

Spacetime & Substance

International Physical Journal

100-year's Anniversary of the Einstein's Relativity Theory

Volume 6, No. 5 (30), 2005

© 2005 Research and Technological Institute of
Transcription, Translation and Replication
JSC

Spacetime & Substance

International Physical Journal

Certificate of the series KB, No. 4858, issued by the State Committee for Information Policy, TV and Broadcasting of Ukraine (February 12, 2001).

The Journal is published by Research and Technological Institute of Transcription, Translation and Replication, JSC (Kharkiv, Ukraine).

It is a discussion journal on problems of theoretical and experimental physics in the field of research of space, time, substance and interactions. The Journal publishes:

- the theories combining space, time, gravitation and others interactions (including the Einstein's SR and GR);
- application of theories for description and/or explanations of properties of the Universe and microcosmos;
- mathematical models and philosophical bases, which touch the description of a physical reality;
- description of set-ups aimed at the realization of fundamental physical experiments and the forthcoming results;
- discussion of published materials, in particular, those questions, which still have not a correct explanation.

The volume of one issue is 48 pages. Format is A4. The periodicity is 5 issues per one year. The language is English. The equivalent versions: paper and electronic — ISSN 1813-9833 (*.TEX, *.PS, *.PDF).

Editorial Board:

N.A. Zhuck (Kharkiv, Ukraine)	P. Flin (Krakow, Poland)	V.I. Noskov (Moscow, Russia)
— <i>Editor-in-chief</i>	L.P. Fominsky (Cherkasy, Ukraine)	J. Quiroga (Pereira, Colombia)
V.V. Krasnoholovets (Kyiv, Ukraine)	Yu.M. Galaev (Kharkiv, Ukraine)	V.L. Rvachev (Kharkiv, Ukraine)
— <i>Vice Editor</i>	J. Gil (Zielona Gora, Poland)	A.A. Romanov (Kharkiv, Ukraine)
B.N. Adamovich (Kyiv, Ukraine)	A.V. Kinderevich (Kyiv, Ukraine)	S.S. Sannikov-Proskurjakov (Kharkiv, Ukraine)
M.M. Abdildin (Almaty, Kazakhstan)	N.D. Kolpakov (Kharkiv, Ukraine)	V. Skalský (Trnava, Slovakia)
L.Ya. Arifov (Simferopol, Ukraine)	A. Loinger (Milan, Italy)	V.I. Skubaev (Cherkasy, Ukraine)
Yu.A. Bogdanov (Kharkiv, Ukraine)	I.Yu. Miklyaev (Kharkiv, Ukraine)	R. Triay (Marseilles, France)
B.V. Bolotov (Kyiv, Ukraine)	V. Mioc (Bucharest, Romania)	V.Ya. Vargashkin (Oryol, Russia)
P. Carlos (Rio de Janeiro, Brazil)	Z.G. Murzakhanov (Kazan, Russia)	Yu.S. Vladimirov (Moscow, Russia)
M.J.F.T. Cabbolet (Eindhoven, Holland)	Lj. Nešić (Niš, Yugoslavia)	
	P.G. Niarxos (Athens, Greece)	

Executive Editor: V.V. Moroz; Technical Editor: A.M. Varaksin

Subscription information:

The price of one paper unit is \$2.0 in Ukraine, \$2.5 in NIS* states, \$10.0 in all other countries (plus \$1, \$1.5 or \$10 postage and handling accordingly). The electronic version price is 25% of the paper version price.

*) NIS (New Independent States without Ukraine) are Azerbaijan, Armenia, Byelorussia, Georgia, Kazakhstan, Kirghizia, Moldova, Russia, Tadzhikistan, Turkmenistan, Uzbekistan.

Accounts:	In US Dollars	In UA Hryvnias
	Correspondent: SWIFT BKTR US33	Account No. 26009011415
	BANKERS TRUST COMPANY. One Bankers	in K HAB ZEMELNY BANK,
	Trust Plaaza, Mew York. NY 10006, USA	MFO 351652,
	Account No. 04-402-971	AO "NTI TTR,"
	Beneficiary Bank: SWIFT KHAB UA 2K	Code 24473039,
	UKRSIBBANK OF UKRAINE	Kharkov, Ukraine
	in favour JSC ZEMELNY BANK	(for Ukraine subscribers,
	Account No. 1600-2-50174-01-00	at the rate of the
	Beneficiary: NTI TTR JSC	National Bank)
	Account No. 26009011415	

The corresponding confirmation as to the paying should be sent to the Editorial Office by E-mail.

Editorial Office: P.B. 352, RTI TTR, 3 Kolomenskaya St., Kharkiv 61166, Ukraine
 Tel.: +38 (057) 719-55-77, (044) 265-79-94. Tel./fax: +38 (057) 719-55-76, 759-12-67, 759-12-87
 E-mail: zhuck@ttr.com.ua, spacetime@ukr.net, krasnoh@iop.kiev.ua. <http://spacetime.narod.ru>

© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

PHYSICISTS MARK INTERNATIONAL YEAR OF PHYSICS

N.A. Zhuck¹

*Research and Technological Institute of Transcription, Translation and Replication, JSC
Box 352, 3 Kolomenskaya St., Kharkov 61166, Ukraine*

Received August 8, 2005

The United Nations designated 2005 as "the year of physics" to mark the centennial of Einstein's relativity and 50th anniversary of his death.

In 2005 the world-wide international scientific and non-governmental community marked the 100-th anniversary of the Special Relativity, the 90-th anniversary of the General Relativity and 50-th anniversary of Einstein's death.

On the other hand, The United Nations designated 2005 as "the year of physics" to mark the centennial of Einstein's relativity and 50th anniversary of his death.

Albert Einstein was born 14 March 1879 in Ulm, Wrttemberg, Germany.

In 1905 was Albert Einstein's "Miraculous Year" - in which he published his famous three papers: on Brownian motion, the photoelectric effect and Special Relativity.

Einstein worked in the patent office from 1902 to 1909, holding a temporary post when he was first appointed, but by 1904 the position was made permanent and in 1906 he was promoted to technical expert second class. While in the Bern patent office he completed an astonishing range of theoretical physics publications, written in his spare time without the benefit of close contact with scientific literature or colleagues.

In the first of three papers, all written in 1905, Einstein examined the phenomenon discovered by Max Planck, according to which electromagnetic energy seemed to be emitted from radiating objects in discrete quantities. The energy of these quanta was directly proportional to the frequency of the radiation. This seemed to contradict classical electromagnetic theory, based on Maxwell's equations and the laws of thermodynamics which assumed that electromagnetic energy consisted of waves which could contain any small amount of energy. Einstein used Planck's quantum hypothesis to describe the electromagnetic radiation of light.

Einstein's second 1905 paper proposed what is today called the special theory of relativity. He based his new theory on a reinterpretation of the classical principle of relativity, namely that the laws of physics had

to have the same form in any frame of reference. As a second fundamental hypothesis, Einstein assumed that the speed of light remained constant in all frames of reference, as required by Maxwell's theory.

Later in 1905 Einstein showed how mass and energy were equivalent. Einstein was not the first to propose all the components of special theory of relativity. His contribution is unifying important parts of classical mechanics and Maxwell's electrodynamics.

The third of Einstein's papers of 1905 concerned statistical mechanics, a field of that had been studied by Ludwig Boltzmann and Josiah Gibbs.

After 1905 Einstein continued working in the areas described above. He made important contributions to quantum theory, but he sought to extend the special theory of relativity to phenomena involving acceleration. The key appeared in 1907 with the principle of equivalence, in which gravitational acceleration was held to be indistinguishable from acceleration caused by mechanical forces. Gravitational mass was therefore identical with inertial mass.

About 1912, Einstein began a new phase of his gravitational research, with the help of his mathematician friend Marcel Grossmann, by expressing his work in terms of the tensor calculus of Tullio Levi-Civita and Gregorio Ricci-Curbastro. Einstein called his new work the General Theory of Relativity (General Relativity, General Theory).

After a number of false starts Einstein published, late in 1915, the definitive version of the General Theory. When British eclipse expeditions in 1919 confirmed his predictions, Einstein was idolised by the popular press.

Einstein was cremated at Trenton, New Jersey at 4 pm on 18 April 1955 (the day of his death). His ashes were scattered at an undisclosed place.

¹E-mail: zhuck@ttr.com.ua

GEORGE FRANCIS FITZGERALD FIRST WITH THREE RELATIVISTIC CONCEPTS

Frank Boring Fitzgerald¹

Planck Length-time Quantum Physics Theorist, 6 Fitzgerald Lane, Joliet, Montana 59041-9304 USA

Received April 24, 2006

The Michelson-Morley experiments of 1881-7 started the hunt for an explanation for their null results on the Earth's movement thru the "ether" of space. That hunt eventually led to Relativity. An explanation was first advanced by George Francis FitzGerald in 1889-92 which began the most remarkable advancement in science to that time—Relativity—altho it was not called Relativity until Einstein was credited with his Special Theory of Relativity in 1905. FitzGerald's contraction concept, aimed at the MM null results, so divided the scientific community as to what his theorem actually meant, it remained for Lorentz to advance the same concept, who independently in 1895 arrived at the same explanation as FitzGerald had several years earlier. Much later, most scientists rightly named the concept the FitzGerald-Lorentz Contraction. At first, confusion caused some scientists to scoff at FitzGerald calling his contraction theory merely "deformation", meaning in volume and size. This continued discussion of deformation versus contraction cost FitzGerald at the time his first place in history when most scientists began calling his contraction theory the Lorentz-FitzGerald Contraction Theory, or, merely Lorentz Contraction.

1. INTRODUCTION

It gives me great pleasure and it is my honor to present this brief article about my distant relative, Professor Doctor George Francis FitzGerald.

The popular physics concept "Relativity," began with Einstein's publication of his Special Theory of Relativity in 1905. But history tells us the multifaceted Relativity concepts had several names before Einstein and describes several events the names were attached to.

In 1889-1892, George Francis FitzGerald was the first to propose an explanation of the failure of the Michelson-Morley experiments to detect the "ether". He first proposed moving bodies "deform" in the direction of motion which cannot be measured because measuring rods "deform" in the same proportion. Then he was questioned about his "deformation", at which point in a lecture, he changed the "deformation" to "contraction." Lorentz independently arrived at the same "contraction" conclusion in 1895 and developed the idea mathematically into a much more detailed description. But, at first, Lorentz also started with "deformation" but also changed it to "contraction" So, it became known as the Lorentz-FitzGerald Contraction Hypothesis which after Einstein it was a theory. That left FitzGerald as second rate, when in fact it was his idea to start with, and, Lorentz admitted FitzGerald was first. FitzGerald should have been named father of Relativity.

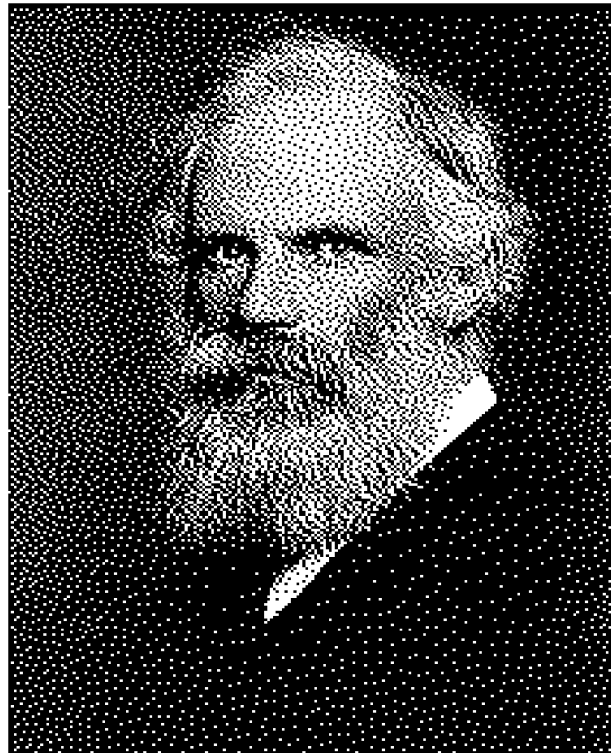


Figure 1: George Francis FitzGerald

Over the years, many scientists rated Lorentz first. This most likely was because they did not see proof of FitzGerald being first, altho they believed he was

¹E-mail: fitzgerald@sofast.net

involved but not first. The proof, for five decades, was buried in obscurity because of a lack of proper attention to preservation of papers, correspondences, and the sad failures of archives to make available full texts of those documents upon demand.

Some scientists even went so far as to drop FitzGerald calling the contraction the Lorentz Contraction. Some of those scientists did not believe FitzGerald was ever involved at all.

Now, many of us who have seen the proof give due credit to FitzGerald by rating him historically first, as in FitzGerald-Lorentz Contraction Theory.

This article offers proof positive FitzGerald was first.

2. PERSONAL HISTORY

George Francis FitzGerald, Irish Physicist, was born August 3, 1851 in Dublin. After surgery, his strength was not enough to survive. He died at age 49 on February 21, 1901 in Dublin [1].

Thruout his short life, FitzGerald was a kind, gentle, generous, uncomplaining person even to the point of apathy.

FitzGerald is an old Irish family surname. The surname consists of two parts: Fitz and Gerald. Fitz stands loosely for house of, or clan of, and Gerald is the name of the head of the house. So, FitzGerald stands for "House of

Gerald". Those with a small "g" in USA are largely descendant from immigrants who came thru Boston where the "G" was dropped to "g". Those who came thru Ellis Isle New York mostly did not drop the "G".

George Francis FitzGerald was born into a highly educated extended family. His early education was obtained at home where he was tutored by M.A. Boole, sister of George Boole, Professor of Mathematics at University College Cork and known as Father of Computer Science. His uncle was George Johnstone Stoney the Irish physicist who introduced the term "electron" for the fundamental unit of electricity [2].

At the age of 16, FitzGerald entered Trinity College Dublin to study mathematics and experimental science graduating in 1871 at the top of his class. He studied for

6 more years then won a TCD Fellowship in 1877. He was appointed a tutor in 1877 and became TCD Professor of Natural and Experimental Philosophy in 1881.

In 1883, FitzGerald concluded, an oscillating electric current would produce EM RF waves and suggested a method how this could be done [3].

So, FitzGerald for the first time was first with a definable Relativistic concept in 1883.

In 1893, he was elected fellow of the Royal Society. That same year, he married Harriette Mary Jel-

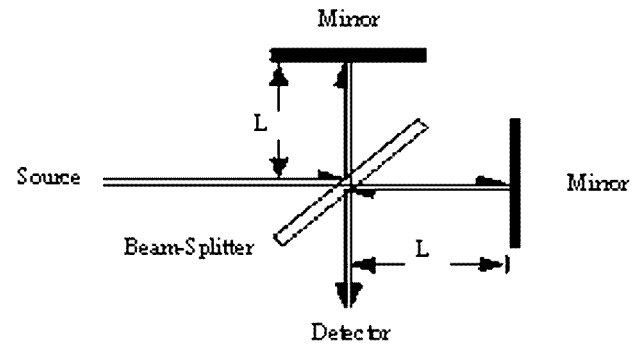


Figure 2: A diagram of the apparatus used in the MM experiments.

let, daughter of the TCD Provost, Professor of Physics. They had 3 sons and 5 daughters.

In 1899, he was awarded the Royal Medal of The Royal Society of London.

3. MICHELSON-MORLEY EXPERIMENTS OF 1881-7

The MM experiments, using an interferometer shown as a diagram in Figure 1, produced null results contrary to classical physics by which the results should have been positive. According to classical theory, the time taken for each of the two round trips, L , should be different. The MM experiment however, demonstrated no difference in travel times.

In 1889, the American journal *Science* published in its May 2nd issue a brief nontechnical 1/2 page Letter to the Editor by FitzGerald, entitled "**The Ether and the Earth's Atmosphere.**" (Something else appeared in the May 17th issue—perhaps his "paper" [4]).

FitzGerald dealt with *Science* in an attempt to capture attention of MM and because he had a falling out with the Royal Society of Dublin.

His letter to *Science* contained his suggestion of a Relativistic concept concerning a length change with velocity which could reconcile 1887 MM experiments with earlier, first-order, ether wind experiments.

QUOTE

"...I have read with much interest Messrs Michelson and Morley's wonderfully delicate experiment attempting to decide the important question as to how far the ether is carried along by the Earth."

"Their result seems opposed to other experiments showing the ether in the air can be carried along only to an inappreciable extent. I would suggest almost the only hypothesis which could reconcile this opposition are lengths of materi-

al bodies change, according as they are moving thru the ether or across it, by an amount depending on the square of the ratio of their velocities to that of light.” ed. ins.

UNQUOTE

So, FitzGerald for the third time was first with a definable Relativistic concept in May 1889. FitzGerald’s letter to *Science* was to remain virtually unknown for over a half century until Brush drew attention to it in 1967. FitzGerald to his death was not sure it had appeared in print. He could not bring himself to the point where he would have contacted *Science* to find out about the letter. Apparently, he did not know anyone who subscribed.

FitzGerald simply was a man not willing to put himself into the picture of current events at the time. Of consequence, he made no effort to contact the publication for details of a print. Today, most people would themselves have made the effort and for that reason see FitzGerald’s lack of will as poor judgment. (I think it was a family trait as it was handed down to me and I have to fight my own lack of effort and complacency).

Larmor, a friend and colleague of FitzGerald, who was responsible for editing FitzGerald’s collected works in 1902 the year following his death, was not aware of the letter’s existence altho he knew what it contained [5]. FitzGerald sought to promote his contraction hypothesis primarily by way of lectures and private communications with colleagues between 1889 and 1892. He voiced the hypothesis in 1889 during a visit to the Liverpool home of Lodge, with Lodge’s first references to it in print in his papers he published on optics in 1892 and 1893. In the first paper, Lodge viewed FitzGerald’s hypothesis as a velocity thru the ether [6].

4. DEFORMATION OF SIZE HYPOTHESIS LED TO LENGTH CONTRACTION THEORY

In a January 1889 letter to Heaviside, FitzGerald offered a suggestion. A Heaviside distortion might be applied “to a theory of the forces between molecules” of a rigid body. If these forces were rendered anisotropic by mere motion of the molecules, then the shape of a rigid body would be altered as a consequence of the motion [7].

So, FitzGerald for the second time was first with a Relativistic concept in January of 1889.

A purely longitudinal contraction theory was not originally proposed by either FitzGerald, 1889, nor Lorentz, 1895, to apply to the MM null results but rather deformation of size. Nor was deformation as artificial or *ad hoc* as it was so often portrayed by some antagonistic scientists then very eager to criticize not fully explained concepts.

A plausible contraction support of the deformation theory was proposed independently by both FitzGerald and Lorentz. But there were important differences between these arguments, each relied on an analogy with the effect of motion on electrostatic forces. Then there was FitzGerald’s shift from deformation to relativistic contraction which he accomplished in the time frame 1889-1892, still before anyone else.

Apparently, there is no proof positive, as words written down by either FitzGerald or Lorentz, as to the exact dates upon which to claim what was written by whom. So, there is admittedly, the possibility of crossover. But it is clear, FitzGerald had the edge over Lorentz via his letter to Heaviside, his letter to *Science* published May 2nd and May 17th, his visit to Lodge’s Liverpool home in 1889, and, via Lorentz’s admission, FitzGerald was first. The subject matter in those cases probably dealt with lengths of bodies versus velocity, meaning the length of a body versus its velocity relative to an observer.

(In the annals of science, we must be most precise in what we mean by such-and-such or some idiot surely will stretch our intent every which way but loose).

The misconstrued concept of 3-D deformation was one promoted by such scientists as Lodge, and by others much later attempting to cast doubt upon FitzGerald’s concept of “...lengths of material bodies change... depending on the square of the ratio of their velocity to...light.”

It should have been clear to all, FitzGerald did not intend his Relativistic concept to include “breadth” changing, nor “height” changing with velocity, only “length”, or he would have addressed them in the same paragraph. In his lectures, he timely, modified his statement he had made to *Science* by confining “lengths” to just one, “a length contracts in the direction of motion”. This new statement was said before a TCD audience competent as to their understanding of his meaning and he said the length statement quite enough times long before Lorentz went public with his own version of size deformation then length contraction.

Lorentz at one time **was** not aware of FitzGerald’s 1889 letter to *Science* and in 1895 he proposed an almost identical deformation in a paper which then took the MM experiment very seriously. When it was pointed out to Lorentz in 1894, FitzGerald had already published a similar theory, he wrote to FitzGerald who replied,

QUOTE

“I do not know if they [*Science*] ever published it.”

(apparently they did on May 17th). “I am glad to know you agree with me for I have been rather laughed at for my view over here.” ed. [8].

UNQUOTE

One only has to look at FitzGerald's personality to see he was one not to follow thru with an investigation on his own of something which bothered him. He really did need some encouragement to overcome his inherent apathy. Most unfortunate, a family trait.

Lorentz took several opportunities after this to acknowledge FitzGerald had proposed the idea first. Only FitzGerald, who did not know if his article had actually been published, believed Lorentz had published first.

The MM 1881-7 experiments challenged classical physics by proving the speed of light is the same for all observers, regardless of their relative motion. FitzGerald and Lorentz attempted to preserve the classical concepts by demonstrating the manner in which length contraction of the measuring apparatus would reduce the apparent constancy of the speed of light to status of an experimental artifact.

Larmor wrote a paper in 1898 *Ether and Matter* in which he wrote down the (Lorentz) transformations (still not written down by Lorentz) and showed the FitzGerald-Lorentz Contraction was a consequence.

Lorentz wrote down the transformations, now named after him, in a paper of 1899, being the third person to have the written them down. He, like Larmor, showed the FitzGerald-Lorentz contraction was a consequence of Lorentz transformations.

A paper relating to Relativity was published in 1898, *La mesure du temps*, by Poincare. In that paper, Poincare says,

QUOTE:

"...we have no direct intuition about equality of two time intervals. The simultaneity of two events or the order of their succession, as well as equality of two time intervals, must be defined in such a way as statements of natural laws be as simple as possible." ed.

UNQUOTE

In a second paper, FitzGerald's claim is misinterpreted by Poincare to be (as deformations of length *and* breadth),

QUOTE

"...size of bodies may be a function of their direction of motion thru the ether; and accordingly length and breadth of MM's stone supporting block [on which the interferometer is mounted] were differently affected..." ed.

UNQUOTE

In a 1988 historical treatment of FitzGerald's hypothesis, Hunt pointed out, giving the benefit of any doubt to FitzGerald,

QUOTE

"...there is no reason to think the idea which dawned on him in Lodge's study involved anything other than a simple [longitudinal] contraction...". ed. [9].

UNQUOTE

Such awareness would certainly have gone a long ways toward explaining FitzGerald's and Lodge's discussions of the deformation hypothesis.

Those discussions had been noted in 1966, by Bork, who wrote they do not state just what contraction is involved, in terms of mathematical details. Bork warned, Lodge's 1893 paper easily could be interpreted to indicate effects were taking place in both length *and* breadth of the moving body, which was exactly how FitzGerald's letter to *Science* was read by Capria and Pambianco in 1992. In his correspondence with Lorentz and Larmor, FitzGerald, it was said, never used the words "contraction" or "shortening," but referred to the length of the body changing depending on the orientation of the body relative to the direction of motion thru the ether, with a consequent alteration in the size of the body.

(That misdirection of FitzGerald's intent is why scientists must be most precise in their correspondences, papers, and lectures. It helps an audience to understand via cycling the same idea over and over again each time expanding to reenforce that which was said before).

Concerning the 1889 discussion with FitzGerald at his Liverpool home, Lodge recalled FitzGerald accepted his suggestion as to the effect of motion on MM's stone slab might be a shear distortion. Lodge apparently was projecting his own view, where the distortion ought to maintain volume.

By 1913, Lodge openly defended the sheardistortion. But Lodge's accounts, from 1892 to 1931, do not attribute shear distortion to FitzGerald other than as one possible kind of deformation amongst others. There appears to be no evidence FitzGerald complained his hypothesis was misconstrued by either Lodge or Lorentz. Yet, in the scientific community, renderings of misconstruction of FitzGerald's hypothesis become common place even up to the mid 1960s. Even now, once in a while, some scientist will cast doubt upon FitzGerald being first to expound a Relativistic concept.

Witness the many published dissertations on Relativity over the years and you will find, contrary to history, references to Lorentz but not FitzGerald as the name attached to the Relativistic concept of longitudinal contraction. In fact, a few renditions say it was written error to have mentioned FitzGerald as so much as involved with contraction.

History is on FitzGerald's side not junk scientists seeking to profit from their criticism.

5. LENGTH CONTRACTION THEORY [10]

In Relativistic terms, the length contraction concept amounts to a shortening of an object along longitudinal direction of its motion relative to an observer, not relative to the so-called “ether.” Breadth and height dimensions are not contracted. This concept agrees with Einstein’s Special Theory of Relativity.

