

This is illustrated in Table 3. (It is important to note that the "states of matter" proposed here also form a triplet!)

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Table 3.

"States of Matter"			Boson
I	II	III	
Energy	*mass*	*"spacetime fabric"*	$H(?)$

The Higgs boson, responsible for generating mass, simultaneously gives rise to gravitational curvature of spacetime fabric around mass concentrations. In this framework, mass and curvature of spacetime fabric are inseparable aspects of the same physical substrate.

3. Conclusions

To advance cosmological theory, it is essential to adopt a precise and ontologically grounded definition of matter. Matter should be understood as a triadic entity consisting of energy, mass, and spacetime fabric, three fundamental forms coexisting and filling the Universe.

Under this hypothesis, spacetime fabric is not a theoretical construction but a primary being, logically needed by the existence of gravitational and matter waves. Its acceptance completes the conceptual framework of the Standard Model by introducing a new triplet corresponding to the triadic patterns observed among particles and forces. At present, there is no cosmological theory predicting existence of such a being; moreover, all existing theories neglect its existence. It should be noted that theories are not empirical laws—they only suggest rational explanations of observed events. It simply means that theories are not perfect otherwise they would be called laws [4,5].

Gravity, as the manifestation of spacetime fabric curvature and dynamics, represents a distinct category of interaction qualitatively different from the electromagnetic, weak, and strong forces. Recognizing its origin in the spacetime fabric could thus open a new path toward the unification of physical laws and a deeper understanding of the structure of the Universe.

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. Louis de Broglie, Recherches sur la théorie des quanta, Paris, 1924, Ann. de Physique (10) 3, 22 (1925).
4. Scientific Theory, Britannica, https://www.britannica.com/science/scientific-theory.
5. A. Franklin Allan and S. Perovic , "Experiment in Physics", The Stanford Encyclopedia of Philosophy (Fall 2023 Edition), Edward N. Zalta and Uri Nodelman (eds.), <https://plato.stanford.edu/archives/fall2023/entries/physics-experiment/>.