Advanced Intelligence Agency

Technical Memorandum for the Record

"I want to know God's thoughts … the rest are details."
Einstein

For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled." Feynman

Thursday, December 09, 1999

Shipov's Torsion Field Theory for Dummies

12th Draft

Originally from Gennady Shipov
Edited with comments by Jack Sarfatti

Note how Gennady is able to describe his new physical ideas in plain English (with a little help from me) without having to hide behind the wall of advanced mathematics. This feature of clarity of expression is independent of the issues of conceptual and logical consistency and agreement with experiments. This is in accord with Bohr's requirement. In fact Gennady makes a common error about Einstein's argument for the use of length contraction for the rotating disk, but it does not damage his main thesis. Sure, the advanced mathematics is required as a tool later on. It is an abuse of mathematics in theoretical physics to use it as a crutch where there is no clear physical idea behind it. Feynman called this abuse, now rampant in peer-reviewed mainstream journals, "rigor-mortis" in which the use of mathematics with no good physical meaning leads to Laputan conclusions.

[Gennady Shipov, Moscow]

During more than three hundred years, Newton's mechanics found its experimental confirmation and there is no reason to doubt its validity. It is successfully used to account for both ballistic trajectories and planetary orbits. It provides the scientific basis for the construction of many technical systems. In terrestrial conditions, Newton's mechanics is quite sufficient for an engineer. However, for engineering designs of deep space ships

with possible motion at near light speeds, it is necessary to take advantage of the second mechanics - relativistic mechanics of Einstein-Lorentz-Poincare. Experts in the physics of high energies and astrophysics apply this mechanics to the description of observable phenomena.

[Jack Sarfatti, San Francisco]

I predict that we will never use spaceships traveling near light speed because the energy requirements are much too great. In addition we have the undesirable fact of time dilation.

[Bill Page, Canada]

IF (big if) propulsion without reaction mass is possible, then I don't see energy requirements as a significant limitation to approaching light speed in a spacecraft.

[Jack]

Yes you have a point if we are using vacuum energy perhaps. However, most missions will not want to suffer irreversible time dilation. They will want to return home to their families - indeed in time for dinner! Fortunately the warp drive concept of Alcubierre and the traversable wormholes of Kip Thorne offer us a low energy alternative in which the local $v/c << 1$ with little time dilation and no g and tidal forces, even though globally the motion is effectively superluminal.

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In spite of its current popularity, I think there is very little real physical evidence of the kind of spatial topology that has been associated with black holes. There are several gauge theoretic descriptions of gravitation that do not give rise to discontinuous event horizons etc. in which black holes are much less mysterious. It seems much more likely to me that "worm holes" are simply a result of a rather impoverished notion of the possible structure of spacetime.[1]

[Jack]

The main data for controlled topology change of space geometry using advanced ET technology is in the authentic UFO data base such as the one at NIDS for example, the one the French Military Think Tank had access to and some reliable mil/intel data I have had access to. I do not expect you to accept what I say on faith of course.

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[1] "If the spacetime has a Cauchy surface, that three-geometry once known… the so-called initial value problem of geometrodynamics… - the future evolution of that geometry follows … deterministically" p. 5 Wheeler & Ciufolini "Gravitation and Inertia" (Princeton, 1995)

The new data on the acceleration of the universe shows a cosmic antigravity force in the physical vacuum that General Douglas MacArthur already sensed in his "Duty, Honor, Country" speech at West Point, I think in 1962. This is the same time that his former staff officer, Colonel Phillip J. Corso was apparently in charge of some of the recovered ET technology from the Roswell flying saucer crash in 1947. Mac Arthur gave the US Army the order to "harness the cosmic energy." The theory of Giovanni Modanese is one clue, which may allow us to do this. Modanese has shown how macroscopic quantum phase coherence, as in a superconductor, can locally destabilize the physical vacuum to make a controllable antigravity field of exactly the same nature that is driving the acceleration of the universe.

[Shipov]

The principle of practical sufficiency, satisfying an engineer, does not limit theoretical physics in search of new scientific truth. One of the major of tasks of physics is the cognition of new laws of Nature and only after that problems arise that are connected to the achievement of practical tasks.

It is useful to give a simple example.[2] Let's consider movement of a body in a freely falling elevator (Einstein's elevator). If the reference system (more often but not quite precisely speaking "coordinate system"), in which we analyze the body's movement, is connected to the Earth and does not rotate together with the Earth (inertial reference system), then Newton's mechanics adequately describes the body movement in the inertial reference system.

[Jack]

This is, of course, only an approximate inertial frame of the "first kind" since a rigid connection to a large mass is really a non-inertial frame.[3] Also the Earth is not only spinning about an axis but is also in elliptical orbital motion around the Sun at the focus of the ellipse. The Sun itself is moving. We have an absolute frame of rest here defined by the Hubble flow in which the cosmic blackbody radiation is isotropic. See Gennady's new idea of the "accelerated locally Lorentz inertial systems of the second kind" below.