While it might be appropriate to write down in this article all of FitzGerald’s equations dealing with his Relativistic concepts so as to propel the truth he was first, and for that matter all of the equations Lorentz wrote down, however, it would be more appropriate to simply write the one length equation to have come out of all that confusion about deformation versus contraction and who said what first. The one equation, now most often called the FitzGerald-Lorentz Contraction, is

$$L = L_0 \sqrt{1 - \frac{v^2}{c^2}}, \quad (1)$$

where v^2/c^2 is that part of the equation which was mentioned in FitzGerald’s May 1889 letter to the editor of *Science*.

References

- [1] Obituary: *The Times* www.aam314.net/FitzGerald.html.
- [2] “Uncle George Johnstone Stoney First to name the electron.” *Encyclopaedia Britannica*, 11:288:3b (1990).
- [3] “EM RF waves first to how to generate by FitzGerald” (1883). *Encyclopaedia Britannica*, 4:806:3a (1990) and F. T. Trouton, George Francis FitzGerald, *Proc. Inst. Electrical Engineers* (1901).
- [4] G.F. FitzGerald, “The Ether and the Earth’s Atmosphere,” *Science* 13, 390 (May 1889) and S. G. Brush (1967), “Note on the History of the FitzGerald-Lorentz Contraction,” *Isis* 58, 230-232 and J. S. Bell (1992), “George Francis FitzGerald,” 1989 lecture, abridged by Denis Weare in *Physics World*, 5, 31–35.
- [5] J. Larmor (ed.), “The Scientific Writings of the Late George Francis FitzGerald.” Hodges, Figgis; Dublin, 1902.
- [6] O.J. Lodge, “George Francis FitzGerald,” *Electrician* (1 March 1901) and O J Lodge, George Francis FitzGerald, *Nature* (March 7, 1901) and O J Lodge, George Francis FitzGerald, *Obituary Notices Roy. Soc. London* (1901) and O J Lodge, George Francis FitzGerald, *Physical review* (May 1901) and Oliver Lodge, “G. F. FitzGerald”, *Proc. Roy. Soc.* **75**, 152–160 (1905).
- [7] F.E. Hackett, “FitzGerald as revealed by his letters to Heaviside,” *Sci. Proc. Roy. Dublin Soc. (NS)* **26**, 3–7 (1952).
- [8] http://www-groups.dcs.st-and.ac.uk/~history/Hist-Topics/Special_relativity.html.
- [9] Bruce J. Hunt, “The Origins of the FitzGerald Contraction,” *British Journal for the History of Science*, 21, 61–76 (1988).
- [10] Alfred M. Bork, “The ‘FitzGerald’ Contraction,” *ISIS*, **57**, 199–207 (1966).
- [11] George Francis FitzGerald. www-groups.dcs.st-and.ac.uk/~history/Mathematicians/FitzGerald.html and www-groups.dcs.st-and.ac.uk/~history/References/FitzGerald.html.
- [12] E. Whittaker, G. F. FitzGerald, *Scientific American* **185** (5) (1953), 93–98.
- [13] J.M.D. Coey (2000), “George Francis FitzGerald, 1851–1901. The Millennium Trinity Monday Memorial Discourse,” <http://www.tcd.ie/Physics/History/Fitzgerald/FitzGerald.html>.
- [14] W.F.G. Swann (1941), “Relativity, the FitzGerald-Lorentz Contraction, and Quantum Theory,” *Reviews of Modern Physics* 13, 197–202.
- [15] H.R. Brown (2001), “The origin of length contraction: 1. The FitzGerald-Lorentz deformation hypothesis,” *American Journal of Physics* 69, 1044–1054. E-prints: gr-qc/0104032; PITT-PHIL-SCI00000218.

TRUE RATIONALE FOR CELEBRATING EINSTEIN'S SPECIAL RELATIVITY THEORY

A.C.V. Ceapa¹

PO Box 1-1035, 014700 Bucharest, Romania

Received March 14, 2006

The centennial anniversary of Einstein's original paper on relativity would have been all the more significant if accompanied with the recognition of both the accuracy of the derivation of the Lorentz transformation (LT) in that paper and its revealed nature. Einstein's development of special relativity theory (SRT) without his 1905 derivation of the LT raised the perennial criticism of SRT and the crisis of modern physics as well. That recognition would enable physicists to turn SRT and the theories relied on SRT from mathematical theories into physical theories by validating the classical physics' principle of physical determination of equations in all these theories, so understand correctly some apparent dysfunctions in SRT, and obtain genuine physical information. It is through these new results that the contribution of Einstein's SRT to the advancement of physics and the progress of mankind is far more substantial than it was believed.

The birth of a new idea or set of coupled ideas promoting the advancement of science is an act of science. The discarding of revelation's role in the act of science was in accord with founding physics as science on measurements and elementary mathematics but has altered dramatically the further advancement of physics when syntheses of experimental data and advanced mathematics have been involved.

Many personalities in the history of science, particularly in that of modern physics, have obtained worthy and valuable results under revelation. However, the prevailing idea that science and divine work are antinomies made them unable to provide any rationale for them [1, 2]. Consequently, they wholly or partly discarded such results, sometimes for worse ones. That is what has happened to Albert Einstein when he developed SRT without the derivation of the LT in the paper just celebrated [3].

As I have proved by deducing the LT as a “complementary” time-dependent coordinate transformation (required by the need to determine the direction and length of the radius vectors of moving geometrical points at the time of their projection onto coordinate axes by tracing them with light signals) [4, 5], despite their apparent want of justification, all the mathematical flats that he used to obtain the LT in [3] were accurate as being physically warranted. So that, Einstein's derivation of the LT in [3] was right. But Einstein did not trace the radius vectors of geometrical points off the x axis by light signals and did not investigate the addition of travel times as scalar quantities. Like “magician-physicist,” he “jumped over all intermediate

(explanatory) steps to a new insight” [5]. He correctly traced abscissas of geometrical points by light signals and obtained the LT but this was not enough to see that βx and βt in the LT are, respectively, Cartesian coordinate and Newtonian time, so to abolish the mysterious nature of the factor $\beta = 1/\sqrt{1 - v^2/c^2}$.

Believing in the physical equivalence of the mathematically equivalent derivations of the LT, Einstein developed SRT without the derivation of the LT in [3], as a mathematical theory: The undisclosed nature of β did not allow him the validation of the classical physics' principle of physical determination of equations within SRT. The principle stipulates that each term of an equation describing a physical phenomenon is in correspondence with a facet of that phenomenon. The fact that Einstein was aware neither of the accuracy of his derivation of the LT in [3] nor of its unique and essential role in validating that principle in SRT proves clearly the revealed nature of the mathematical flats that led to the LT in [3]. Unfortunately, within a century's span, no such principle has been recognized in SRT. Neither has it been recognized in modern physics which theories have been relied on Einstein's SRT. No textbook paid any attention to this principle, as well as to its importance for the advancement of physics.

Consequently, without the constraints imposed by the classical physics' principle of physical determination of equations 1) SRT appeared to conflict with Newton's mechanics and predict — as part of a “new view of space and time” — the length contraction (never proved experimentally) and the time dilation (also never proved experimentally [7]; the larger lifetimes of the “relativistic” particles does not mean time dilation) as

¹E-mail: alex.ceapa@yahoo.com

true physical phenomena -although a mathematical theory that was not turned into a physical one can not make accurate physical predictions, 2) the relativistic quantum theory missed essential physical information, 3) the relativistic quantum theories were partly without physical foundation, and 4) the mathematical models devoted to describe some unconventional experimental results failed to give evidence for the common nature of the phenomena they were concerned with, and, so, to refine such experiments into radically novel technology. It is here where the crisis in modern physics has risen from, as much as the crisis in technology.

Einstein's uncommon merit was that (although not aware of dealing with revealed knowledge) he turned (by parts) in [3] a revealed knowledge into a rational knowledge. Recognizing the key role played by revelation in the act of science, I consciously completed this conversion. "Rehabilitating" the derivation of the LT in [3], and validating the classical physics' principle of physical determination of equations in SRT, I have opened the way toward removing the two crises. The classical physics' principle of physical determination of equations in Einstein's SRT prompts the inference of further physical information. Such novel information is complementary to the old one provided by the Copenhagen school interpretation, and indispensable in understanding and exploiting that obtained by colliding relativistic particles. So arises the true, magnificent role (yet hidden) of SRT in physics. A reviewing of modern physics — built by discarding the revelation role in the act of science — in the light of the classical physics' principle of physical determination of equations needs be effected by looking for the information hidden in the terms of the basic equations, so removing the useless ascendancy that mathematics gained over physics. The resulting information that feeds radically new technologies (not its "survival for the best part of a century" [8]) is that providing the rationale for celebrating Einstein's SRT.

References

- [1] A.C.V. Ceapa, "Revelation & Progress in Science: Einstein & Relativity," in Proceedings. "Physical Interpretation of Relativity Theory-IX." (3rd-6th September 2004, Imperial College, London; Ed. M. Duffy, PD Publications, Univ. of Liverpool, 2004, pp. 82–84.
- [2] A.C.V. Ceapa, <http://arxiv.org/abs/physics/0603015> (Appendix 4).
- [3] A. Einstein, "Zur Elektrodynamik bewegter korper," *Annalen der Physik*, 17, 891 (1905).
- [4] A.C.V. Ceapa, "Lorentz Transformation as a Complementary Time-Dependent Coordinate Transformation," *Galilean Electrodynamics*, 16, 3–11 (2005).
- [5] A.C.V. Ceapa, <http://arxiv.org/abs/physics/0603015>.
- [6] S. Weinberg, "Dreams of a Final Theory," Vintage Books, Random House, Inc., 1994, p. 67.
- [7] A.G. Kelly, "Reliability of Relativistic Effect Tests on Airborne Clocks," Monograph 3, Institute Engineering Ireland, 1996.
- [8] A.C.V. Ceapa, *letter from Phys. Rev.*

CLASSIC CONCEPTIONS OF SPECIAL AND GENERAL RELATIVITY THEORY. TRIUMPHS AND DIFFICULTIES OF THE THEORY

N.A. Zhuck¹

*Research and Technological Institute of Transcription, Translation and Replication, JSC
Box 352, 3 Kolomenskaya St., Kharkov 61166, Ukraine*

Received August 8, 2005

This work is devoted to the anniversaries of the Relativity Theory creation, life and creative work of its author - Albert Einstein, triumphs and difficulties of this theory as well as alternative views at space, time and gravitation.

1. Introduction

Contemporary physics, as considered, is based on two “foundations”: Relativity Theory and Quantum Theory. This work is devoted to the creation anniversaries of the first one, i.e. history of the Relativity Theory creation, life and creative work of its author - Albert Einstein, triumphs and difficulties of this theory as well as alternative views at space, time and gravitation.

At once it should be noted that two concepts or two theories are included actually in the term “Relativity Theory”: The Special Relativity (SR) [1], created by Einstein in 1905, i.e. exactly 100 years ago, and The General Relativity (GR) [2], created by the same author in 1915, i.e. exactly 90 years ago. It should be added as well that this year there is 50 anniversary since the death day of Einstein, who died in 1955, his age was 76 years.

What do these two theories of relativity represent conceptually?

If to tell very briefly, so SR united space and time into single four-dimensional space-time and showed how the coordinates of some events in this four-dimensional one would be transformed at transition from one to any other inertial reference system, i.e. to the coordinate system moving evenly, rectilinear, with permanent speed.

Space, time and gravitation were united in GR, i.e. this theory can be called rightly as the new theory of gravitation, which described gravity interactions in four-dimensional space-time.

By other words, SR is a certain part of GR. In this sense they are inseparable, although some gravitation cases can be presented without SR. So, for example, the gravity interaction in GR is brought to the Newton’s gravitation law for two reposing material points.

So, let us be absorbed by the physics atmosphere

of centenary remoteness and observe, what caused the appearance of SR and then GR.

2. Physics crisis of XX century beginning

In classic physics, i.e. in that physics, which was formed by XX century end, three fundamental principles became firmly established (assertions based on certain facts):

1) relativity principle, saying that the physics laws are identical in all inertial reference systems and that it is impossible to set the selected position of some one by no mechanical experiments;

2) principle of the light velocity constancy asserting that the light velocity in relation to a receiver does not depend on the source movement velocity;

3) principle of time absoluteness, meaning identicalness of its flow in all inertial reference systems.

It should be noted that the third principle wasn’t formulated in the obvious type in classic physics at the very beginning, because nobody did suppose something other at all, i.e. this principle was simply implied as understanding in itself. But it was formulated since the classic physics principles began to be transmitted to the electrodynamics (in particular, optical) phenomena on the eve of XIX and XX centuries and the requirement paradoxicality of their simultaneous implementation came to light.

This paradoxicality was caused by both the insufficient study of light nature and the absence of the time other imagination, than those were formed within the classic physics framework. From one side, if light consisted of particles (within the light corpuscular theory), so the first principle would execute, but the second wouldn’t executed. From other side, if light was a wave (within the light wave theory) spreading in ether from point to point, so the second principle would executed,

¹E-mail: zhuck@ttr.com.ua

but the first wouldn't be executed, because the selected reference system can be bound to this environment that conflicts with the first principle [3].

The second contradiction can be shown more evidently as follows. Let's the spaceship sweep over with permanent but pre-light speed by the immobile observer (in some reference system), and at the moment of their most rapprochement (when it is possible to ignore the distance between them) there is the light flash (it is unimportant, who did it - the observer or astronaut on spaceship). Then after a while the light wave front will be like the sphere in the center of which he is, taking into account the light speed constancy according to the immobile observer imaginations.

The spaceship will relocate also in space for the same time, but astronaut on its board, taking into account the second physics principle, must be in the sphere center of the same radius as well, which the light wave front is the surface. But the same sphere can not have two foci! And this contradiction based on sensible logic and, it would seem, correct principles were the basic problem of XIX century end and the beginning of XX century.

3. Special Theory of Relativity

And what do physicists do for this contradiction solution? Without selecting any of them, it is necessary to show the logic which misguide all of them. The matter is the persuasion appeared at the end of XIX century that, taking into account the light velocity limited nature, the information about simultaneous events for one observer will be unsimultaneous for another, moving relatively the first. Then it was offered to use a lot of the clocks located in those space points to simplify the events analysis of times and intervals between them, where the indicated events occur. The mislead appeared on this basis, as it strengthened the opinion firmly about the time unidimensionality.

The mislead sense resulted in the following. Even if the first and second principles for the mechanical phenomena are executed fully and does not conflict with the mechanics laws, so the third principle should be modified (considering that three principles but not two were in contradiction at once [3]), introducing so-called local time, which flows on a moving spaceship another way than the time of immobile observer. Thus two first principles were succeeded to reconcile as well as agree that the observers, immobile and moving observers see on the shipboard different (let's underline - different!) spheres formed by the light wave front.

If at first development stages of this point of view since Fögt (1887), Lorentz (1892, 1895, 1904) and concluding by Puankare (1905), unidimensional local time in the moving reference system was examined as certain mathematical principle necessary for the first two

principles concordance, so it was converted into objective physical property by Einstein (1905). At the same time he stuck the ether refusal as a physical environment filling the whole outer space [4] for all physicists. Both the first and second were Einstein's error and that is why.

The first is related to the fact though really existent connection between space and time came to light on the border of foregoing ages, but this connection was immediately presented asymmetrically: space was measured by three coordinates, and time - by one. Obviously that their aggregate as so-called four-dimensional space-time could not become deformed symmetrically as for its nature at transition from one reference system to another. Lorentz' transformations appeared from here and there, which described this unsymmetry. But there is a question: if space and time is tied-up between themselves, why so asymmetrically? And does tying-up asymmetrically mean non-equivalently?

However Lorentz' transformations, which came in the stead of Galilei's transformations, had their trump, their triumph: at last, they made Maxwell's electrodynamics equalizations as invariant at transition from one inertial reference system to another. But these equalizations have failing, which Maxwell even knew that they are not full, because they do not describe moving charges and open-ended currents. And that is why they result in a conclusion that only transversal electromagnetic waves (flat or spherical) can exist in nature. With such conclusion the history of XX century gave birth the nature anomalous phenomena heap and only in 90th single physics enthusiasts opened experimentally longitudinal waves at last, which are beyond the "Procrustean bed" of Lorentz' transformations in any way.

Now let's pass to Einstein's second error - refusal of ether. Not only this refusal deprived material transmitter energy, because the Universe space became empty, so it comes also into conflict with longitudinal electromagnetic waves existence.

In this case the reasonings should be conducted ex contrario. Let's assume that ether exists. But then every waves distribution must be accompanied by its particles displacement. If there are transversal waves, which vectors of electric and magnetic tension are mutually perpendicular and simultaneously perpendicular to waves distribution direction, i.e. located in the transversal plane to waves distribution direction, why the ether particles can be displaced only in this plane, i.e. have two freedom degrees only? If the space three-dimensional, so it can be concluded on legal ground that the ether particles have three freedom degrees, and longitudinal waves are possible as well. But they conflict with Lorentz' transformations. And where is the exit from this bewitched circle?

And an output invites to by itself: if Lorentz' transformations dissatisfy to the nature real phenomena, so

it is needed to refuse them simply, get back to physics bases, analyze them and offer new transformations of space and time at transition from one inertial reference system to another. Especially because 100 years ago there was no such clear determination of length and time units, as nowadays.

4. Crisis of Lorentz' transformations

From the philosophical point of view space and time are categories, designating the basic forms of the matter all types existence. Space expresses the order of separate objects existence, time is the order of the phenomena changing [5].

The length, which characterizes an extent, remoteness and moving of bodies or their parts along the set-line, is the space measure. Time characterizes the successive changing of the phenomena and matter states, and also their life duration [6].

Without going into the determinations and description history of physical units various systems, we will specify modern determinations of the length and time units only: meter and second. And let's begin it with a second, as this unit got its modern determination earlier than a meter.

Development of molecular and atomic spectroscopy enabled exactly enough to bind time units to the vibrations period, corresponding the spectral line of some element. Therefore the second determination valid until nowadays was given by the XIII General Conference decision on measures and scales (1967), according which the second duration is 9 192 631 770 of radiation periods corresponding the transition between two superthin levels of caesium-133 basic atom state [7]. Consequently, the above-mentioned periods number will be equal simply to caesium-133 radiation frequency.

The measurings exactness increase allowed binding the length unit - a meter to the wavelength of the certain spectral line. The krypton-86 orange line was accepted as such one. This line corresponds to electron transition in the krypton atom between the certain quantum states. According to the determination accepted at XI General Conference on measures and scales, a meter contained 1 650 763.73 of wavelength in this spectral line vacuum.

However further achievements of laser technique and quantum electronics, high accuracy, which succeeded to be attained at light velocity measuring, allowed to link the length unit determination — a meter with the time unit — a second - together. And the XVII General Conference on measures and scales made decision to give the following, valid until now, the meter definition: the meter is the distance passable in vacuum by a flat electromagnetic wave for $1/299\,792\,458$ seconds. The light velocity value is accepted as the value, not subjected to clarification at such meter determination,

i.e. it is exactly equal $299\,792\,458$ m/s.

Thus, the second is the certain number duration of caesium-133 radiation periods and the meter is the certain distance passable by the electromagnetic wave. But nothing forbids using that electromagnetic radiation for meter determination that is used for the second determination. Therefore we use the radiation corresponding to transition between two superthin levels of basic caesium-133 atom state for the reasonings simplification in future.

It is not difficult to make equivalent proportions of two valid determinations of meter, second and agreement accepted above. So, it turns out of the second determination that the wavelength of above-mentioned caesium-133 radiation is equal 0.0326122557 m, and the meter, accordingly, will be equal 30.6633189 of this radiation wavelength.

Here we came to conclusion that one meter is equal 30.66331899 of the radiation wave-length corresponding to the transition between two superthin levels of caesium-133 basic atom state that is like the meter determination, given by the XI General Conference on measures and scales in 1960. If we take another radiant, so we'll obtain another number. And caesium-133 is chosen of those considerations that its frequency is very stable.

Now it is not out of place to tell about the author's time imagination. But at first one proverb should be reminded that is used more frequently than in businessmen circles: "time is money". So money act part of universal equivalent in society by means of which an exchange of goods and services happens. And the money inlaid in business brings a profit in the course of time, i.e. new money. The above-mentioned proverb is apparent from here.

But, probably, a few physicists from modern ones (and businessmen the more so) turned attention on the fact that there is other connection based on the use analogue between money and time. Strangely enough, ancient philosophers were better well-informed about it than we're informed now. And the paper's author [4, 8], suggesting to measure time in units of mass (by kilograms, grams, pounds, ounces etc.).

And now I give my own time determination: time is some universal equivalent by which the comparison of various processes flowing speed is performed. The concept of time is senseless out of these processes [3]. In some cases they use year, in other — month, in third — hour, in fourth — minute, and in physics in the international units system SI — second — as an equivalent. Even if it is uncomfortable (for quickly changing processes, for example), so they use a millisecond, a microsecond or even more little period of time as the standard equivalent part for the processes comparison.

As the processes can not flow differently, as by the position change (moving, flow from one place to another) of some mass (energy), so the transition from an

artificial parameter (time) to natural one (mass) taking into account its minimum possible value (quanta) appears not only reckless (by impression), but also timely (by necessity) idea of the XX century end, which the paper's author expressed [4, 8]. Therefore the author put again the time concept in its frames which exceeded the bounds in the XX century, growing into everything, whichever, except the equivalent for the comparison of various processes flowing speed. The special and general theories of relativity as well as other theories were created outside these frames. And in some theories the authors ended by that they began to materialize time and even invented the time particle — a chronon.

And can the processes flow in all three spatial directions? Yes, they can. So time is three-dimensional. By other words, the scales of space and time in all three spatial directions can be different. Therefore in general case it is necessary to talk about six-dimensional space-time (3+3), but not about four-dimensional one (3+1) at any integration of these two properties.

5. Two ways in gravitation theory creation

The people familiar with quantum mechanics know that it has two mathematically equivalent formulations: matrix and wave. The similar situation was formed in GR as well: the field formulation appeared besides geometrical one. If the first one describes the matter motion on the distorted space-time background by it, the second is the field theory like Maxwell's electromagnetism theory, in which the fields variables are considered on the flat world background.

Even in 1905 at first Puankare suggested the idea of relativism theory construction for all physical forces, including gravitation, in flat four-dimensional space in the paper "About the electron dynamics". He marked also that the gravity field must spread with the light speed and as the interaction delay is assumed, so its material transmitter should be.

Some later Puankare expressed the supposition that future physics must include the Plank's discovery of the electromagnetic field quantum character. Thus, Puankare can be considered as the ideological founder of that way, which is called as relativistic quantum gravitation in modern language and in which the gravitation is considered as the material field in flat space-time [9].

This way is similar to that, on which the whole non-gravity physics development really went on that resulted in such fundamental theories creation as quantum electrodynamics, quantum theory of electroweak interactions, quantum chromodynamics. Obviously, quantum gravity dynamics should be included in this group.

However in 1915 Einstein opened other way, at which gravitation is described not as the matter, moving in space and time, but as curvature of space-time

under the action of the whole non-gravitating matter. Afterwards this way was called as geometrodynamics. Thus, GR put the gravitation in exceptional position in relation to other physical interactions, as it was stipulated not by material interaction transmitters, but space-time curvature itself.

Substantially, the empty space surrounding material objects, materialized with GR creation as though it could distort, broaden, compress and even spread as gravity waves. Thus no special transmitters of the gravity field were foreseen. By other words, it simply lost its physical essence, remaining here as means of interaction between objects.

Thus, two ways were already defined sharply at the beginning of XX century for the gravitation theory, which some people inclined to consider as alternative, mutually exclusive, and other as complementary (for example, wave and matrix forms of quantum mechanics). However the second way got the primary development with GR creation, and the first one was forgotten as though.

6. General Relativity Theory

The GR creation by Einstein — as contrary to SR — was always considered as the striking example of the problem development and decision from start to finish by one unique scientist. But also here climbing up scientific Olympus "from a back door" was not done without efforts. And here repeatedly robbed Puankare was ahead of Einstein on ten years, creating the first and unique relativistic gravitation theory until 1916. And exactly this theory exhaustively explaining physical essence of gravitation by difficult mathematical apparatus, made the kernel of Einstein's paper "Bases of General Relativity Theory" [10]. The fact was suppressed also that the mathematician D. Gilbert got and published this theory basic equalization earlier, after which the denomination "Einstein's equalization" was assigned afterwards [11].

Really surprising history happened with Gilbert's equalization. It was reported in private correspondence to Einstein by Gilbert who stuck to the first scientist with questions: and they say what did you get? Gilbert "deceived" for a long time without wishing to give out his own results to the nimble colleague, but then he exposed them to publication for the persistent correspondent. And he suddenly read surprisingly in the next Einstein's message: imagine, he said, I came to such conclusion exactly just before your letter receipt... Here Gilbert grabbed his head and, cursing himself for hastiness, asked to accelerate the article publication with his equalization which was called as "Einstein's" all the same afterwards [12]. Only this fact can explain that Einstein's article on GR of 1915th end was presented without proof (he snaffled a result, but he did not know

a conclusion).

