

The intrinsic structure of fields

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February 11, 2022

Abstract

In field theory, physical action is explained by fields, which are present in the entire space under consideration. Standard physics only describes the effects of fields, but ignores the question: “of what are the fields actually composed?” Some “out of the box” thinkers like Nicola Tesla and Tom Bearden have provided answers, but could not integrate their views into the framework of existing physics. The internal structure of fields is also a new subject in ECE theory. This theory can give a quantitative explanation by using the spin connection structure of spacetime and its antisymmetry relations. A static electric field becomes equivalent to a flow of aether particle compounds consisting of internal oscillations, which leads to gravitation as a special electromagnetic radiation that interacts with charge elements of matter.

Keywords: Unified field theory; gravitation; electromagnetism.

1 Introduction

Interaction between physical bodies is mediated either by direct contact or by force fields (which are present throughout space). Electromagnetic and gravitational forces are created by sources, and in classical physics it is assumed that sources interact with other bodies by an “action at a distance”. The actual mechanism of how this action works is unknown. It is only known that electromagnetic fields expand at the velocity of light, and the same is assumed for gravitation.

Nobody can tell, however, what a field really “is”; only the effects of force fields are described in physical theories. Classical standard physics does not describe internal mechanisms that could produce a force effect. It is only in some quantum theories (for example, quantum electrodynamics) that internal mediators of action are assumed, which are photons in the electromagnetic case and gravitons in the gravitational case. However, the existence of gravitons is hypothetical, and no generally relativistic description of quantum theory exists. The same wave-particle duality that is assumed as for photons is also assumed for gravitons. Both are “mediator particles”.

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Some “out of the box” thinkers like Nicola Tesla and Tom Bearden have tried to explain the intrinsic structure of force fields. Tesla did it by aether particles, and Bearden [6] described it by an internal flow that can also be attributed to aether structures. Another explanation of aether structures and their fields was provided by Joseph Cater [7], who described them on a very detailed qualitative level. All three authors could not integrate their results into the framework of ordinary physics. This is not surprising, because such an approach would require both the integration of the aether idea into regular physics (which has not had any viable theories that could achieve this, to date), and the inclusion of general relativity into the quantum world.

ECE theory provides a coherent interpretation of the aether, as well as unifying quantum theory with general relativity [1–5]. This has enabled a new view of the internal structure of physical fields. In this article, we take selected ideas of Tesla, Bearden and Cater and put them into a new context, which appears to give us the quantitative theory of intrinsic field structure that is being sought and extends ECE theory unification of electromagnetism and gravitation. To accomplish this, additional postulates have been used that are based on hitherto unknown experimental findings.

2 The structure of fields

2.1 General intrinsic structure

To describe the intrinsic structure of physical fields, we need unification of electrodynamics, mechanics and fluid dynamics. The electric Coulomb law and Newton’s law of gravitation are formally identical. They can be formulated as the divergence equations

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}, \quad (1)$$

$$\nabla \cdot \mathbf{g} = -4\pi G \rho_m, \quad (2)$$

where \mathbf{E} is the electric field, ρ the electric charge density, ϵ_0 the vacuum permittivity, \mathbf{g} the gravitational field, ρ_m the mass density and G Newton’s gravitational constant.

In Chapter 8 of [5], it was shown that both fields can be described by Kambe’s divergence equation (Eq. (8.69) in [5]):

$$\nabla \cdot \mathbf{E}_F = q_F, \quad (3)$$

where \mathbf{E}_F is a flow field and q_F is a source or sink of the flow. Consequently, electric and gravitational fields should have an internal flow structure. In ECE theory, both fields are defined in equivalent form by the potentials and spin connections. According to Eq. (4.211) of [5], the definition for the electric case is:

$$\mathbf{E} = -\nabla\phi - \frac{\partial\mathbf{A}}{\partial t} - c\omega_{0e}\mathbf{A} + \omega_e\phi, \quad (4)$$

and for the gravitational case, according to Eq. (7.38) of [5], it is:

$$\mathbf{g} = -\nabla\Phi - \frac{\partial\mathbf{Q}}{\partial t} - c\omega_{0g}\mathbf{Q} + \omega_g\Phi. \quad (5)$$

