Comments on Comay and Dvoeglazov

It is demonstrated in the fifth reply to Comay that his assertions on O(3) electrodynamics are erroneous. Some answers are given which have not already been published. Dvoeglazov's comments are largely irrelevant.

1. Introduction

Comay [1] has recently repeated some of his earlier criticisms [2-5] of O(3) electrodynamics, reproducing some of the same published diagrams and text again without citing any replies [6-9]. In this fifth reply to Comay, it is shown that he has misunderstood the basic hypothesis of O(3) electrodynamics, that it is an O(3) gauge theory [10-15] applied rigorously to electrodynamics. Comay continues to argue erroneously within U(1) Yang-Mills gauge theory, which is Maxwell-Heaviside theory. This fifth reply is restricted to a small amount of original material in Comay's article [1]. Some errors made by Dvoeglazov in the same issue [16] are corrected briefly, showing that Dvoeglazov's appreciation of O(3) electrodynamics is confused, and confusing, so must be read with caution.

2. Brief review of Comay's previous arguments

Comay's figure (1) is reproduced from another journal [2] and the claim is repeated that two charges of opposite sign rotating on a disc refute O(3) electrodynamics, a claim that has been answered in detail [6]. Comay does not cite these replies. Comay uses this argument to show that $\mathbf{B}^{(3)}$ is not a U(1) field, which is precisely the result of O(3) electrodynamics. Comay discusses some irrelevant work by Dvoeglazov [16], but this latter work is not O(3) electrodynamics. It is an irrelevant adaptation of the B Cyclic theorem [10-15]. Comay repeats his erroneous use of the Stokes Theorem [7], which is also used erroneously by Dvoeglazov [16]. Within the hypothesis of Evans *et al.*, [10-15] the non-Abelian Stokes theorem must be used to describe $\mathbf{B}^{(3)}$. Neither Comay nor Dvoeglazov grasp this basic fact. The two authors criticise each other at length in an irrelevant manner concerning the Lorentz covariance of the B Cyclic theorem. According to hypothesis [10-15], Lorentz covariance follows from the covariance of the field tensor of the O(3) gauge theory being used, and is a well known property of the gauge theory [10-15]. The whole of the argument between Comay and Dvoeglazov in this context is therefore irrelevant, again because they argue on a U(1) level.

Dvoeglazov greatly confuses the simplicity of the original B Cyclic theorem by constructing an obscure variation and leaving himself open to criticism by Comay. This is not criticism of the hypothesis by Evans *et al.* [10-15]. It has been proven to ultimate rigor that O(3) gauge theory can be applied to electrodynamics [10-15] and this is the hypothesis that these critics fail to understand.

3. Original material by Comay

The only original material in Comay's article seems to be an assertion that $\mathbf{B}^{(3)}$ is not a magnetic field because it is not proportional to charge. This is trivially incorrect because $\mathbf{B}^{(3)}$, and its magnitude $B^{(0)}$, are both C negative classically. This has been shown many times [10-15]. On p. 235 of Comay's article, he criticises a construction by Dvoeglazov, a four vector which does not appear in the original hypothesis of O(3) electrodynamics [10-15]. Comay claims that $\mathbf{B}^{(3)}$ and its magnitude are not proportional to charge, but to the modulus of charge. This is trivially incorrect because $\mathbf{B}^{(3)}$ is negative under C symmetry [10-15]. The error again arises from Comay's use of the U(1) level. The B Cyclic theorem is a fundamental construct of O(3) electrodynamics which correctly conserves C [10-15]. This is a trivial result because it is part of a gauge theory [10-15].

Finally, Comay constructs the systems:

$$x = R\cos\omega t,\ \ y = R\sin\omega t,\ \ z = 0 \qquad (1)$$

$$x' = -R\cos\omega t,\ \ y' = -R\sin\omega t,\ \ z' = 0 \qquad (2)$$

(Note that there are misprints in both of his equations which are corrected above.) It is then claimed that a third system, which is the "union" of these two systems, has no transverse electric fields, and no $\mathbf{B}^{(3)}$, and that this means that $\mathbf{B}^{(3)}$ does not obey the superposition principle. These claims are trivially incorrect because system (2) is generated from system (1) by parity inversion, under which:

$$\mathbf{E}^{(1)} \times \mathbf{E}^{(2)} \xrightarrow{P} \mathbf{E}^{(1)} \times \mathbf{E}^{(2)} \qquad (3)$$

$$\mathbf{B}^{(3)} \xrightarrow{P} \mathbf{B}^{(3)} \qquad (4)$$

and so neither $\mathbf{E}^{(1)}$ nor $\mathbf{B}^{(3)}$ vanish under parity inversion.

4. Comments on Dvoeglazov

Dvoeglazov accepts the original B Cyclic theorem, [10-15] but in this paper, again confuses the Abelian and non-Abelian Stokes theorem, as did Comay [7] and Hunter [17]. The original hypothesis by Evans *et al*. [10-15] requires the use of a non-Abelian Stokes theorem, as described in the same issue of *Apeiron* [18] by the AIAS group. Dvoeglazov attributes to Evans the "erroneous" statement that there cannot be longitudinal components in linear polarization, whereas it has been stated [10-15] for several years that $\mathbf{B}^{(3)}$ is equal and opposite in linear polarization. The next step in Dvoeglazov's paper is to elevate the original classical hypothesis by Evans *et al.* [10-15] to the quantum level. The correct way of doing this is given by Evans and Crowell [15]. Dvoeglazov is self-contradictory, at one point he regards the original B Cyclic theorem (correctly) as a fundamental relation between spins. Dvoeglazov is in print as accepting the theorem in its original form [9] and is in print as describing it as fundamental and non-trivial [19]. Paradoxically, it is claimed a few lines later that $\mathbf{B}^{(3)}$ is not fundamental after all, but shortly after that, it is claimed that O(3) electrodynamics is compatible with something that he regards as important and fundamental—a theory by Weinberg [20]—and also compatible with a theory by Kalb *et al*. [21]. So in a few lines, we see that $\mathbf{B}^{(3)}$ is important, not important, and important. Since natural philosophy is the construction and testing of a hypothesis against data, "importance" is not an issue.