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[2] "fractional contribution by a given mass there to the … direction of axes of the local gyroscopes … here is of the order of (mass there)/(distance there to here) … Mount a gyroscope … float it weightless in space to eliminate the gravity force … the Earth turns beneath the heedless gyro … The corrected turning rate of the gyro relative to the distant stars, is of the order of …. 330 milliarcsec per year … 'Dragging' Einstein called it in … 1913 … to Mach … Others often call it … the Lense-Thirring effect … Today…. That force at work on the gyro which causes the slow turning of its axis: gyrogravitation or gravitomagnetism … rotation of a sphere induces by viscous drag a motion in the surrounding fluid that imparts to an immersed ball a rotation in the same sense as gravitomagnetism drags the inertial frame defined by gyroscopes." Wheeler op-cit.

[3] "No matter if we are freely falling or not, the gradiometer will eventually detect the gravity field and thus will allow us to distinguish between the freely falling cabin of the spacecraft in the gravity field of a central mass and the cabin of a spacecraft away from any mass." Wheeler p.15 op-cit.

Note from Wheeler, the definition of the torsion-free LIF (Local Inertial Frame) in which the gravity field, but not the tensor curvature field locally vanishes over a small enough 4D spacetime region.:

" at any point … one can find coordinate systems such that … the metric tensor … is the Minkowski metric …. And the first derivatives … with respect to the chosen coordinates, are zero" p. 15 Wheeler & Ciufolini "Gravitation and Inertia".

Therefore, the LIF corresponds to a frame-dependent max/min/saddles in the metric tensor field.

"However, one cannot in general eliminate certain combinations of second derivatives … which form … the Riemann curvature tensor…. represents at each point, the intrinsic curvature of the manifold, and, since it is a tensor, one cannot transform it to zero in one coordinate system if it is nonzero in some other coordinate system."

Note this is not so for the max/min/saddles defining the LIFs which are not tensor properties.

"in a neighborhood of a spacetime event, in a freely falling, nonrotating, local inertial frame, to second order in the separation δx^{α}, from the origin

$g_{00} = - 1 - R_{0i0j}\delta x^{i}\, \delta x^{j}$

$g_{0k} = -(2/3)R_{0ikj}\delta x^{i}\, \delta x^{j}$

$g_{kl} = - \delta_{kl} - R_{kilj}\delta x^{i}\, \delta x^{j}$

where i,j,k = 1,2,3.

For example,

$g_{00} = - 1 - R_{0101}\delta x^{1}\, \delta x^{1} - R_{0102}\delta x^{1}\, \delta x^{2} - R_{0102}\delta x^{1}\, \delta x^{3}$ + 6 other terms

Can we apply catastrophe theory to these equations for the LIFs? What are the control parameters to metric engineer spacetime? We need to compute the metric stability matrix determinant from the Riemann curvature tensor for each metric tensor field component.

For example, the torsion-free space-space metric stability 3x3 matrix of the Bohm point is

$$\frac{\partial^2 g_{kl}}{\partial x_i \partial x_j} = -\frac{1}{3} R_{kilj}$$

Its determinant is then

$$S_{kl} = \left| -\frac{1}{3} R_{kilj} \right|$$

The critical points, defining LIFs, where $S_{kl} \neq 0$ are isolated, nondegenerate "Morse points" (AKA "equilibrium points"). So non-inertial local frames (NLIFs) are non-equilibrium points. Zero eigenvalues of the metric stability matrices for the different components of the metric tensor are nonisolated, degenerate non-Morse points (AKA critical points as in a phase transition). Evidently when we add classical torsion fields they will act as control parameters for metric curvature catastrophes desirable for metric engineering of warp and wormhole. The classical torsion fields may built from high Tc superconducting order parameters giving us the Modanese metric catastrophes.

That is, the classical "state" from the point of view of catastrophe theory has 16 components. We can get this down to 9 for the initial value problem on the 3D sub-geometry. This becomes more interesting when we add the torsion fields. Now will we have the control parameters for metric engineering from the mechanical rotation rates? When we go to Bohm's configuration space of the 3D sub-geometry to do canonical quantum gravity we then have an infinite network of nonlocally connected rotating electromagnetic gravity machines in the sense of Gabriel Kron's 1942 theory. We can coarse grain to get a finite lattice network for a given resolution of the detectors.

[Gennady]

However Einstein noticed that, if one connects the reference system with the freely falling lift, then Newton's mechanics is not sufficient for the description of the body's movement with respect to the accelerated reference system.

[Jack]

Important conceptual correction to Shipov's text follows: I should have caught this first time round. I think the problem is with Gennady's limited English. Of course, the freely falling lift is a local inertial frame LIF in which Newton's laws work. The uniformly accelerating frame in empty space is equivalent to a non-inertial frame in a uniform gravity field where Newton's laws also work. Newton's laws also work, at least partially, in the non-inertial frames when one adds the inertial centrifugal and Coriolis forces. Gennady is trying to say that the local Lorentzian inertial frames that Wheeler calls "LIFs" of "the first kind" must be supplemented by local rotating inertial frames of "the second kind" "RLIFs" when torsion fields are generated in rotating mechanical and electromechanical macroscopic machines. These effects were first studied by Gabriel Kron at General Electric in the 30's and during WWII possibly in connection with the real Navy "Philadelphia Experiment" that most skeptics consider to be without any basis in fact at all.