7. Alternative theories of gravitation

If do not take into consideration Birkhoff's paper dated 1944 [13], which is detached somehow and in which the gravity field equalizations are postulated simply, so the revival of the strict field approach to the gravitation theory started only since 1961 beginning with Tiring's paper [14]. The revival of this way, probably, is related to GR inability to respond numerous questions in its ordinary form, including ones in the cosmology field.

Currently 5 basic directions can be selected in physics, somehow or other joining the Einstein's and Puncare's ideas concerning the gravitation and unified field theory [15]:

1. Theory of space, time and gravitation as Einstein's GR, in which gravitation is considered as geometrical property of space-time and radically differs from all other types of physical interactions [21, 23, 33, 36-39]. Space between atoms, planets, stars and galaxies is considered empty and distorted somehow. For many tens of years, passing after GR creation, it seems, everything possible is explored in this theory. Therefore this approach is valuable only in a theoretical and retrospective aspect, because today even skeptics understand clearly that absolute emptiness is impossible.

2. Gravitation field theory as the absolute alternative of GR. This theory is built on a background of flat (Euclid) space. The works by Yu.V. Baryshev, M. Moshynsky and, in Baryshev's opinion, G.D. Birkhoff, V.E. Tiring, G. Kalman, S. Deser, R.P. Feynman and even A. Puncare can exemplify.

3. Gravitation field theory as alternative of GR, but assuming geometrical interpretation. A.A. Logunov's relativistic gravitation theory can exemplify. The approach is supported by Yu.M. Loskutov, M.A. Mestvirishvily, Yu.V. Chugreev, A.V. Genkom, Yu.P. Vibliy and other physicists.

4. Gravitation field theory as other mathematical form of GR. Ya.B. Zeldovich, V. Ginzburg, L.P. Grischuk, A.N. Petrov, A.D. Popova had always an outlook to such problem. Above-mentioned V.E. Tiring and S. Deser asserted the same, in my opinion.

5. Geometrized theories, in which the attempt of the unified field theory construction, looking like GR, but including other interactions as well, is given. This direction continues Einstein's program, realization of which he devoted the last 30 years of his life. G.I. Shipov's physical vacuum theory is related to it, which is supported by A.E. Akimov, E.A. Gubarev, A.N. Sidorov, I.A. Volodin.

If Einstein's GR is built in four-dimensional space-time on symmetric tensors for which the equality $T_{ik} - T_{ki} = 0$ is true, so the number of measurings is multiplied in the theories of the fifth direction either it is

considered that $T_{ik} - T_{ki} \neq 0$ (i.e. twisting is taken into account) or that and other is done. Shipov's theory is just based on the second way, i.e. the twisting use in four-dimensional space-time. (It should be noted that the conservation laws exist only for symmetric tensors).

8. Quadrodynamics

My universe theory from the day of the first new results obtaining developed 18,5 years (as a whole I am engaged in this field study and research more than 30 years) and currently it is either in the shade of Einstein's GR or in the shade of theories, opposable to it, while actually it relates neither to that nor other. Having genetic link to GR, it cardinally differs from this theory at the same time and needs the proper name.

As considered GR is the relativistic, but unquantum theory of space, time and gravitation. The theory developed by me is based on GR mathematical apparatus (i.e. on the tensor calculation and differential geometry of multidimensional spaces) [15], but according to its last (2002) [16, 17] content is the ether relativistic quantum theory and actually is the unified theory of all fundamental interactions. As for our perception (including by devices) only 4 fundamental interactions are accessible (gravitation, electromagnetism, nuclear and weak interactions), and there is only 4 basic equalizations (for free space) in my theory, so this one served as the reason to call it as quadrodynamics.

It should be noted that GR is also the unified fundamental interactions theory as for its content actually, however this fact was understood by neither its creator nor contemporaries and followers until nowadays due to considerable complication of the theory mathematical apparatus and plenty of the errors or interpretations laid in it.

Currently it is possible to call the following 10 basic quadrodynamics differences from GR:

- 1) the completely symmetric 6-dimensional space-time (3 spatial coordinates + 3 temporal), which only turns into 4-dimensional (3 + 1) as well as in GR at measuring on local scales, is used instead of the asymmetrical 4-measured space-time (3 spatial coordinates + 1 temporal);

- 2) at the same time space and time turned into continuous actually at space-time dynamic deformation due to the discrete value, where its dimension sense is lost;

- 3) the group of affin coordinates transformations, which saves the light cone equalization as unchanging, is used instead of Lorentz' transformations;

- 4) the light velocity instead of constant became a tensor and only at measuring according to proper scales of space and time remained a constant as in GR;

- 5) The Universe is homogeneous, isotropic and flat (these properties are put into the theory from outside as

experimental facts) in global scales initially, i.e. it has Euclid's geometry in contrary to the Universe indefinite geometry in GR;

6) the Universe became stationary-static (non-expanding) with the appropriate change of all (all!) physical laws of its functioning instead of dynamic (in a standard cosmological model);

7) these components deviations from the flat space-time tensor components are used in quadrodynamics instead of absolute values - components of metrical tensor in GR (as it is done in so-called field formulation of GR), the light velocities multiplied to square that forms the field potential components in aggregate;

8) quadrodynamics contains only 4 basic equalizations instead of 6 equalizations in GR (for the space-time dimension $3+1$, as in GR);

9) instead of 10 variables (metrical tensor components) in GR quadrodynamics contains 6 variables in a general view, 3 of which reflect the static constituent projections of the charge electric field (i.e. the ether polarization near a charge), and 3 other ones - dynamic deformation projections of this field on three coordinates axes (there is only 4 according to proper scales of the charge space and time of such variables);

10) instead of one force (gravitation) in GR, quadrodynamics describes 4 fundamental interactions as multipole-multipole electric charges interactions at the matter levels different on scales (ether amers, electrons-positrons, charges atoms and combinations of various levels).

9. Conclusion

Quadrodynamics had not a single contradiction with nature until now, while GR was always included into the conflict with properties of the real world, especially in the cosmology area. A traditional electrodynamics is also contradictory and incomplete. Therefore in future the further development task not the gravitation theory (only the applied aspects are important in it), but electrodynamics as the bases of all fundamental interactions.

References

- [1] A. Einstein, "Zur Elektrodynamik der bewegter Körper," *Ann. Phys.*, **17**, 891 (1905).
- [2] A. Einstein, "Die Feldgleichungen der Gravitation." *Sitzungsber. preuss. Akad. Wiss.*, **48**, 2, 844–847 (1915).
- [3] B.V. Medvedev, "Theoretical physics principles." — Moscow: "Nauka", 1977, 496 p. (in Russian).
- [4] V. Pauli, "Theory of relativity." — Moscow: "Nauka", 1991, p. 23–24 (in Russian).
- [5] L.A. Sena, "Units of physical values and their dimensions." — Moscow: "Nauka", 1988, p. 48–50 (in Russian).
- [6] I.M. Galitsky, "New in physics, mathematics, science." — Gomel: FENID, 1992 (in Russian).
- [7] I.M. Galitsky, "About new physics (Principles)." *Space-time & Substance*, **2**, 2, 84–94 (2001).
- [8] DISCUSSION: N. A. Zhuck — I. M. Galitsky. *Spacetime & Substance*, **2**, 2, 96 (2001).
- [9] A. Pies, "Scientific activity and Albert Einstein's life." — Moscow: "Nauka", 1989, 568 p. (in Russian).
- [10] V.K. Bulavin, "Genius of all times. (To Albert Einstein's 120 Anniversary and 80-Anniversary of great legend about him)" // Newspaper "Duel," N 32 (123), 10 August, 1999 (in Russian).
- [11] A.A. Tyapkin, A.S. Shibanov "Puankare." — Moscow, 1979 (in Russian).
- [12] V.P. Visgin, "Relativistic theory of gravitation." — Moscow, 1981 (in Russian).
- [13] G.V. Birkhoff, "Flat space-time and gravitation." // *Gravitation*, v. 2, ed. 2, 1996, p. 21–29 (in Russian).
- [14] V.E. Tiring, "Alternative approach to the gravitation theory." // *Gravitation*, v. 2, ed. 2, 1996, p. 40–58 (in Russian).
- [15] N.A. Zhuck, "Cosmology," — Kharkiv: Model Vselennoy Ltd, 2000, 464 p. (in Russian).
- [16] N.A. Zhuck, "Quadrodynamics: The New Relativistic Quantum Theory of Space, Time and Fundamental Interactions." Published by Infobank Ltd. in 2004, Kharkiv, Ukraine, 24 p.
- [17] N.A. Zhuck, "Quadrodynamics as the new relativistic quantum theory of space, time and fundamental interactions." *Spacetime & Substance*, **4**, 2, 49–57 (2003).

THE GAUGE INTERPRETATIONS OF GENERAL RELATIVITY

P.I. Danylchenko¹

SPE "GeoSystem", Vinnytsya, Ukraine

Received May 11, 2005

It is shown here that Lorentz transformations are caused by gauge effect of motion on matter (principle nonobservability of effect of motion on matter). This gauge effect of motion is caused by interdependence and mutual determination of propagation velocity of interaction between elementary particles and of rate of course of matter proper (standard) time. The Lorentz transformations are derived without any linearity assumptions and being based only on the presence of relativistic shrinkage of the length of moving body and on clock desynchronization at its slowest transfer along this body.

1. Introduction

A lot of publications, being prejudiced fundamental postulates of Special Relativity (SR), have appeared recently. The most important among the brought-up problems is considering such substance as the physical vacuum (PV) to be a physical reality. After all, PV substitutes absolute ether of classical physics at rest in many ways. In addition, the possibility to work out the value of peculiar velocity of absolute motion of the Solar System by anisotropy of frequency of cosmic microwave background radiation contradicts with the established in the scientific literature opinion about the absence of special absolute (fundamental) frame of references of coordinates and time (FR), motionless relatively to the PV.

The aim of the present work is to show that seeming mutual incompatibility of the fundamental SR postulates with the presence of the undraggable by a moving body PV and corresponding to it the unique fundamental PVFR is caused only by imperfect understanding of physical essence of Lorentz transformations. The essence of these transformations (as it will be shown below) is in the precise mathematical mapping of gauge¹ effect on matter and its space-time continuum (STC)

[1, 2]. This gauge effect is the cause of principal nonobservability of any changes, which have realized in the objects and physical processes.

2. Derivation of the Lorentz transformations

As it was first shown by Fitzgerald and Lorentz [5], at the transformation of a state of body absolute rest into the state of steady inertial body motion relatively to the PV, uniquely definable shrinkage of the body size in the direction of its motion realizes itself in the absolute (fundamental)² space. This shrinkage is connected with isobaric self-contraction of body matter [3]. The self-contraction of matter is the result of adaptation of its molecules, atoms and elementary particles to changed conditions of their interactions.

Let the body moves at the absolute velocity $V < c$ relatively to the PV. Then only longitudinal size X_{ij} of the body, and consequently, the corresponding to it size of length standard, located on the body, shrink along the direction of motion in the same quantity of times: $X_{ij0}/X_{ij} = (1 - V^2/c^2)^{-1/2} = (1 - V^2)^{-1/2}$.

Where: $c = 1$ considering the measuring of linear dimensions in light units of length. As a result of identical (mutually proportional) size shrinkage of measured objects, as well as of measurement instrumentation, motionless relatively to the moving body, no changes in geometry of its objects in body FR will be found out. And, consequently, changes of linear and angular dimensions of the objects in the fundamental space for the moving body and for the inertial FR (IFR), rigidly bound up with it, will be purely gauge. And the body will be gauge-self-deformed in this space. Due to such relativistic shrinkage of longitudinal sizes of the body

¹E-mail: pavlo@vingeo.com

¹As we know, influence of electric field on matter is realized only by spatial increments of electric potentials, not by the values of potentials. So we can gauge-transform these values. In analogy to this influence, influence of motion on matter, which we can observe in matter intrinsic FR as strengths of graviinertial (removable gravitational) field [3], is realized only by space-time increments of linear momentum, not by the values of linear momentum. Therefore, linear momentums of matter objects and, consequently, velocities (linear momentums are the functions of velocities) also can be gauge transformed by proceeding from observation of motion of this matter from one FR to the observation of it from another FR, as well as directly in the same FR - by their change in time, for example, for accelerating matter, which has rigid intrinsic FR (Moller FR) [3, 4].

²According to Newton, this space is only a container for matter and, therefore it can be considered as Universal space.

the duration of absolute (cosmological) time of interaction between any two body points (or rather located there elementary particles):

$$\Delta T = \Delta T_1 + \Delta T_2 = 2\Gamma \sqrt{X_{ij0}^2 + Y_{ij0}^2 + Z_{ij0}^2} = \Gamma \Delta T_0, \quad (1)$$

will increase in Γ times, where:

$$\begin{aligned} \Delta T_1 &= \Gamma^2 [\sqrt{X_{ij}^2 + (1 - V^2)(Y_{ij}^2 + Z_{ij}^2)} + V X_{ij}] = \\ &= \Gamma (\sqrt{X_{ij0}^2 + Y_{ij0}^2 + Z_{ij0}^2} + V X_{ij0}), \end{aligned} \quad (2)$$

and:

$$\Delta T_2 = \Gamma (\sqrt{X_{ij0}^2 + Y_{ij0}^2 + Z_{ij0}^2} - V X_{ij0}), \quad (3)$$

- durations of time intervals of propagation of interaction waves accordingly in forward and reverse direction, and: $X_{ij}, Y_{ij} = Y_{ij0}, Z_{ij} = Z_{ij0}$ - orthogonal projections of the segment between the interacting in the process of motion body points. As we see, the increase of duration of interaction time does not depend on the values of angles between the direction of body motion and directions of propagation of electromagnetic wave (virtual photon) in the forward and reverse move. And consequently, the repetition frequency of all the periodic physical processes, realizing in the moving body, including processes that used for chronometry, will decrease in Γ times. And this means, that as the result of gauge effect of motion on matter, the time on the moving body (in the IFR, corresponding to it) will course Γ times slower than on a body, conventionally motionless³ relatively to the PV. However, observers and instruments, motionless relatively to the body, will find no changes in realization of physical processes, which take place directly on the moving body.

Relativistic time dilation in IFR can't be observed in principle by the intrinsic clock of IFR. Therefore, according to (2) and (3), time intervals ΔT_1 and ΔT_2 must have the following durations by the clock of IFR:

$$\Delta \tilde{t}_1 = \Delta T_1 / \Gamma = \sqrt{x_{ij}^2 + y_{ij}^2 + z_{ij}^2} + V x_{ij}, \quad (4)$$

$$\Delta \tilde{t}_2 = \Delta T_2 / \Gamma = \sqrt{x_{ij}^2 + y_{ij}^2 + z_{ij}^2} - V x_{ij}, \quad (5)$$

where: $x_{ij} \equiv X_{ij0}, y_{ij} \equiv Y_{ij0}, z_{ij} \equiv Z_{ij0}$ - projections dimensions of the moving body segments, observed in its IFR (in compliance with gauge transformations) with the same value as in case of their observation in

³Because of the wave nature of matter, it can't be at the state of rest relatively to PV (and consequently in fundamental space of PV) in principle. Therefore, quanta of action (quantum changes of collective space-time state of matter resting in IFR), which propagate in any IFR momentarily in principle, in PVFR, as well as in any FR not comoving with this matter, propagate at supraluminal, but finite velocity [3]. This, as well as isotropy of frequency of relict radiation that is peculiar only to PVFR, makes PVFR stand out from the totality of all possible FR.

state of body rest relatively to the PV. According to this, the value of the average velocity of propagation of interaction wave in the forward and reverse move will be observed in IFR the same as at its observation in the PVFR:

$$\tilde{c} = 2 \sqrt{x_{ij}^2 + y_{ij}^2 + z_{ij}^2} / (\Delta \tilde{t}_1 + \Delta \tilde{t}_2) = 1.$$

This doesn't allow us to find out mutual inequality of observed in the IFR and PVFR velocities of propagation of interaction wave or light, using location or interferometer.

Inequality of time intervals of the propagation of interaction wave in forward (ΔT_1) and reverse (ΔT_2) move to its average value:

$\langle \Delta T \rangle = (\Delta T_1 + \Delta T_2) / 2 = \Gamma \langle \Delta \tilde{t} \rangle$, is also impossible to be found out by IFR clock. After all, even in the case of slowest transfer of the clock along the shortest path from one point of the IFR to another, a mutual desynchronization of transferred and motionless in the IFR clocks realizes:

$$\begin{aligned} \delta \tilde{t}_{ij} &= \lim_{\delta \mathbf{V} \rightarrow 0} \{ \Delta T_1 [\sqrt{1 - (\mathbf{V} + \delta \mathbf{V})^2} - \sqrt{1 - \mathbf{V}^2}] \} = \\ &= \lim_{\delta \mathbf{V} \rightarrow 0} \{ [\sqrt{1 - (2\delta V_x V + \delta V^2)\Gamma^2} - 1] x_{ij} / \Gamma^2 \delta V_x \} = \\ &= -V x_{ij} = \langle \Delta \tilde{t} \rangle - \Delta t_1, \end{aligned} \quad (6)$$

where: $\Delta T_1 = X_{ij} / \delta V_x = x_{ij} / \Gamma \delta V_x$

and: $\delta \mathbf{V} = \mathbf{V}' - \mathbf{V}$ is Galilei difference of vectors of absolute velocities of slowly transferred (\mathbf{V}') and motionless (\mathbf{V}) in IFR clocks. This desynchronization is observed only in PVFR. And it compensates in the IFR the difference of the intrinsic time intervals $\Delta \tilde{t}_1$ and $\Delta \tilde{t}_2$, which proportionally synchronized with ΔT_1 and ΔT_2 correspondingly:

$$\Delta t_1 = \Delta \tilde{t}_1 + \delta \tilde{t}_{ij} \equiv \langle \Delta \tilde{t} \rangle = \sqrt{x_{ij}^2 + y_{ij}^2 + z_{ij}^2},$$

$$\Delta t_2 = \Delta \tilde{t}_2 - \delta \tilde{t}_{ij} \equiv \langle \Delta \tilde{t} \rangle \equiv \Delta t_1.$$

As a result of this, a question appears, if equality in all the IFR points of proper quantum time (which determines their "age") really does exist according to the observations from the PVFR. After all, in the process of increase of the value of velocity (till the value of uniform velocity) the motion of different points of the body realizes at unequal velocities [3]. And this leads to the fact that "age" of different points of the body (measured by their quantum proper clock) will be unequal, according to (1). And consequently, the difference of points "age" will essentially depend on the law of motion of the body points during the process of reaching by them the equal values of absolute velocity. And as a result, standard time, determining the body points "age", should be considered as their path-like proper (standard) time. To realize the possibility of analysis of dynamics of objects, which move in the IFR, coordinate-like intrinsic time (unified in all the points) [2, 4] must be introduced into it.

All of this is a sufficient reason for adoption of the conception of non-simultaneity of observation in the IFR of

events, which realize simultaneously in the PVFR. The impossibility to observe in the IFR the desynchronization of the clock at its slowest transfer from one point of IFR to another:

$$\delta\tilde{t}_{ij} = \lim_{v \rightarrow 0} \{ \Delta t (\sqrt{1-v^2} - 1) \} = \\ = \sqrt{x_{ij}^2 + y_{ij}^2 + z_{ij}^2} \lim_{v \rightarrow 0} \{ (\sqrt{1-v^2} - 1)/v \} = 0$$

shows up non-triviality of gauge transformation of time intervals. Time interval between the events, fixed in different points of the IFR by its intrinsic clock (which counts IFR coordinate time), is determined in PVFR, according to (6), by the following transformation:

$$\Delta T = \Gamma \Delta \tilde{t} = \Gamma (\Delta t - \delta\tilde{t}_{ij}) = \\ = \Gamma (\Delta t + V x_{ij}) = \Gamma \Delta t + \delta T_{ij}, \quad (7)$$

where: $\delta T_{ij} = \Gamma V x_{ij}$ - observed in the PVFR mutual desynchronization of events, which have simultaneously happened in the i and j points of the moving body IFR. Considering gauge transformation of size of the parallel to the direction of motion projection of segment x_{ij} , transformations of distance projections between these points at noncoinciding time moments $\Delta T = T - T_0 \neq 0$, will be the following:

$$\Delta X = X_j - X_{i0} = (x_{ij}/\Gamma) + V \Delta T = \Gamma (x_{ij} + V \Delta t), \\ \Delta Y = Y_j - Y_{i0} = y_{ij}, \Delta Z = Z_j - Z_{i0} = z_{ij}. \quad (8)$$

According to (7) and (8) projections of velocity of the moving object at the transition from the IFR into PVFR and inversely will be transformed according to Lorentz rules [4]. In that way, the velocity of light in free space will not depend in the IFR on absolute velocity of body, possessing this IFR. This, of cause, is connected with the equality of the velocity of light in free space⁴ to the velocity of propagation of the wave of electromagnetic interaction, which determines the frequency of this interaction between elementary particles of matter, and thus, the course rate of the IFR intrinsic time.

Consequently, Lorentz transformations are based on real relativistic shrinkage in fundamental space of dimensions of objects along the direction of their motion, as well as on IFR intrinsic time dilation and desynchronization of slow-transferred clock, which are observed in the PVFR. Due to this, Lorentz transformations guarantee the impossibility to find out in the IFR any

⁴In fact, the frequency of electromagnetic interactions of molecules, atoms and elementary particles is being determined not by vacuum value of the velocity of light, but by real value of the velocity of light in matter (gauge-proportional to vacuum value). Such simplification is acceptable only because of the presence of gauge invariance of all forces in nature to mutual proportional transformations of improper (coordinate) values of the velocity of light v_c within the limits of the whole space. Not only D'Alembert inertial pseudoforce $F_{in} = -H d \ln \Gamma / dX$ and gravitational pseudoforce $F_g = -H grad(\ln v_c)$, but also any natural force can be represented in gauge-invariant form. The proportionality of all forces and pseudoforces not to mass, but to hamiltonian H makes the problem of equivalence of inertial and gravitational masses unactual.

changes, which have happened to objects and physical processes, realizing in IFR, after the body has changed its state from conventional state of absolute rest to its uniform motion relatively to the PV. In that way, the correctness of the first Einstein postulate about the sameness of realizing of all the physical phenomena in all the inertial systems is confirmed.

3. Effects, caused by Lorentz transformations

As the result of time dilation in the IFR the increase of the value of its effective velocity relatively to the PV (which is determined by conventionally motionless in PVFR observer, according to (8) when $\tilde{x}_{ij} = 0$, not by its own clock but by moving together with IFR clock) takes place:

$$v_{eff} = \Delta \tilde{X} / \Delta t = V \Gamma. \quad (9)$$

Therefore, because of bigger in Γ times dash repetition frequency of motionless relatively to the PV distance scale, the value of its division will seem to be Γ times smaller in the IFR. And consequently, according to (7), the path ΔX , covered by the IFR in fundamental space, which is observed in it as "contracted", will be perceived in the IFR as Γ times smaller:

$$\Delta x = V \Delta \tilde{t} = V \Delta \tilde{T} / \Gamma = \Delta \tilde{X} / \Gamma. \quad (10)$$

Where: $\Delta \tilde{X} \equiv \Delta X(x_{ij} = 0)$; $\Delta \tilde{t} \equiv \Delta t(\delta\tilde{t}_{ij} = 0)$; $\Delta \tilde{T} \equiv \Delta T(\delta\tilde{t}_{ij} = 0)$, and $\delta\tilde{t}_{ij} = 0$ because of the absence of increase of longitudinal coordinate between points i and j ($x_{ij} = 0$).

On the other hand, at the same IFR intrinsic time ($\Delta t = 0$) its different points will be opposed to the PV points at the moments of cosmological time, mutually detached by the interval:

$$\Delta T' = \delta T_{ij} = V \Delta X'. \quad (11)$$

where according to (7) and (8):

$$\Delta T' \equiv \Delta T(\Delta t = 0) = \Gamma V x_{ij} = \delta T_{ij}; \\ \Delta X' \equiv \Delta X(\Delta t = 0) = \Gamma x_{ij} = \Delta T' / V.$$

These moments correspond (as it is shown in the figure, when $\Gamma = 2$) to different positions of the IFR relatively to the PV (events, simultaneous in the IFR, marked in the Table 1 by the symbol "**").