Dvoeglazov quotes the experimental criticisms of $\mathbf{B}^{(3)}$ theory by Rikken [22]and Raja *et al.* [23] but again does not quote the replies [24, 25]. This seriously undermines his scholarship, whereas that of Comay is non existent, because he never quotes replies. Finally, there is a tremendously elaborate exchange between these two authors about the covariance of the B Cyclic theorem, which follows trivially from the original hypothesis by Evans *et al.* [10-15] that O(3) gauge theory can be applied to classical and quantum electrodynamics [15]. Nearly all of this exchange by both authors is irrelevant.

These comments are enough to show that neither author understands the hypothesis [10-15] and are flailing at windmills. Comay's work is obscure, but Dvoeglazov has a partial understanding of the hypothesis which he confuses by asserting non-existent errors and by constructing irrelevant variations, thus spoiling the clarity and simplicity of the original hypothesis. Neither author cites the success of O(3) electrodynamics [10-15] in interferometry and the Sagnac effect.

5. Lorentz Boosts

If we consider Lorentz boosts in the *Z*, *Y* and *X* directions, it is found that:

$$B_Z^{(3)'} = B_Z^{(3)} \qquad (5)$$

$$B_Z^{(3)'} = \gamma B_Z^{(3)} + \gamma\beta E_X^{(3)} = \gamma B_Z^{(3)} \qquad (7)$$

$$B_Z^{(3)'} = \gamma B_Z^{(3)} - \gamma\beta E_Y^{(3)} = \gamma B_Z^{(3)} \qquad (6)$$

respectively, where

$$\beta = \frac{v}{c};\ \ \gamma = \left(1 - \frac{v^2}{c^2}\right)^{-1/2}, \qquad (8)$$

and where v is the velocity of frame K' with respect to frame K. The quantities $E_X^{(3)}$ and $E_Y^{(3)}$ are zero by definition, because $\mathbf{E}^{(3)}$ is directed in the Z axis of frame K by definition. The fundamental definition of $\mathbf{B}^{(3)}$ in O(3) electrodynamics is:

$$\mathbf{B}^{(3)*} = -ig\mathbf{A}^{(1)} \times \mathbf{A}^{(2)} \quad (9)$$

where $\mathbf{A}^{(1)} \times \mathbf{A}^{(2)}$ is the conjugate product of vector potentials in the complex basis [(1), (2), (3)], and where g is a proportionality coefficient which is invariant under Lorentz transformation. We consider the effect of a Z boost on the vector potential $A^{(1)}$:

$$A^{(1)} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \gamma & i\gamma\beta \\ 0 & 0 & -i\gamma\beta & \gamma \end{bmatrix} \begin{bmatrix} A_X^{(1)} \\ A_X^{(2)} \\ 0 \\ 0 \end{bmatrix} = A^{(1)} \quad (10)$$

Similarly, $\mathbf{A}^{(2)}$ is unchanged under a Z boost. Therefore the overall result of a Z boost is to leave:

$$\mathbf{B}^{(3)*} = -ig\mathbf{A}^{(1)} \times \mathbf{A}^{(2)} \quad (11)$$

invariant in the vacuum.

The effect of a Y boost on $A^{(1)}$ is as follows:

$$\mathbf{A}^{(1)} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \gamma & 0 & i\gamma\beta \\ 0 & 0 & 1 & 0 \\ 0 & -i\gamma\beta & 0 & \gamma \end{bmatrix} \begin{bmatrix} A_X^{(1)} \\ A_Y^{(1)} \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} A_X^{(1)} \\ \gamma A_Y^{(1)} \\ 0 \\ -i\gamma\beta A_Y^{(1)} \end{bmatrix} \quad (12)$$

and similarly on $A^{(2)}$. Therefore using:

$$B_Z^{(3)*} = -ig\varepsilon_{(1)(2)(3)} A_X^{(1)} A_Y^2 \quad (13)$$

it is found that a Y boost has the effect:

$$\gamma\mathbf{B}^{(3)*} = -ig\gamma\mathbf{A}^{(1)} \times \mathbf{A}^{(2)} \quad (14)$$

so the fundamental relation remains unchanged and is Lorentz invariant under a Y boost. Similarly, it is Lorentz invariant under an X boost.

6. Discussion

The fundamental definition of $\mathbf{B}^{(3)}$ is Lorentz and gauge invariant in O(3) electrodynamics. This means that it is the same to an observer in frame K and K', and so is a fundamental invariant of the Lorentz group in the same way as the Casimir invariants are fundamental properties of the Poincaré group. Another example of an invariant of the Lorentz group is the product of four vectors:

$$\mathcal{J}_\mu \mathcal{J}^\mu = \mathcal{J}_\mu{}' \mathcal{J}^{\mu'} \quad (15)$$

which is the same in frame K and K' using the relation:

$$\gamma^2 \left(1 - \beta^2\right) = 1 \quad (16)$$

Therefore, for all v, the relation (9) remains the same for an X, Y or Z Lorentz boost. This is a fundamental property of the Yang-Mills and fiber bundle theory which underpins O(3) electrodynamics, making it a rigorous gauge theory. There is plentiful experimental evidence for $\mathbf{B}^{(3)}$, but none for the putative $\mathbf{E}^{(3)}$. The latter cannot be generated from $\mathbf{B}^{(3)}$ by a Lorentz transformation. The overall effect is that effectively one may as well not apply a Lorentz transformation to relation (9).

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Heisenberg Uncertainty is not Accepted

I object to J.R. Croca's [1] outrageous claim that "… the usual Heisenberg's uncertainty relations have been accepted by the scientific community as the last word on our possibility to make predictions on the measurements." As far as I am aware, few physicists have ever accepted this anti-science principle, that precise prediction is intrinsically impossible. In addition, it is readily shown [2] that the huge uncertainties demanded by the Heisenberg principle are, in fact, up to 10^6 times greater than the actual experimental uncertainties that have been observed.