[Gennady]

To create a new mechanics, Einstein had to introduce Riemannian geometry to replace Euclidean. Moreover, Einstein had to replace the Galileo-Newton's relativity principle by the general relativity principle, which (locally) established the physical equality of the special class of accelerated reference systems - locally Lorentzian systems of the first kind. Freely falling lifts or space stations are examples of such reference systems.

Since general relativity theory's creation, it became obvious for physicists, that, while describing gravitational phenomena, the real space is curved. However in weak gravitational fields, the usual context of engineering accounts, it is possible to consider space as flat with the high degree of accuracy, where Newton's mechanics "works" well enough with excellent practical precision.

Newton's mechanics has not ceased to exist with the appearance of Einstein's general relativistic mechanics, and also after one more generalization - quantum mechanics. Newton's mechanics was not even shaken. Only the boundaries of its applicability were established for the description of new physical phenomena.

It is important to stress, that in the fundamentals of any mechanics, as the development of physical ideas testifies, three fundamental concepts are needed: the geometry of space, the relativity principle, and the reference system. For example, in Newton's mechanics these are the Euclidean geometry, the Galileo-Newtonian relativity principle and the inertial reference system. In special relativistic mechanics they are: Minkowski space-time geometry, the special relativity principle, and the relativistic inertial reference system.

I will now, further, specify a number of simple mechanical systems, which cannot be described neither within the framework of Newton's mechanics, nor Einstein's gravitation theory. One more mechanics will be constructed, which includes a new class of reference systems - accelerated locally Lorentzian reference systems of the second kind. The new mechanics gives answers to many questions which have arisen in classical mechanics and which have been vague since Newton's times. It allows the prediction (and experiment confirms this prediction), that on the foundation of these new physical principles, it is possible to create mechanical systems based on the concept of torsion fields.

Being guided by existing scientific literature, it is possible to allocate in mechanics three areas having no final conventional explanations. The first and the oldest riddle of mechanics is the inertial forces problem.

[Jack]

Some of the inertial forces are the centrifugal and Coriolis forces in rotating non-inertial frames as well as the "g-force" felt by pilots and astronauts in a linearly accelerated non-inertial frame.

[Gennady]

Since Newton's times there is no unambiguous understanding of the following simple issues:

What are the sources of the inertial forces?

Are the inertial forces real or not?

Is it possible to classify these inertial forces as internal and external ones with the respect to an isolated system?

Do they obey Newton's mechanics laws, for example, the law of action and reaction?

In our country, Russia, discussions on inertial forces problem resurface every 20-30 years. Analysis of texts on theoretical mechanics reveals the absence of consensus on these issues. For example, concerning the question of whether inertial forces are real or not, the judgements are distributed (approximately) as follows:
60 % of authors hold that inertial forces are unreal;
20 % - believe that they are real;
10 % - maintain that some inertial forces are real and others are unreal;
10 % - ignore the subject altogether.

Inertial forces are observed in accelerated reference frames, therefore Newton, Euler, Mach, Einstein and many others thought of these forces as real. Experiment also suggests that during accelerated motion in an extended body, a field of inertial force emerges, with the resultant force acting (sometimes) on the body's center of mass as an effective "external force." It would be a good idea, therefore, to take closer look at the physical behavior of what I conjecture to be a new "inertial field", which generates inertial forces. This new interpretation of inertial forces, and their generating inertial fields, lies beyond the scope of Newton's classical mechanics and Einstein's general relativity.

The second problem of classical mechanics is connected to rigid body rotation. The majority of the contributors consider, that the mechanics of the rigid body (Newton - Euler's mechanics) follows from Newton's one. However experiments with gyroscopic systems show, that this point of view is erroneous. For example, this is what K. Magnus, a well-known specialist in gyroscope theory, wrote on the problem:

[Jack]

I think Gennady is translating this quote from Russian to English, so I am guessing on some of the proper phrasing.

[Gennady]

"To explain the behaviour of a rotating body, one frequently uses the analogy between rotary body motion and the motion of a material point. However in gyroscope theory this analogy is rather harmful, than useful, since the area of its applicability terminates just at the beginning of typically gyroscopic appearances. According to R.Grammel, for the area of gyroscopic phenomena " rigid body anisotropy, generated by its rotation ", has no analog in the mechanics of material points. If we plot the impact on a resting material particle, then it will begin to move in the direction of the impact momentum. And, on the contrary, it is completely not necessary that the application of an impact moment to a resting body generates its rotation around the axis of moment action."

[Jack]

I do not understand the last sentence.

[Gennady]

In the other words, if in the mechanics of a material point, space is homogeneous and isotropic, then in the mechanics of rotated body it becomes anisotropic.

