@ I S S U E

Correspondence, conference threads and debate

Farewell Minkowski Space

The "Thomas Precession" is a consequence of Lorentz transformations in (3+1) dimensions. It violates the definition of an inertial frame of reference and is experimentally non-existent. "Minkowski space" is untenable, but Poincaré's dynamic group in energy-momentum representation retains its validity. The true invariant $E^2 - (cp)^2$ replaces $(ct)^2 - r^2$.

1. Introduction

In the physical world, rectilinear motion seems to be the exception rather than the rule. Every piece of matter, be it macro—or microscopic, interacts with all other pieces of matter and, therefore, its motion will be non-uniform and, as a rule, non-linear. One cannot but wonder about the profound intuition of the ancient Greeks who always saw rotational motion as fundamental and ubiquitous.

The reference frames to which the investigated motions are referred, are themselves "pieces of matter" interacting with and influenced by other pieces of matter. All physics is pervaded—whether pointed out openly or not—by the abstraction called *inertial frame of reference* (IFR), i.e. "a non-rotating frame in which free non-interacting particles move uniformly without rotating around their own center of mass (CM) along straight lines". The number of IFR's is very restricted: Rigorously speaking, it is equal to one which corresponds to the unique, global, absolute IFR determined by the universe as a whole. This unique "master" IFR of physical pedigree is replaced in Einstein's "special" relativity theory (SRT) by a triple infinity of immaterial, phantomatic IFR's obeying the "dream of absolute democracy and equality"...

The fallacious idea of "special" relativity (purported, actually, to be very general, namely a generalization of "Galileian relativity" to all physical phenomena except gravitation) is rooted in a mathematical property of a very particular Newtonian equation of motion:

$$\frac{\partial(m_i \mathbf{v}_i)}{\partial t} = \sum_j \mathbf{F}(\mathbf{r}_j - \mathbf{r}_i) \tag{1}$$

namely one with masses $m_i =$ constant and forces $\mathbf{F}$ dependent on relative distances $(\mathbf{r}_i - \mathbf{r}_j)$ and their derivatives only. Had the velocity dependence of masses been discovered earlier, the invariance of (1) under Galileian transformation

$$\mathbf{r}' = \mathbf{r} - \mathbf{v}t \tag{2}$$

with $\mathbf{v}$ a uniform velocity were absent and there would have been no need to reconcile Newtonian mechanics with Maxwellian electrodynamics (both theories being, at any rate, conceived in the unique global very privileged IFR mentioned above).

Rotational motion is an embarrassment to Einstein's general theory of relativity and the "Achilles' heel" of SRT. The fact that rotation is generally recognized as absolute, together with the fact that it is easily detected in a "closed laboratory", leads to the inescapable conclusions that the universe is an inter-connected whole providing the unique IFR, that the separability of "local systems" is always a practical approximation, and that physics without gravitation is, in principle, wrong.

2. Lorentz "boosts"

In both classical mechanics and SRT it is accepted that the totality of spatial translations of a material point forms a commutative (Abelian) group.

While (extended) body, center of mass, rotation around CM, momenta of inertia, potential energy are well-defined—albeit idealized—concepts in classical mechanics, they are contradiction-ridden concepts in SRT. The world of SRT is that of free, non-interacting, point-like particles moving uniformly along straight lines, as "observed" from non-interacting fictitious IFRs—very massive, but devoid of gravitational mass! Such a world provides the scenario for the axiomatic derivation of the one-dimensional Lorentz transformations (LT) in space (x), also called (1+1)-dimensional LT if time t is included as an additional dimension [1]. Assuming:

Postulate 1: Straight (x, t) particle trajectories in the IFR I transform into straight (x', t') trajectories in I',

Postulate 2: Finite (x, t) values transform into finite (x', t') values,

Postulate 3: The origins of I and I' coincide at $t = 0$,

one has the following transformation $T_{I \to I'}$ connecting (x', t') with (x, t):

$$\begin{aligned} x' &= \gamma(v)[x - vt]; \\ t' &= \alpha(v)t + \beta(v)x \end{aligned} \tag{3}$$

where $\gamma(v)$, $\alpha(v)$, and $\beta(v)$ are arbitrary functions of the relative velocity v between I and I'.