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Closing argument

There is one comment by Xu Shaozhi, or Xu for short (*Apeiron* **6**, no. 3-4 which I will abbreviate to **6**, 3-4), with which I heartily agree,—intellectual differences about science are consistent with friendship. For example, Herbert Dingle and Max Born were good friends.

When I, in **6**, 3-4, said "I relinquish the floor to Xu for the time being" I meant that, in our debate, we should not "speak [debate with each other] at the same time", that is, in a single isssue of "@ issue". He has interpreted me to mean that our discussions "are over" and has made his closing statement by emphasizing some points (but without agreeing that he had made any mistakes). His previous arguments appeared in **4**, 2 (incorrectly labelled **3**, 2); **4**, 4; **5**, 1-2; **5**, 3-4; and **6**, 1-2 (which are answered by me in **4**, 4; **5**, 1-2; **5**, 3-4; and **6**, 1-2). Watch out for misprints!

A discussion of methods for deriving the LT is not necessary for our debate which is concerned with the self-consistency or inconsistency of the LT. It *is* necessary to discuss its *physical* meaning or interpretation. The LT is not *merely* algebra.

I will here reply again to the first two points made by Xu in **6**, 3-4. He puts weight on these two points, by placing them first, and he expresses them in English that anyone can understand. Dart, **6**, 3-4, has proposed that we might be arguing from different premises (like the legendary two women shouting at each other from balconies on opposite sides of a street). So let me say what I understand by the (special) LT. It refers to a situation where there are no (or negligible) gravitational fields and there are two inertial observers. The LT is given by the identities

$$x' = \gamma\left(x - vt\right),\ t' = \gamma\left(t - {vx}/{c^2}\right),\ y' = y,\ z' = z$$

where $\gamma = \left(1 - v^2/c^2\right)^{-1/2}$ As in all of the books on SRT that I have seen, v has a real value whose absolute value is strictly less than c, where c denotes the speed of light *within* every inertial frame according to an observer at rest in that frame (his NCS or Natural Coordinate System). That c is an invariant is of course one of Einstein's assumptions. The symbols x, y, z, x', y', z' represent measures of lengths while t and t' are measures of time, made by the inertial observers O and O′. It is assumed that the space-time origins for the two sets of coordinates represent the same event. If x, y, z, t are the "coordinates" of a (point) event in the NCS of O, then those of the *same* event are $\left(x', y', z', t'\right)$ in that of O′. I follow Einstein and others in referring to t and t' as coordinates although they are temporal, not spatial. The velocity of O′ relative to O is v and the axes

are chosen so that this relative velocity is along the x and x' axes. (There is a more general LT in which this assumption is not made: for a review, see Ref. 1.) It is then possible to choose the other axes so that $y' = y$ and $z' = z$. The meaning of the (special) LT is that for "each and every" (point) event (x, y, z, t), the coordinates used by O′ satisfy the LT. (I use the horrible expression "each and every" for the sake of great emphasis. Usually "each" is enough and "every" is too.)

All that is standard usage, but Xu's STONE-EGG argument or joke shows that it is not Xu's usage. He is interpreting the LT in some private sense, for it is indisputable that stones and eggs are not measures of length or time.

I now consider his second main argument in which he tries to prove that $t' = t$ (which contradicts the LT). His point (ii) is "Einstein's tenet that every 'coordinate system has its own particular time', so that $y'/u = t'$ and $y/u = t$." Here u denotes any non-zero speed. I take it that the equation $y = ut$ refers to a path P whose (orthogonal) projection on the (t,y) plane makes an angle $\tan^{-1}u$ with the t axis. Similarly, the equation $y' = ut'$ represents a path P' whose projection on the (t', y') plane makes the same angle $\tan^{-1}u$ with the t' axis. According to the LT the paths P and P' cannot represent the same physical sequence of events. By implicitly assuming that they do, Xu obtains a contradiction. Therefore his implicit assumption is inconsistent with the LT. If he wants to use this fact to disprove the LT he must prove that his implicit assumption is correct.

As far as the remaining arguments of Xu are concerned, I leave it to the reader to consult our previous exchanges. Until Xu states that his physical interpretation of the LT differs from that in the books, I don't have the t or t' to continue with this debate. Life is too short.

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I.J. Good

No one can save the LT

Since the discussions between I.J. Good and I [1,2], more and more of *Apeiron* readers have come to see clearly that the LT is a mathematical fallacy, and that each of "Bingo" arguments by Good is a circle in logic and none of his refutations is tenable. Good retreated in defeat again and again, but he remains to have an unduly high opinion of himself and seems very pleased with himself at his quixotic victories. As a matter of fact, Good is just a representation of unknown relativists and not better than the "leading scientists" such as A. Einstein and H. Poincaré, et al., who indeed had not solid knowledge enough, in mathematics and logic and so forth.

The purpose of this correspondence is to continue clearing up some confusion caused by Good, despite his relinquishing "the floor to Xu for the time being" [2e].

(1) The "simplest" but crucial argument that $y' = y$ gives $t' = t$.

This is an irrefutable argument repeated for several times. Unfortunately, Good remains to reject it by invalid but confusing argument. So, a further clarification in more detail is needed.

Obviously, the form $y' = y$ is one among the LT equations

$$t' = \gamma\left(t - vx/c^2\right), \tag{1a}$$

$$x' = \gamma\left(x - vt\right), \tag{1b}$$

$$y' = y, \tag{1c}$$

$$z' = z. \tag{1d}$$

Those four equations form *one and the same set* of equations and purport to describe *any* event, according to Einstein.

First of all, it ought to be made clear that either the LT prevails over mathematical rules or conversely the former should obey the latter. No one would disagree that the LT and any result from it *should* follow mathematical rules in any case. Otherwise, he ought to go back to school and re-learn what mathematical rules are used for.