[Jack]

Einstein's equivalence principle shows that translational acceleration of a frame is locally indistinguishable from a frame at rest in a uniform gravitational field. Einstein then showed that this translational idea without rotation shows itself geometrodynamically as the Riemann curvature field in non-Euclidean space-time geometry in 4 dimensions with the +++ - signature for the differential invariant space-time interval between two nearby events. Gennady is here proposing an extension of Einstein's equivalence principle to rotating frames, leading to the geometrodynamics of Cartan's torsion in addition to Riemann's curvature. What is different about Gennady's proposal is that he says that these torsion fields are large for simple macroscopic mechanical systems in which $v/c << 1$ and the Riemann curvature is practically speaking zero. Gennady says that this strong torsion field geometrodynamics can be harnessed to build practical vacuum propelled unconventional flying objects that do not need to eject material like a jet engine in air or a rocket engine in vacuum. Graviton emission can be safely ignored here. These elusive quanta of translational space-time curvature play no significant role in our terrestrial vacuum propeller design concepts. Shipov is talking about an allegedly powerful classical torsion field. Another way to look at this is in terms of Kibble's derivation of Einstein's general relativity from the Yang-Mills principle of local gauge invariance starting with the four-dimensional translation group instead of the non-Abelian internal symmetry groups of the weak and strong forces. Gennady is extending Kibble's method to the additional six parameters (three space-space rotations and three space-time boosts) of the Lorentz group to get the additional torsion field. Although the boost will not play a strong role when $v/c << 1$, it is the local gauging of the space rotation group O(3), expressing the

non-point extended space structure of elementary test particles, that apparently introduces the strong inertial vacuum reaction field for rotating mechanical systems.

[Gennady]

This leads to the third problem - what is the structure of internal geometry of a rotating body? The reasoning carried out above suggests that the space geometry of the rotary motion of matter should differ from the Euclidean geometry underlying Newton's mechanics. Einstein first showed that for rotating disk the ratio of its circle length L to its radius R is less then 2π

$$L/R < 2\pi$$

This inequality arises because of Lorentzian reductions of circle length during the disk rotation, whereas circle radius remains constant.

[Jack]

Gennady has made a common error here. Einstein's original argument is that the meter sticks along the circumference of the rotating disk Lorentz contract whilst those along the radius do not. Therefore, you need a larger number of meter sticks to go around the circumference of the rotating disk than when the disk is not rotating. Therefore,

$$L/R > 2\pi$$

For example p. 63-4 of Brian Greene's "The Elegant Universe"

"As Slim begins to measure the circumference, we immediately see from our bird's eye perspective …. that the ruler's length is shortened … this means that Slim will measure a longer circumference than did we. What about the radius? Well Jim uses the head-to-tail method … from our bird's eye view we see that he is going to find the same answer we did. The reason is that the ruler is not pointing along the direction of the instantaneous motion … as it is when measuring the circumference … they will get a number that is larger than our answer of two times π."

Einstein's classical analysis is completely operational almost the same as Bohr's quantum analysis that "no elementary phenomenon is a phenomenon until it is a measured phenomenon." The point is that space itself is not determined until it is measured. The tangential meter stick is shorter than the radial meter stick for the rotating disk compared to a nonrotating disk. Therefore, you need more meter sticks to cover the circumference of the rotating disk. Hence, the ratio of circumference L to radius R of the rotating disk is greater than 2π.

[Gennady]

It follows from the inequality, that rotated disk internal geometry is not Euclidean one (in Euclidean geometry the equality $L/R = 2\pi$ is violated), and corresponds to Lobachevski geometry with negative curvature.

[Jack]

This statement by Gennady is true. What is not true is that $L/R < 2\pi$ in that hyperbolic case of negative curvature. When the deficit in sum of angles of a triangle on a curved surface is less than π you have hyperbolic negative curvature from ordinary matter of positive energy density. The circle has a longer circumference to radius ratio exceeding 2π.[4] Exotic matter does the opposite. Einstein's actual historical example of the rotating disk generates negative curvature with an excess greater than 2π. On the other hand, too much nonrotating positive mass greater than a critical density, with an excess over 2π, will close the universe at any cosmic instant into a "snapshot" (Deutsch) of a closed 3D sphere causing a Big Crunch with the possibility of Tipler's "Omega Point." In fact the universe appears spatially flat on the cosmic scale. Gennady's example would require that the meter sticks tangent to the circumference in the rotating disk expand rather than contract. This may happen for hypothetical causality-violating "tachyonic" superluminal inertial frame transformations in which the gamma factor $[1 - (v/c)^2]^{-1/2}$ $v/c < 1$ is replaced by $[(v/c)^2 - 1]^{-1/2}$, $v/c > 1$ where there is no "rest frame." Einstein, of course, excluded these tachyon transformations in the special relativity of 1905 on the basis of his IMHO wrong idea that there are no future causes of past effects.

In contrast, Thomas Phipps, Jr. says there is no Lorentz contraction at all. Therefore, Einstein's picture of gravity as geometrodynamic curvature seems to break down. This may eventually prove Phipps wrong and Einstein correct since Einstein's theory is passing rigorous experimental tests. On the other hand Phipps did an experiment on the Thomas precession and found none. This suggests that the Lorentz contraction is not real. Experiments using head-on heavy ion collisions are relevant to this problem. On the other hand, we have the problem of explaining the origin of the observed and replicated data showing an anomalous unexpected anti-gravity acceleration of the universe. That does not in itself imply that Einstein was wrong since Einstein's cosmological constant seems to be the classical piece of the still not understood explanation. The influence of the future universe on our present measurements of the cosmic acceleration may explain the data. I have been saying this for some time now. It is implicit in the Hoyle-Narlikar "everything is particles" Wheeler-Feynman theory. In Wheeler-Feynman theory the electromagnetic, gravity, weak and strong force classical material fields do not have independent dynamical degrees of freedom. The dynamics is all in the sources and sinks not the forces. Furthermore, you need to include the closed time loop transaction between both future and past sinks and present sources.