We have denoted the spin connections in the respective equations by the indices e and g , and have omitted the polarization indices of ECE theory. In our interpretation of potentials, \mathbf{A} and \mathbf{Q} are aether flows. In particular, \mathbf{Q} has the units of m/s and was handled as a velocity in the examples in [5]. In the above equations, we see that there are two contributions from the vector potentials: a time derivative, and a contribution that is directly proportional to \mathbf{A} or \mathbf{Q} . The time derivatives are also used in standard physics, but the direct contributions (multiplied by a spin connection) appear only in ECE theory. In the static case, the Coulomb and gravitational fields read

$$\mathbf{E} = -\nabla\phi - c\omega_{0e}\mathbf{A} + \omega_e\dot{\phi} \quad (6)$$

and

$$\mathbf{g} = -\nabla\Phi - c\omega_{0g}\mathbf{Q} + \omega_g\dot{\Phi}. \quad (7)$$

The scalar potentials ϕ and Φ also contribute by their gradients. In the fluid dynamics interpretation of spacetime, the gradients can be considered as terms of aether pressure. We see that both types of potentials (scalar and vector) are present in static fields of electrodynamics and gravitation. This is a result that cannot be obtained from standard physics.

The equations (6, 7) can be simplified further by applying the antisymmetry laws (5.24) and (7.59) of [5]:

$$-\frac{\partial\mathbf{A}}{\partial t} + \nabla\phi - c\omega_{0e}\mathbf{A} - \omega_e\dot{\phi} = \mathbf{0}, \quad (8)$$

$$-\frac{\partial\mathbf{Q}}{\partial t} + \nabla\Phi - c\omega_{0g}\mathbf{Q} - \omega_g\dot{\Phi} = \mathbf{0}. \quad (9)$$

In the static case, it follows for \mathbf{E} and \mathbf{g} that:

$$\mathbf{E} = -2c\omega_{0e}\mathbf{A}, \quad (10)$$

$$\mathbf{g} = -2c\omega_{0g}\mathbf{Q}. \quad (11)$$

The formula for the electric field was derived in Example 8.4 in [5]. The vector potential \mathbf{A} corresponds directly to a velocity field \mathbf{v} via the ratio x between mass and charge density in the vacuum:

$$\mathbf{E} = -2cx\omega_{0e}\mathbf{v} \quad (12)$$

with

$$x = \frac{\rho_m}{\rho}. \quad (13)$$

Thus, both equations (10) and (11) refer to an aether flow directly.

2.2 Aether flow of a single charge

The interpretation of static fields as flow fields is not new. Nicola Tesla argued in that direction, and Thomas Bearden [6] interpreted the field of an electric charge to be an output flux of condensed aether material. If there is a current of aether output flux, there must also be an input flux, otherwise the continuity

equation would be violated. We know that charges are always connected with matter, see for example the famous ratio e/m for electrons. So, when there is an output flux of the electric field, there must also be an equivalent input flux of aether material, and a gravitation field is the only available candidate (see Fig. 1).

A gravitational field is always attractive, i.e., it provides the same aether current for both types of charges, and is nothing more than a compensating flow caused by electromagnetic effects. Because these flow types are different, there must be “aether particles” or, more accurately, “aether compounds”, with different internal structures, which constitute an electric and a gravitational aether flux¹. This research subject is essentially unexplored, with discussions being primarily on a philosophical level (see, for example, [7]).

