

# Connection Between Einstein's Unified Field Theory and the Biefeld-Brown Effect

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## ABSTRACT

In the 1950s, there was a rumor that Einstein completed his unified field theory on electricity and gravitation, but afterwards he withdrew it and it has remained obscure until the present time. However, Dr. Boyko V. Ivanov derived another electrogravitic formula from the Weyl-Majumdar-Papapetrou solutions of general relativity theory, which was similar to my electrogravitic formula for the Biefeld-Brown effect. This paper presents letters from Ivanov on his electrogravitic theory and also gives an outline of Ivanov's theory.

## INTRODUCTION

In the 1950s, there was a rumor at the Princeton Advanced Institute that Einstein did indeed complete a version of his "Unified Field Theory for Gravitation and Electricity." At first, this theory was published in German, appearing in a Prussian scientific journal for 1925 and 1927. In his papers, Einstein announced what he referred to as "highly convincing" results from his quest to find a mathematical proof of the connection between the forces of electromagnetism and gravity, but this work was withdrawn as incomplete, although no published reason is given save that Einstein was not satisfied with it.<sup>1</sup>

According to his paper in 1925, the formula of Einstein's unified theory is given by<sup>2,3</sup>

$$g_{\mu\nu} = -\delta_{\mu\nu} + \gamma_{\mu\nu} + \phi_{\mu\nu},$$

$$-\frac{\partial^2 g_{\mu\nu}}{(\partial x_\alpha)^2} + \frac{\partial^2 g_{\alpha\nu}}{\partial x_\nu \partial x_\alpha} + \frac{\partial^2 g_{\alpha\nu}}{\partial x_\mu \partial x_\alpha} - \frac{\partial^2 g_{\alpha\alpha}}{\partial x_\mu \partial x_\nu} = 0,$$

where  $\phi_{23}$ ,  $\phi_{31}$ ,  $\phi_{12}$  are intensities of the electric field and are intensities of the magnetic field: From which, he derived for the first approximation for weak fields of this equations becomes

$$-\frac{\partial^2 \gamma_{\mu\nu}}{(\partial x^\alpha)^2} + \frac{\partial^2 \gamma_{\mu\alpha}}{\partial x^\nu \partial x^\alpha} + \frac{\partial^2 \gamma_{\nu\alpha}}{\partial x^\mu \partial x^\alpha} - \frac{\partial^2 \gamma_{\alpha\alpha}}{\partial x^\mu \partial x^\nu} = 0,$$

$$\frac{\partial \phi_{\mu\nu}}{\partial x_\nu} = 0, \quad \frac{\partial^2 \phi_{\mu\nu}}{(\partial x_\alpha)^2} = 0,$$

which show that the electromagnetic field and the gravitational field are independent of each other. According to Berlitz, Lord Russel considered Einstein's unified field theory complete, but felt that "Man is not ready for it and shan't be

until after World War III."

Thus the unified field theory on the connection between gravity and electromagnetic field has been obscure until the present time.

However, in 2004, Ivanov of the Institute for Nuclear Research and Nuclear Energy in Bulgaria published a preprint<sup>4-6</sup> of the formula for describing coupling between electromagnetism and gravitation from the Weyl-Majumdar-Papapetrou solutions for the metric space-time, which showed connections between strong electromagnetic fields and the gravitational field.

## IVANOV'S LETTERS ON ELECTROGRAVITY

After my article, "The Possibility of Strong Coupling Between Electricity and Gravitation," was published in *Infinite Energy* in 2004,<sup>7</sup> I received email letters from Ivanov several times. He told me that he was very much interested because he worked on the same topic. Some of his correspondence related to the unified theory is shown as follows:

I noticed this effect in 1994 and wrote two papers but they were rejected by two well-known journals. In the same time these journals published without any problems my papers where I reported smaller or no effects in other situations. I had no access to the Los Alamos online archive then, so my idea couldn't reach anybody. The following 10 years I studied general relativity and its exact solutions up to 1994.