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[4] "Nicolai Ivanovich Lobachevski (1793-1856) was his name. Hey!" Tom Lehrer

My above analysis has elicited a comment from Tony Smith:

[Tony Smith, Georgia]

I am puzzled that Gennady would say, as he does: "... the ratio of its circle length L to its radius R is less then 2π ... ... It follows ... that rotated disk internal geometry is not Euclidean ... and corresponds to Lobachevski geometry with negative curvature. ...".

It seems to me that, in the limit that v at circumference equals c, the circumference L of the rotating disk would contract to zero, and that the circumference would then be like a point, and that therefore the rotating disk would curl up into a sphere, which has spherical geometry with positive curvature and not "... Lobachevski geometry with negative curvature. ...".

[Jack]

No, I think Gennady is correct in that particular part when the sum of the angles of a triangle is less than π we have negative hyperbolic curvature where the circumference of a circle is anomalously longer than its flat length because the meter sticks shrink along the tangential motion. When the sum is greater than π we have positive elliptic curvature where the circumference of a circle drawn on the sphere shrinks. Euclidean geometry is parabolic zero curvature. Also I don't think the topology will change from disk to closed sphere?

[Tony]

See Figure 3.2 on page 65 of the book of Brian Greene, where Greene says "... A circle drawn on a sphere … has a shorter circumference than one drawn on a flat sheet of paper, … while a circle drawn on the surface of a saddle … has a longer circumference, even though they all have the same radius."

[Jack]

True, there is no immediately obvious relation between the sum of the angles of the triangle on the curved surface and the ratio of circumference to radius on that surface. However, from what you say Gennady is correct that the curvature of the rotating disk is negative hyperbolic Lobachevski like in a saddle, but he is incorrect is thinking that this means a shorter circumference! It is a longer circumference for rotation. We need to distinguish the effective curvature from the rotation from what it is for a nonrotating mass. So it looks as though the rotating mass of positive energy density makes the negative hyperbolic spatial curvature of Lobachevski in which the ratio of circumference to radius is greater than 2π. In contrast, the nonrotating mass of positive energy density makes a positive elliptical spatial curvature in which the ratio of circumference to radius is less than 2π. The two effects, static and rotational, will, therefore, tend to cancel each

other. Exotic matter of negative energy density does the opposite. Remember, in a nonrotating universe too much positive mass closes it up into a 3D sphere with the Big Crunch. Rotating the universe will lessen this maybe to the point of acceleration as in the current data? The rotation of the universe is making the area of the past horizon of infinite redshift bigger that we see in our telescopes than it should be if the universe is not rotating. This argument assumes retarded causality of course. We simply take this area and divide it by 4π to get the effective radius of the universe, which is anomalously bigger that we misinterpret as anti-gravity. If this is the explanation it shows the reality of the length contraction and therefore refutes Phipps. On the other hand, this may not be the correct explanation.

[Gennady]

Einstein's approach to space geometry of rotary motion, from my point of view, cannot be accepted, because of the absence, in his model, of two fundamental factors. At first, in Einstein's theory the angular coordinates are not used in the rotational description (we shall remind the reader, that in four-dimensional pseudo-Euclidean space-time there should be six rotations). Secondly, Lorentz contraction reductions represent the special relativistic effect, while the effective geometry change is observed during small rotation rates. Indeed, let's imagine a rubber disk, on which the Cartesian coordinate pattern is put down. Let now imagine that the disk rotates around the axis passing through its center. As a result of disk rotation we shall see distortions of the coordinate patterns that are stronger, the farther we are from the rotation axis. The problem is to describe properties of disk internal geometry, which is generated by its rotation and which takes into account the angular coordinates (in this case there are three).

To develop the theory consistently, it is necessary to renounce the concept of the absolute rigid body, as a very rough model, and to proceed to concept of plastic body, giving to it elastic properties. Indeed, in practice at very large rotations (about 10^6 RPM) any actual body is deformed under inertial forces. These deformations proceed, until the internal elastic forces will not compensate the inertial forces arising due to the body's rotation. It is quite obvious, that all the above problems arise for the rotational motion of material objects and, hence, are related to the inertial torsion fields and the inertial forces, which they generate.

New concepts of inertial fields and forces allow us to go beyond the scope of some theorems formulated earlier in classical mechanics. Let's take, for example, the theorem of momentum conservation of the isolated mechanical system's center of mass. According to this theorem, internal forces in an isolated system cannot change a momentum of its center of mass. The proof of the theorem requires the following conditions:

1) internal forces satisfy Newton third law of action and equal but oppositely directed reaction;

2) internal forces are all those forces, which act on internal volumes limited by the isolated system's walls.