2.3 Microscopic interpretation

The remarkable result that static fields are determined solely by the vector potentials or spacetime flows can be developed further. In Eqs. (10, 11), the spin connections represent a wave number or, with the factor c included, an angular velocity (or time frequency). This may be a hint that the fields are connected with quantum states, analogously to the quantum energy $\hbar\omega$. The fields may be interpreted as the internal structure of aether compounds that constitute the flows. According to contemporary quantum electrodynamics, photons mediate the electromagnetic interaction, and gravitons mediate the gravitational field. The quantum energy of photons is $\hbar\omega$, which gives us an interpretation of the spin connection ω_{0e} in Eq. (10). The quantum energy of the mediating photon then is

$$E_e = \hbar c \omega_{0e}, \quad (14)$$

and that of the mediating graviton is

$$E_g = \hbar c \omega_{0g}. \quad (15)$$

These will have very different values, because the electromagnetic and gravitational field energies differ by many orders of magnitude. Both intrinsic structures (photons and gravitons) represent radiation fields that are also present in neutral matter. Because molecules contain internal covalent or ionic bonds, they also contain strong electric fields, as do atoms in their electronic shell structure.

2.4 Counteracting gravitational radiation

Knowledge about the internal structure of fields allows us to counteract gravitation. Assume that we know the internal frequency ω_{0g} of the graviton radiation of a body. We overlay this field with electromagnetic radiation having the same frequency. Then, the electromagnetic field provides aether compounds of the type expressed as gravitation, and the external gravitational field of the Earth,

¹In ECE theory, “aether particle” and “aether compound” are defined in the following way. An “aether particle” is the smallest (discrete) unit of aether, as well as the basic building-block of micro-macroscopic aether. Electromagnetic and gravitational waves consist of structures that are specific arrangements of these basic particles, and we are calling these structures “aether compounds”.

for example, cannot couple to the body. No effect of macroscopic gravitation is then detectable and the body is levitating. This is depicted in Fig. 2. Such a process is reported to have already been realized experimentally in the 1950s².

The frequency of graviton radiation should be in the spectral range between microwave and infrared radiation [8], where the penetration depth into solids is largest. This effect is beyond the scope of standard physics. By ECE theory, however, we have found a possible explanation that does not require quantum electrodynamics or other highly complicated theories.

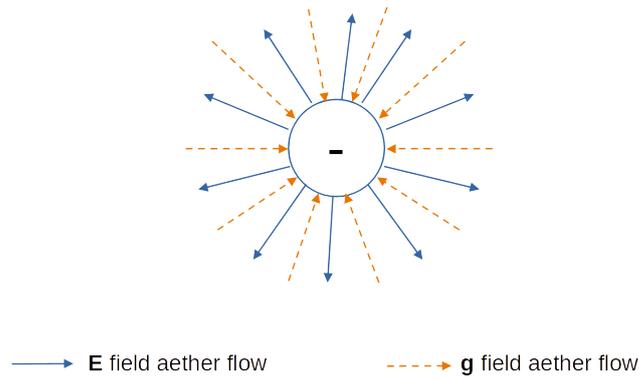


Figure 1: Aether fields of a negative source charge.

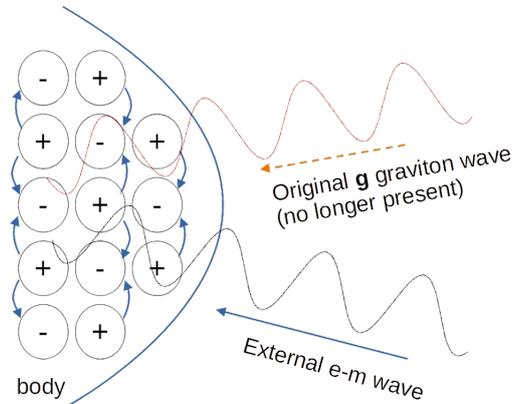


Figure 2: Replacement of a graviton wave by an electromagnetic wave (not all \mathbf{E} fields that are present in the body are shown).

²It is difficult to find references for these experiments, but they were reported in journals of aeronautics in the 1950s. The counter-gravitational effect may be related to metamaterials. These materials have a negative permittivity and permeability. The energy of the Poynting vector propagates inversely to the phase velocity [9].

3 Hypotheses for a comprehensive theory of gravitation

In the preceding sections we have seen that the description of fields on a microscopic level leads to the notion of gravitational radiation. The next question is how to extend this to macroscopically observable effects. To answer this, additional postulates regarding the structure of matter will be required. They will not be purely ad-hoc, but rather based on existing experiments that have been mostly ignored.