Clearly, according to mathematical rule, (1c) yields

$$y'/C = y/C,$$

and then

$$y'/c = y/c, \qquad (1e)$$

where C is an arbitrary non-zero constant and c is the speed of light.

Second, Good should not reject the fact that *above all*, y' (or y) is a coordinate value (in y′-y-axis), *viz*., *a length*. Otherwise he should re-learn what the coordinate means and what the coordinate representation is used for. It is hence *ridiculous* when Good used Pythagorean theorem to save the LT or himself!

Then, what will (1e) lead to? It is doomed to yield

$$t' = t \qquad (1f)$$

that should be accepted by Good, unless he rejects Einstein's tenet that every "coordinate system has its own particular time".

That's all.

Undoubtedly, Good made a funny mistake since he denied the irrefutable fact that y' (or y) is *a length*, due to a lack of sound knowledge of coordinate and so forth.

It is a bit interesting that Good is, like Einstein, very good at contriving fools to defend himself, but he fooled himself at last, and that Good contrives fools merely since he has been fooled by Einstein, an adept in contriving fools.

Evidently, (1f) or (1c) comes into conflict with (1a). That is, the LT contradicts itself and is thereby a fallacy, violating mathematical rules.

(2) Another disproof of the LT's "self-consistence".

One can find many ways more to invalidate the LT. Some of them have been shown to readers before [1,3]. Now I offer a new one.

According to Einstein, the LT applies to **any** event in 4-D space. Now let us compare two "events", P_x and P_r, as shown in Fig.1,

$P_x : (x_1, 0, 0, T), (x'_1, 0, 0, T')$

and

$P_r : (x_1, y_1, z_1, \tau), (x'_1, y'_1, z'_1, \tau')$,

where $y_1 = y'_1 \neq 0$ and $z_1 = z'_1 \neq 0$.

[Fig. 1]

Clearly, those events, P_x and P_r, have the same x-x′-coordinates x_1 and x'_1, but the former is in x-x′-axis and the latter not.

According to Einstein's physical model (*cf*., Fig.1) on which the LT rests, one should have

$$T = x_1/c,$$

and

$$\tau = (x_1^2 + y_1^2 + z_1^2)^{1/2} / c,$$

that is,

$$T \neq \tau. \qquad (2a)$$

On the other hand, however, when x_1 and x'_1 are given, (1b) determines a definitive and unique $t = t_1$, because (1b) is a function containing three parameters, x', x and t only, due to Einstein's premise that v is a given constant. That is, putting the given x_1 and x'_1 into (1b) is doomed to have t_1 so that

$$T = \tau = t_1, \qquad (2b)$$

contradicting (2a), obviously.

This contradiction implies the self-contradiction hidden in the LT, resting on the Einstein's false physical model.

Equation (2b) or (1b) means that the light signals emitted from origin at $t = t' = 0$ will arrive at both points P_x and P_r, simultaneously!

That is, (2b) or (1b) implies that a spherical light-wave from the origin O (or O′) has to reach simultaneously those points, P_x and P_r, which are in a plane Q perpendicular to x-x′-axis (see Fig.1). However, even a standard schoolboy knows it is impossible!

In other words, the supposed *spherical* wave-front becomes a *plane* wave-front extending to infinite, a blatant and explicit fallacy!

(3) Concerning the STONE-EGG "joke."

As I said, the STONE-EGG argument is much beyond Good. Yet, he was not convinced.

The meaning of this argument is indeed very clear. Now that anything including the meaningless STONE and EGG makes the LT satisfy the 4-D invariant, it goes without saying that, at least,

1) whether or not the LT satisfies the 4-D invariant is worth nothing, despite the hail of the 4-D Invariance among relativists;
2) the LT itself is meaningless and useless, nothing but a mathematical fallacy.

That's all.

The above is so clear and unassailable that few would not see and accept it. Unfortunately, Good proves himself failure to understand, for he slighted it by saying the "argument is like claiming that Newton's inverse square law of gravitation shows that rhubarb travels in an ellipse around a confession". If Good firmly believes he is right and competent, he should show readers a deduction in mathematics like that I gave.

But, Good did not. And, I think, it is impossible for him to do so, forever. If Good disagrees, then he may have a try. Otherwise, excuse me for following Good himself, he should confess and withdraw his hollow words that "it is below my feet".

Perhaps Good remains to think that the (STONE, EGG)-(x, t) substitution is illegitimate because Einstein (and Lorentz) obviously intended x (or t) to refer to a spatial (or temporal) coordinate. But, I must say, it is never a new discovery. And, I cannot but remind the story that when James proves the Emperor's New Clothes nothing but naught because they are suitable to woman, baby, mountain, the Sun and anything else, Bob says "James is wrong because the Clothes are intended to refer to the Emperor's"!

(4) Concerning $y' = ct'$

It is no surprising that Good failed, due to his prejudice, to keep it in his mind that both equations

$$y' = ct'; \qquad (4a)$$

$$y = ct \qquad (4b)$$

rest on the so-called "Principle of invariance of the velocity of light" (PIVL), which as a *pre-requisite* of the LT must be followed by any defender of the LT. And then, Good has to accept those equations, (4a) and (4b), *in any case*, unless he rejects the LT.

Thus, Good's conclusion that "Xu was misled by his somewhat messy notation" is ungrounded and untenable. In other words, he made an invalid and fake refutation due to his one-sided mind and prejudice.

Good is apt to compel his opponents to confess their "mistakes". Yet, Good did never confess even one of his own errors. Now I must confess my mistake, namely that I always over-highly appreciated Good's faculty, though I did say he is no better than Einstein.

In fact, Good, like most relativists else, did not know the irony rule that any false theory can never be rescued by means of its own tenets, and that it is hence futile to use any of expositions covered by the SRT to validate the SRT itself.

Good, like most relativists else, did not know the irony principle either that any mathematical rule is allowed of no defiance.

Consequently, It is no wonder that Good said "the meanings of the pair (y, y') in (A1) are therefore not the same as in (A2) and (A3)", where (A1) = (1c) here, and (A2) = (4a), (A3) = (4b).