The majority of classical mechanical forces satisfies the first condition and can be divided into external and internal forces according to the second one. However, in mechanics there are forces, which do not satisfy Newton's third law. Those forces, as it is well known, are the inertial ones, since it is impossible to tell, what bodies these forces are applied from.

[Jack]

They are obviously universal, and this is Gennady's point, geometrodynamical, in Einstein's and Wheeler's sense, when the latter is extended from translational curvature to rotational torsion. In other words, the inertial forces are the direct reactions of the physical vacuum on the accelerating matter fixed to what Newton would call non-inertial frames but which Gennady calls accelerated inertial frames of the second kind. This gets us to Mach's principle that the entire universe determines the local absolute rotation. The best Einsteinian space-time picture of this is the Wheeler-Feynman idea of *hyperbolic* action at a distance along the zero-proper time light cones. Therefore, backward causation from the future universe not only determines the 1/r far-field radiation reaction of accelerating electric charges and the zero point transverse polarized electromagnetic vacuum fluctuations, but also the torsion fields. In addition to this there are the *elliptic* $1/r^2$ near fields with velocity-dependence that act outside the light cone i.e. they are in Sciama's words "felt" but not "seen." This apparently requires adding a superluminal term to the purely luminal Feynman-Wheeler action at a distance model. Both terms violate retarded causality that there are no future causes of past effects. Future causes of past effects are teleological final causes that not only explain the generation of consciousness as a universal post-quantum process, but also explain the meaning, purpose, intelligence and destiny of physical reality - of existence itself.

[Gennady]

Moreover, inertial forces do not fall under the second condition, since they are simultaneously internal and external for isolated (in above defined sense) mechanical systems.

[Jack]

In other words they are in contact with the dynamic physical vacuum that is itself, like matter, non-rigid and plastic. This is certainly true in quantum electrodynamics in which the physical vacuum is a foamy frothing Dirac plasma of virtual electron-positron pairs, i.e. electrons "off the mass shell" moving both forward and backward in time. If you accept the Wheeler-Feynman "everything is particles" picture in Wheeler's "Geons, Black Holes and Quantum Foam", then there are no electromagnetic zero point fluctuations with

independent existence. The electromagnetic zero point vacuum fluctuation effects of the Casimir force and the Haisch-Rueda-Puthoff model for the origin of inertia and rest mass are all from the backward causation from the future universe on the present universe. We can also explain them in terms of Bohm's instantaneously acting quantum potential Q.

[Gennady]

Hence the center of mass of an "isolated system" can move under an operation of local inertial fields, generated by rotating elements inside the isolated (in a mechanical sense) system. This conclusion does not contradict Newton's mechanical theorem of momentum conservation of the isolated system's center of mass because inertial forces do not satisfy the conditions under which the theorem was proved.

[Jack]

Consider Noether's theorem connecting continuous symmetries of the dynamical action to conservation laws that is the corner stone in the Temple of Theoretical Physics. Conservation of linear momentum corresponds to symmetry of the action under space translations.[5] There is no contradiction if the dynamical vacuum is included in the explicit material action. Gennady attempts to do this with the additional torsion field degrees of freedom. Gennady is assuming that fields have independent dynamical degrees of freedom unlike Wheeler-Feynman theory.

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This is true, in general, however it is important to remember that at its base, Shipov's theory is "fully geometrized". In other words, the concept of the physical vacuum itself is a geometric one. This is rather different than the now current view of the "Dirac vacuum", for example.

[Jack]

Perhaps, but one cannot simply throw quantum electrodynamics into the trash. The proper point to make here is that Shipov's theory is a classical theory yet to be properly quantized to include many-particle entanglements such as the Pauli exclusion principle for example. Gennady admits that. It may require a generalization from A_4 to A_{4N} for N particles. However, the equivalent of the torsion field will come about in the Feynman-Wheeler "everything is particles" paradigm by rejecting the notion of point particles and using action at a distance along light cones of zero proper time for extended elementary particles as in Vigier's program. Therefore, Gennady's general approach is sound.

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[5] The classical material action is the phase of the complex mental quantum information field's path amplitude.

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I think Jack's conclusion above is premature, unless he has actually worked out the details of what he has proposed. I think this idea is quite foreign to Shipov's whole "field and geometry" approach.

[Jack]

Your point is well taken I am perhaps erring on the optimistic side that Shipov's theory can be quantized since Einstein's so far cannot. But unless it can be it is seriously incomplete.

[Gennady]

Modern physics represents a whole consisting of several parts such as electrodynamics, quantum mechanics, general relativity theory etc. As the starting point for all these parts one assumes that classical Newtonian mechanics is the most justified. This is not true, Newtonian mechanics, in fact, gives us a very narrow representation of many common phenomena, especially when it comes to inertial motion. The research on accelerated inertial motion offered here opens a new approach to already known physical phenomena, in which the essential role is played by a new torsion field for the inertial forces from the physical dynamical vacuum.

Inertial fields generate the inertial forces;…

[Jack]

In the same way that internal gauge fields generate the electro-weak and strong forces?