In Fig. 1, we have shown the flux fields of a negative charge. An equivalent picture should be valid for a positive charge, with reversed directions of electric and gravitational flows. These flows must be in opposite directions, because the continuity equation for aether material has to be fulfilled. Combining a positive and a negative charge gives a dipole, and then we have an electric and a gravitational attraction, as depicted in Fig. 3. When we consider macroscopic neutral bodies, received opinion says that there is a gravitational attraction, but no electrical interaction. So far, this is in accordance with classical gravitational theory. However, it is known that the surface of the Earth has an excess of negative charges, and that there is an electric field of about 130 V/m perpendicular to the Earth's surface. A common argument is that the ionosphere is positively charged and forms a capacitor together with the surface of the Earth. Then, however, there must be equalizing currents that discharge the capacitor. A discharge is not observed, therefore the charges at the Earth's surface must have a different origin. Computations give a total amount of -0.6 mega Coulomb [10], which is quite a lot. This is similar to the situation with metals, where we have a negative potential barrier at the surface and the "work function" has to be overcome to extract charges from the surface.

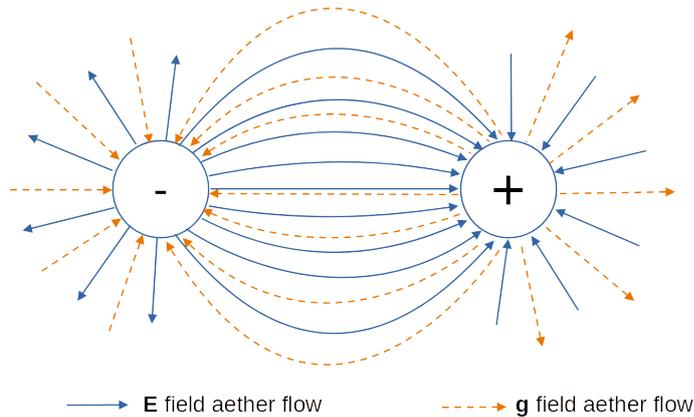


Figure 3: Aether fields of an electric dipole.

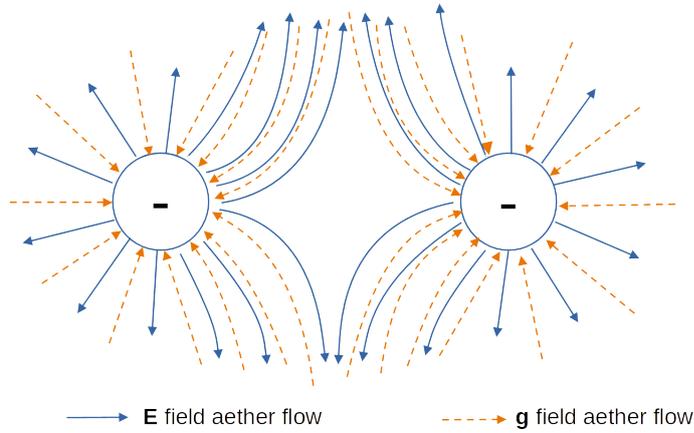


Figure 4: Aether fields of two equal charges.

If the negative charges at the Earth’s surface come from internal material, there must be a small charge separation of unknown origin. This brings us to the first postulate:

- Neutral atoms and molecules have a (very) small positive excess of charge.

This was suggested by Cater [7]. The reason is the internal structure of nuclei and elementary particles. The “standard model” of elementary particles is phenomenological, and little is known about their internal structure. High-energy experiments destroy matter, so that nothing can be said about the structuring of the decay products in undistorted nuclei. ECE theory is the only one to provide insights on a semi-classical level using the non-linear Proca equation [11].

A further question is what happens when two bodies with a negative surface charge come into proximity. There is of course an electrostatic repulsion, but on a microscopic level, under the conditions shown in Figs. 1 and 3, there must also be a gravitational repulsion due to the continuity equation (see Fig. 4). Such an effect has been observed experimentally [12]. Negative charges tend to fall upwards rather than downwards. This leads us to the second postulate of gravitation:

- A gravitational field repels negative charges. Gravitational radiation accelerates negative charges in a direction that is opposite to the direction of propagation of this radiation.

