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# Gravitomagnetism: Nature's phenomenas, Experiments, Mathematical Models

## Annotation

Some nature's large-scale phenomena and unexpected experiments are analyzed. It is shown that they can be explained by the existence of gravitomagnetism and substantial by the value of gravitomagnetic forces. On the same base it is proved that there can exist a generator using the energy of the source of gravitational conservative forces in order to perform work, and that this fact does not contradict to the energy conservation law.

## Contents

## 1. Introduction

There are widely known Maxwell's equations for the electromagnetic field in the form suggested by Heaviside. Heaviside is also the author of gravitation theory in which the gravitational field is described by equations of similar form. Later it has been shown that in a weak gravitational field at low velocity it is possible to derive from the basic equations of general relativity the gravitational analogs of the electromagnetic field.

Thus, in the weak gravitation field of the Earth the Maxwell-like equations may be used for the description of gravitational interactions. It means that there exist gravitational waves having a gravitoelectrical component with intensity $E_g$ and gravitomagnetic component with

induction $B_g$. On a mass $m$, moving in a magnetic field with a velocity $v$, a (an analog of the known Lorentz force) is acting.

The equations similar to equations of Maxwell's electrodynamics - Maxwell-Like Gravitational equations (hereinafter MLG-equation) are usually called as gravitomagnetism equations.

The interaction between moving masses is described by gravitomagnetic (hereinafter GL-forces), similar to the Lorentz forces in electrodynamics. From the analogy between Maxwell equations for electrodynamics and MLG follows that there exists also a flow S of gravitational energy. The mathematical models presented below are using the MLG and GL-forces. The latter have the following form

$$F_L = J \times B , \qquad (1)$$

where $J$ is mass current, and gravitomagnetic induction is

$$B = G\xi H , \qquad (2)$$

Here $G$ is gravitation constant, $\xi$ - gravitomagnetic permeability of the environment. It is necessary to clarify the meaning of this value.

Below we analyze the results of recent works of Samohvalov, who conceived and carried out a series of unexpected and surprising experiments. These experiments can be explained by gravitomagnetic Lorentz forces (it should be noted that Samohvalov explained his experiments otherwise). It is important to note that the observed effects are so significant that for their explanation within the specified MLG-equations these equations should be supplemented by a certain empirical coefficient. Based on the results of these experiments and on the assumption that they are explained by GL-forces a rough estimate of gravitational permeability of vacuum has been established as

$$\xi \approx 10^{10 \cdot}$$

But (as follows from the same experiments) it decreases drastically with increasing pressure. It can be assumed that the air may serve as a screen for gravitomagnetics induction due to the fact that in it under the action of this induction there appear mass currents (similar to Foucault currents) Then it can be expected that, for instance, in water, where mass currents of water interact without an air screen, the value of gravitational permeability approaches to the specified value for vacuum.

Thus, <u>GL-forces may have a significant value.</u>

More details about this is discussed in [6].

## 2. Conservative forces source do the work on a closed trajectory

Below we prove that the conservative forces source (including gravitational forces) does work on **closed** trajectories of set bodies motion, in conditions that these bodies are not rigidly connected and between them there are forces, depended on these bodies velocity. This section for the reader convenience is moved from [9].

We shall begin with considering some examples.

**Example 1.** There is an electrical charge $Q$ and another charge much smaller by its size $q_1 << Q$. Coulomb forces acting of the $q_1$ from the side of the charge $Q$ do not perform any work on a closed path of the motion of charge $q_1$. Let there be another charge $q_2 << Q$, and both charges $q_1$ and $q_2$ are moving along near closed paths. Then between them Lorentz forces are acting. Let the medium in which the charges $q_1$ and $q_2$ are moving provides some resistance to their motion. Then under the influence of Lorentz forces a certain work will be performed. The energy for this work is provided from the electrical charge $Q$ (this is similar to the fact that Lorentz forces acting as Ampere forces perform work by the energy of the power force). Thus, the source of Coulomb forces performs work on closed paths of the two charges motion.

**Example 2.** There is a DC motor with self-excitation (in which the armature winding and the electromagnetic field are connected in series or in parallel). In such a motor the energy source is a DC voltage source, i.e. a source of Coulomb forces. This source explicitly performs work.

In the general case from these examples it follows that the source of Coulomb forces performs work on closed trajectories of multiple unconnected charges motion. As the Coulomb forces are conservative, then the previous conclusion is equivalent to the following:

0) The source of conservative forces performs work along **closed** trajectories of multiple bodies motion, if
- a body – it is something, on which a conservative force is acting,
- The bodies are not connected rigidly,
- Between the bodies are acting forces that depend on the speed of these bodies motion.

Conservative forces (by definition) do not perform work on a closed trajectory. The force of gravity is a conservative force (which is proved mathematically). Hence the conclusion is reached that

> 1) there does not exist a motor using only conservative forces (specifically, the force of gravity) to perform work.