This will lead to observation in the IFR of "imaginary" shrinkage in Γ^2 times of dimensions of objects, motionless relatively to the PV. However, considering real shrinkage in fundamental space of the dimensions of IFR objects in Γ times, the resulting shrinkage, observed in the IFR, of dimensions of objects, motionless relatively to the PV, will be only in Γ times:

$$x_{ij} = \Gamma (\Delta X' - V \Delta T') = \Delta X' / \Gamma. \quad (12)$$

That is why, the presence of real shrinkage in fundamental space of dimensions of the IFR objects and the

Table 1: Positions of the scale of distances in IFR relatively to the scale of distances in PVFR

Scale of the PVFR										
Position of	0	1	2	3	4	5				
scale	I	I	I	I	I	I				
Scale of the IFR										
First position	0	1	2	3	4	5				
of scale	*	I	I	I	I	I				
Second position				0	1	2	3	4	5	
of scale				I	*	I	I	I	I	I
Third position							0	1	2	3
of scale							I	I	*	I
$V\Delta T' = V^2\Delta X' \quad x_{ij}/\Gamma = X\Gamma^{-2}$ <div style="text-align: center;"> $\begin{array}{c} \text{i} \text{-----} \text{i} \text{-----} \text{i} \\ \Delta X' \\ \text{i} \text{-----} \text{i} \end{array}$ </div>										

presence of "imaginary" shrinkage in the IFR space-time continuum of dimensions of objects, motionless relatively to the PV, leads to observation of dimensions of objects, motionless relatively to the IFR, in the PVFR and dimensions of objects, motionless relatively to the PV, in the IFR, as reduced in the same number of times. As the result of clock desynchronization $\delta\tilde{t}_{ij}$ at its slowest transfer along the moving body, "imaginary" cosmological (absolute) time dilation in Γ^2 times in the IFR STC will also take place. However, because of the presence of real IFR intrinsic time dilation in Γ times in comparison with cosmological time, the resulting cosmological time dilation, observed in the IFR, will be, according to (6), only in Γ times:

$$\Delta T = \Gamma(\Delta t - \delta\tilde{t}_{ij}) = \Gamma(\Delta t + Vx_{ij}) = \Delta t/\Gamma, \quad (13)$$

where, according to (8), $x_{ij} = -V\Delta t$ $x_{ij} = -V\Delta t$, because of the counting of cosmological time by the clock, conventionally motionless in PVFR, ($\Delta X = 0$). Consequently, the presence of real time dilation in the IFR and "imaginary" dilation of cosmological time leads to mutually observed time dilation on objects, moving in any of the FR. So, mutually observed identical shrinkages of objects and time dilations in mutually opposed FR are caused only by principle lack of mutually coincidence of time moments of reading in them of one of the two counts of space coordinates and principle lack of superposition of points of reading in them of one of the two counts of coordinate-like time accordingly. Incomprehension and neglect of this (together with indiscrimination of FR coordinate-like time and standard (path-like proper) time of objects [6]) is the cause of origination in the SR of various imaginary paradoxes. And moreover, it causes false treatment of SR by some physicists as purely mathematic theory, which allows explaining observed physical phenomena only with some degree of conventionality.

4. Conclusions

Lorentz transformations correspond to gauge self-deformation in the fundamental (absolute) space of STC of uniformly moving body. And at this they image the impossibility of detection of any changes, which have realized in the objects and physical processes after replacement of conventional state of absolute rest of the body to the state of its uniform motion relatively to the PV. And consequently, they image the principle impossibility of detection, in which of the two states the body is, using direct methods. However, the equality of any IFR with the PVFR, caused by this, by no means does not deny the natural occurrence of the unique PVFR, as well as of substance, motionless in it, - the PV (the absolute ether of classical physics), in which motion of objects, possessing mass, and propagation of electromagnetic waves take place. The PVFR in the Lorentz and Poincare groups of transformations is the element of not only set of the IFR, but also of sets of any other FR types of gauge-deformed and gauge-self-deformed bodies [2]. Moreover PVFR is the unique common element of all the possible FR sets.

Gauge invariance of eigenvalue of the velocity of light (uniquely determined by matter proper quantum clock) in any of the groups of transformation is caused by interdependence and mutual determination of time course rate and of the velocity of propagation of interaction⁵ (equal to the velocity of light). In this way the interaction propagation velocity in space is set in the time. And the course rate of matter proper time, in its turn, depends on the velocity of propagation of interaction. After all, the rates of realization of any physical process-

⁵Such topological interconnection between the rate of time course and the velocity of light is in a good agreement with Bohr principle of complementarity. And this interconnection maybe is the one of the causes of the fact that this principle corresponds to physical reality.

es, used for chronometry, are proportional to velocity of propagation of interaction. That's why it is impossible here to detect, which of the two physical parameters (time or the velocity of propagation of interaction) is initial (first-born). In that way, the impossibility of observing by the proper clock not only the change of course rate of time, measured by them, but also the change of velocity of propagation of interaction in the point of localization of the clock, is a property (postulated by Einstein only for IFR) of any other possible FR. And the relativity principle of SR is only the consequence of more fundamental principle - principle of gauge deformation of matter and its STC under the effect of motion and gravity [2].

References

- [1] P. Danylchenko, "Gauge Justification of Special Relativity," in: *The Gauge-evolutional theory of the Creation (GETC)*, Vinnytsya, Ukraine, 1, 10 (1994); "Gauge foundations of special relativity", in: *Gauge-Evolutional Interpretation of Special and General Relativities (GEITR)*, O. Vlasuk, Vinnytsya, Ukraine, 3 (2004); also on: (http://pavlo-danylchenko.narod.ru/docs/Foundations_Eng.html).
- [2] P. Danylchenko, "Foundations of the Gauge-evolutional theory of the Creation (space,time, gravitation and the Universe expansion)," Vinnytsya, Ukraine, 1994; see also "Gauge-evolutional interpretation of special and general relativities" (in Russian) on: http://pavlo-danylchenko.narod.ru/docs/Osnovy_Rus.html (English version will be available soon).
- [3] P. Danylchenko, "Nature of relativistic length shrinkage," in: *Gauge-Evolutional Interpretation of Special and General Relativities (GEITR)*, O. Vlasuk, Vinnytsya, Ukraine, 3 (2004) (http://pavlo-danylchenko.narod.ru/docs/Nature_Eng.html); "Relativistic length shrinkage and gravitational waves", NiT, Kyiv, 2005 (in Russian)(<http://n-t.org/tp/ns/rsd.htm>)
- [4] C. Möller, "The Theory of Relativity," Clarendon Press, Oxford, 1972.
- [5] H. Lorentz, "The theory of electrons," Teubner, Leipzig, 1916.
- [6] P. Danylchenko, "Physical essence of twins paradox," in: *Gauge-Evolutional Interpretation of Special and General Relativities (GEITR)*, O. Vlasuk, Vinnytsya, Ukraine, 25 (2004) (http://pavlo-danylchenko.narod.ru/docs/Twins_Eng.html).

A NEW INTERPRETATION ABOUT THE EVOLUTION OF THE COSMOS

FangPei Chen¹

Department of Physics, Dalian University of Technology, Dalian 116024, China

Received August 15, 2005

Based on Lorentz and Levi-Civita's conservation laws, it can be shown that the energy of the matter field in the universe might originate from the gravitational field as a result of the latter field's energy decrease and the total entropy increase followed by cosmic expansion. By exploring this possibility and by using some new evidences discovered from recent astronomical observations, we establish an alternative theory of cosmology, which gives a new interpretation about the evolution of the cosmos and a number of new explanations regarding dark energy and dark matter.

1. Introduction

The prevalent theory in cosmologies is the standard big bang cosmology (SBBC), which is based on the theory of general relativity and the cosmological principle that assumes the universe being homogeneous and isotropic in space. A distinguished feature of this theory is that the universe begins to expand from a state of matter field in infinite density called big bang and immediately undergoes a brief period of exponentially fast expansion called inflation. The deductions or predictions of SBBC, such as the cosmic microwave radiation background and the abundance of the helium nuclei in the universe, have been verified by astronomical observations, which help establishing it as the prevalent theory.

In the past two decades numerous new evidences, such as dark energy, dark matter, the strong support for inflation and the total mass-energy density of the universe being close to the critical value, have been accumulated from space surveys. However some new discoveries can not be satisfactorily interpreted by the SBBC theory. For instance, it is difficult or impossible to answer the following questions: Is there really a beginning to the universe? What events led to the onset of inflation [1]? And what are the essence of dark energy and dark matter [2, 3]? These problems make some cosmologists worry that cosmology has “become a victim of its own success” and doubt that the standard model “is less a solid edifice than scaffolding with many gaps resting on uncertain foundations” [1-3]. Other cosmologists think that SBBC is in trouble and it is therefore not premature to give some consideration to alternative cosmologies [4]. These views are well worth considering. In this paper we propose an alternative cosmology in order to give a new interpretation about the evolu-

tion of the cosmos.

2. OBSAVERTIONAL CONCLUSIONS AND THEORETICAL DEDUCTIONS – FOUNDATIONS TO ESTABLISH AN ALTERNATIVE COSMOLOGY

In the following observational conclusions and theoretical deductions will be used as foundations to establish an alternative cosmology; we shall analyze them first.

2.1. Spatial homogeneity and isotropy

A high degree of isotropy in cosmological observations, specifically the cosmic microwave radiation background temperature measurements, has been observed [5]. But it is difficult to prove the spatial homogeneity directly in cosmological observations. However astronomical observations tell us that the earth, or the solar system, or our galaxy, or our local group of galaxies, does not occupy any specially favored position in the cosmos, hence we might hypothesize that all positions in the universe are essentially equivalent, *i.e.* the universe is spatial homogeneous.

Using the mathematical property of symmetric space, the Robertson-Walker metric

$$d\tau^2 = -dt^2 + a(t)^2 \left\{ \frac{dr^2}{1 - kr^2} + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2 \right\} \quad (1)$$

for the universe can be deduced immediately [6], where (r, θ, ϕ) are commoving coordinates and $a(t)$ is the scale factor. The constant $k = -1, 0, 1$, is used to indicate the spatial curvature. It has been determined

¹E-mail: chenfaf@dlut.edu.cn

$k=0$ from astronomical observations [3]; but we are not confined to the case $k=0$ only and shall study the general cases at first.

The homogeneous and isotropic assumption also implies that $T_{\mu\nu}$, the energy-momentum tensor of the matter field, should take the form of ideal fluid:

$$T_{\mu\nu} = (\rho + p)u_\mu u_\nu + pg_{\mu\nu}, \quad (2)$$

where u_μ is the 4-velocity of matter, ρ is the mean energy density, and p is the mean pressure.

2.2. Lorentz and Levi-Civita's conservation laws of energy-momentum tensor for gravitational system including matter fields and gravitational fields

The energy-momentum tensor of the matter field is defined by

$$T_{(M)\mu\nu} \stackrel{def}{=} \frac{2}{\sqrt{-g}} \frac{\delta(\sqrt{-g}L_M)}{\delta g^{\mu\nu}}. \quad (3)$$

Following the above definition Lorentz and Levi-Civita had defined the energy-momentum tensor for the gravitational field by

$$T_{(G)\mu\nu} \stackrel{def}{=} \frac{1}{8\pi G\sqrt{-g}} \frac{\delta(\sqrt{-g}L_M)}{\delta g^{\mu\nu}}. \quad (4)$$

The equations of gravitational field can be derived [7] from the requirement that the variation of action integral $I = \int \sqrt{-g} (L_G + 16\pi L_M) d^4x$ should be $\delta I = 0$. Thus they obtained the conservation laws of energy-momentum tensor for gravitational system including matter fields and gravitational fields [8]:

$$T_{(M)\mu\nu} + T_{(G)\mu\nu} = 0 \ \& \ \frac{\partial}{\partial x^\mu} (T_{(M)\mu\nu} + T_{(G)\mu\nu}) = 0 \quad (5)$$

we shall call them Lorentz and Levi-Civita's conservation laws.

In the last few years I have thoroughly studied Lorentz and Levi-Civita's conservation laws and found that these conservation laws not only are rational and perfect but also have abundant physical contents [9-12]. A number of new specific properties of gravitational fields or gravitational waves can be deduced and can be tested via experiments or observations [12]. About eighty years ago Einstein did not agree with these conservation laws; the only reason given by him is that these conservation laws "do not exclude the possibility that a material system disappears completely, leaving no trace of its existence." [8], because Einstein believed that the relation expressed by Eq. (5) should make a material system, being $T_{(M)\mu\nu} \neq 0$ in the initial state, to $T_{(M)\mu\nu} \rightarrow 0$ spontaneously. We shall show that this view is not correct. According to statistical mechanics the entropy S of a macroscopic system must obey the

Boltzmann's relation $S = k \ln N$, where N is the number of microscopic states. For a macroscopic system, there must be $N \gg 1$ always, thus $S > 0$ usually. If a gravitational system (including matter and gravitational field) could disappear completely and spontaneously, then in the disappearing process N will decrease to $N=1$ gradually; at here we look upon the complete disappearance as a special state. Because there is no difference in the meaning between macroscopic and microscopic state for the complete disappearance, so $N=1$. Therefore in the complete disappearance process of this gravitational system its entropy should decrease to $S=0$ from $S>0$; this is contrary to the theorem of entropy increase; hence a gravitational system can not disappear completely and spontaneously.

The energy density of matter field is always positive, so according to Eq. (5) the energy density of gravitational field should be always negative. From Eq. (5) we get $\Delta T_{(M)\mu\nu} = -\Delta T_{(G)\mu\nu}$ immediately, this relation means that for an isolated gravitational system if the energy-momentum of matter field increases, then the energy-momentum of gravitational field should decrease, *i.e.* the energy-momentum of gravitational field might transform into the energy-momentum of matter field. This possibility might occur in reality, since the number of microscopic states both for matter field and gravitational field should all increase in this process so that the entropy of the system increases. It is worth to remember that in the above process the absolute value of gravitational field energy is increasing, thus the number of microscopic states for gravitational field should increase also. This possibility could be used as an important basis for establishing an alternative cosmology.

2.3. The cosmological constant λ , the correction tensor $D_{\mu\nu}$, and the modified Einstein equations for the universe

From astronomical observations we believe that $\lambda \neq 0$ [3, 13], so the term $\lambda g_{\mu\nu}$ should be added in the equations of gravitational field for the universe. On the other hand we have shown in section 2.2 that the energy-momentum of gravitational field might transform into the energy-momentum of matter field; this energy-momentum transformation is equivalent to the creation of matter field's energy-momentum (and the decrease of gravitational field's energy-momentum). The creation of matter field's energy-momentum is a useful concept. This concept had been introduced first in the steady state cosmology [6]; in order to reflect the creation of matter field's energy-momentum, Hoyle had modified the Einstein equations by adding a correction tensor $D_{\mu\nu}$. Therefore the equations of gravitational field for the universe might be the modified Einstein equations

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R - \lambda g_{\mu\nu} + D_{\mu\nu} = -8\pi G T_{(M)\mu\nu}. \quad (6)$$

In Eq. (6) the terms $\lambda g_{\mu\nu}$ and $D_{\mu\nu}$ lie on the left. This means that they are similar to $R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R$, they are all used to describe the gravitational field; thus $\lambda g_{\mu\nu}$ and $D_{\mu\nu}$ should belong to gravitational field. The gravitational field is different from the matter field: between a gravitational field and a matter field there is only gravitational interaction but between two matter fields there are also other interactions; so it might be possible to distinguish them.

Comparing Eq. (6) with Eq. (5), we get

$$T_{(G)\mu\nu} = \frac{1}{8\pi G} \left(R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R - \lambda g_{\mu\nu} + D_{\mu\nu} \right). \quad (7)$$

This equality means $T_{(G)\mu\nu}$ can be divided into three parts:

$$T_{(G)\mu\nu} = \overset{R}{T}_{(G)\mu\nu} + \overset{\lambda}{T}_{(G)\mu\nu} + \overset{D}{T}_{(G)\mu\nu}, \quad (8)$$

where $\overset{R}{T}_{(G)\mu\nu} = \frac{1}{8\pi G} (R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R)$ is the part of gravitational field's energy-momentum due to space-time curvature; $\overset{\lambda}{T}_{(G)\mu\nu} = -\frac{\lambda g_{\mu\nu}}{8\pi G}$ is the part of gravitational field's energy-momentum due to cosmological constant; $\overset{D}{T}_{(G)\mu\nu} = \frac{D_{\mu\nu}}{8\pi G}$ is the part of gravitational field's energy-momentum due to the correction tensor $D_{\mu\nu}$. $D_{\mu\nu}$ should be similar to $R_{\mu\nu}$, $g_{\mu\nu}$ and $T_{(M)\mu\nu}$, their non-zero components are only the (0, 0), (1, 1), (2, 2) and (3, 3) component.

The terms $-\lambda g_{\mu\nu}$ and $D_{\mu\nu}$ in Eq. (6) have the property that they look as if they are a part of energy-momentum tensor of the matter fields, for Eq. (6) can be transformed into

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = -8\pi G T_{\mu\nu}^{\text{mod}}, \quad (9)$$

where $T_{\mu\nu}^{\text{mod}}$ is a modified energy-momentum tensor [6]:

$$T_{(M)\mu\nu}^{\text{mod}} \equiv T_{(M)\mu\nu} - \frac{\lambda}{8\pi G} g_{\mu\nu} + \frac{D_{\mu\nu}}{8\pi G}. \quad (10)$$

$T_{\mu\nu}^{\text{mod}}$ could also be written as the perfect-fluid form:

$$T_{\mu\nu}^{\text{mod}} = p^{\text{mod}} g_{\mu\nu} + (p^{\text{mod}} + \rho^{\text{mod}}) U_\mu U_\nu \quad (11)$$

with a modified density and pressure

$$\begin{aligned} \rho^{\text{mod}} &= \rho_M + \rho_{G\lambda} + \rho_{GD}; \\ \rho_{G\lambda} &= \frac{\lambda}{8\pi G}, \\ \rho_{GD} &= \frac{D_{00}}{8\pi G}, \\ p^{\text{mod}} &= p_M + p_{G\lambda} + p_{GD}; \end{aligned} \quad (12)$$

$$\begin{aligned} p_{G\lambda} &= -\frac{\lambda}{8\pi G}, \\ p_{GD} &= \frac{D_{11}}{8\pi G g_{11}}, \end{aligned} \quad (13)$$

where $\rho_{G\lambda}$, ρ_{GD} , ρ_M represent respectively the time-time component, *i.e.* the energy density, of $\overset{\lambda}{T}_{(G)\mu\nu}$, $\overset{D}{T}_{(G)\mu\nu}$, $T_{(M)\mu\nu}$; $p_{G\lambda}$, p_{GD} , p_M are the pressure produced by $\overset{\lambda}{T}_{(G)\mu\nu}$, $\overset{D}{T}_{(G)\mu\nu}$, $T_{(M)\mu\nu}$ respectively.

$D_{\mu\nu}$ might be constructed from an unknown field variable, for example, Hoyle had suggested [6] that $D_{\mu\nu} = C_{;\mu;\nu}$, C is a scalar field, called C-field. Since we do not yet know the specific properties of the unknown field variable, in this paper we study only the general properties of $D_{\mu\nu}$. The possibility that $D_{\mu\nu}$ might be constructed from an unknown field variable means that the gravitational field variable might not be only the metric tensor $g_{\mu\nu}$, it is therefore possible to include other variable. I believe this possibility and use it as a fundamental hypothesis of the new theory. Of course, whether it is correct or incorrect must be tested by experiments and observations.

2.4. Some deductions

From Eqs. (5-8) we obtain

$$\overset{R}{T}_{(G)\mu\nu} + \overset{\lambda}{T}_{(G)\mu\nu} + \overset{D}{T}_{(G)\mu\nu} + T_{(M)\mu\nu} = 0; \quad (14)$$

$$\frac{\partial}{\partial x^\mu} \left(\overset{R}{T}_{(G)\mu\nu} + \overset{\lambda}{T}_{(G)\mu\nu} + \overset{D}{T}_{(G)\mu\nu} + T_{(M)\mu\nu} \right) = 0 \quad (15)$$

then we have

$$\rho_{GR} + \rho_{G\lambda} + \rho_{GD} + \rho_M = 0; \quad (16)$$

$$\frac{\partial}{\partial t} (\rho_{GR} + \rho_{G\lambda} + \rho_{GD} + \rho_M) = 0. \quad (17)$$

The value of ρ_M is always positive, *i.e.* $\rho_M \geq 0$; the value of ρ_{GR} is always negative, *i.e.* $\rho_{GR} \leq 0$; the value of $\rho_{G\lambda}$ is always positive also, *i.e.* $\rho_{G\lambda} \geq 0$, because $g_{00} = -1$ and if $\lambda > 0$. We shall explain below that $\rho_{G\lambda}$ might be interpreted as the density of dark energy. As for ρ_{GD} since it will be interpreted as the density of dark matter, we could assume its value is positive, *i.e.* $\rho_{GD} \geq 0$.

From Eqs. (1), (9), (11-13) we can derive the following two fundamental equations for the scale factor $a(t)$ [6]:

$$\left(\frac{da}{dt} \right)^2 + k = \frac{8\pi G}{3} (\rho_M + \rho_{G\lambda} + \rho_{GD}) a^2; \quad (18)$$

$$\begin{aligned} \frac{d^2 a}{dt^2} &= -\frac{4\pi G}{3} \times \\ &\times (\rho_M + \rho_{G\lambda} + \rho_{GD} + 3p_M + 3p_{G\lambda} + 3p_{GD}) a. \end{aligned} \quad (19)$$

The deriving process for these equations might give us a confusing idea that $-\frac{\lambda}{8\pi G}g_{\mu\nu}$ and $\frac{D_{\mu\nu}}{8\pi G}$ are two *true* parts of energy-momentum tensor for the matter fields; however, although $\lambda g_{\mu\nu}$ and $D_{\mu\nu}$ take an active part in the expansion of the universe, yet as it is indicated above that they are not energy-momentum of the matter fields. Eqs. (9) and (10) have only equivalent meaning. Actually the Eqs. (18) and (2.4.) can be also derived from Eqs. (1), (2), (6).

Besides the above relations, we know that: $(R^{\mu\nu} - \frac{1}{2}g^{\mu\nu}R)_{;\nu} = 0$ and $(\lambda g^{\mu\nu})_{;\nu} = 0$; from Eq. (6) we shall have

$$(D^{\mu\nu} + 8\pi G T_{(M)}^{\mu\nu})_{;\nu} = 0. \quad (20)$$

But there exist the possibilities that $T_{(M);\nu}^{\mu\nu} \neq 0$ and therefore $D_{;\nu}^{\mu\nu} \neq 0$ either; we shall explain that in these cases the energy-momentum might transform between gravitational field and matter field:

Since $T_{(M)}^{\mu\nu} = (\rho_M + p_M) U^\mu U^\nu + p_M g^{\mu\nu}$, we can get [6]

$$\begin{aligned} T_{(M);\nu}^{\mu\nu} &= \frac{\partial p_M}{\partial x^\nu} g^{\mu\nu} + \frac{1}{\sqrt{-g}} \frac{\partial}{\partial x^\nu} \times \\ &\times [\sqrt{-g} + (\rho_M + p_M) U^\mu U^\nu] + \\ &+ \Gamma_{\nu\lambda}^\mu (\rho_M + p_M) U^\mu U^\lambda. \end{aligned} \quad (21)$$

For $\mu = t$, then $T_{(M);\nu}^{0\nu} = \frac{\partial \rho_M}{\partial t} + 3 \frac{\partial a}{a} (\rho_M + p_M) \approx \frac{\Delta(\rho_M V)}{V \Delta t} + p_M \frac{\Delta V}{V \Delta t}$, where V is any volume in the space, $\frac{\Delta(\rho_M V)}{V \Delta t}$ represents the energy change per unit volume per unit time for the matter field, $p_M \frac{\Delta V}{V \Delta t}$ represents the work done by the matter fluid during the cosmic expansion. If $T_{(M);\nu}^{\mu\nu} = 0$, then $p_M \frac{\Delta V}{V \Delta t} = -\frac{\Delta(\rho_M V)}{V \Delta t}$; this relation tells us that the whole energy for work done stems from entirely the decrease of matter field energy. If $T_{(M);\nu}^{\mu\nu} \neq 0$, then when $p_M \frac{\Delta V}{V \Delta t} > -\frac{\Delta(\rho_M V)}{V \Delta t}$, the decrease of matter field energy is less than the work done, so the gravitational field energy must also decrease during the cosmic expansion;

when $p_M \frac{\Delta V}{V \Delta t} < -\frac{\Delta(\rho_M V)}{V \Delta t}$, the decrease of matter field energy is larger than the work done, some matter field energy must transform to gravitational field energy during the cosmic expansion.