Yet, even a standard schoolboy knows that once a symbol is defined, it should preserve its definition persistently. It is exactly the most blatant absurdity among those Einstein made that at times he uses $x = ct$ and at other times uses $x = vt$ as he pleases.

Unfortunately, Good thinks, as Einstein did, that mathematical symbols would, like his pet dog, listen to him as he pleases! I agree with Good's words that "wishful thinking is an important source of error"[2d], which, however, exactly fit Good himself, no more and no less.

Just by virtue of such wishful thinking, the SRT endues (x, t) with different meanings implied in different equations, such as

$$x'^2 + y'^2 + z'^2 - c^2 t'^2 \equiv 0 \text{ and } x^2 + y^2 + z^2 - c^2 t^2 \equiv 0; \qquad (4c)$$

$$x'^2 + y'^2 + z'^2 - c^2 t'^2 \equiv x^2 + y^2 + z^2 - c^2 t^2 \,(= F); \qquad (4d)$$

$$x'^2 - c^2 t'^2 \equiv x^2 - c^2 t^2 \;(= f); \qquad (4e)$$

$$x = vt \text{ and } x' = -vt'; \qquad (4f)$$

$$x = ct \text{ and } x' = ct', \qquad (4g)$$

and so forth.

Relying on so many "equations" in conflict with each other, even the most incompetent relativist must be full of confidence to defend the fallacious LT (or SRT)!

It is expected that the above will not be beyond Good. The rest, including the following mistaken assertions by Good, leaves for Good himself:

1) The equation $x = vt$ "applies only to events on path of a particle at rest in the primed system, not to all events";

2) "A simpler example would be a pair of events simultaneous in a given inertial frame of reference!"

It is suggested that Good should stop mentioning "simultaneous" events, until he really understands "simultaneity" at primary-level. Incidentally, Einstein's "relativity of simultaneity" is a fake proposition, worthless [4].

It is also suggested that Good on longer blow his own trumpet by means of expositions for the LT, like in [2,5], until he makes clear mathematics, logic and others.

Good's misfortune lies in that when LT being beheaded, he cries over hairs on its head!

Anyway, no one has the power capable of rescuing the false LT from collapsing.

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Astronomical Coincidences Support Earth Expansion

In a recent letter, Frank Lee (*Apeiron* Vol.5, no. 3-4,1998, pp. 241-242) argued that various empirical relationships between the masses, densities and radii of planets contradict the theory of earth expansion as proposed by S.W.Carey, L.S.Myers and others. While I do not question the validity of these relationships, I believe that they strengthen the argument, not only for earth expansion, but also for the expansion rate that Carey has proposed.

Arp (*Apeiron,* Vol.2, no.2, 1995 and *Seeing Red*, 1998) has suggested a number of coincidences involving the number 1.23. Among these is the fact that the ratios of the masses of the planets are integral powers of 1.23. To this, Lee adds two more coincidences involving planet radii and densities. If we can assume that the planets have similar composition (in the radii and density coincidences, Lee is always comparing the ratios of two gas giants to two earthlike planets, or the ratio of an earthlike planet and a gas giant to the ratio of a similar pair), then we have only one coincidence—the mass ratios. This can be explained by a combination of premises that are at the heart of earth expansion theories. If we make the assumption, advocated by Dirac and others, that mass is created where mass already exists, or a body's increase in mass per time is proportional to its existing mass, then

$$dM/dt = kM \qquad (1)$$

where M is the mass of an astronomical body and k is a constant. Then mass as a function of time would be approximated by:

$$M = M_o \exp(kt) \qquad (2)$$

It is now obvious that if the ratio of two astronomical masses at any point in time is 1.23 or some other ratio, then that ratio will remain for future times. All that is required to introduce quantization is the assumption that mass creation is cyclic or episodic as suggested by Arp and Narlikar. This combination of assumptions would lead to an earth expansion rate that would have a cyclic term but would be expotential when averaged over long periods of time. This is precisely the expansion rate that Carey has long advocated.

In summary, the quantization appearing in astronomy and the strong evidence for earth expansion in geology support each other. Earth expansion is a significant but ignored theory. The primary motivations for rejecting it are more often philosophical, emotional, or the application of a physical law in a realm where it has not been proven. I strongly suggest that

those interested in nonstandard theories of astronomy and cosmology also read the original works of Warren Carey, Hugh Owen, Warren Hunt, Paul Wesson and Lester King. If these do not convince you that something is seriously wrong with the continental drift theory, look at the scale models of Klaus Vogel (they can be viewed at

www.geocities.com/CapeCanaveral/Launchpad/6520/

under links to fellow expansionists) who assembled the continents on globes of reduced radius. The quality of the fit is just too remarkable to be the result of an accident.

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"Gravitational Time Slowing down" *vs.* General Relativity

It has been marked earlier [1] that the general relativity (GR) conclusion (based on the law of energy conservation) of non-variability of photon frequency at its emission in a gravitational field contradicts special relativity and the experiments on the "gravitational time slowing down" [2-4]. We show below that another known GR conclusion of the gravitational ("metric") change of time rate also contradicts these experiments.

The influence of a gravitational field on the clock rate was predicted by Einstein at the beginning of our century [5]. As he remarked, "the process taking place in clocks (and, in general, any physical process) proceeds the faster the lager the gravitational potential in the region where this process runs". Quantitatively, its reading is grater in $(1+\Phi/c^2)$ time than the reading of a free clock. (Here Φ is a positive gravitational potential).