I worked in the field of quantum physics and string theory. The strength of the effect was puzzling to myself, so I felt some relief when I read about the work of Townsend Brown, which is not accepted by mainstream science. In fact this effect could have been discovered theoretically by Herman Weyl already in 1917, but he worked in relativistic units and was obsessed like Einstein by the unification idea. It could have been proved experimentally by Biefeld and Brown in 1923 as they in fact did, and the course of physics could have changed substantially. In 2003 I worked hard on my idea to clarify all annoying issues that such a strong effect causes and the first of my papers was ready by New Year. Strange things happened meantime in my personal life, which delayed the publication of the paper till 13 July 2004. This time I put it on the archive, because being a referee for one journal myself I knew that the idea will meet

much opposition in the peer-reviewed journals. Which is exactly what happened, hence, it stays unpublished till today, rejected by some journals and waiting evaluation for months in others. Even in the archive the response was minimal. Therefore I was very astonished when a friend of mine pointed my attention towards your paper in *Infinite Energy*. (A journal whose contents I didn't used to read and the issue is from January 2004, so probably you came to this idea earlier.) I think that the main idea is that the gravitational field induced by an electric one is proportional to the latter. Then using the dimensions of  $G$  and  $c$  (speed of light) and epsilon which is dimensionless in CGS but has dimension in SI one can easily come to your Equation (12) which is equivalent to my formula. In fact my formula contains some metric factors, but they are so close to one that there is in practice no difference between the exact formula and the approximation.

After that, I obtained mail from him shown as follows:

Thank you for your explanation about your work. It seems to be another dead end although the results were encouraging, because anti-gravity research is dubbed unscientific by big corporations. Once, in the fifties however they were eagerly pursuing it, especially in USA. About Weyl: in my paper gr-qc/0407048 his paper is quoted under No. 14: H.Weyl, *Annalen der Physik* 54 (1917) 117. It is in German which I don't know much except for the equations and has not been translated into English. Nevertheless many people quote it. There the linear term in the metric appears for the first time albeit in relativistic units. It is about the effect of electricity upon axially-symmetric gravitational fields. Weyl never spoke about this paper again neither in his further papers nor in the book you quote. The plane-symmetric solution which is relevant for the capacitor was found by Kar in 1926 and is quoted in my paper under No. 85. It is in *Physikalische Zeitschr.*, another obscure now journal, which I found after some difficulties. It is discussed in English and in contemporary terms in a paper by Bonnor in *Proc.Phys.Soc A* 66 (1953) 145 (No. 19 in the references to my paper) and appeared in the year I

was born. This journal is also quite obsolete unlike *Proceed.Royal Soc.* for example. In 1947 it was shown by Majumdar and Papapetrou in two independent papers (No. 11,12) that a linear term appears also when the metric has just one Killing vector, for example it is static and does not depend on time. These solutions are described also in the book of J. Singe, *Relativity: The General Theory*, from 1960, which seems to be most available.

According to Ivanov's letters, the connection between gravity and electromagnetism was contained in the framework of general relativity but it was not noticed by any researchers until now.

## OUTLINE OF IVANOV'S ELECTROGRAVITICS THEORY

In general relativity, EM fields do indeed alter the metric of space-time and induce a gravitational force through their energy-moment tensor given by

$$T_{\nu}^{\mu} = \frac{1}{4\pi} \left( F^{\mu\alpha} F_{\nu\alpha} - \frac{1}{4} \delta_{\nu}^{\mu} F^{\alpha\beta} F_{\alpha\beta} \right), \quad (1)$$

where  $F_{\mu\nu} = \partial_{\mu} A_{\nu} - \partial_{\nu} A_{\mu}$  is the electromagnetic tensor and  $A_{\mu}$  is the four potential.

Ivanov had taken into account that  $T_{\mu}^{\mu} = 0$  and he further assumed that the metric and EM fields do not depend on time. In this stationary case, the problem can be simplified by setting  $A_{\mu} = (\bar{\phi}, 0, 0, 0)$ , then there is just an electric field given by

$$E_{\mu} = F_{0\mu} = -\bar{\phi}_{,\mu}, \quad (2)$$

Let us further assume that the space-time is static, so that  $f \equiv g_{00} = F(\phi)$  has the unique form  $f = 1 + B\phi + \phi^2$ , which was found by Weyl in 1917 in the axially-symmetric case, solutions of which are known as Weyl fields.

Then the equation for the gravitational field induced by static electric field can be given by

$$g_i = c^2 f^{-1} \left( \frac{B'}{2} \sqrt{\frac{\kappa\epsilon}{8\pi}} \bar{\phi}_i + \frac{\kappa\epsilon}{8\pi} \bar{\phi} \bar{\phi}_i \right), \quad (3)$$

where  $f \equiv g_{00}$ ,  $B'$  is a constant and  $\kappa = 8\pi G/c^4$ .