As a result of this effect, a highly negatively charged body would have a tendency to levitate. If positively charged, the body would increase in weight.

There is one more point that contradicts received opinion: The inertia of a mass is not proportional to its amount but depends on its charge [13, 14]. This leads us to the third postulate:

- Charged bodies show a higher inertia than uncharged bodies.

For charged elementary particles, this means that their inertial mass would be higher than that of a compound of the same elementary particles with a balanced charge. This is a violation of the equivalence principle and has very fundamental consequences.

4 Summary and conclusions

We have found that physical fields can be described on three logical levels:

1. Force fields
2. Potentials
3. Intrinsic flow quanta

The third level has been developed in this paper. This is a significant proposition that has refined our understanding of physical fields and, most importantly, is independent of quantum-mechanical methods. As has often been the case throughout the development of ECE theory, we have found that classical and semi-classical methods can be developed in a way that avoids the need for a quantum-mechanical description.

It should be noted that the original experimental work is only summarized by Cater [12, 13], and also in [14]. He provides no references to the original sources, and it would certainly require significant bibliographical research to find the original papers. However, because the authors (Lippmann and the RCA laboratories in Princeton, mentioned in [12–14]) are scientifically reputable persons and institutions, there is no reason to question their results a priori. The authors did not continue to pursue this research, probably to avoid damaging their scientific reputations.

Since these experiments are few in number, and currently not directly accessible, we have presented their results as postulates in order to not stray from the well-founded Scientific Method. According to Cater [7], the fundamental basis for these results is the complex structure of aether compounds, which accompany radiation and are also present in solids. The compounds that make up gravitational radiation belong to sub-infrared electromagnetic radiation. Due to their high penetration depth, they only show a small interaction with matter. Therefore, the resulting gravitational force from them is very weak compared to the electromagnetic force.

The developments in this paper suggest a broad range of research subjects. One important approach would be to write the equivalence principle as it appears in textbooks when gravitational mass (m_g) and inertial mass (m_i) are introduced, and before it is stated that both are equal. The classical equivalence principle would then take the form

$$m_i \ddot{\mathbf{r}} = -m_g \frac{M G}{r^3} \hat{\mathbf{r}}, \quad (16)$$

where the left side is Newton's law of motion (dynamics) and the right side is Newton's law of gravitation. The extensive task would then be to find a number of cases where both types of masses are different. These cases will probably be in the microscopic realm. Finding these cases would allow the results of Lippmann and the RCA labs to become common knowledge.

Acknowledgments

I am grateful to the AIAS colleagues Kerry Pendergast and John Surbat for valuable hints concerning the content of this article. In particular, I would like to thank John Surbat for the careful proofreading.

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- [11] Paper 443, Unified Field Theory (UFT) Section of www.aias.us.
- [12] Text in Ref. [7], p. 144 (English version: p. 168):
It has been stated that a gravitational field repels negative charges. This has been shown to be the case. The RCA laboratories in Princeton, New Jersey, allegedly demonstrated this in 1959. They supposedly discovered that negative charges tend to fall upward instead of downward, as had been expected. It is readily apparent why nothing more has been heard about it. Some of Reichenbach’s experiments, to be discussed in Part IV, also indicate that such is the case. This effect was predicted on purely theoretical grounds by the author prior to the knowledge of these confirmations.
- [13] Text in Ref. [7], p. 144 (English version: p. 168):
Lippmann found that bodies in the charged state offered a greater resistance to acceleration than in the uncharged state. He called it “the inertia of static electricity”.

[14] Text in https://judaism-enc.en-academic.com/12355/LIPPMANN%2C_GABRIEL:

In 1879 he [Lippmann] presented before the Académie des Sciences, to which he was elected seven years later, his work dealing with the effective mass of a charged body, in which he claimed that the moment of inertia in a charged body was higher than that of an un-charged body. This conclusion is of fundamental importance in the study of the electron.