From $(D^{\mu\nu} + 8\pi G T_{(M)}^{\mu\nu})_{;\nu} = 0$ we can derive the relation

$$\frac{\partial}{\partial t} (\rho_{GD} + \rho_M) + 3H (\rho_{GD} + \rho_M + p_{GD} + p_M) = 0, \quad (22)$$

where $H(t) = \frac{da(t)/dt}{a(t)}$ is the Hubble's constant at time t . The equations (16), (17) and (22) can be

used to discuss the energy transformations between gravitational field and matter field. From the cosmological principle and using the commoving coordinates we can show that $\rho_{GR}(t)$, $\rho_{G\lambda}(t)$, $\rho_{GD}(t)$, $\rho_M(t)$ and $H(t)$ are all functions of t only [6]; if $\lambda = \text{const}$, then $\rho_{G\lambda}(t) = \text{const}$. The initial states of $\rho_{GD}(0)$, $\rho_M(0)$; $p_{GD}(0)$, $p_M(0)$ at $t=0$ and the variation rate $\frac{d}{dt} \rho_{GD}(t)$, $\frac{d}{dt} \rho_M(t)$ have many possibilities, such as:

(1) $\rho_M(0) = 0$, $p_M(0) = 0$, $\frac{d}{dt} \rho_M(t) > 0$, $\frac{d}{dt} p_M(t) > 0$;

(2) $\rho_M(0) > 0$, $\rho_{GD}(0) > 0$, $\frac{d}{dt} (\rho_M(t) + \rho_{GD}(t)) = 0$;

(3) $\rho_M(0) > 0$, $\rho_{GD}(0) > 0$, $\frac{d}{dt} \rho_M(t) > -3H(\rho_M + p_M)$ etc.

We shall discuss the first two cases as examples.

Case 1. $\rho_M(0) = 0$, $p_M(0) = 0$, $\frac{d}{dt} \rho_M(t) > 0$, $\frac{d}{dt} p_M(t) > 0$ everywhere

Since $T_{(M);\nu}^{\mu\nu} = p_M g_{\mu\nu} + (\rho_M + p_M) U_\mu U_\nu$, therefore at $t=0$, $T_{(M);\nu}^{\mu\nu}(0) = 0$ everywhere; i.e. the energy-momentum of the matter field is equal to zero in the universe. From Eq. (22), we have:

$$\begin{aligned} \frac{d}{dt} (\rho_M) + 3H (\rho_M + p_M) &= \\ &= - \left[\frac{d}{dt} (\rho_{GD}) + 3H (\rho_{GD} + p_{GD}) \right]. \end{aligned}$$

Because $\frac{d}{dt} \rho_M(t) > 0$ and $\frac{d}{dt} p_M(t) > 0$, then $\rho_M(t) > 0$, $p_M(t) > 0$. The observations of cosmological red shift tell us $H(t) > 0$. Thus the left hand side of the above equation is always larger than zero, which shows that the increase of matter field energy stems from the decrease of gravitational field energy. This means that the energy of matter field might originate from the gravitational field.

Case 2. $\rho_M(0) > 0$, $\rho_{GD}(0) > 0$, $\frac{d}{dt} (\rho_M(t) + \rho_{GD}(t)) = 0$ everywhere.

In this case it is evident that $\rho_M(t) + \rho_{GD}(t) = \text{const} > 0$, Eq. (22) tells us $p_{GD}(t) + p_M(t) = \text{const} < 0$. Besides, if $\lambda > 0$, then $p_{G\lambda} = -\frac{\lambda}{8\pi G} < 0$ also, the universe shall expand with negative pressure. Astronomical observations tell us that the space might be flat i.e. $k=0$, from Eq. (18), $\frac{da}{dt}/a = H = \text{const}$ for all t , therefore $a(t) = \exp(H(t-t_0))$ [6]. This result means the universe is inflating.

3. A NEW THEORY OF COSMOLOGY

The results of discussions in the section 2 are sufficient to establish a new theory of cosmology. The chief contents of the new theory given by this paper are:

(1). It accepts the cosmological principle, i.e. the universe is spatial homogeneous and isotropic, so the

universe has the Robertson-Walker metric

$$d\tau^2 = -dt^2 + a(t)^2 \times \left\{ \frac{dr^2}{1 - kr^2} + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2 \right\}. \quad (23)$$

Astronomical observations indicate the universe is spatial flat, *i.e.* $k=0$; then Eq. (23) become

$$d\tau^2 = -dt^2 + a(t)^2 \{ dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2 \}. \quad (24)$$

(2). It adopts the modified Einstein equations, Eq. (6), as the equations of gravitational field for the universe. These equations and the conclusions deduced from them apply to the whole cosmos, for the entire cosmos $\rho_{G\lambda}, \rho_{GD}, \rho_M$ are all less than the critical density [6] $\rho_C = \frac{3[H(t_0)]^2}{8\pi G} = 1.9 h^2 \times 10^{-29} (g/cm^3)$.

But for a macroscopic gravitational system, $\rho_M \gg \rho_C$ and $\rho_{G\lambda}, \rho_{GD}$ still less than ρ_C (but from Eq. (16) $\rho_{GR} \approx -\rho_M$, therefore Eq. (6) degenerates to:

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = -8\pi G T_{(M)\mu\nu}$$

(3). It uses the Lorentz and Levi-Civita's conservation laws as one of its theoretical foundations. It means that the energy-momentum of matter field might create from gravitational field.

The equations $T_{(M)\mu\nu} + T_{(G)\mu\nu} = 0$ tell us, when $T_{(M)\mu\nu} = 0$, $T_{(G)\mu\nu} = 0$. In this state, $\rho_M = 0$, $p_M = 0$, this is the lowest state of energy-momentum for the matter field in the universe. It must indicate that this state does not equal to the other 'lowest' energy state of pure matter field, *i.e.* the so called 'vacuum' state, of quantum matter field; at the 'vacuum' state, $\rho_M > 0$. It must indicate also that the energy creation of a matter field does not mean the matter field creation, thus if at $t = 0$, $\rho_M(0) = 0$, at $t > 0$, $\rho_M(t) > 0$, it means only that the state of matter field does change from the lowest energy state to a higher energy state, the concept of matter field creation is not necessary.

Why $\rho_M(0) = 0$, $p_M = 0$ is the lowest state of energy-momentum for the matter field in the universe? How is the energy-momentum transformed from the gravitational field into the matter field? These problems relate with the quantum theory of gravitational field. On account of a complete and consistent quantum theory of gravitational field has not been constructed yet till now, so we can not reply fully these problems at once now.

(4). It hypothesizes that $\rho_{G\lambda}$ is the density of dark energy and ρ_{GD} is the density of dark matter.

Astronomical measurements suggest that the expansion of the universe is accelerating; using the hypothesis (4) we can easily explain the accelerating expansion of the universe. Because $p_{G\lambda} = -\frac{\lambda}{8\pi G} < 0$, therefore, from Eq. (2.4.) if $(\rho_M + \rho_{G\lambda} + \rho_{GD} + 3p_M + 3p_{GD}) < -3p_{G\lambda}$; then $\frac{d^2 a}{dt^2} > 0$.

From Eq. (18) and $k = 0$ we can get the relation [13]:

$$\Omega_M + \Omega_{G\lambda} + \Omega_{GD} = 1 \quad (25)$$

where $\Omega_M = \frac{\rho_M}{\rho_C}$, $\Omega_{G\lambda} = \frac{\rho_{G\lambda}}{\rho_C}$, $\Omega_{GD} = \frac{\rho_{GD}}{\rho_C}$; $\rho_C = \frac{3[H(t_0)]^2}{8\pi G}$ is the critical density [6]; t_0 is the time of the present moment. The conclusions from CMB data tell us that [3] the Universe has 73% dark energy, 23% dark matter and 4% ordinary (baryonic) matter. According the above hypothesis we would have: $\rho_{G\lambda}/\rho_{mod} = 73\%$, $\rho_M/\rho_{mod} > 4\%$, $\rho_{GD}/\rho_{mod} < 23\%$ and $\rho_M/\rho_{mod} + \rho_{GD}/\rho_{mod} = 27\%$; because some parts of the 'dark matter' might be material matter [3], such as the neutrino, a weakly interacting massive particle (WIMP) and the massive compact halo objects (MACHOs, including low-luminosity stars and black holes). In the new theory the other part of the dark matter should be the field of $D_{\mu\nu}$ with energy density ρ_{GD} . We have considered that the field $D_{\mu\nu}$ should be a part of gravitational field in essence, so the properties of ρ_{GD} would be different from ρ_M . Their differences might be tested by experiments and observations in the future.

It is reasonable to interpret $\rho_{G\lambda}$ as the density of dark energy. In addition to the explanation of the accelerating expansion of the universe as shown above, the term $-\lambda g_{\mu\nu}$ can also be used to explain the universe's inflation. The inflation stage is necessary for the standard big bang cosmology but is not necessary for the new theory of cosmology established in this paper.

$\rho_{G\lambda}$ is a part of gravitational field's energy density and belongs to $-\frac{\lambda}{8\pi G} g_{\mu\nu}$, the vacuum energy density is a part of matter field's energy density and belongs to $T_{(M)\mu\nu}$, thus they might be different in essence. So it appears that there is no definitive relation between $\rho_{G\lambda}$ and the vacuum energy density. Such a relationship was assumed to exist [13], but such an assumption all led to some form of difficulties and complications. In the new theory of cosmology it is not necessary to establish the relation between $\rho_{G\lambda}$ and the vacuum energy density.

The SBBC has a starting state called big bang and assumes that the total energy of matter fields (including the inflation field) has existed from the big bang; moreover, this theory does not study the origin of the matter field's energy. The new theory of cosmology established in this paper has no big bang, it is without a beginning and without an end; the space expands continuously. The view of no beginning means that the state $t = 0$, $\rho_M = 0$ does not exist. Why isn't there a beginning state $t = 0$, $\rho_M = 0$? This is due to the quantum fluctuations, at any time there must always be energy-momentum transformation between gravitational field and matter field, so the beginning state $t = 0$, $\rho_M = 0$ is not possible to appear.

The steady state cosmology introduced firstly the concept regarding the creation of matter field's energy

and modified firstly the Einstein equations by adding a correction tensor $D_{\mu\nu}$; the quasi-steady state cosmology, which is a revised theory of steady state cosmology, adopted firstly the modified Einstein equations, *i.e.* Eq. (6), with the term $\lambda g_{\mu\nu}$. However our new theory of cosmology is different in principle from the above two cosmologies: the new theory uses the Lorentz and Levi-Civita's conservation laws as one of its theoretical foundations, but the other two do not; the steady state cosmology affirms that there are $\frac{d}{dt}(\rho_M(t) + \rho_{GD}(t)) = 0$ everywhere and $H = \text{const}$ for all t (see **2.4 case 2**), but the new theory does not; the quasi-steady state cosmology assumes that

$$D_{\mu\nu} = -\frac{2}{3} \left(C_\mu C_\nu - \frac{1}{4} g_{\mu\nu} C_\sigma C^\sigma \right), \quad (26)$$

C_μ is a vector field; but the new theory keeps $D_{\mu\nu}$ in general form, so that Eq. (26) is only its special case, and $D_{\mu\nu}$ could suit many cases.

It is well known that the observations of the cosmic microwave radiation background and the observed abundances of light nuclei in the universe caused many cosmologists to favor the standard cosmology (SBBC) over the steady state cosmology; since SBBC can explain these two events well, but the steady state cosmology does not. In SBBC the observed abundances of light nuclei in the universe are explained as the result of nucleon-synthesis taking place in a very hot dense stage after the big bang. There are other explanations about the observed abundances of light nuclei in the universe. Some cosmologists in the 1950's had studied the possibilities that the light nuclei in the universe are formed from hydrogen in the interiors of stars [6]. But the cosmic abundance of helium is too large to be easily explained in terms of nucleon-synthesis in the interiors of stars at 10^{10} years estimated by SBBC. However the new theory of cosmology is without a beginning state, the helium nuclei in the universe might have synthesized for a very long time; therefore the above problem does not exist. In SBBC the cosmic microwave radiation background is interpreted as the relic of the early hot era. There are other explanations also about the cosmic microwave radiation background; even for the steady state cosmology, Weinberg said: "it is not out of the question for a microwave background to be created along with the baryons in a steady state model", although the Plank distribution law is possible but quite artificial. The quasi-steady state cosmology maintains [4] that the microwave background is the thermalized relic starlight left by stars that have burnt during the ancient times and considers that the iron whiskers can act as efficient thermalizers of starlight. I shall adopt the above viewpoints of the quasi-steady state cosmology, although there are some problems in their calculations; these problems might be corrected by changing the initial states of $\rho_{GD}(0)$, $\rho_M(0)$; $p_{GD}(0)$, $p_M(0)$ at

$t = 0$ and the variation rate $\frac{d}{dt} \rho_{GD}(t)$, $\frac{d}{dt} \rho_M(t)$ which have many possibilities as we have seen in **2.4**.

Whether a theory is correct or not, it must be tested by experiments and observations. We outline a few tests that could either confirm or disprove the new theory of cosmology in the following:

1). Testing the Lorentz and Levi-Civita's conservation laws

Various concrete experiments and observations using the specific properties of gravitational waves to test the Lorentz and Levi-Civita's conservation laws were enumerated in Ref. [12]. These conservation laws are the foundation of the new theory; their correctness means that the energy-momentum of the matter field might create from gravitational field. So that to confirm these conservation laws is to confirm indirectly the new theory of cosmology and to disprove SBBC, since SBBC does not permit the creation of matter field's energy-momentum. The quasi-steady state cosmology does not adopt the Lorentz and Levi-Civita's conservation laws but permit the creation of matter field's energy-momentum; therefore to confirm these conservation laws is neither to confirm nor to disprove the quasi-steady state cosmology.

2). Probing into the essence of dark matter

We have explained above that in the new theory of cosmology some parts of the 'dark matter' might be material matter, the other part of the dark matter should be the field of $D_{\mu\nu}$ with energy density ρ_{GD} and $\rho_M/\rho_{\text{mod}} > 4\%$, $\rho_{GD}/\rho_{\text{mod}} < 23\%$ and $\rho_M/\rho_{\text{mod}} + \rho_{GD}/\rho_{\text{mod}} = 27\%$. $D_{\mu\nu}$ is a part of gravitational field. The gravitational field is different from the matter field, ρ_{GD} and ρ_M can interact with gravitational force but can not interact with other forces, so it might be possible to distinguish them. But SBBC and quasi-steady state cosmology all consider the dark matter as some kinds of matter field [4], hence to confirm the above viewpoints is to confirm the new theory of cosmology and to disprove SBBC and the quasi-steady state cosmology.

3). Probing into the essence of dark energy

We have indicated above also that $-\lambda g_{\mu\nu}$ is a part of gravitational field, $\rho_{G\lambda}$ and ρ_M can interact with gravitational force but can not interact with other forces, so it might be possible to distinguish them as to distinguish ρ_{GD} and ρ_M .

4). Finding very old stars

The new theory of cosmology is without a beginning and without an end; therefore very old stars must exist. To find very old stars is necessary to confirm the new theory of cosmology and to disprove SBBC. But this test in itself does not distinguish the new theory from the quasi-steady state cosmology or the steady state cosmology as they are all without a beginning state.

4. CONCLUDING REMARKS

As it has been explained in the introduction section of this paper, the new evidences of observations have brought out some crucial weaknesses of SBBC. It is necessary to introduce new concepts and new laws; the main objective of this paper is to show such necessity and to derive a new alternative theory of cosmology. The current work is only preliminary and it is hoped that this work may generate further interests and studies in establishing a better alternative theory of cosmology.

References

- [1] S. Gratton P. Steinhardt, "Beyond the inflationary border." *Nature* **423**, 817 (2003).
- [2] S. Carroll, "Filling in the background." *Nature* **422**, 26 (2003).
- [3] M. Fukugita, "The dark side." *Nature* **422**, 489 (2003).
- [4] J. V. Narlikar, "The quasi-steady state cosmology: Theory and observations." *Pramana-J.Phys.* **53**, 1093 (1999).
- [5] G. F. R. Ellis, "Relativistic cosmology 1999: issues and problems" *Gen. Rel. Grav.* **32**, 1135 (2000).
- [6] S. Weinberg, "Gravitation and Cosmology," Wiley, New York, 1972.
- [7] M. Carmeli, "Classical Fields: General Relativity and Gauge Theory," Wiley, New York, 1982.
- [8] C. Cattani, M. De Maria, "Conservation laws and gravitational waves in general relativity". In: The Attraction of Gravitation, Edited by Earman, J., Janssen, M. and Norton, J. D. Birkhauser, Boston. 1993.
- [9] F. P. Chen, "Restudy in energy-momentum tensor density for gravitational field in general relativity." *Journal of Dalian University of Technology* **37**, 33 (1997). (In Chinese)
- [10] F. P. Chen, "Investigation on problem of coincidence between the observed and the predicted value of orbital period decay rate p_b for PSR1534+12." *Ziran Zazhi (Journal of Nature)* **20**, 178 (1998). (In Chinese)
- [11] F. P. Chen, "The historic debate in the definition for energy-momentum tensor density of gravitational field and its new study." *Journal of Hebei Normal University* **24**, 326 (2000). (In Chinese)
- [12] F.P. Chen, "The restudy on the debate between Einstein and Levi-Civita and the experimental-tests." *Spacetime & Substance*. **3**, 161 (2002).
- [13] P. J. E. Peebles, B. Ratra, "The cosmological constant and dark energy." *Rev. Mod. Phys.* **75**, 559 (2003).

PROBLEMS OF WORLD OUTLOOK

A.N. Barbarash¹

Odessky RI of Television Technique, Ukraine

Received August 29, 2005

The author has executed the analysis of physical problems of the World outlook and he has developed the mental model capable to decide these problems.

It seemed earlier that the scientist's basic world outlook problems refer to the area of philosophy, causality, attitude to religion, views at a society etc. But again a series of especially physical problems, washing out the world outlook foundation, appears. Let's talk about them.

1. Incomprehensible expansion. The contemporary science tells about former Big Explosion and subsequent rapid expansion of the Universe on the basis of cosmological redshift. But the explosion products fly away with more or less identical speeds, whereas galaxies fly away quicker deepening, if to trust the redshift. Incomprehensible!

2. "Dark matter." The study of galaxies dynamics and their superclusters showed a certain "hidden mass" existence in the Universe exceeding the whole visible world mass in tens of times. It is natural to think that some invisible "dark matter" possesses this mass, but it is incomprehensible, why it does not impede celestial bodies motion, as the air invisible for us impedes the shell flight.

3. Quasars are the matter and energy "of Nothing." Millions of quasars (quasistar objects) are discovered in the Universe, which are the galaxies superactive nuclei actually. Quasars release so much energy for millions of years in succession that it exceeds repeatedly, for example, the thermonuclear synthesis possibilities. The matter enormous amount releases at the same time, as if "of Nothing." The quasars activity is called as explosive, but it's not one explosion, but rather the "fire at an ammunitions storehouse." It is assumed that most galaxies pass the quasars stage. However, the total quasars amount is small in the Universe and it means that they represent only a small period in the galaxies' life (let's say, tens of millions years of many milliards). The most noticeable line of the matter birth process by the quasars and galaxies nuclei is its chaotic character and abruptness.

But quiet galaxies do not relieve of the riddle, put by quasars as well, they also throw out the inexplicable

amount of matter and energy. So, our galactic nucleus throws out so much matter annually that the nucleus mass life would last only during some million years, while the galaxy age is about 13 milliards of years, and there is no evidence that the nucleus changed substantially for the last milliards of years.

4. As well the incomprehensible birth of energy and matter. It is known that the Jupiter's thermal radiation exceeds twice the energy got from the Sun. (The Jupiter for us is the most powerful source of decametric radiation after the Sun). The Saturn remains not considerably behind it. Weaker, but so incomprehensible heat flows are registered from the Uranium and Neptune entrails. The temperature calculation in the Sun center, based on the parameters of chromosphere pulsations, showed only 6.5 millions K instead of 15 million Kelvin expected that can provide only the percent fractions of the energy really radiated by our luminary due to the process sharp non-linearity of helium thermonuclear synthesis of hydrogen. Therefore, the former imaginations of the solar energy source appeared incorrect. The shortage in 2-4 times of the solar neutrino flow, originating at the thermonuclear synthesis, results in the same conclusion. It is true, this information does not conform — the shortage of thermonuclear synthesis intensity is approximately in 10'000 times, and neutrino shortage is only in 2-4 times. But, perhaps, the unknown process, giving energy to the Sun, gives birth to a neutrino as well, only of fewer amounts than thermonuclear synthesis.

It is impossible to go by another fact. According to the theory, the diagram of earthly surface heights must have one maximum with the casual (Gauss) distributing of heights near it. Really the diagram has two maximums (+100 m and -3700 m) with the Gauss distributing of heights round each of them. Only one explanation can be found for this fact — after the cooling-down and formation of the earth's primary crust presenting continents nowadays, there was slow growth of the Earth volume, the primary crust tore, so thinner and deeper located crust of oceans bottom began form-

¹E-mail: barbarash@farlep.net

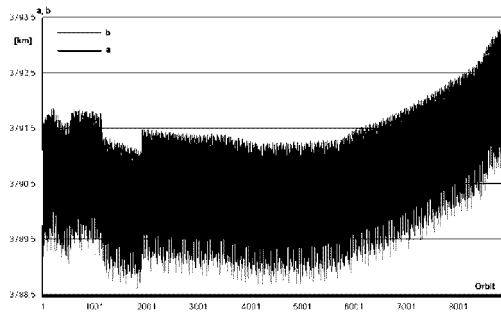


Figure 1: Change graph of large (a) and small (b) semiaxes of the Mars artificial satellite elliptic orbit MGS

ing and broadening in intervals. The same process goes nowadays as well, increasing the width of all oceans. So on December 26, 2004 the Earth volume increase led to the appearance of thousand kilometers crack on the Indian Ocean bottom that caused catastrophic tsunami.

Incomprehensible matters and energies influx of “nowhere” to the celestial bodies entrails diminishes as far as the gravitation field weakening. The Mars’ mass is 10.8% of the Earth’s mass, so its cracks are less than ones of our oceans. But also here is the grandiose canyon of Coprates with the length over 2000 km, depth about 6 km and width about 120 km to the south of the dark Lake of Typhon (Tithonius Lacus)! Why not the Atlantic Ocean in a miniature?!

The Moon mass is even less. Nevertheless, the great number of cracks with very steep edges is marked on the Moon. Their width and depth are several hundreds meters, but the length is equal to 100 km and reaches 350 km in one case (the crack in the Trisnecker’s crater region). Wider and steeper of them (probably, more ancient) are called as furrows. Usually these and those have fractures and bends along its length (the typical break picture at tension). Often cracks are quasi a thread, which numerous shallow craters are beaded on. Naturally the break passes along the craters, as along the tension concentration places at the lunar crust strain (“the chain is no stronger than its weakest”). You can look through more details about it in the Internet, on the website <http://barbarashan.narod.ru/>.

5. “Repulsion” of a satellite by the Mars.

In April 2001 NASA published materials about orbital motion of the artificial satellite MGS during the first 9000 circuit of its flight round the Mars. The information about the large and small semiaxes of an elliptic orbit on every coil, characterizing the satellite moving away from the planet and approaching to it, is shown in the

The graph simply shows the increase of both orbit semiaxes, whence it follows that the satellite moves (as the first approximation) along the untwisted spiral. The small as well as large of the ellipse semiaxes from the first circuit to 9001st increased approximately in

two kilometers. An opposite tendency is characteristic for terrestrial satellites — their spiral compresses gradually, while the satellite falls down on the Earth. It is connected to the inhibitory affect of the terrestrial atmosphere.

The thin structure of the ellipse semiaxes change graph attracts the special attention by showing semiaxes lengths variations at separate days and weeks (perhaps, connected to the Mars natural satellites affect — Phobias and Deimos). These changes are reflected in the small semiaxis value in several times stronger (in absolute values!), than in large one that it can be interpreted as the feature **of the perturbation influence strengthening as far as approaching to the planet**. Thus it is important, that this perturbation, as NASA remarks, “doesn’t depend on the planet surface anomalies of the local character”!

The observed effects can’t be explained by the fact that the potential energy transmits to kinetic one, as the satellite does not fall onto the planet, and, eventually, moves away from it. The satellite leaves the Mars gravitation field slowly. It tells about the strange phenomenon — about the gradual increase both potential and kinetic energy of the satellite. Probably, the similar effects were not observed on terrestrial and Venus satellites due to the fact that they were blurred by the atmospheric braking. But the Mars, possessing the very weak atmosphere, allowed registering the surprising phenomenon.

Whatever one may say, we have to think that the MGS satellite got the unknown energy, repulsing it from the Mars, from somewhere! Thus **it is significant that the energy influx is very unstable as to the value, it is unpredictable**. If to try finding some analogy for such a process, so it reminds the oscillogram of the electric current circuit with the unreliable, sparkling contact. The current ceases completely sometimes, as if the electrodes heated by a spark became deformed and disconnected (such picture can be seen between 1001st and 2001st circuits), but here metal had got cold, the contacts had adjoined, and a spark appeared again between them. Sparkling — as it applies to the satellite motion — is the fantastic phenomenon that is beyond any known physical laws!