From this, Ivanov derived the formula of gravitational force  $F_g$  shown here for a capacitor as<sup>4-6</sup>

$$F_g = \sqrt{G\epsilon} \frac{M}{d} \bar{\psi}_2 = \sqrt{G\epsilon} \mu S \bar{\psi}_2, \quad (4)$$

where  $M$  is the mass of the dielectric,  $\mu$  is its mass density,  $\epsilon$  is dielectric constant,  $d$  is the distance between the plates,  $\psi_2$  is the potential of the second plate when  $\psi_1 = 0$  and  $S$  is an area of the plate.

This effect had been discovered by Thomas Townsend Brown in 1923, together with Prof. P.A. Biefeld, and is now referred to as the Biefeld-Brown effect.

As mentioned in Ivanov's letter, Equation 4 is equivalent (in a modulo  $Z$ ) to the following formula for the gravitational field generated for dielectrics by high potential electric field, which was derived independently for the capacitor

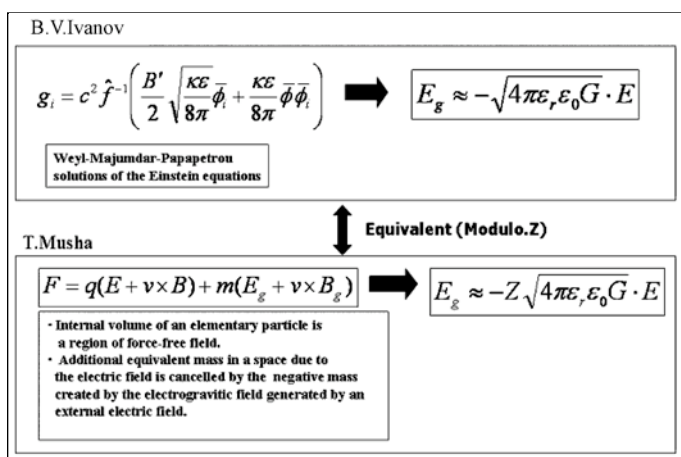


Figure 1. Correspondence between Ivanov's theory and Musha's formula.

under static electric field by the author<sup>7</sup>:

$$E_g \approx -Z\sqrt{4\pi\epsilon_r\epsilon_0 G}E = -8.62 \times 10^{-11} Z\sqrt{\epsilon_r}E, \quad (5)$$

where  $E_g$  is an electrogravitic field,  $Z$  is an atomic number of dielectric material,  $\epsilon_r$  is the specific inductive capacity of the dielectric and  $E$  is an impressed electric field to the capacitor. The relation of these equations is shown in Figure 1.

Ivanov also had shown that magnetic fields would produce the same effects as electric ones. From the definition of the magnetic field given by

$$H_i = -\frac{1}{2}\sqrt{-g}\epsilon_{ikl}F^{kl}, \quad (6)$$

Analogous to those for electric fields, Ivanov obtained the formula for the connection between magnetic and gravitational fields given by

where  $\mu$  denotes the magnetic constant.

$$g_i = -\sqrt{G\mu}H_i, \quad (7)$$

### POSSIBILITY OF ANTIGRAVITY PROPULSION BY ELECTROMAGNETIC FIELD

Thus, according to Ivanov's formulation, it is possible to create an unbalanced acceleration by creating intense electric

and magnetic fields in a dielectric or ferromagnetic medium. These predicted coupling effects for electromagnetic and gravitational fields would be static and thus they should be able to produce a net force to propel a spaceship, as shown in Figure 2.

Brown, who discovered the electrogravitic effect, made several experiments during 1950s and succeeded to generate thrust without the reliance on a surrounding medium (*e.g.*, air) by applying high voltages to materials with high dielectric constants. U.S. aerospace companies had also become involved in such research, but most of these results became a classified subject. In the late 1980s and early 1990s, a rash of observer "sightings" of unidentified high speed, high flying air vehicles continued, but the U.S. government denied it has developed or is developing an aircraft to replace the Mach 3-plus Lockheed SR-71 strategic reconnaissance platform. In the 1990s, a quest for an antigravity propulsion system was conducted by the USAF Science Applications International Corp. on behalf of USAF's then-Astronautics Laboratory at Edwards AFB, as an unclassified "Electric Propulsion Study." BAE also provided internal resources for its own anti-gravity studies.<sup>8</sup>

In Thomas Valone's book *Electrogravitic Systems*, published in 1994, P.A. LaViolette claimed that electrogravitic technology was developed under a U.S. Air Force black project since