Remind that the conclusion of the gravitation influence on the time rate follows strictly from the invariance of internal (metric form)

$$ds^2 = c^2 d\tau^2 = g_{ik} dx^i dx^k , \qquad (1)$$

where i,k=0,1,2,3. This quantity (more exactly, the metric tensor g_{ik}) becomes depending on the gravitational potential. For this, the interval invariance allows one to connect the clock reading at points with different Φ. Based on the known Schwarzschild solution, we have

$$ds^2 = \left(1+2\Phi/c^2\right)c^2dt^2 - r^2\left(d\Theta^2 + \sin^2\Theta d\varphi^2\right) - \frac{dr^2}{1+2\Phi/c^2}, \qquad (2)$$

where Φ=–|Φ|. Whence in the simple case of weak (stationary) fields of gravity and immovable clocks, we obtain

$$\left(1+\Phi^h/c^2\right)t^h \cong \sqrt{g^h_{00}}\,t^h = \tau = \sqrt{g^g_{00}}\,t^g \cong \left(1+\Phi^g/c^2\right)t^g . \qquad (3)$$

Here the right side represents the ground quantities and the left the corresponding quantities high above the Earth. Since $|\Phi^g|>|\Phi^h|$ and $g^h_{00}>g^g_{00}$ based on Eq. (3) we have

$$t^g > t^h > \tau . \qquad (4)$$

As seen, this result corresponds completely to the above-cited statement. What is more, since the ground clock showed the greater time, this means that it "ticked" frequently. Whence it, as one would think, follows that the frequency of the given and, consequently, any other periodic process in the gravitational field must be greater, *i.e.*, displaces in the violet side of the spectrum. It is evident that the generally accepted representation of "gravitational time slowing down" does not absolutely agree with the obtained result.

As far as one can judge, the generally accepted representation traces back to the other, more late, conclusion of Einstein [6]: "the clock goes slower if it is placed near ponderable masses". As seen, the latter statement is in fact contrary to the initial one. But what is especially wonderful, it leans upon the same equality(3). Therefore, the mentioned experiments [2-4], in which the "slowing down" of a ground atomic clock in comparison with a "high-altitude" one (for example, the clock in the airplane) was observed:

$$t^g_{ex} < t^h_{ex}, \qquad (5)$$

are impossible to consider as the confirmation of GR.

Here, however, we want to pay attention to the other side of the considered problem. The fact is that the observed "gravitational time slowing down" is in fact conditioned by the mechanism of an atomic clock. The gravitational shift of atomic levels leads to the frequency decrease of the corresponding

transition that causes the rate change of the clock like this. Whereas, a similar displacement of spectral lines takes place in electric and magnetic fields (Stark and Zeeman effects). We have the "electric or magnetic change of time rate" as a result of atomic clock location in these fields. What is more, differently arranged clocks (for example, pendulous or sand-glass), on the contrary, accelerate their rate with increasing gravitational field. As we know, the swing frequency of the pendulum increases proportionally to $g^{1/2}$, where g is the acceleration of the gravity force.

All-said can be considered as a decisive argument against GR and in favor an alternative Lorentz-covariant theory of gravity (relativistic gravidynamics) [7].

The author thanks V.A. Nikitin for valuable discussions.

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From Gravidynamics to Electroweakgravitational Interaction

As it turned out quite recently [1] that the general relativity contradicts directly the experiments on the "gravitational time slowing down". Thus, we have one wore strong argument in favor of the relativistic gravidynamics or Lorentz-covariant theory of gravity (see, e.g., [2,3]).

Relativistic gravidynamics. Recall that the relativistic (4-vector) Newton potential serves as the basic of this theory. It may be named "electromagnetic-like" since we have a surprising similarity between electrodynamics and gravidynamics beginning from Coulomb's and Newton's potentials, Poisson's equations and the Lorentz-invariance of the corresponding charges (electric and gravitational—mass). This likeness becomes particularly striking when it turns out that the intensities of the gravitational field are also described by the antisymmetric 4-tensor of rank 2, and field equations take the form of Maxwell-Lorentz's equations.

Especially, pay attention to the relativistic generalization the Newton formula for potential energy

$$p_g^i = m\Phi^i / c .$$

Whence it directly follows that the energy (frequency) and momentum (wave length) of the photon, the mass of which is equal to zero, do not change at its propagation in a gravitational field. *The photon is gravitationally neutral.*

The prediction of antigravitation (an effective repulsion of antiparticles by an ordinary gravitational field) can be considered as a very outstanding result of gravidynamics. The effective negative gravitational charge is the consequence of the known Feynman representation of antiparticles as objects moving backward in time [3].

Electrogravidynamics. The indicated similarity of electrodynamics and gravidynamics gives the idea to consider them as different sides of the united theory—electrogravidynamics. (It fulfils Einstein's unifield fielt theory, which was to combine the laws of electromagnetism and gravitation in one system of formulae).

The absence of obvious objects with a negative mass must not embarrass since the sign of charge does not directly figure in the field equations.

Quantum gravidynamics. On the other hand, the similarity of gravidynamics with electrodynamics leads automatically to the decision of an important problem of construction of the quantum theory of gravity or quantum gravidynamics (QGD). For this, the vector nature of the gravitational potential

means that the quantum of the gravitational field (graviton) has spin 1 as photon.

At the same time, the identification of gravity with the space-time metric in GTR leads to apparently insurable difficulties of quantization of this metric, necessary for a quantum theory of gravity.

Thus, if the electromagnetic interaction is described by the quantum electrodynamics (QED), then QGD allows one to solve the fundamental problem of gravitational interaction description.

Electrogravitational interaction. In its turn, the result of QED and QGD amalgamating or, that it is the same, the quantum electrogravidynamics (QEGD) allows one to talk about the united electrogravitational interaction.

Electroweakgravitational interaction. If we remind now that the electromagnetic interaction is one of the manifestations of the electroweak interaction, the subsequent step of constructing theory of electroweakgravitational interaction seems to be very plausible. On the other hand, the electroweak interaction is a part of the grand unifield theories (GUT). Therefore the corresponding inclusion of the gravitational interaction, i.e. the constructing theory uniting all fundamental interactions (SuperGUT), seems to be quite real.

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The Universe: finite or infinite?

Surely, these are the most facinating questions of all: does the Universe have a limited life span or permanent existence? Is it limited or infinite in size? Is Earth the only inhabited planet? Has there ever been a period when no life of any sort existed anywhere in the Universe?