[Gennady]

… therefore, it is possible to assert, that in classical mechanics the problem of inertial forces cannot be successfully solved without research into the torsion dynamics of inertial fields. The only recognized field theory, in which the attempt is made to describe inertial field dynamics, is Einstein's theory of gravitation. However this theory has not changed our knowledge about these fields, therefore in modern physics the concepts of inertial forces were kept from Newton's times. In his famous book "The Science and the Life of Albert Einstein" Pais notices:

"Besides this, from my point of view, the problem of origin of inertia was and remains the most vague problem in the theory of particles and fields ."

It is possible to solve the "riddle" of inertial forces only in a new fourth fundamental mechanics completely equivalent to a theory of the physical vacuum. New fundamental

mechanics is understood as a theory, which includes a new and more general (than in old mechanics) class of reference systems, a more general space geometry and a new relativity principle.

Special relativity theory and Einstein's general relativity theory can be classified as fundamental generalizations of Newton's mechanics. Indeed, in special relativity theory (in addition to non-relativistic inertial systems), the class of relativistic inertial reference systems, Minkowski space, generalizing Euclidean space, and the relativistic special relativity principle are used. General relativity theory expands the class of reference systems to include accelerated locally - Lorentzian systems of the first kind in which the space of events is endowed with Riemannian geometry. The equality of rights of these accelerated systems is the general relativity principle.

The torsion field theory of the plastic mutable physical vacuum represents one more fundamental generalization of Newton's mechanics with far-reaching theoretical and experimental consequences. This fundamental mechanics following after Einstein also includes a new class of reference systems - accelerated locally inertial reference systems of the second kind. The event space of such systems is endowed with a geometry of "absolute parallelism" space in which Einstein's translational Riemannian differential metric

$$ds^2 = g_{ij}\, dx^i\, dx^j$$

[Jack note - I have edited Shipov's ms extensively here using his book "A Theory of Physical Vacuum"]

Is supplemented by the rotary Killing-Cartan metric

$$dt^2 = T_{bi}{}^a\, T_{aj}{}^b\, dx^i\, dx^j$$

$T_{jk}{}^i$ is the contorsion field third rank tensor field of A_4 geometry written in terms of the tetrad $e_a{}^i$ combinations that form the torsion.

$$T_{jk}{}^i = e_a{}^i\, D_k\, e_j{}^a$$

[Jack]

D_k = covariant derivative using only Γ^i_{jk} Note that the antisymmetrical anisotropic torsion connection Δ^i_{jk} in addition to the Einstein torsion-free Christoffel connection Γ^i_{jk} for parallel translation of vectors around closed loops in space-time is

$$\Delta^i_{jk} = \Gamma^i_{jk} + T^i_{jk} = e_a{}^i\, e_{j,k}{}^a\ .$$

Can we self-referentially define T^{i}_{jk} using Δ^{i}_{jk}? See below.

This torsion theory can, in turn, be done with quantum Penrose spinors that are qubit information mental fields that form the pregeometric substratum of these material geometrodynamical fields. Material space-time coordinates are actually projections of entangled universal quantum computing gate of two qubits in the Bell "quantum teleportation" basis. Ref. eq. 1.2.15 p. 14 "Spinors and Space-Time" Vol. 1 Penrose and Rindler. All of curvature-torsion field theory can be reformulated as quantum computing information theory in accord with John Archibald Wheeler's *"It from Bit"* program suitably generalized from Ed Fredkin's c-bit program to qubits and e-bits of entanglement.

[Page]

Shipov also develops his theory in terms of spinors (in Part II) but does not reach any of the conclusions that Jack implies by his statements above and which followed.

[Jack]

You are wrong about that. Shipov says the spinors are "mental". He downplays that in the English edition because of knee-jerk responses such as the one you just gave. There is more about that in the Russian edition. For example, p. 73 of Shipov's English edition on the existence of the "primary superconsciousness" that is the source of nonrandom post-quantum order in reality. Again on p. 74 Shipov writes of what is obviously Bohm's super-implicate order:

"At this level of reality a decisive role is played by 'superconsciousness.' Which appears as the active origin of the ideal that acts within the framework of the universal principle of relativity."

Then again on p. 75

"Transition from the first level of reality to the second one (the level of the primary torsion field) occurs …. under the action of an external torsion field, which is shown by experiments to be, apparently, the vehicle of the 'field of consciousness'."