Perhaps, only unforeseeable energy influx “from nowhere” can explain this effect. Such weak influx was not succeeded finding out by other methods. And the two-year satellite circumplanetary rotation appeared the very sensible experiment and indicator. Probably, a part of inflowing energy is thrown out by the Mars like the radiations, which are not controlled by NASA devices (for example, by the electromagnetic waves of infrared-range, with the frequencies of units or hertz fractions order). Their influence is like the light pressure, they push away the satellite from the planet. And the energy influx chaoticness explains the satellite orbit variations disorderliness.

6. Chaotic vibrations of energy streams can be discovered in the Earth history, only if they reached the large value and were reflected, let's say, in a paleontology chronicle. And really do not we know the inexplicable, irregular freezing periods depicted by paleontologists? And really now is not the sun activity incomprehensible growth registered from one 11-years-old cycle to another? Whatever one may confront everything with exceptional chaoticness of quasars activity, with the force unforeseeableness repelling an artificial satellite from the Mars?! Does not this self-willed process influence on the sun activity as well, causing the unexpected freezing sometimes?

7. Surprising disintegration of particles. Passing from the space size level to the level of atoms and elementary particles, we confront with one more strangeness.

Only isotopes with certain numbers of protons and neutrons appear more or less stable among atoms. One of them disintegrates to a neutron, positron and neutrino spontaneously in the kernels with protons excess. It occurs, for example, at the radioactive transformation of sodium-22 to neon-22 with the half-life period of 2,6 years, or in the case of phosphorus-30 transformation into silicon-30 etc. And, vice versa, one of kernels disintegrates to a proton, electron and antineutrino spontaneously in the kernels with neutrons excess, for example, at radioactive transformation of strontium-90 to yttrium-90 or lead-214 to bismuth-214. Similarly a free neutron disintegrates (to a proton, electron and antineutrino) as well, so it occurs with a half-life period of 16 minutes only!

It is surprising that a proton disintegrates to a neutron (plus positron and neutrino) and the appearing neutron disintegrates to a proton again (plus electron and antineutrino). The cycle occurs, in which a proton transforms to a neutron and a neutron transforms to a proton again. But some charged particle (electron or positron) as well as neutrino and antineutrino are born at every step of transformations and then **the matter conservation law is violated**. Here **the matter “of Nothing” occurs** as in quasars kernels. Indeed, the additional energy source can be seen in all known cases — either as the mass defect at radioactive atoms disintegration or as the field energy at the experiments on accelerators.

Protons and neutrons consist of quarks — the particles, the properties of which are succeeded exploring on accelerators, but which weren't succeeded extracting in pure form. Each of the quarks is designated by a letter. The quarks combination, making a proton, is designated by the letters **uud**, and a neutron is designated by **udd**, accordingly. The mentioned neutron disintegration to a proton, electron and antineutrino, is the consequence of the quark **u** transformation to the quark **d**. It is interesting that the disintegration without such changes is discovered (the processes with weak

neutral currents) except of the disintegration with the particles electric charge change.

Quarks are referred to the fermions and submitted to so-called Pauli's prohibition, without allowing two particles, being in the identical state, to exist together. Therefore two quarks in a proton and neutron, designated by identical letters, must differ from each other necessarily. This difference was called as color, and its carrier — as color charge. The strong interactions theory — quantum chromodynamics — tells about the **three types of color charges** existence providing amalgamation of quarks and anti-quarks in strong interaction. Every quark possesses some combination of these charges, but their complete mutual compensation does not occur in one particle, therefore the quark possesses the resulting color, so there is the retention to strong interaction. But when three quarks unite to a proton or neutron, the color charges total combination in each of them is such, that a nucleon, as a particle, appears neutral regarding the color [1].

The main function of strong interaction is to connect quarks and anti-quarks to nucleons. The function of weak interaction is reverse, it consists of complicated microparticles destruction, if any of the elements, being the part of their composition, possesses a weak charge. Similar transformations do not occur painlessly for component particles containing poorly interacting quarks, these formations disintegrate transforming to other particles.

The problem occurs unintentionally whether the known scheme of neutrons and protons disintegration remained, if the events happened without the energy influx outside — when force fields lack almost, and the temperature is close to the absolute zero as in the Universe cell cavities? Perhaps, then the disintegration scheme would look in another way. For example, the electron and antineutrino birth couldn't be compensated by the energy influx outside and then a new proton occurrence will be impossible. Instead of it, perhaps, the nucleons parts — quarks, separate, non-stable in the free state will appear, they will disintegrate soon as well.

8. Incomprehensible nature of neutrino. In spite of intensive researches, six particles (three particles and three anti-particles) united by the name “neutrino” can be considered the most enigmatic of all elementary particles. They have so small mass of rest that it is not succeeded to measure exactly until now. They interact with the matter so poorly that would easily go through a leaden wall with the thickness of million kilometers. Therefore, if the Universe “hidden mass” consists of neutrino, so there are no reasons to be surprised, why it does not brake the motion of celestial bodies.

And what else is very strange — at the enormous amount of neutrino and antineutrino in the Universe (those et al exceed the number of protons in milliards

times), there is no evidence of their collisions and proper annihilation in space emptiness.

9. Cells of the Universe. The galaxies clusters form giant cells reminding bees cells. There are a lot of galaxies and their clusters in “cells walls” and there is emptiness inwardly. The cell diameter is about 300 million light years, the walls thickness is about 10 million light years. Thousands of such cells are registered. How they originated, what is their role in the Universe structure, why they, despite of the Universe expansion imagination, keep relatively stable sizes — everything refers to the riddles area. Meanwhile, the comprehension of the cells nature and existence reasons should be referred to the most important problems of the physical world outlook.

10. Energy of the eternal motion. The Universe age can be estimated on the basis of various processes (its spreading rate, radioactive atoms disintegration, pulsars rotation retardation etc.). Various estimations define its age from 13-15 milliards to hundreds milliards of years. All the time the Universe matter is in continuous motion. (“The main matter property is motion”). The permanent matter motion can occur only at the presence of stable energy inflow covering its expenses for milliards of years. The more so as all the processes have the coefficient of efficiency (CE) less than 100%. Where is this inexhaustible energy source?

11. Incomprehensible “refrigerator”. Except for the fresh energy permanent inflow, the Universe needs the continuous taking of spent, low temperature energy. Otherwise the problem of “thermal death” predicted by Clausius rises due to the entropy growth and minimum temperature increase. Diminishing of the temperature **difference** would result in the flowing impossibility of any natural (and artificial) processes even at the powerful energy influx. Therefore, the “eternal refrigerator” existence taking up the low temperature heat is needed for the Universe normal existence, except for the continuous energy supply.

In the middle of XX century there was an idea that the Universe observed part must be considered as an open system and then the problem of “thermal death” raised by R.Clausius is eliminated in principle. Such approach is incorrect, because it implies the existence of a bit other Universe outside the observed one with other laws and antientropy processes predominance compensating the entropy growth in our world. If it was true, so the powerful **unilateral** energy streams can be observed on the visible Space scopes (how in general, on every large area scopes), whatever it is not present. It should be concluded that inexhaustible energy source and antientropy processes along with it, compensating the entropy growth, are not somewhere in the distance, but hidden into the Universe observed part.

Galaxies radiate the huge energy fluxes continuously. Thus 92% of the matter, known to us, make stars. For heating of other 8% known matter (planets, as-

teroids, interstellar gas-dust matter) about 6'000 K — whereupon the Sun was not able to radiate — there would be the enough only a few tens thousands of years (space emptiness does not possess the heat capacity in itself). And all the same, science does not mark the Universe overheat. The equilibrium temperature of microwave radiation coming to us evenly from all sides and characterizing Space adequately, is very low — higher than the absolute zero only in 2.73 K. It shows that the Universe “eternal refrigerator” is needed not only in the theory, but also it exists actually — that's why the Space expanses possess so low temperature. But what process creates so powerful cooling? The riddle of the Space stable cryogenic temperature keeping is added to the riddle of the fresh energy permanent influx to the Universe. These problems are no less difficult, no less fundamental than the cells surprising nature.

12. Incomprehensible vacuum. And one more riddle — if to take into account all the gases thrown out by stars and galaxies for their existence milliards of years, so the fantastic depth of space vacuum will become incomprehensible. This vacuum is so perfect that it exceeds the best vacuum obtained in earthly laboratories in a few orders.

* * *

Now we will build the mental model capable to eliminate the listed riddles.

A) An atom was considered as an indivisible particle for a long time (what gave it this name). But atoms elementariness caused doubt in the past, as different atoms possess various characteristics — different weight, different chemical properties etc. It befits more for composite particles. Otherwise the physicists treated protons and neutrons found out later — they were called as elementary particles more confidently, because all protons (as well as all neutrons) are indistinguishable from each other, and it corresponds to the intuitional imaginations of elementariness. Then it was suddenly discovered in the experiments on accelerators that protons and neutrons are not elementary that they consist of quarks. But they began to consider quarks as truly elementary particles. But quarks repeated the situation, which happened with atoms — they, as well as atoms, differ sharply by individual properties — they have different electric and color charges, different masses that contradicts the imaginations of elementariness also.

It is possible to assume that, actually, every quark is a composite particle as well. Simply, the science has not discovered it yet. And one of the quark elements is the color charge. But it is impossible to extract it from the quark, as the first approximation. However physics quite often confront with improbable processes unobserved the first approximation. There is no miracle herein. For example, the tunneling effect is known for electrons, at which this particle is capable, overcoming a high power barrier as well as flying over a gap between

electrodes (that violates the laws of the first approximation). The tunneling microscope work is based upon it. It can be assumed that the color charge is capable for improbable tunneling skip from a quark to a quark that would explain the long chain of consequent events.

Perhaps, as a result of such skip and “reshuffle,” there can be color charges combinations neutral as for the color, which, accordingly, are not held out by strong interaction in quarks. **Colorless charges combination must possess very high penetrable ability and abandon an atomic kernel easily.** Perhaps, the combination of color charges, neutral in color, isn’t subjected to strong interaction and perceived by us as neutrino or antineutrino. Must be three kinds of their colorless combinations are possible at three kinds of color charges whence there are three kinds of neutrino (electronic, muonic and crux-neutrino).

B) In 1899 P.N. Lebedev opened the light pressure upon solids, and in 1907 — upon gases. According to these laws, the powerful radiations of galaxies and their clusters must press onto the gas-dust fraction of intergalactic matter, pushing it to the Universe cells emptiness. The emission reactive force to the cells cavities is able to balance mutual attractive force of the cells walls, as well as explain the pushing away force, which A.Einstein searched so persistently (when the Space cells were not known yet). The pushing away force, sufficient for the Universe stationarity providing, according to calculations, is very small - in 30 orders weaker than the gravitation force that close to our imaginations of the light pressure intensity.

Taking into account the substance masses, pushed into the emptiness by the galactic radiations, is very important for processes understanding, determining the Universe state. This pushing does not only counterbalances the gravitation force, but determines the Space thermal mode. Exactly the expansion of large gas masses in the conditions of innermost vacuum creates a powerful cooling effect resulting in the cryogenic space temperatures, so it realizes the same “eternal refrigerator,” which is so necessary for the Universe “thermal death” prevention according to Clausius. But the very deep vacuum must be maintained for such refrigerator eternal existence in space emptiness everlastingly, despite the continuous gas intake. Otherwise speaking, the gas intaking to the emptiness must be taken out continuously of it in the same way, even so the removal process shouldn’t create the thermodynamic heating. It’s interesting! It’s surprising! What is the further substance fate thrown out to the cells cavities? It is possible to conclude that the substance really leaves these cavities somewhere, as it is not revealed inside these cavities by astronomers. But where?

Because the light pressure area on hard particles, at identical mass, is less than the proper gas molecule area, so the light pressure makes separation — it separates dust from gas. Hard dust particles go back to galaxies

under the gravitation affect, and hydrogen with the helium impurity, overcoming the gravitation, is pushed by the radiation into the cells emptiness. Here, taking into account the cells sizes (the diameter is 300 million light years), the gas molecules are doomed, let’s presuppose, to the milliard years of flight, for which they are able to disintegrate to quarks and elements, their constituents. Possibly, the cavities temperature approximately absolute zero favors it, drawing kernel quarks together, hence facilitating tunneling skips of color charges.

Almost the complete absence of any power fields in the cells cavities must promote to tunneling. Let’s remember that neutrons in atoms composition provide stability of the Egyptian pyramids, and a half of neutrons disintegrates into 16 minutes at releasing from atoms fields. Probably, it accelerates the particles disintegration and release from other fields. The stability of remaining quarks is irreversibly violated and, as it was marked above, there is their further disintegration after color charges unification into combinations (i.e. neutrino formations) neutral in color and leaving a kernel by them. Exactly such processes perform slow, but continuous transition of hydrogen and helium from our world to the “neutrino” one. As well they explain the deep vacuum storage in Space, despite the receipt of huge gas amounts from stars and galaxies.

As well there is another neutrino flow besides the main matter flow from our world to the “neutrino” one through cells cavities, giving birth at the radioactive decay of unstable atoms at nuclear and thermonuclear processes. These two flows form the “neutrino” world together, so they create the substance that astrophysics call as the “hidden mass,” “dark matter” of the Universe.

One of the major neutrino features is their extremely small rest mass, probably, near the mass quantum. The fact is explained by the circumstance that the neutrino and antineutrino impacts, occurring in Space doubtlessly, do not reach the quantum interaction threshold (Plank’s constant), and that’s why does not occur as though in general. But impacts must increase in the gravity fields, by which their origin is explained, as though “nowhere,” of the quasars explosive energy is the annihilation result of the neutrino and antineutrino enormous masses in the gravitational fields. Such intensive energetic processes, naturally, do not only create the wide radiation gamut, but also result in the matter birth, foremost - the simplest atoms of hydrogen and helium.

It is doubtless that in the areas of the gravity fields most tension of the Sun, Jupiter, Saturn, Earth and other celestial bodies, though with less intensity than in quasars accordingly, the same neutrino-antineutrino annihilation process runs, with the energy release, formation of small hydrogen and helium amounts. The most specific feature, uniting these processes, is their uneven, chaotic running at any levels of the intensi-

ty (“fire at the ammunitions storehouse”). It concerns the great number of similar processes equally — from the quasars radiations to the tectonic processes in the Earth’s entrails.

The small neutrino mass, near to the quantuming threshold, reveals the riddle of cosmological redshift, creating the illusion of the Universe accelerating expansion. Astrophysics let know long ago that the photons reddening in space can not be explained by Dopler’s effect, but photons collisions with some particles, for example, with gas atoms. But this idea wasn’t considered at once, as in this case, the light dispersion and sharpness loss of remote galaxies images must be observed except for the photons energy loss, whatever is not present. Moreover, the photon complete absorption and reverse emission occur at its collision with an atom. There is no evidence of such reverse emission as well. And only the neutrino mass, near to the quantuming threshold, created a new situation that is the interaction threshold (Plank’s constant) can be achieved only in the cases of high-accuracy counter impacts of photon and neutrino, when their trajectories deflection does not exceed the angle quantum (probably, such quantum exists). And all other impacts, attaining no quantum threshold, as if does not occur in general.

And what happens at an ideal (with the accuracy to the angle quantum) counter impact? Probably, one mass quantum **in principle can not** take more energy from a photon at such impact than one action quantum (Plank’s constant). The green light quantum with a wavelength $\lambda = 530$ nm must transfer one Plank’s constant to a neutrino, on the average, every 219 millions km of the way or every 12 minutes 10 seconds of the flight **for the explanation of the real redshift**. It’s quite possible!

The new physical imaginations change the world outlook as a whole. The continuous matter circulation between our and “neutrino” world is brought to the forefront. A permanent influx of high temperature energy of stars, galaxies and quasars is provided to our world by them with the simultaneous removal (through the cells cavities) of low temperature energetic wastes. The entropy growth in our world is always compensated by opposite processes in the “neutrino” world on the entering of which the low temperature matter comes, and matter flows with the temperature in thousands and millions degrees burst through stars and quasars to our world from there. The same process, creating the gases stream from the Space cells walls in their cavity, provides the pushing away reactive force, counterbalancing gravity attraction of the cells walls. Such views in combination with neutrino interpretation of cosmological redshift eliminate the problem of the Universe accelerating expansion and the Universe expansion generally, they allow to consider it as stationary, i.e. eternal one.

B) There is a series of less strict suppositions from there. The quiet transition of neutrino (for example, at

the radioactive decay) to the “neutrino” world and the special terms necessity - the powerful gravity fields - at the reverse transition (let’s say, through the quasars kernels) can be interpreted as the index available between our and “neutrino” worlds, the asymmetrical energetic barrier. It is easily overcome in one direction and very hard overcome - in opposite direction. To understand the barrier nature is quite difficult, because two worlds are combined with each other both in space and time. It would seem, there is no place for some walls or scopes between them simply. Ultimately, there are the events, which are interpreted the most successfully as this barrier disruption by the powerful force field, like the isolation sparking disruption. These are the short, but enormously intensive splashes of gamma-radiations, registered by the Earth satellites and accompanying by the new galaxy origin in the place of the “disruption” [2]. It looks as if brightly “made” disruption of energetic barrier initiates the beginning of the matter powerful flowing from the “neutrino” world to ours in this point of the Space. (You can find more detailed information — in the electronic author’s book “Code. Life. Universe.” on the website <http://barbarashan.narod.ru/> or, in more early variant, on the website <http://www.sciteclibrary.ru/rus/catalog/pages/6018.html>).

The main part of the Universe general mass is presented by “liquid” phase of the “neutrino” world. It is self-organized, so it forms the Space cells skeleton, like the Benar’s cells in the oil of burning hot frying pan. Much less this skeleton gravitation determines the galaxies and their clusters location in space. Equidistributed in Space “gas-like” phase of the “neutrino” world, creating the cosmological redshift, is less massive. There is as well, to all appearances, “hard” or “crystal” phase of the “neutrino” world, framing large celestial bodies - galaxies stars and kernels - like small islands. The peculiarity of the “hard” phase is the prolonged preservation of the chaotic “disruption picture” of the energetic barrier, arising at the moment of this celestial body origin.

The same saved picture of the energetic barrier damage determines the “energetic landscape” of the near-sun space as well. The picture moves in Space together with the Sun. Its energetics influences upon the biological processes course, including, the human embryos formation.

References

- [1] R.E. Rovinsky, “The developing Universe.” Israel, Karney Shomron, 2001, 191 p.
- [2] D. Fishman, D. Gartman, “Splashes of gamma-rays radiations.” *The world of science*, No. 2 (8), 64–71 (2001).

TESTS QUESTIONS FOR GRAVITATION THEORIES VERIFICATION

N.A. Zhuck¹

*Research and Technological Institute of Transcription, Translation and Replication, JSC
 Box 352, 3 Kolomenskaya St., Kharkov 61166, Ukraine*

Received August 8, 2005

The author offers 75 test questions for gravitation theories verification.

Introduction

Currently there is the great number of various theories or gravitation theories variants, developed both within the framework of Einstein's general relativity theory (GRT) and other bases in principle. It is considered most often that the contemporary gravitation theory, i.e. GRT exists and nothing is needed to invent. And the task is only in the fact to unite this theory with electrodynamics, nuclear forces theory and quantum mechanics.

Nevertheless, there are enthusiasts both among professionals and amateurs, who offer new gravitation theories in principle. Mainly they concern gravitation nature opening without influence on final results. It is proved most often that the Newton's gravitation law turns out on the offered gravitation model basis. Thus the authors of such theories do not pay attention to the fact that Newton's gravitation law is just the approximate law which can be used only in the very limited terms. This law does not "work" in the case of the gravity field large intensity, high relative speeds or cosmic scales as well. The task of such theory comprehensive verification originates, and its limited nature demonstration to the author originates more as well.

Moreover, the new theories researchers (readers) do not always think of the fact that the theories can be created, in which errors are assumed, as well as false theories (or antitheories) can be created, into which errors are brought intentionally, in order to lead a researcher (reader) away those or other problems solving, which overcoming conflicts with the certain public. Therefore the public analysis, which the author belongs to, the true authorship definition, as well as those forces, which support the offered theory, can expose eyes on the veritable affairs state in this theory.

¹E-mail: zhuck@ttr.com.ua

1. Questions of social-economic character

1. *Who is the true author* of the theory?
2. *Are there co-authors* or helpers in the theory development?
3. *How long ago* did the author develop its bases and verify its efficiency?
4. *What author's publications* (including the known and unknown manuscripts) accompanied this process?
5. *Were there* his theory predecessors, prototypes and analogues?
6. *Is there the theory's customer?*
7. *What social (scientific, political, economic) circles* support this theory?
8. *What scale of the natural phenomena scope* does a new theory presuppose?
9. *What technical innovations* can it bring?
10. *What economic results* can the theory application bring to?

2. Questions of methodological character

11. *Which is the theory character* of three possible types:
 - fully conservative;
 - semi-conservative;
 - non-conservative?
12. *Whether is the theory connected with the space-time metrics*, i.e. whether it is:
 - metrical (based on the space-time curvature);
 - bimetric (containing the non-dynamic metrics);
 - non-metrical?
13. *Whether does the theory contain 10 laws of storage:*
 - energy (1 law);
 - motion quantity (3 laws);

- moment of momentum (3 laws);
- gravity center (3 laws)?

An affirmative answer should be proved mathematically.

14. *Does la grange theory assume formalism? And if it does, so what is la grange view and how is the theory basic equation deduced on the variation principle basis?*

15. *Whether does the theory contain motion laws:*

— in free space without local forces influencing (inertia law);

— near-by a massive body (law of falling)?

If it contains, so what is these laws view and what is their conclusion of the theory basic equation?

16. *What model of the Universe is in the theory basis, if, certainly, they are connected between themselves somehow (as the Universe model and its physical laws are inseparable of each other, as a hen and an egg):*

— dynamic (dilative) or static;

— homogeneous or non-homogenous;

— isotropic or non-isotropic;

— eventual or endless;

— boundless or having scopes;

— steady or unsteady;

— flat, spherical, elliptic or having other curvature;

— having geodesic curvature and what one?

17. *What categories underlie in the theory:*

— field;

— particles;

— space-time;

— field + particles;

— field + space-time;

— particles + space-time;

— field + space-time + particles;

— other?

18. *How are the theory equations got:*

— the known equations are used;

— the known equations are modified;

— made on some principles basis;

— deduced on the known methods basis;

— deduced on the new methods basis?

19. *Is there connection of gravitation with electrodynamics, nuclear interactions and quantum mechanics, and if it exists, so what one?*

20. *What range of space and time scopes does the theory cover?*

3. Questions of theoretical (mathematical) character

21. *What is the gravitation described in the theory:*

— by scalar;

— by vector;

— by tensor;

— by combination of scalar and tensor;

— by other concept (and which one)?

22. *What is the nature of gravitation, i.e. what model of gravity interactions is in the theory basis?*

23. *The gravitation is connected with geometrical or geodesic curvature of space-time?*

24. *Is the superposition principle executed in the theory, i.e. is it linear or nonlinear?*

25. *Is the accordance principle executed in the theory, if it is more general than Newton's theory?*

26. *Are there the inertial reference systems in the theory, and if there are — so give them determination? Do they differ from co-ordinates systems in principle?*

27. *Is there the selected (primary) reference system in the theory, and if there is — so list the privileged position effects?*

28. *Is there the invariance concept of physical laws in the theory regarding some co-ordinates transformations, and if there is, so what are these transformations groups?*

29. *What is the space and time dimension in the theory? Are space and time connected with each other, and if they are, so how?*

30. *What is the "time" from the theory approach? And does its flow depend upon the motion or mass being near-by?*

31. *What is the energy of a material body connection with all the other masses of the Universe from the theory approach?*

32. *Does the theory assume the ether existence, and if it does, so what is its structure and numerical characteristics?*

33. *Does the theory assume the ether deformation, and if it does, so does it include such concepts as the "medium deformation tensor" and "inertia tensor" expressed by the tensors of the second grade (but nothing else), and also the medium curvature tensor (or space-time), expressed by the tensor of fourth or some other grade?*

34. *How does the theory explain transversal waves distribution in ether, in particular, ordinary (i.e. transversal) electromagnetic waves?*

35. *Does the theory assume the gravitation merger with electrodynamics and if it does, so how?*

36. *How does the theory explain the distinction of electromagnetic and gravity interactions as to the value of 10^{39} times (regarding the interaction between electrons and positrons)?*

37. *Is there the theory merger with quantum mechanics and if there is, so how?*

38. *What does Plank's constant mean from the theory approach? What is its physical interpretation?*

39. *Does the theory foresee the masses gravity screening possibility? Is there the masses defect in the gravitation at material bodies merger?*

40. *Does the body mass or, vice versa, interaction force depend upon its motion rate in the theory?*

41. *Is there the light velocity maximally possible or not in the theory? Is the body motion rate formed with*

the light speed in some cases or is this speed an absolute constant?