Next *an unproven* conclusion is made that

> 2) there **does not exist** a motor using **the energy** of conservative forces source (including the gravity forces), for performing the work.

Coulomb forces are also conservative. From this by analogy one can make the conclusion 1). However, the conclusion 2) is easily refuted by the previous assertion 0). Therefore, in the general case, the assertion 2) is incorrect, and the true statement is as follows:

> 3) **There can exist** a motor using **the energy** of conservative forces source for performing work.

Nevertheless, the existence of the motor that uses energy of the **electrical** conservative forces source (ECF) does not mean that there is a motor that uses the energy source of the **gravitational** conservative forces (GCF).

Electrical forces create the charges motion along a closed trajectory – *electric current* which forms a magnetic field. Due to this the energy of ECF turns into magnetic energy. It occurs even if the energy is not expended for the motion of the charges on the closed path. Thus, the energy of ECF exceeds the energy of the mechanical motion of the charges. This is the reason for the existence of a motor using the energy ECF.

Gravity forces also can create a mass motion on a closed trajectory – *mass current*. Let us assume that mass current also forms a *gravity magnetic* field (it is shown in [3]). Then by analogy with the previous we may assume that

> 4) **there can** exist a motor using the **energy** of the source of **gravity** conservative forces for performing work.

This does not contradict the law of conservation of energy: it is the energy of GCF that is converted into work, and GCF power source loses some of its energy (it cannot be said that the energy of GCF may be used only for the movement of the masses).

## 3. Nature's phenomenas

Exist numerous Nature's phenomena that can be explained by an assumption about significant value of gravitomagnetic forces. As far as is known to the author, for many of them there is no strict mathematical model, and, subsequently, there are no quantitative estimates. More details of these phenomena and their mathematical models may be found in the articles mentioned in the publication list. These articles may be downloaded from this list, and thus are not mentioned here.

Among such phenomena we must highlight the following:

3.1. Dust Whirl [12, 3]
3.2. Sea Currents [14]
3.3. Ocean Whirlpool [20]
3.4. Funnel and Flow from Pipe [17]
3.5. Water Soliton [15]
3.6. Water and Sand Tsunami [11]
3.7. Turbulent Flows [13]
3.8. Additional (non-newtonian) interaction forces of celestial bodies [4, 5]

## 4. Experimental devices

Exist experimental devices which are attributed allegedly to "perpetuum mobile", only because that is no acceptable explanation of their work. However some of them can be explained by an assumption of significant values of gravitomagnetic forces. More details of these experimental devices and their mathematical models may be found in the articles mentioned in the publication list. These articles may be downloaded from this list, and thus are not mentioned here.

Among such experimental devices we must highlight the following:

4.1. Samohvalov's experiments [6]
4.2. Unusual fountain [16]
4.3. Wheel of Aldo Costa [19]
4.4. Tolchin's Inertioid [8]

## 5. Offer for cooperation

So, **the assumption of** significant **values of gravitomagnetic forces** permit to explain a wide range of Nature's phenomenas and known experiments. Consequently, with a high degree of confidence we may assert that this assumption **is proved experimentally.**

It was also proved above that there can exist a engines using the **energy** of the source **of gravitational** conservative forces in order to perform work, and that this fact does not contradict to the energy conservation law.

Both of these assertions together can serve a base of confidence in the possibility of creating a generator that converts the energy of the source of gravitational conservative forces into useful work or, in other words, a **<u>gravitational energy generator</u>**. In fact, the Nature's phenomenas described above may be considered as such generator.

The author developed several projects of gravitational energy generator, for example

1. **improved analog of Aldo Costa wheel** (for stationary generator),
2. **improved analog of Clem's engine** (for vehicles),
3. **adjustable ocean whirlpool** (for generation electric power comparable with the electric power of hydro power plant).

The author invites to cooperation all those who became interested in the proposed projects.

# 6. List of articles by S. Khmelnik regarding to "Gravitomagnetism"

| # | | Article's name | Archi-ves | File | Link |
|---|---|---|---|---|---|
| **1** | 604 | Активное поле пчелиных сот (Active field honeycomb) | DNA-21 | 21.113 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/21.113 |
| **2** | 670 | Детектирование гравитационных волн (The detection of gravitational waves) | DNA-20 | 20.137 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/20.137 |
| **3** | 772 | Дополнение к математической модели песчаного вихря (Supplement to Mathematical Model of Dust Whirl) | DNA-33 | 33.152 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/33.152 |
| | 756 | | ViXra | 1505.0054 | http://vixra.org/abs/1505.0054 |
| **4** | 601 | Дополнительные силы взаимодействия небесных тел (Additional forces of interaction of heavenly bodies) | DNA-21 | 21.57 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/21.57 |
| **5** | 701 | Еще о дополнительных (неньютовских) силах взаимодействия небесных тел (Another additional (non-newtonian) interaction forces | DNA-24 | 24.149 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/24.149 |