The connection of the material classical world tetrads e^{i}_{a} (in Bohm's explicate order) with the mental quantum spinor entangled pairs of qubits in the Bell quantum teleportation basis of the pilot De Broglie field (in Bohm's implicate order) is given by Shipov on p. 108 eq. 3.114 as

$$e^{i}_{o} = (1/2^{1/2})\, \sigma^{i}_{\alpha\beta}\ \ (|0\alpha>|0\beta> + |1\alpha>|1\beta>)$$

$$e^{i}_{1} = (1/2^{1/2})\, \sigma^{i}_{\alpha\beta}\ \ (|0\alpha>|1\beta> + |1\alpha>|0\beta>)$$

$$e^i{}_2 = (1/2^{1/2})\ \sigma^i{}_{\alpha\dot{\beta}}\ \ (|0\alpha>|1\dot{\beta}> - |1\alpha>|0\dot{\beta}>)$$

$$e^i{}_3 = (1/2^{1/2})\ \sigma^i{}_{\alpha\dot{\beta}}\ \ (|0\alpha>|0\dot{\beta}> - |1\alpha>|1\dot{\beta}>)$$

where $\sigma^i{}_{\alpha\dot{\beta}}$ are the Newman-Penrose symbols that connect the explicate material world tetrads to the implicate mental pregeometric 2-component spinor qubit Einstein-Podolsky-Rosen pairs in the pregeometry of the "Mind of God" AKA Dirac's "substratum". On p. 109 Shipov says that these qubits are the "potentials of the inertial field $T_{jk.}{}^i$."

Go back now to Gennady's formula for contorsion and my previous question "Can we self-referentially define $T^i{}_{jk}$ using $\Delta^i{}_{jk}$?" Note that he uses the ordinary covariant derivative not the connection with the contorsion to define the contorsion. We have to think what would happen if we do use such a self-referential loop?

The contorsion tensor in A4 geometry is

$$T_{jk}{}^i = e_a{}^i\ D_k\ e_j{}^a$$

D_k is Einstein's covariant derivative with only the translational Christoffel connection $\Gamma_{jk}{}^i$. The connection in A_4 i.e. Riemann curvature + Cartan torsion is

$$\Delta_{jk}{}^i = \Gamma_{jk}{}^i + T_{jk}{}^i$$

The A_4 covariant derivative using the $\Delta_{jk}{}^i$ connection rather than the $\Gamma_{jk}{}^i$ connection is D'_k, δ means flat partial derivative.

So what if we define

$$T_{jk}{}^i = e_a{}^i\ D'_k\ e_j{}^a = e_a{}^i\ [\delta_k e_j{}^a + (\Gamma_{bk}{}^a + T_{bk}{}^a)e_j{}^b]$$

$$= e_a{}^i\ \delta_k e_j{}^a + e_a{}^i(\Gamma_{bk}{}^a + T_{bk}{}^a)e_j{}^b]$$

$$T_{jk}{}^i - e_a{}^i\ T_{bk}{}^a e_j{}^b = e_a{}^i\ \delta_k e_j{}^a + e_a{}^i \Gamma_{bk}{}^a\ e_j{}^b$$

So that each component of the 3rd rank contorsion tensor field is a sum with the contorsion double-contracted on a and b indices, i.e. the $e_a{}^i\ T_{bk}{}^a e_j{}^b$ term. Are there self-consistent solutions? Can we solve for $T_{jk}{}^i$?

Note that the material classical world tetrads e_a^i in the explicate order are entangled qubit pairs in the mental quantum spinor implicate order transduced by the Newman-Penrose symbols $\sigma^i_{\alpha\beta}$ acting as formal "Eccles Gates" at the cross roads between mind and matter. So, this is a fundamental equation for the mind-matter connection. The 3rd rank contorsion material world tensor field T_{jk}^i is then a complex of 6 qubits forming a kind of computing gate in the mental quantum implicate order.

[Gennady]

… with the general relativity principle being replaced by the universal relativity principle requiring relativity of all physical fields. For the description of universal relativity the concept of the conformal reference system is introduced. It has basis vectors with variable length. This generalization allows constructing one more (fifth) mechanics describing birth processes of material objects from vacuum or their transition back into the vacuum state.

The main conclusions of the new concepts of inertial fields and forces are as follows:

1) accelerated reference systems, in which inertial fields and forces act, require for their description an introduction of an event space geometry, which is distinct from Euclidean (or the pseudo-Euclidean one in relativistic case) even in the non-relativistic approximation;

2) for accelerated locally Galilean reference systems (locally Lorentzian ones in the relativistic case) accelerated inertial motion is permissible, explaining the stability of nuclear and atomic systems;

3) the inertial fields are generated by the torsion of absolute parallelism space, which is considered as the event space of relative coordinates of arbitrary accelerated reference systems;

4) the new class of accelerated locally Galilean reference systems - accelerated locally Galilean reference systems of the second kind - is discovered, which arise when mutual compensation of inertial forces acting on the reference body is taking place;

5) dynamics of the center of mass of a four-dimensional gyroscope representing actual example of locally Galilean reference system of second kind is investigated; the system is generated by an operation of artificial inertial forces, created inside it giving the capability of construction of a new type of "vacuum propeller" (John Walker - note by Sarfatti) permitting it to move in vacuum space without the use of a jet or rocket engine is shown.

[Jack]

Note for further study

Is the superstring duality R = 1/r the same as the duality between subluminal and superluminal Lorentz transforms? That is there is a duality in the DeBroglie equation

$$v(\text{particle})\ v(\text{wave}) = c^2$$

That is, to go from subluminal particle to superluminal particle interchange particle and wave in the above formula.

A superluminal particle moves like a subluminal particles quantum pilot wave. That is we can imagine a shadow universe of exotic tachyonic matter on the other side of the light cone barrier that is "felt" but not "seen" (Sciama).