We can have a useful idea of the size of a lake or a forest, even of a state or country; however, looking away from Earth into space stretches the imagination to the extreme. Aware of my limitations I submit the following:

A choice needs to be made between finite and infinite size and between finite and infinite life span.Without an understandable explanation as to what lies beyond the limits; my choice is for infinite in both cases.

The finite-size view seems to be assuming a state of "absence of everything" at the edge of an island-universe. The finite-life view requires this same "absence of everything" before and after a limited life-span and it must also require a super-power capable of both universal creation and destruction. This power is not required if the assumption is made that the Universe had no origin and will always exist. Of course, infinite size and lifespan are not understandable concepts in the same way as the size of a lake or wood. This leads to the basis of my argument—in English, finite means limited, and to say that the Universe is limited is to say that once the limit is reached all trace of everything disappears; Now this is more difficult to accept than to assume infinite lifespan and size—It is reasonable to ask those who claim limited size and lifespan to explain how space and material came into existence from nothing, how it will disappear again, and to explain the situation beyond the edge of a finite-sized Universe; Otherwise, are we not forced into the conclusion that the size and lifespan of the Universe are unlimited?

Barely detectable distant galaxies are very near objects indeed in a limitless universe: they are as close as the next grain of sand on an infinitely large beach. Although our tiny microcosm(the detectable universe) will follow universal laws there has not been proof,observational or otherwise, of big-bang expansion.(Infinite size contradicts the big-bang theory). In a universe of infinite size, if there was a "bang" it was a local mini-bang, big only by our microscopic standards and not connected with"the origin"of a universe that had no origin.

The Universe cannot expand or contract: these terms do not apply to infinite size and

something of infinite age cannot be evolving with time. Matter: in one form or another always occupies infinite space and is not an "island";otherwise the "beyond the island" question remains. Only the components of space are subject to curvature not space itself; otherwise an understandable explanation of "curved nothing"is required.

The Universe does not have an "edge" or an "age"and any component would take an impossible infinite time to "cross" the Universe.(Of course, the expression"to cross"does not apply to infinite distance) Unlimited space, time and material have probably always and will probably always produce life at various levels; However, conditions required to produce life will occour infrequently by our standards and contact is unlikely. The nearest of a endless number of examples could well be located too far away for any form of communication during the remainder of our brief microseconds on beautiful jewel planet Earth.

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Stellar Aberration and Relativity

In a recent issue of *Apeiron* (Vol. 6, pp. 205-216), Y.-G. Yi argues that light speeds greater than c may be needed to understand stellar aberration. His arguments have led me to consider this problem further.

Let us consider the problem of local measurement by a moving detector, for light received from a distant star at speed c. If the detector is moving transversely at speed v to a distant light source, then any light so received will have to enter such a detector on a microscopic scale, from an angle somewhat ahead of the direction of motion, in order to remain within the finite space of the detector throughout a finite time of measurement.

It seems useful to imagine a microscopic "measuring box", as a rectangle of diagonal-length c and upper-side length v. If motion of the detector is from left to right, then any incoming light will have to enter such a box from its upper right-hand corner, in order to exit later from its lower left-hand corner, and so be measured. The angle of aberration will then be sin (alpha) = v/c as is well known. The diagonal c of that box will also contain more light waves at constant time t than for a detector at rest, by a factor N'/N = 1/cos (alpha) as the transverse Doppler effect.

I argue elsewhere that other "relativistic" phenomena such as mass-gain or time-dilation follow from a different physical cause, where finite particles moving at speed v must modify their fast internal motions, in order to maintain constant speed c as seen by the vacuum at rest.

Great confusion has reigned for the past 90 years, because physicists have lumped all of these various phenomena under a single theoretical heading known as "special relativity". By that view, everything happens mysteriously by abstract kinematics, and no mechanism is available to ease the tortured mind. Might there be fewer arguments in that field, if such effects were understood more clearly in terms of mechanism rather than mathematics?

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Do black holes exist?

The well written article by E. Santos Corchero [1] belongs to the select category of efforts trying to rescue the "general theory of relativity"(GTR) from some physical absurdities to which its applications lead. Similar attempts were made within the "special theory of relativity" (STR) regarding the absurdity of both *reciprocal* and *real* "Lorentz contraction" and "time dilation," respectively [2]. Establishment physics has always strongly opposed these attempts, since without the esoteric, science-fictional effects associated with the "twin paradox," the "black hole" and like, the popularity without precedent of Einstein's brain childs would have drastically fallen. In the case of SRT this resulted in a – generally unrecognized—splitting between

"pure relativists" and "neo-Lorentzians". Official physics continues to play in the spirit of the successful "Heads I winn, tails you lose" strategy. The field of GTR is—even less recognized—divided in "supporters of physical singularities" and "adepts of Einstein's continuous field". This dualistic practice provides, seemingly, support to Bohr's (in)famous statement: "*The opposite of a deep truth is a deep truth, too*...." Einstein himself has changed several times his convictions which—in itself—is not condemnable. "Only a donkey is unable to change his mind!" exclaimed once a well known politician, former minister of defense in a Middle East country. Before WWI Einstein was a convinced *atomist*, *operationalist and opponent of ether,* after WWI he became a *fundamentalist* supporter of both *continuous field* and *ether.*

He didn'seem to be troubled by facts like the incompatibility between continuum theory and statistical mechanics. Only in his religious conviction he remained a consequent *monotheist à la Spinoza.* Einstein's conjecture that "black holes do not exist in physical reality" was an extrapolation of a highly idealized model, triggered by *faith.* Santos Corchero correctly points out that the question whether Einstein's conjecture is true is still open, which of course ignores an entire literature on the *thermodynamics of black holes* and the claimed astronomical evidence for "black holes" at galaxy centers....