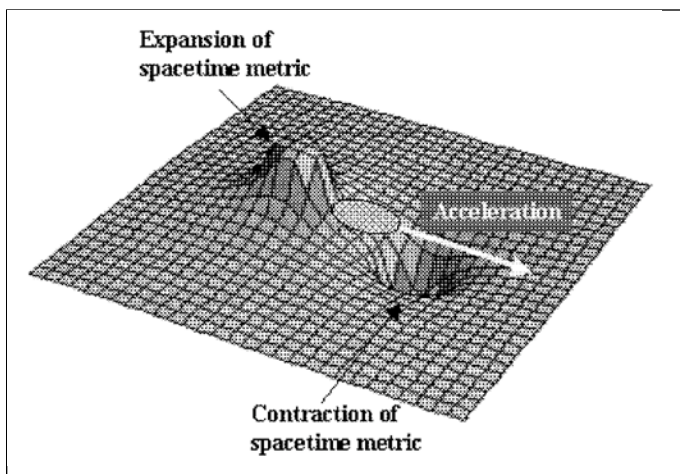


Figure 2. Electrogravitic effect induced by high potential electric field.



Figure 3. B-2 advanced technology bomber.

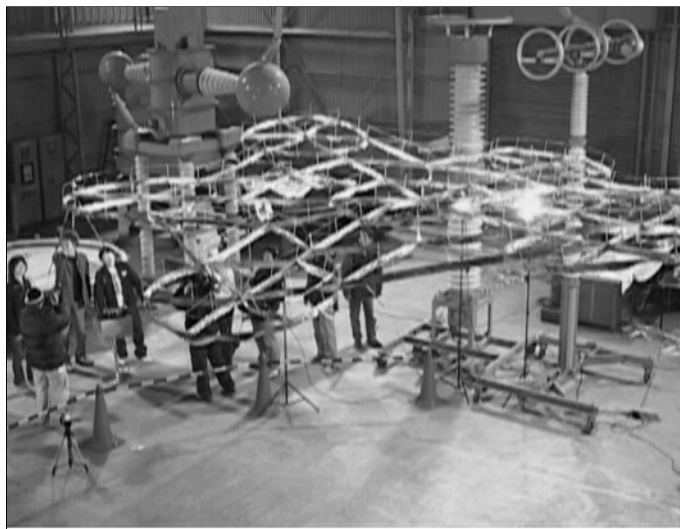


Figure 4. Giant lifter experiment at Meisei University.

late 1954, and it may now have been put to practical use in the B-2 Advanced Technology Bomber (shown in Figure 3) to provide exotic auxiliary mode of propulsion. An electrogravitic drive of B-2 could allow it to fly at a sufficiently high speed at high altitude (or even space).<sup>9</sup>

Afterwards, there was no significant progress in this area, but in the late 1990s, a group at the Honda Corporation Research Institute and the author conducted an experiment to confirm the electrogravitic effect and obtained a positive result.<sup>10</sup> In 2003, a group at Meisei University also conducted the experiment by manufacturing a giant lifter and they succeeded in uplifting to the air with a stable hovering at 15 meters above the ground inside the gymnasium, as shown in Figure 4. The voltage used during this experiment was 41 kV DC and the electric current was 10.7 mA.

In 2004, the author and Ivanov independently published a paper on the electrogravitic effect for the dielectric material under high voltage, which shows the connection between electromagnetic and gravitational forces.

## CONCLUSION

As shown in Ivanov's letters, there is a possibility that someone revealed the connection between gravitational and electromagnetic fields, but it has been classified until the present time. More than fifty years after Einstein's death, there still remains a puzzling question of whether Einstein could reveal the connection between gravitational and electromagnetic forces. But his main ideas might lead to the development of nuclear weapons and also to the development of gravity control technology, such as U.S. anti-gravity high speed, high flying air vehicles. Berlitz wrote in his book that some months before his death, Einstein had burned papers relating to some of his more advanced theories. He might think that the world was not ready for such things before the time when the morality of mankind would be advanced.

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### About the Author

Dr. Musha graduated from Shinshu University (Nagano, Japan) and received both an M.E. (1977) and Ph.D. (1994) in bio-science and mechanical engineering. He was employed by the Technical Research & Development Institute, MoD (Japan) as a research scientist. He is director of the non-profit Advanced Science-Technology Research Organization. Musha has published numerous articles in scientific and engineering journals, and edited and authored the e-book *Field Propulsion Systems for Space Travel: Physics of Non-Conventional Propulsion Methods for Interstellar Travel* (Bentham Science Publishers, 2011).

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