42. *What group of co-ordinates transformations is used for transition to the other inertial reference system?*

43. *Is there the energy dissipation in the theory at material bodies motion and electromagnetic waves distribution or other oscillating processes? And if there is, so what is its law and what are its numerical characteristics?*

44. *Is there a place for the longitudinal electromagnetic waves in the theory, which exist, generate, are accepted experimentally and pass through electromagnetic screens really?*

45. *Does the theory assume necessary densities of the matter forming at its various levels, if the theory is universal?*

4. Applied questions (comparisons and predictions)

46. *How does the theory explain the planets perihelion drift, in particular the age-old perihelion displacement of Mercury on 43"? What is the formula of this displacement and what numerical (i.e. calculation) value of this displacement?*

47. *How does the theory explain the light diffraction near-by massive bodies? What is the formula of such diffraction in the theory and what is the numerical value of the diffraction depending on the body mass and aiming distance from its surface (or its center)?*

48. *How does the theory explain the light redshift, emitted from the massive body surface? What is the formula of such displacement in the theory and what is the numerical value of the displacement depending on the body mass and height above its surface?*

49. *How does the theory explain the "superfluous" radioecho delay at the planet location being behind the Sun, when a radio signal passes near the Sun edge? What is the formula of such delay in the theory and what is the numerical delay value depending on the body mass (Sun) and aiming distance?*

50. *How does the theory explain the night sky blackness despite the photometry paradox of the classical physics?*

51. *How does the theory settle a gravity paradox implied by the Newton's gravitation formula?*

52. *How does the theory explain the numerical equality of inert and gravity masses, well proven experimentally with high accuracy? Is there the direct theoretical proof of this proportion or the masses identical equality?*

53. *How does the theory explain the microwave background radiation of space with the effective temperature 2.7 K?*

54. *How does the theory explain the blackbody character of the space microwave background radiation? As well as the "shrivel" in its intensity on the whole sky?*

55. *How does the theory explain the redshift (cosmological shift) in the radiation spectra of other galaxies? Are its numerical characteristics deduced from the theory?*

56. *How does the theory explain the reasons of the matter crowding (gathering) into galaxies, in particular, these crowding scales as for the galaxies mass and middle distance between them?*

57. *How does the theory explain the effect of "soap-suds" (or honeycomb, cellular character) in the Universe large-scale structure on scales more than 100 megaparsec?*

58. *How does the theory explain the periodicity in the quasars radiation spectra, proportional to the argument $\ln(1+z)$, where z is their redshift parameter?*

59. *How does the theory explain (settle) the virial paradox in astrophysics?*

60. *How does the theory explain the distinction in the superstable clock course transported by a jet plane round the Earth to its rotation direction and against the rotation? As well as the retardation as compared to an earthly clock, if an airplane flew above one place for a long time?*

61. *How does the theory explain the "life prolongation" of high-speed mesons on the whole order as compared to immobile ones?*

62. *How does the theory explain the formula of the body mass dependence upon its speed omitted! , confirmed in numerous experiments and, in particular, at the modern accelerators operation?*

63. *How does the theory explain the resilient collision of high-speed particles, the flying away angulars of which are submitted to the relativistic laws?*

64. *How does the theory explain the Compton's effect, the formulas of which are submitted to the relativistic laws?*

65. *How does the theory explain the masses defect, originating at nuclear transformations and submitted to the relativistic formula $\Delta E = \Delta mc^2 \times \sqrt{1-v^2/c^2}$, which is confirmed both in the separate experiments and during the nuclear reactors operation?*

66. *How does the theory explain the Doppler's longitudinal and transversal effects, the formulas of which have the relativistic coefficients confirmed in the experiments?*

67. *How does the theory explain Fizeau's experience?*

68. *How does the theory explain the light astronomic aberration?*

69. *How does the theory explain anomalous deceleration of spaces vehicles of the type "Pioneer-10/11"?*

70. *How does the theory explain small speeds of stars and galaxies?*

71. *How does the theory explain the resonance phenomena of the Earth, Sun and Galaxy?*

72. *How does the theory explain the Earth rotation deceleration?*

73. *Does the theory provide new results in principle of the nature description?*

74. *Does the theory offer new experiments for its verification?*

75. *Has the theory brought new technical solutions useful to people?*

Conclusion

The above-mentioned list of test questions does not settle an opportunity of the theory separate details clarification, its internal consistency verification as well as practical or other application. Everything depends on the theory concrete peculiarities. So these additional questions bear the private character. The above-mentioned list of questions should be added by such private questions to cover all aspects of the theory possible application completely.

UNUSUAL LIGHTNING

A.A. Romanov¹

Karazin Kharkov National University, 4 Svoboda sq., Kharkov 61077, Ukraine

Received June 27, 2005

The photos on a digital video camera in 2002 (Kharkov, Ukraine) depicting an unusual lightning, which began as an ordinary linear lightning, then as volumetric luminescence of the atmosphere part and ended with three ball lightnings formation, are given.

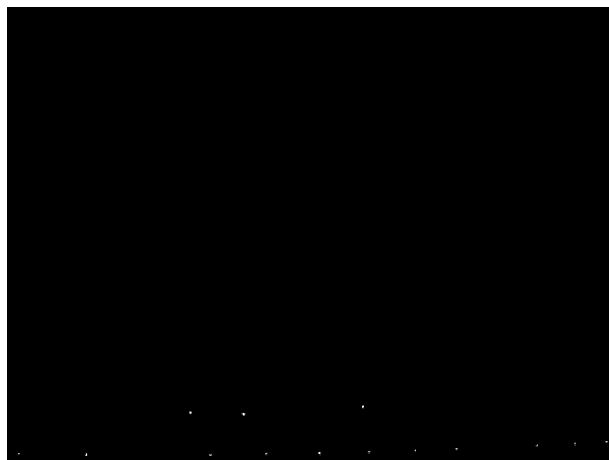


Figure 1: At time $t = 0.00$ sec

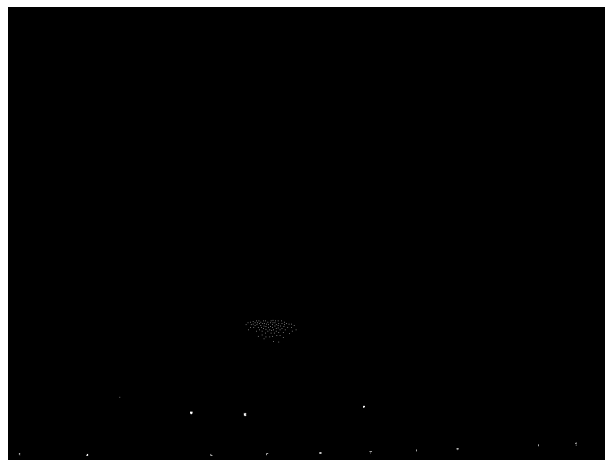


Figure 2: At time $t = 0.02$ sec

We decided to use a digital video camera for the lightnings photographing. The advantage is that the video camera can be held in the turn-on state within unlimited time, and if there is lightning, the camera is always synchronized with the survey process. A videotape requires no developing, and the camera can be reused multiple times. The whole process of the lightning formation and existence is always recorded in series. The time between separate shots was 0.02 sec.

In particular, it was discovered that the lightning is not always a single discharge, but the whole series of independent single discharges following in sequence one by one and that way. Usually lightning has a bit dim color (for example, rose or bluish).

One lightning differed substantially as to appearance and conduct among more than fifty registered lightnings:

- there were the poorly luminous “icicles” of rose color from a cloud to earth at the beginning, then they grew into the bright discharge pole, which had the loop form in the middle (Fig. 1–7).

¹E-mail: romanov@kfti.ua



Figure 3: At time $t = 0.04$ sec

- the discharge disappears completely on the next shot (Fig. 8, 14).
- then the space between a cloud and earth flashes by a bright white colour (as it was done at photoflash).

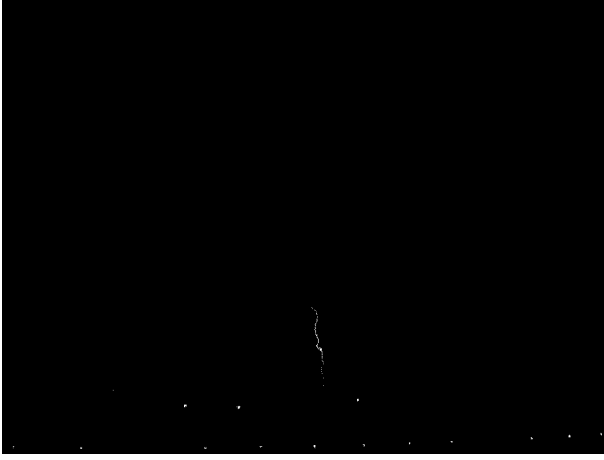


Figure 4: At time $t = 0.06$ sec

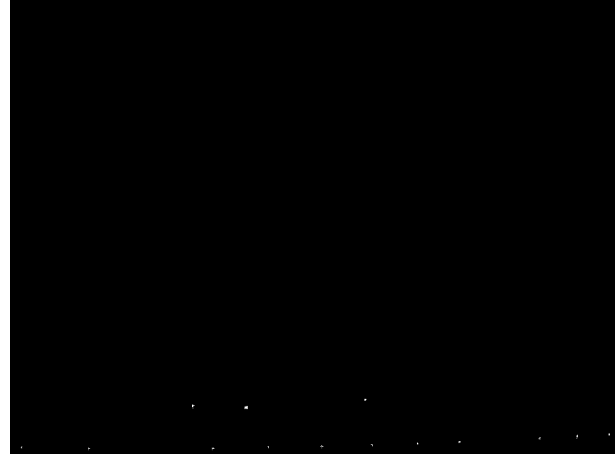


Figure 7: At time $t = 0.012$ sec



Figure 5: At time $t = 0.08$ sec



Figure 8: At time $t = 0.014$ sec



Figure 6: At time $t = 0.10$ sec

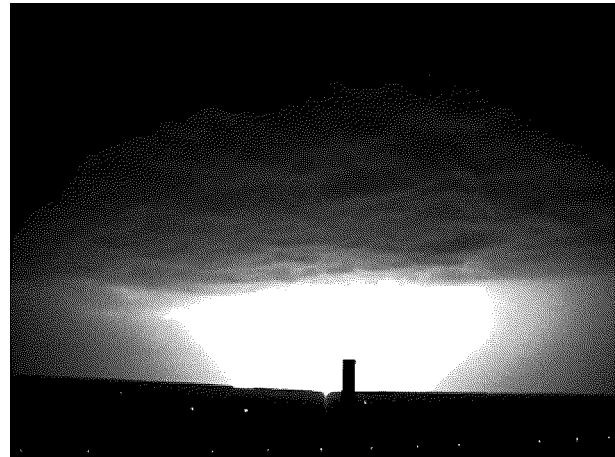


Figure 9: At time $t = 0.16$ sec

This luminescence exists for a long times (a few shots in a series) (Fig. 9, 10, 13 15–20).

- luminescence diminishes gradually. The same arc

pole becomes visible, which was at its origin beginning, but where there was a loop, three ball lightnings are visible which slowly “resolve” and disappear (Fig. 11,

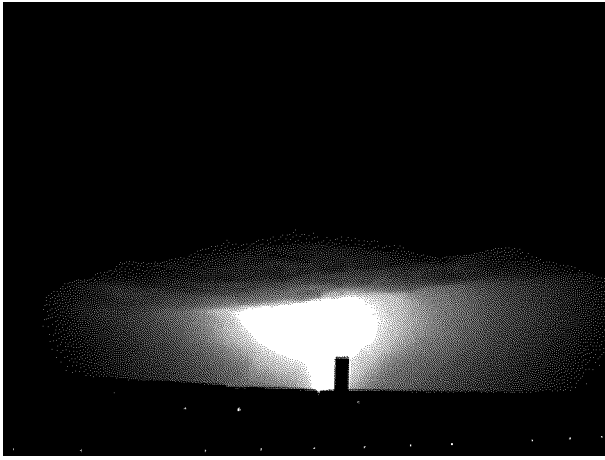


Figure 10: At time $t = 0.18$ sec

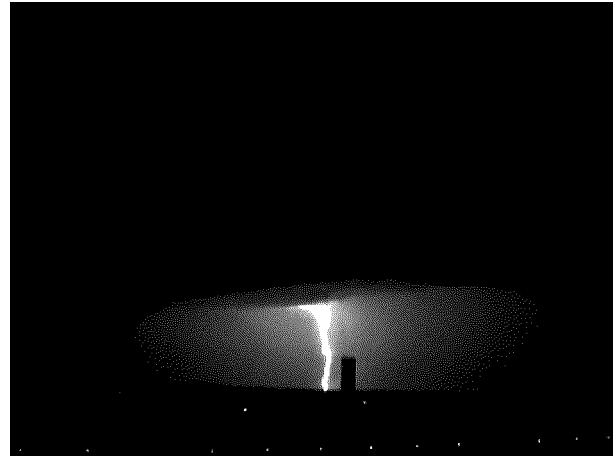


Figure 13: At time $t = 0.24$ sec



Figure 11: At time $t = 0.20$ sec

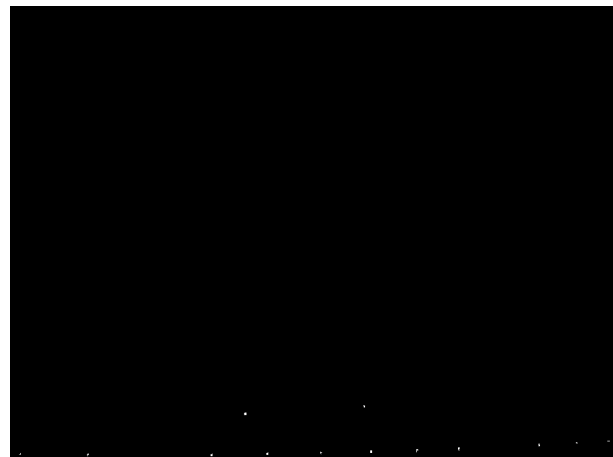


Figure 14: At time $t = 0.26$ sec

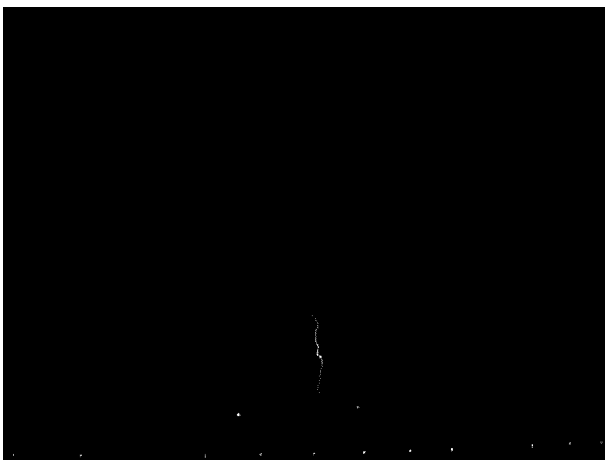


Figure 12: At time $t = 0.22$ sec

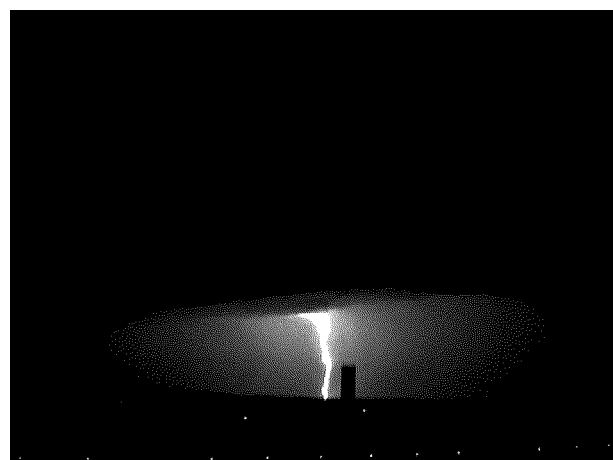


Figure 15: At time $t = 0.28$ sec

21–25).

This discharge view is given on the pictures. Videoshots are quite rare, as they show the origin process and lightning development in a dynamics.

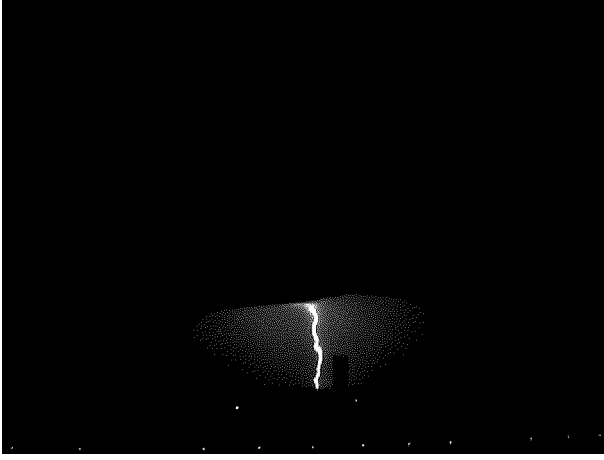


Figure 16: At time $t = 0.30$ sec

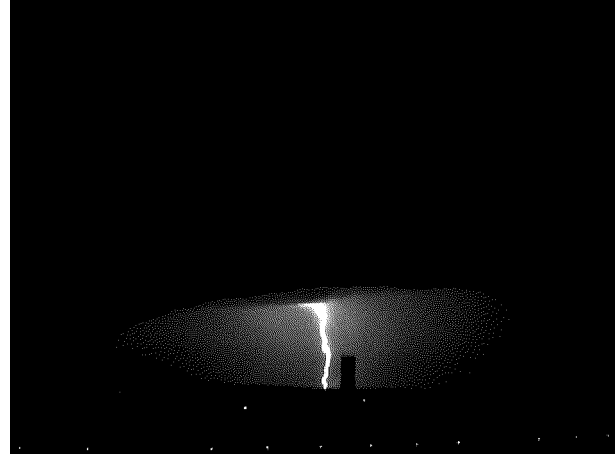


Figure 19: At time $t = 0.36$ sec

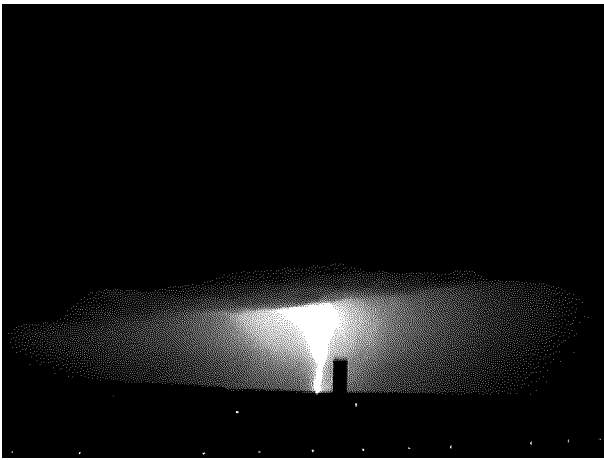


Figure 17: At time $t = 0.32$ sec

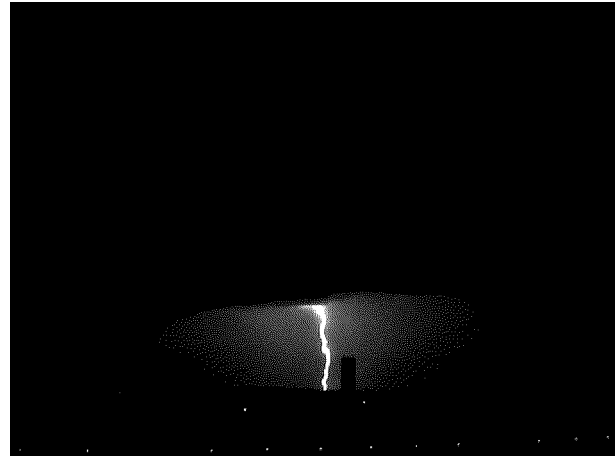


Figure 20: At time $t = 0.38$ sec



Figure 18: At time $t = 0.34$ sec

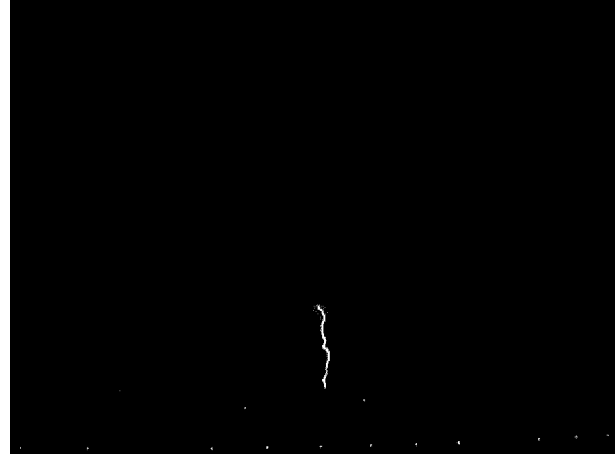


Figure 21: At time $t = 0.40$ sec

We hope that this material will help researchers in the nature study both ordinary and ball lightnings.



Figure 22: At time $t = 0.42$ sec



Figure 23: At time $t = 0.44$ sec



Figure 25: At time $t = 0.48$ sec

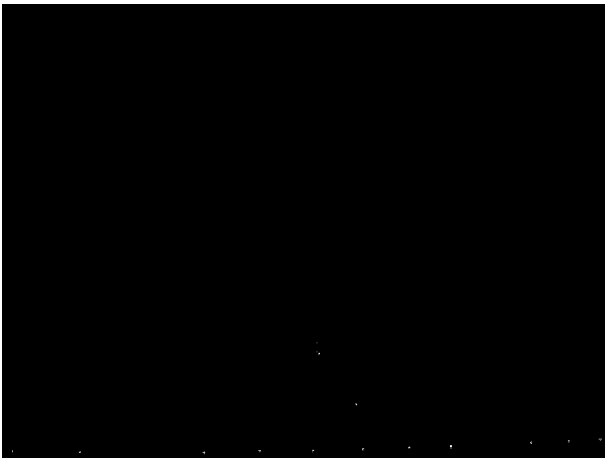


Figure 24: At time $t = 0.46$ sec

International Scientific and Technical Conference in Kharkiv
“ANOMALOUS PHYSICAL PHENOMENA IN POWER ENGINEERING
AND PROSPECTS OF UNTRADITIONAL ENERGY SOURCES CREATION”
(POWER ENGINEERING – 2005)
(June 15–16, 2005, Kharkiv, Ukraine)

Organizers:

1. Research and Technological Institute of Transcription, Translation and Replication, JSC (Kharkiv)
2. Kharkiv Planetarium called after Yu.A. Gagarin
3. Model of the Universe, Inc. (Kharkiv)
4. Special Automatics, Ltd (Kharkiv)

Scientific Organizational Committee:

1. V.A. Atsukovsky, Academician of RAEN, MABET, MAEIN, Corresponding Member of RAETN (State University of Management, Moscow, Russia).
2. Yu.A. Bogdanov, Academician of MAEIN (“Geoindustry”, RTI TTR, Kharkiv, Ukraine).
3. B.V. Bolotov, Academician of RNA (Kiev, Ukraine).
4. Yu.M. Galayev Corresponding Member of RAEN (Institute of Radiophysics and Electronics of NANU, Kharkiv, Ukraine).
5. N.A. Zhuck, Corresponding Member of RAEN (RTI TTR, Kharkiv, Ukraine).
6. N.V. Kosinov, Academician of MAFOB (vice-president of MAFOB, Kiev, Ukraine).
7. G.V. Nikolayev, Academician of Petrovsky Academy of Sciences (Tomsk, Russia).
8. Yu.S. Potapov, Academician of RAEN, MACE, MALBA (International Academy of Construction and Ecology, Moscow, Russia).
9. S.S. Sannikov-Proskuryakov, D.in Ph-M. Sc.(RTC KhPhTI NANU, Kharkiv, Ukraine).
10. L.P. Fominsky, Academician of RAEN (Cherkassy, Ukraine).

Local organizational committee:

1. V.V. Balyberdin, Ph.D. in TS (RTI TTR, Kharkiv, Ukraine).
2. N.A. Zhuck, Corresponding Member of RAEN (RTI TTR, Kharkiv, Ukraine).
3. V.M. Zamolotsky, Ph.D. in TS (RTI TTR, Kharkiv, Ukraine).
4. I.I. Zima, Academician of the International Academy of the Applied Radioelectronics(Military University, Kharkiv, Ukraine).
5. D.A. Pereverzev, D. in TS (IPMACH NANU, Kharkiv, Ukraine).

Discussed topics:

1. Anomalous physical phenomena in power engineering.
2. Supersingle hydrodynamic heat generators.
3. Low temperature nuclear boilers.
4. Non-fuel and non-driven electrodynamical generators.
5. Non-fuel electrostatic energy sources.
6. Other types of untraditional energy sources.
7. Safety and ecological purity of energy sources.

The Conference Program:

15 June, 2005 (Wednesday)

Chairman — N.A. Zhuck

09.00–10.00 — registration of the conference participants.

10.00–10.10 — opening of the conference.