The original Schwarzschild metric of a non-rotating, spherically symmetric body with sharp boundary and mass M has a *coordinate singularity* at $r = 2M$, which marks also a sudden *exchange of the roles of the temporal and radial coordinates* (!), too. It was not until 1960 [3] that the nature of the coordinate singularity at $r = 2M$ was elucidated. Schwarzschild coordinates are singular at $r = 2M$ but the curvature of the manifold not. Kruskal has shown that it is possible to introduce non-singular coordinates which may be used to analytically continue the manifold from the domain of ist original definition $r > 2M$ to encompass the points for which $r < 2M$. This so called "Kruskal metrics" is singular only at the *curvature singularity* where $r = 0$.

In 1935 [4] Einstein and **R**osen (**R** from EP**R**) expressed the view that "Every field must... adhere to the fundamental principle that singularities of the field are to be excluded".

Since 1940 Rosen developed and refined during more than a half century a "*bi-metric* general relativity and cosmology" in which, in addition to the usual metric tensor describing the space-time geometry and gravitation, there exists also a background metric tensor. From personal discussions with Nathan Rosen I know that his motivation to start this strange theory have been: a) the *positive* results of Dayton Miller, b) the hope to remove the *essential* (rather than *coordinate*) *singularity* in the origin and c) to derive an energy-momentum density *tensor* for the gravitational field in place of the *pseudo-tensor* (violating energy conservation!) in the conventional form of GTR. The "universe of Rosen" is closed in space but open in time, i.e., it expands indefinitely, and this holds whatever the present mean density of matter. On the other hand from the Einstein field equations without the "cosmological term" one gets a model which is closed both in space and time (for a density above a certain critical value) or else one which is open both in space and time. The closed space solution of Rosen has in common with a "black hole" that neither particles nor light rays can enter or leave. In Rosen's words: "If one *believes* (bold type by G.G.) that a good theory should be free from singularities, the above picture of a collapsed object seems to be more satisfactory than the black hole, with a singularity of the curvature tensor at ist centre. It raises compellingly the question, 'do black holes exist?' [5] .

Another attempt to avoid a *curvature singularity* has been that of Mendel Sachs [6], who has shown that this singularity is a consequence of the one-way "membrane paradigm" [7] and the splitting of the Schwarzschild problem into "*exterior*" and "*interior*," respectively. In order to avoid discontinuities in spacetime (so called "horizons") and surface boundaries, Sachs replaced the mass M confined to a sphere with

radius R, with a *continuous mass density* which is everywhere different from zero, therefore the spacetime curvature being different from zero, too. This alternative *black hole paradigm*, based on analyticity and nonsingularity requirements possess the essential feature that it leads to *closed geodesics*, which means that the "object" would uncouple itself completely from the rest of the universe. This means that the null geodesics—along which all forces, including gravity, propagate—would be closed, as well as the timelike geodesics –along which matter propagates.In Pazameta's view [8], this object would be "blacker" than other "black hole" models because it would uncouple completely from the rest of the universe, and have no "imprints," i.e. properties such as mass, charge, spin, detectable by an observer "at infinity". Sachs has also found that in his 'properly understood GTR' stars should naturally pulsate without collapsing to a singular point. He conjectured that the regular emission of radiation from a pulsar is dynamically rooted in a (smaler) part of the pulsation cycle when the star is out of the black hole state (less dense—open geodesics) –when radiation would be emitted to the outside world—and the (greater) part of the cycle when it is in the black hole state (more dense—closed geodesics)—hence radiation would not be emitted. [6].

Attractive as Sachs' model is, it didn't receive the aproval of the Establishment. Vladimir Fock's gravitational theory (no general relativity), in which the matter distribution possesses an 'island structure' [9], enjoys perhaps more popularity. The intention of this short essay on "black holes" was just to stress the fact that GTR can be used to prove a fact *and* his opposite.

Thereticians like Penrose and Hawking can gain popularity and fame by formulating "singularity theorems," others –relying on Einstein and Rosen—can argue for continuous matter described by continuous fields. It is not difficult to discern here the old dispute between *atomism* and *continuum (ether) theory* or—at the bottom—between *polytheism* and *monotheism*.

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ERRATA: V5N3-4

The paper by J.P. Wesley "The Marinov Motor, Without a Magnetic **B** Field," (pp. 219-225) specifies only a portion of the force acting on the ring rotor, as pointed out by Thomas Phipps in a private communication. In particular, it may be shown using Cartesian coordinates that the component of the force of interest is given by

$$F_\phi = -\left[\frac{q(\mathbf{v}\bullet\nabla\mathbf{A})}{c}\right]_\phi = -ld\phi\left(\frac{\partial A_\phi}{\partial\phi} + A_r\right)\mathbf{e}_\phi ,$$

instead of simply the first term in the bracket as erroneously assumed. Carrying out the appropriate integratiosn yields the total force as

$$F_\phi = -4i\left[\frac{2b}{r^2-b^2} + \frac{1}{r}\ln\left(\frac{r+b}{r-b}\right)\right].$$

Except for the magnitude of the force predicted, the conclusions remain the same.

ERRATA: V5N1-2

In the paper by J.P. Wesley "Induction produces Aharanov-Bohm Effect," (pp. 89-95)

a similar error has been pointed out by Dennis Allen in a private communication. The Eq. (15) is wrong, and needs to be replaced by

$$F_x = -\left(\frac{e(\mathbf{v}\bullet\nabla)\mathbf{A}}{c} \right)_x = -\frac{\mathbf{v}Kxy}{r^4},$$

where now K (equal to twice the old K) is

$$K = \frac{4\pi e\eta a^2}{c^2} = \frac{e\Phi}{\pi c}.$$

And in Eqs. (30) and (31) the old K should now by replaced by $K/2$. The conclusions remain the same.

ERRATA: V6N3-4

Page 237 line 4, equation (1) should read:

$$\frac{\mathrm{d}\mathbf{A}}{\mathrm{d}t} = \frac{\partial\mathbf{A}}{\partial t} + (\mathbf{v}\bullet\nabla)\mathbf{A} + (\mathbf{A}\bullet\nabla)\mathbf{v},$$