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| | | of celestial bodies) | | | |
| **6** | 710 | Еще об экспериментальном уточнении максвеллоподобных уравнений гравитации (Experimental Clarification of Maxwell-Similar Gravitation Equations) | DNA-25 | 25.62 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/25.62 |
| | 822 | | ViXra | | http://vixra.org/abs/1404.0089 |
| | | | | 1404.0089 | |
| **6e** | 810 | | ViXra | 1311.0023 | http://vixra.org/abs/1311.0023 |
| | 563 | Experimental Clarification of Maxwell-Similar Gravitation Equations | | 28.104 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/28.104.pdf |
| | | | DNA-28 | | |
| **7** | 614 | Звук и гравитация (The sound and gravity) | DNA-21 | 21.65 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/21.65/pdf |
| **8** | 709 | Инерциоид Толчина и ОТО (Tolchin's Inertioid and GTR) | DNA-25 | 25.77 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/25.47.pdf |
| | 824 | | ViXra | 1404.0429 | http://vixra.org/abs/1404.0429 |
| **9** | 789 | Источник консервативных сил совершает работу на замкнутой траектории (A Source of Conservative Forces | Vixra | 1507.0134 | http://vixra.org/abs/1507.0134 |

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| | | do Work on a Closed Trajectory) | | | |
| **9e** | 790 | A Source of Conservative Forces do Work on a Closed Trajectory | Vixra | 1507.0146 | http://vixra.org/abs/1507.0146 |
| **10** | 605 | К теории лозоходства (On the theory of dowsing) | DNA-21 | 21.125 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/21.125 |
| **11** | 765 | Математическая модель водного и песчаного цунами (Mathematical Model of Water and Sand Tsunami) | DNA-33 | 33.169 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/33.169 |
| | 759 | | ViXra | 1505.0100 | http://vixra.org/abs/1505.0100 |
| **12** | 771 | Математическая модель песчаного вихря (Mathematical Model of Dust Whirl) | DNA-33 | 33.141 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/33.141 |
| | 754 | | ViXra | 1504.0169 | http://vixra.org/abs/1504.0169 |
| **12e** | 758 | Mathematical Model of Dust Whirl | ViXra | 1505.0087 | http://vixra.org/abs/1505.0087 |
| **13** | 598 | Механизм возникновения и метод расчета турбулентных течений (The Emergence Mechanism and Calculation Method of Turbulent Flows) | DNA-21 | 21.11 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/21.11 |
| | 821 | | ViXra | 1404.0088 | http://vixra.org/abs/1404.0088 |
| **14** | 787 | Морские течения и гравитомагнетизм (Sea | Vixra | 1507.0113 | http://vixra.org/abs/1507.0113 |

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| | | Currents and Gravitomagnetism) | | | |
| **15** | 766 | Неволновая математическая модель водного солитона (Non-Wave Mathematical Model of Water Soliton) | DNA-33 | 33.162 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/33.162 |
| | 757 | | ViXra | 1505.0060 | http://vixra.org/abs/1505.0060 |
| **16** | 783 | Необычный фонтан и гравитомагнетизм (Unusual Fountain and Gravitomagnetism) | Vixra | 1507.0049 | http://vixra.org/abs/1507.0049 |
| **17** | 782 | О потоке воды в воронку и из трубы (About Flow of Water into the Funnel and from Pipe) | Vixra | 1506.0201 | http://vixra.org/abs/1506.0201 |
| **18** | 593 | О скорости распространения гравитационного воздействия (The speed of propagation of gravitational effect) | DNA-23 | 23.152 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/23.152 |
| **19** | 832 | ОТО и реабилитация вечного двигателя (GTR and Perpetuum Mobile Rehabilitation) | DNA-26 | 26.185 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/26.185 |
| | 817 | | ViXra | 1403.0084 | http://vixra.org/abs/1403.0084 |

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| **19e** | 818 | GTR and Perpetuum Mobile Rehabilitation | ViXra | 1403.0086 | http://vixra.org/abs/1403.0086 |
| | 865 | | DNA-28 | 28.82 | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers/28.82.pdf |
| **20** | 780 | Уравнение водоворота (The Equation of Whirlpool) | Vixra | 1506.0009 | http://vixra.org/abs/1506.0009 |
| **20e** | 781 | The Equation of Whirlpool | Vixra | 1506.0157 | http://vixra.org/abs/1506.0157 |
| **21** | 753 | Гравитационное колесо (Gravitational wheel) | Project | | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers2/AldoMy3.pdf |
| **22** | 794 | Двигатель Клемма (Clem's engine) | Project | | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers2/Klemm.pdf |
| **23** | 792 | Регулируемый океанский водоворот - генератор электроэнергии (adjustable ocean whirlpool - electric power generator) | Project | | http://izdatelstwo.com/clicks/clicks.php?uri=lib.izdatelstwo.com/Papers2/ROWP.pdf |

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