10.10–10.40 — **V.A. Atsukovsky (Moscow, Russia)**. “TESLA’S TRANSFORMER: ENERGY OF ETHER.” 10 min. — for answering questions.

10.50–11.10 — **L.P. Fominsky (Cherkassy, Ukraine)**. “QUASINEUTRAL DEUTRON IS THE KEY TO COLD NUCLEAR FUSION.” 10 min. — for answering questions.

Break for 20 min. Tea, coffee.

11.40–12.10 — **L.P. Fominsky (Cherkassy, Ukraine)**. “HOW WATER BURNS.” 10 min. — for answering questions.

12.20–12.50 — **N.A. Zhuck (Kharkiv, Ukraine)**. “SYSTEM OF PHYSICAL LAWS AND POWER ENGINEERING.” 10 min. — for answering questions.

13.00–14.00 — *dinner break*.

Chairman — G.V. Nikolayev

14.00–14.15 — **I.I. Zima (Kharkiv, Ukraine)**. “ABOUT POSSIBILITY OF THE USE IN HEATING ENGINEERING OF THE PHENOMENON OF WATER MAGNETIC ROTOR PREDISSOCIATION.” 5 min. — for answering questions.

14.20–14.35 — **B.M. Posmetny, Yu.I. Gorpinko (Kharkiv, Ukraine)**. “SUPERSINGLE HEAT GENERATORS OF ROTORS CONSTRUCTIONS: STEAM OBTAINING AND NEW PHYSICAL EFFECTS.” 5 min. — for answering questions.

14.40–14.55 — **V.V. Balyberdin, N.A. Zhuck, A.V. Nechayev, S.I. Chernyshov (Kharkiv, Ukraine)**. “MAGNETIC HYDRODYNAMICS ROTOR HEAT GENERATOR.” 5 min. — for answering questions.

Break for 20 min. Tea, coffee.

15.20–15.35 — **B.A. Slivytsky, A.B. Slivytsky (Moscow, Russia)**. “INFRINGEMENT OF ENERGY CONSERVATION LAW IN “SUPERSINGLE” ENERGY SOURCES.” 5 min. — for answering questions.

15.40–15.55 — **Yu.I. Gorpinko, B.M. Posmetny (Kharkiv, Ukraine)**. “ANOMALOUS CHANGES OF HEAT-TRANSFER EFFICIENCY.” 5 min. — for answering questions.

16.00–16.15 — **V.V. Balyberdin, N.A. Zhuck, A.V. Nechayev, S.I. Chernyshov (Kharkiv, Ukraine)**. “BIOCHEMICAL AND ELECTROCHEMICAL WATER PROPERTIES FROM THE MAGNETIC HYDRODYNAMICS ROTOR MACHINE.” 5 min. — for answering questions.

16.20–16.35 — **P.A. Osaul, A.I. Osaul, I.G. Yakovleva (Zaporozhie, Ukraine)**. “DEVELOPMENT OF autonomous HEAT PRODUCTION SYSTEMS WITH THE ENERGY TRANSFORMER OF LIQUID MOTION, COMBINED WITH HEAT EXCHANGER.” 5 min. — for answering questions.

16.40–16.55 — **V.I. Balabay, Yu.V. Ivanko, V.V. Shapovalenko (Kharkiv, Ukraine)**. “MAGNETIC ELECTROSTATIC INDUCTION.” 5 min. — for answering questions.

17.00–17.15 — **S.A. Ponyatovsky (Saint Petersburg, Russia)**. “PRIMARY SOURCE OF GLOBAL ENERGY.” 5 min. — for answering questions.

17.20–17.35 — **Yu.M. Galayev (Kharkiv, Ukraine)**. “OBSERVATION OF ETHER WHIRL NEAR-BY EARTHLY SURFACE.” 5 min. — for answering questions.

17.40–19.00 — *general discussion*.

16 June, 2005 (Thursday)

Chairman L.P. Fominsky

09.00–09.30 — G.V. Nikolayev (Tomsk, Russia). “ENERGY OF MAGNETIC FIELDS INTERACTIONS IN PHYSICAL VACUUM.” 10 min. — for answering questions.

09.40–09.55 — V.V. Berdinskykh (Cherkassy, Ukraine). “HYDRODYNAMIC BASES OF FREE ENERGY PHYSICS. PART 1. RADIAL FLOW.” 5 min. — for answering questions.

10.00–10.15 — V.V. Berdinskykh (Cherkassy, Ukraine). “HYDRODYNAMIC BASES OF FREE ENERGY PHYSICS. PART 2. NON-WORKING WINDING OF LIQUID STREAM.” 5 min. — for answering questions.

10.20–10.35 — V.V. Berdinskykh (Cherkassy, Ukraine). “HYDRODYNAMIC BASES OF FREE ENERGY PHYSICS. PART 3. BASIC PRINCIPLES OF FREE ENERGY APPLICATION.” 5 min. — for answering questions.

Break for 20 min. Tea, coffee.

11.00–11.30 — S.S. Sannikov-Proskuryakov (Kharkiv, Ukraine). “DYNAMIC THEORY OF ETHER.” 10 min. — for answering questions.

11.40–12.10 — N.V. Kosinov (Kiev, Ukraine). “WATER IS THE POWER CARRIER CAPABLE TO REPLACE OIL.” 10 min. — for answering questions.

12.20–12.50 — N.V. Kosinov (Kiev, Ukraine). “EXPERIMENTS ON WIRELESS ENERGY TRANSMISSION: CONFIRMATION OF TESLA’S REVOLUTIONARY IDEAS.” 10 min. — for answering questions.

13.00–14.00 — dinner break.

Chairman V.A. Atsukovsky

14.00–14.15 — A.A. Khalatov, A.S. Kovalenko, S.V. Shevtsov (Kiev, Ukraine). “TEST RESULTS OF VORTEX HEAT GENERATOR 5,5 - 1.” 5 min. — for answering questions.

14.20–14.35 — V.N. Karpenko (Dnepropetrovsk, Ukraine). “ANOMALOUS PHYSICAL PHENOMENA. CONCEPTUAL ASPECT.” 5 min. — for answering questions.

14.40–14.55 — R.V. Potemin (Tomsk, Russia). “FREE ENERGY AND EXTRATERRESTRIAL CIVILIZATIONS.” 5 min. — for answering questions.

15.00–15.15 — V.N. Karpenko (Dnepropetrovsk, Ukraine). “NATURE OF GRAVITATION AND ELECTROMAGNETISM.” 5 min. — for answering questions.

Break for 20 min. Tea, coffee.

15.40–15.55 — V.I. Balabay, V.V. Shapovalenko (Kharkiv, Ukraine). “BASES OF COMPLEX-SPATIAL ANALYSIS AND EXAMPLE OF ITS APPLICATION TO RANKE’S EFFECT INVESTIGATION.” 5 min. — for answering questions.

16.00–16.15 — V.I. Balabay (Kharkiv, Ukraine). “BASIC THEOREMS OF PHYSICAL-MATHEMATICAL MODEL OF COMPLEX ENERGETIC SPACE.” 5 min. — for answering questions.

16.20–16.40 — L.P. Fominsky, T.G. Shevchenko, R.M. Gruzman, N.V. Glukhov, A.R. Khabrakhmanov (Ukraine, Russia). “ILLUSIVE HEAT OF SUPERSINGLE HYDRODYNAMIC HEAT GENERATORS.” 10 min. — for answering questions.

16.50–17.00 — summation and closing of the conference.

POSTER REPORTS:

1. **A.K. Aleynik, P.N. Garkusha, N.A. Zhuck, A.P. Lubchenko, V.Yu. Melanchuk, L.I. Nechuyviter, S.I. Chernyshov.** “ENERGY-SAVING THROUGH FRICTION REDUCTION.”

2. **V.G. Aleshinsky.** “ABOUT CONSERVATION LAWS IN ELECTRODYNAMICS.”

3. **E.I. Andreyev, A.P. Smirnov, A.A. Shumkov, Yu.A. Brezhnev, D.A. Ustimenko, N.I. Lukyanchikov.** “NEW TECHNOLOGIES OF ENERGY OBTAINING WITHOUT ORGANIC OR NUCLEAR FUEL APPLICATION.”

4. **A.G. Belyavsky.** “ABOUT THE POSSIBLE MECHANISM OF URANIUM ARROWS AFFECT ON AN ARMOUR.”
5. **A.G. Belyavsky.** “STOVES WITH THERMAL TUBES.”
6. **B.V. Bolotov.** “PHOTONUCLEAR AND BETANUCLEAR SYNTHESIS IN WILDLIFE.”
7. **B.V. Bolotov, N.A. Bolotova, M.B. Bolotov, I.M. Bolotov.** “COLD SYNTHESIS AT ELECTRONIC BOMBARDMENT.”
8. **B.V. Bolotov, N.A. Bolotova, M.B. Bolotov, I.M. Bolotov.** “ELECTROLYSIS EFFECTS BY AN IMPULSIVE CURRENT WITHOUT A PERMANENT COMPONENT.”
9. **I.M. Galitsky.** “ABOUT EXPERIMENTAL CONFIRMATIONS OF SOME PROGNOSSES EFFLUENT FROM THE “TIME PROBLEM” SOLUTION.
10. **Yu.I. Gorpinko, B.M. Posmetny.** “TECHNOLOGIES AND ADVANTAGES OF THE TEMPERATURE INCREASE OF HEAT-TRANSFER PRESSURE.”
11. **N.A. Zhuck.** “POTAPOV’s NON-FUEL MOLECULAR ENGINE.”
12. **N.A. Zhuck.** “SLAV-ARYAN VEDAS ABOUT HUMANITY HISTORY AND ENERGY CRISES.”
13. **V.E. Kats.** “ABSOLUTE SIGN SYMMETRY.”
14. **N.D. Kolpakov.** “ABOUT SCIENTIFIC BASES OF PROBLEM SOLUTION OF ENERGY EXTRACTION FROM “FREE” SPACE.”
15. **V.D. Kozhevnikov.** “MODEL OF MATERIAL SPACE.”
16. **P.D. Nagorny.** “IDEA OF “PERPETUM MOBILE” CREATION.”
17. **A.S. Naumenko.** “MAIN PROBLEM OF NUCLEAR ENERGETICS.”
18. **B.M. Posmetny, Yu.I. Gorpinko.** “SUPERSINGLE HEAT GENERATORS ON RANK’s TUBE BASIS: EFFICIENCY INCREASE AND RADIATION PHENOMENA.”
19. **I.V. Pomerantsev.** “HEAT, WORK AND PHYSICAL VACUUM.”
20. **A.P. Smirnov.** “BASES OF NEW SCIENTIFIC PARADIGM.”
21. **V.Ya. Sotnikov.** “MODELS ON THE BASIS OF ETHER SPIRAL TORE-LIKE WHIRLWIND.”
22. **B.A. Troshenkin.** “INFLUENCE OF SOLAR SYSTEM IRREVERSIBLE PROCESSES ON THE EARTH FORMATION.”
23. **V.V. Shapovalenko.** “EVOLUTION OF TORNADO PHYSICAL STRUCTURE.”

DECLARATION

of International Scientific and Technical Conference in Kharkiv

“ANOMALOUS PHYSICAL PHENOMENA IN POWER ENGINEERING AND PROSPECTS OF UNTRADITIONAL ENERGY SOURCES CREATION”

We live in the epoch, when thoughtless and infinite incineration of the organic fuel stores on the Earth by the people has already resulted in the strongest nature contamination, dwelling environment poisoning and leads to the developing climatic catastrophe. Unfortunately, the “fire admirers” union, making a profit out of the organic fuels trade and those dark forces that have already matured plans of the humanity enslavement and elimination within more than 3 thousand years and taken the humanity basic riches and power in the hands in most countries, was formed for the last centuries. They already succeeded to take humanity for a throat and impose it the “Gold milliard” theory, according which the humanity quantity must be reduced, at least, in 5 times for the nearest 50 years due to the oil and natural gas deficit – at the expense of Slavonic and Arabic people elimination foremost.

In this situation the humanity rescue is seen in the alternative energy sources transition such as: heat-pumps, extracting surpluses of thermal energy from rivers, oceans, atmosphere, turbine towers, cold nuclear fusion and other, providing the ecological cleanness of energy receipt and without leading to the ecosphere thermal contamination.

Only those alternative energy sources are listed above, which currently either well studied already or non-studied enough yet, but well-known. But incomparably large possibilities can be given by those lying beyond the scopes of well known and studied, these anomalous physical phenomena in power engineering, which our conference was devoted.

But, unfortunately, there always were and are such scientists among others, which consider sincerely, that the science has already experienced everything, that their today’s knowledge is the truth in the last resort. They do not want to understand that our today’s level of knowledge will be called as our ignorance level more correctly. These conservatives from the science call any attempts of the new phenomena search in nature as pseudo-science and fight with them. So it happened always: both at Leonardo’s times and nowadays as well. But nowadays these conservatives are fed up by powerful oil mafia, stimulating their fight against new by Nobel prizes and other awards.

The existence of the Commission fighting against pseudo-science at RAS Presidium is the disgrace for modern science, heading and co-ordinating this fight of old, stiff with new, borning for more than 5 years. Our Conference expresses the mistrust to this Commission and reprobrates the attempts of analogous commission creation in NAS of Ukraine.

Our Conference joins the opinion of the Nobel laureate Richard Feinmann that “much-vaunted modern physics is the continuous cheating”. The conservatism in science was its reason. The erroneous and outdated conservation laws, especially groundless law of energy conservation are the Procrustean bed in this system of modern physics created by conservatives. Enormous harm to natural science development was inflicted by so-called theory of relativity, fully falsified by zionists with the purpose of Einstein’s personality cult creation as a “genius of all times and one nation”. The theory was an obstacle to the science development for 100 years.

The achievements of his really prominent contemporaries, as Nikola Tesla and Victor Shauburger, having done much for the alternative power engineering development were suppressed and trampled down simultaneously with Einstein’s groundless praising by dark forces imposing its sharp claws paw on the science pulse.

Our conference blames the practice of separate researchers works suppressing as for political, racial, religious and other reasons. Everybody was given a word, wishing to make reports regarding the conference subjects. The results of numerous enthusiasts’ researches of alternative energy sources use and researchers of anomalous physical phenomena in power engineering were heard.

The conference calls all enthusiasts and defenders of new knowledge to unite into associations, unions, amateur science academies for the fight against the massed dark forces offensive expanded against them using conservatives from science as the shock detachment in the fight for world domination and enslavement of the whole humanity.

June 16, 2005

Kharkiv, Ukraine

Spacetime & Substance

Contents of issues for 2005 year

Vol. 6 (2005), No. 1 (26)

- S.S. Sannikov-Proskuryakov.** NON-NEUMANNIAN REPRESENTATIONS OF ROTATION GROUP (TO THE ETHER THEORY). 1 (1).
- J.A. Belinchón.** BULK VISCOUS FRW WITH TIME VARYING CONSTANTS REVISITED (8).
- S.N. Arteha.** CRITICAL REMARKS TO THE RELATIVITY THEORY (14).
- S.S. Sannikov-Proskuryakov.** NON-NEUMANNIAN REPRESENTATIONS OF ROTATION GROUP (TO THE ETHER THEORY). 2 (21).
- Angelo Loinger.** NO GW IS EMITTED BY B PSR1913+16 (28).
- Geetanjali Sethi, Pranav Kumar, Sanjay Pandey & Daksh Lohiya.** A CASE FOR NUCLEOSYNTHESIS IN SLOWLY EVOLVING MODELS (31).
- N.A. Zhuck.** SLAV-ARYAN VEDAS ABOUT THE UNIVERSE STRUCTURE AND HUMANITY HISTORY (39).

Vol. 6 (2005), No. 2 (27)

- Jozef Šima and Miroslav Súkeník.** FAR-INFRARED LOW-TEMPERATURE SPECTRA OF CHEMICAL COMPOUNDS – GRAVITATIONAL EFFECTS (49).
- Geetanjali Sethi, Pranav Kumar, Sanjay Pandey & Daksh Lohiya.** A CASE FOR NUCLEOSYNTHESIS IN SLOWLY EVOLVING MODELS (53).
- Angelo Loinger.** ON SERINI'S RELATIVISTIC THEOREM (61).
- Frank Boring Fitzgerald.** QUANTUM MATRIX REALITY, REAL AND J REACTIVE (64).

Vol. 6 (2005), No. 3 (28)

- J.A. Belinchón and J.L. Caramés.** PERFECT FLUID FRW MODELS WITH TIME VARYING CONSTANTS REVISITED (97).
- P.I. Danylchenko.** THE NATURE OF RELATIVISTIC LENGTH SHRINKAGE (109).
- A. Pradhan, P. Pandey, G.P. Singh and R.V. Deshpandey.** CAUSAL BULK VISCOUS LRS BIANCHI I MODELS WITH VARIABLE GRAVITATIONAL AND COSMOLOGICAL “CONSTANT” (116).
- Dumitru Pricopi.** THERMAL VARIATION IN THE EXTERNEED ONE-ZONE RR LYRAE MODEL. II NON LINEAR RESULTS (121).
- Miroslav Súkeník and Jozef Šima.** ON THE CONSTANCY OF NATURAL CONSTANTS (124).

Sushil Kumar Singh and Subhash Kumar. LINEAR WAVES IN AN IMPERFECT ANISOTROPIC MHD FLUID IN RELATIVISTIC FORMALISM (128).

Dumitru Pricopi. THERMAL VARIATION IN THE EXTERNEED ONE-ZONE RR LYRAE MODEL. II NON LINEAR RESULTS (132).

V.R. Terrovere. EXPLANATION AND MORE PRECISE DEFINITION OF MOTION OF MERCURY'S PER-HELION WITHOUT USE OF GENERAL RELATIVITY (140).

Vol. 5 (2004), No. 4 (29)

A. Pradhan, K.D. Thengane and J.K. Jumale. PLANE-SYMMETRIC MAGNETO-FLUID UNIVERSE WITH TIME DEPENDENT COSMOLOGICAL TERM Λ (145).

Angelo Loinger. ON THE DISPLACEMENTS OF EINSTEINIAN FIELDS *ET CETERA* (151).

C. Gauthier, C. Walker. SPACE-TIMES WITH DISCRETE AXIAL AND MIRROR SYMMETRIES (154).

I.M. Galitsky. ABOUT EVOLUTION OF SYSTEMS OF THE BASIC UNITS OF MEASURE (PHYSICS) (157).

K.E. Putro. PRESENTATION OF THE WORLD UNIFIED PHYSICS (165).

B.V. Bolotov, N.A. Bolotova, M.B. Bolotov, I.M. Bolotov. COLD SYNTHESIS AT ELECTRONIC BOMBARDMENT (168).

F.A. Gareev, I.E. Zhidkova and Yu.L. Ratis. ENHANCEMENT MECHANISMS OF LOW ENERGY NUCLEAR REACTIONS (181).

NEW BOOKS. (192).

Vol. 5 (2004), No. 5 (30)

N.A. Zhuck. PHYSICISTS MARK INTERNATIONAL YEAR OF PHYSICS (193).

Frank Boring Fitzgerald. GEORGE FRANCIS FITZGERALD FIRST WITH THREE RELATIVISTIC CONCEPTS (194).

A.C.V. Ceapa. TRUE RATIONALE FOR CELEBRATING EINSTEIN'S SPECIAL RELATIVITY THEORY (199).

N.A. Zhuck. CLASSIC CONCEPTIONS OF SPECIAL AND GENERAL RELATIVITY THEORY. TRIUMPHS AND DIFFICULTIES OF THE THEORY (201).

P.I. Danylchenko. THE GAUGE INTERPRETATIONS OF GENERAL RELATIVITY (207).

FangPei Chen. A NEW INTERPRETATION ABOUT THE EVOLUTION OF THE COSMOS (212).

A.N. Barbarash. PROBLEMS OF WORLD OUTLOOK (219).

N.A. Zhuck. TESTS QUESTIONS FOR GRAVITATION THEORIES VERIFICATION (225).

A.A. Romanov. UNUSUAL LIGHTNING (229).

Scientific and Technical Conference. "POWER ENGINEERING - 2005" (234).

Scientific and Technical Conference. DECLARATION (238).

Spacetime & Substance. Contents of issues for 2005 year (239).

Spacetime & Substance

International Physical Journal

INFORMATION FOR AUTHORS

The Editorial Council accepts the manuscripts for the publication only in an electronic variant in the format for LATEX 2.09. They should be completely prepared for the publication. The manuscripts are accepted by e-mail or on diskettes (3.5"). The manuscripts can be adopted in other view only for familiarization.

The original manuscripts should be preferably no longer than 6 pages. They should contain no more than 4 figures. Length of the manuscript can be up to 10 pages only in exclusive cases (at arguing problems of primary importance). If the length of the manuscript exceeds 10 pages, it should be divided by the author into two or more papers, each of which should contain all pieces of a separate paper (title, authors, abstracts, text, references etc.). The Editorial Council accepts for the publication the brief reports too.

The payment for the publication of the manuscripts is not done. Each author gets the electronic version of that Journal edition, in which his paper was published free of charge.

An E-mail message acknowledging the receipt of the manuscript will be sent to the corresponding author within two working days after the manuscript receipt. If a message is not received please contact *krasnoh@iop.kiev.ua* to inquire about the manuscripts.

The Style File and Instructions for its use can be found at <http://spacetime.narod.ru> (sample.zip, 19 kb).

An abstract (within 20 lines) must be submitted. This one should be concise and complete regardless of the paper content. Include purpose, methodology, results, and conclusions. References should not be cited in the abstract. The abstract should be suitable for separate publication in an abstract journal and be adequate for indexing.

If the argument of an exponential is complicated or long, "exp" rather than "e" should be used. Awkward fractional composition can be avoided by the proper introduction of negative degrees. Solidus fractions (l/r) should be used, and enough enclosures should be included to avoid ambiguity in the text. According to the accepted convention, parentheses, brackets, and braces are in the order { [()] }. Displayed equations should be numbered consecutively throughout the paper; the number (in parentheses) should be to the right of the equation.

Figures (black-and-white) should be of minimal size providing clear understanding. Breadth of the figure should not exceed 84 mm or 174 mm (in exclusive cases). Figures should be made out as separate files in the format of *.pcx (300 dpi/inch), *.ps or *.eps (minimum of kb).

Each figure must be cited in numerical order in the text and must have figure legend.

Tables should be typed as authors expect them to look in print. Every table must have a title, and all columns must have headings. Column headings must be arranged so that their relation to the data is clear. Footnotes should be indicated by reference marks ¹, ² etc. or by lowercase letters typed as superiors. Each table must be cited in the text.

The Editorial Council accepts also response on papers, published in the Journal. They should be no more than 1 journal page in length and should not contain figures but only to refer to the already published materials. But they can contain the formulas. The recalls are publishing in section "Discussion."

The list of references may be formed either by first citation in the text, or alphabetically.

Only works cited in the text should be included in the reference list. Personal communications and unpublished data or reports are not included in the reference list; they should be shown parenthetically in the text: (F.S. Jones, unpublished data, 1990).

The title of paper is permissible not to indicate. It is permissible to give only the initial page number of a paper. The format of the reference list is as indicated below.

References

- [1] F.W. Stecker, K.J. Frost, *Nature*, **245**, 270 (1973).
- [2] V.A. Brumberg, "Relativistic Celestial Mechanics", Nauka, Moskow, 1972 (in Russian).
- [3] S.W. Hawking, in: "General Relativity. An Einstein Centenary Survey", eds. S.W. Hawking and W. Israel, *Cambr. Univ. Press*, Cambridge, England, 1979.

Read the Journal before sending a manuscript!

CONTENTS

N.A. Zhuck. PHYSICISTS MARK INTERNATIONAL YEAR OF PHYSICS	193
Frank Boring Fitzgerald. GEORGE FRANCIS FITZGERALD FIRST WITH THREE RELATIVISTIC CONCEPTS	194
A.C.V. Ceapa. TRUE RATIONALE FOR CELEBRATING EINSTEIN'S SPECIAL REL- ATIVITY THEORY.....	199
N.A. Zhuck. CLASSIC CONCEPTIONS OF SPECIAL AND GENERAL RELATIVITY THEORY. TRIUMPHS AND DIFFICULTIES OF THE THEORY	201
P.I. Danylchenko. THE GAUGE INTERPRETATIONS OF GENERAL RELATIVITY .	207
FangPei Chen. A NEW INTERPRETATION ABOUT THE EVOLUTION OF THE COS- MOS	212
A.N. Barbarash. PROBLEMS OF WORLD OUTLOOK	219
N.A. Zhuck. TESTS QUESTIONS FOR GRAVITATION THEORIES VERIFICATION .	225
A.A. Romanov. UNUSUAL LIGHTNING	229
Scientific and Technical Conference. "POWER ENGINEERING - 2005"	234
Scientific and Technical Conference. DECLARATION	238
Spacetime & Substance. Contents of issues for 2005 year	239