Since ordinary, 3-dimensional, spatial translations form a group, one tries to require group properties from translations with uniform velocities, too.

The reciprocity of the relative velocity between I and I':

$$v = v_{I \to I'} = -v_{I' \to I} = |v| \tag{4}$$

and the existence of the inverse transformation of $T_{I \to I'}$ lead

to:

$$x' = (x - vt)(1 - \mu v^2)^{-1/2};$$
$$t' = [t - \mu v x](1 - \mu v^2)^{-1/2} \quad (5)$$

where $\mu(v) \equiv -\beta(v)/v\alpha(v)$.

Two successive, ordinary transformations being always equivalent to one single transformation, one requires transitivity:

$$T_{I\to I''}(v'') = T_{I\to I'}(v) \cdot T_{I'\to I''}(v') \quad (6)$$

which turns out to be possible only for:

$$v'' = \frac{v + v'}{1 + \mu v v'} \quad (7)$$

and for $\mu = \text{const}$.

The transformation:

$$x' = \gamma(v)[x - vt];$$
$$t' = \gamma(v)[t - \mu v x] \quad (8)$$

with $\gamma \equiv (1 - \mu v^2)^{-1/2}$ contains, therefore, the unknown constant μ.

3. The vector form of Lorentz transformations and the "Thomas angle"

Splitting the position vector $\mathbf{r}$ of a material point P in I into components parallel and perpendicular to the uniform velocity $\mathbf{v}$:

$$\mathbf{r} = \mathbf{r}_\parallel + \mathbf{r}_\perp \quad \text{or} \quad \mathbf{r} = \frac{(\mathbf{r}\cdot\mathbf{v})\mathbf{v}}{v^2} + \mathbf{r}_\perp \quad (9)$$

and assuming that only $\mathbf{r}_\parallel$ is affected by motion, one has:

$$\mathbf{r}' = \gamma(v)[\mathbf{r}_\parallel - \mathbf{v}t] + \mathbf{r}_\perp = \gamma(v)\left[\frac{\mathbf{r}\cdot\mathbf{v}}{v^2}\mathbf{v} - \mathbf{v}t\right] + \mathbf{r}_\perp \quad (10)$$

For the parameter t', one has:

$$t' = \gamma(v)[t - \mu(\mathbf{v}\cdot\mathbf{x})] = \gamma(v)[t - \mu(\mathbf{r}\cdot\mathbf{v})] \quad (11)$$

Hamilton [2] argued that (10a) is inherently wrong, since the three-vectors $\mathbf{r}$ and $\mathbf{r}'$ lie in different hyperplanes in spacetime. We shall argue that (10a,b) is wrong because it violates the definition of the IFR as a non-rotating reference frame.

Since the time of Sommerfeld and Silberstein [3] it is (or better: should have been) known that the transformation (10a,b) is equivalent to a boost followed by a spatial rotation. In other words, the LT "boosts" (actually, the pure LT) do not form a group in (3+1) dimensions. In order to regain the group structure, spatial rotations have to be added to the LT boosts, therewith destroying the inertiality of motion.

Dividing side by side (10a) by (10b) and putting $\mathbf{r}'/t' = \mathbf{u}'$; $\mathbf{r}/t = \mathbf{u}$, one obtains the non-commutative vector addition law of non-parallel velocities:

$$\mathbf{u}' = \frac{\mathbf{u} - \mathbf{v}}{1 - \mu(\mathbf{u}\cdot\mathbf{v})} - \frac{(\gamma - 1)\mathbf{v}\times(\mathbf{v}\times\mathbf{u})}{v^2[1 - \mu(\mathbf{u}\cdot\mathbf{v})]\gamma} \quad (12)$$

In kinematical terms, this is tantamount to non-reciprocity of relative velocities.

In Ungar's notation [4], the composition law of non-collinear velocities is written:

$$\mathbf{v} \oplus \mathbf{u} = \Re[\mathbf{u};\mathbf{v}](\mathbf{u} \oplus \mathbf{v}) \quad (13)$$

where

$$\Re(\mathbf{u},\mathbf{v}) = \mathbf{I} + F(\mathbf{u},\mathbf{v})\sin\varepsilon + G(\mathbf{u},\mathbf{v})(1 - \cos\varepsilon) \quad (14)$$

designates the "Thomas rotation" while $\mathbf{I}$, Θ, ε, F, G, respectively, denote the 3×3 identity matrix, the angle between velocities $\mathbf{u}$ and $\mathbf{v}$, the Thomas angle, and two functions given explicitly in [4]. For infinitesimal changes one can use the classical velocity composition law, so that $\mathbf{u} - \mathbf{v} = d\mathbf{v}$ and the differential Thomas angle is calculated [5] as:

$$d\varepsilon = -\frac{\gamma - 1}{v^2}(\mathbf{v}\times d\mathbf{v}) = -\frac{\gamma - 1}{\gamma v^2}(\mathbf{v}\times\mathbf{u}) \quad (15)$$

From (14), one gets the so-called "Thomas precession":

$$\frac{d\varepsilon}{dt} \equiv \omega_T = -\frac{\gamma - 1}{v^2}(\mathbf{v}\times\mathbf{a}); \quad \mathbf{a} = \frac{d\mathbf{v}}{dt} \quad (16)$$

For the practically relevant case of uniform circular motion, the angle of precession for a single turn is:

$$\eta = \int \omega_T\, dt = -(\gamma - 1)\int \frac{\mathbf{v}\times\mathbf{a}}{v^2}\, dt = -2\pi(\gamma - 1) \quad (17)$$

since $v = \omega r$ and $a = \omega^2 r$.

4. The absence of "Thomas precession"

Writing (15) as

$$\omega_T = -\frac{\gamma - 1}{v^2}(\mathbf{v}\times\mathbf{a}) = (1 - \gamma)\omega \quad (18)$$

or

$$\omega = \omega_T + \omega_o \quad (19)$$

with $\omega_o = \gamma\omega$ and keeping in mind that ω_T is negative, one should expect a radially varying differential rotation $\omega(r)$. This $\omega = \omega_o(1 + \mu\omega_o^2 r^2)^{-1/2}$ would assure a finite value, $\mu^{-1/2}$, for ωr as r goes to infinity. Moreover, the disk radius would shrink due to torsion, therefore "the premises leading to the Ehrenfest paradox" need not exist [6]. (The expectation was that both the circumference and the radius would shrink by the same factor, their ratio remaining 2π!) Weinstein [6] proposed as a laboratory experiment to rotate a disk (10 cm diameter) with 1000 r.p.s. for a period of 30 days. The expected retrograde curving of an initially straight ideal line marked on the disk surface was $\eta \approx 0.16°$. Thomas E. Phipps, Jr. [7] took Weinstein's suggestion seriously and performed the experiment. A 1.35 cm diameter stainless steel disk was spun continuously in air for about four months at

6072 r.p.s. (rms speed). During rotation 20 ns laser flash photographs were taken of the disk surface, on which several straight lines had been scribed. A very clear null effect was registered. The vanishing of ω_T implies with necessity $\gamma \equiv 1$ and $\mu \equiv 0$, i.e. a return to the Galileian transformation (2), instead of (5) with μ finite. Remarkably, the Phipps experiment allows unequivocal determination of the linear transformations relating two IFR's and possessing group properties, without even mentioning light, light signalization, or any other electrodynamic phenomena. It is symptomatic for present day physics that this crucial experiment is totally concealed. Even P.F. Browne [8], writing a comprehensive paper on "Relativity and Rotation" three years later, did mention Weinstein's proposal but completely ignored its realization by Phipps. The absence of "Thomas precession" automatically implies the absence of "asymmetric aging of twins", since—as pointed out by Weinstein himself—the two cumulative and material independent effects are tightly interwoven.

One may wonder about the fate of the hypothetical "Thomas precession" in microphysics. First, we must recall that the idea of "spin as an intrinsic angular momentum" of the electron, in addition to its orbital momentum, predates the measurements of Uhlenbeck and Goudsmit (1925) by ten years and was launched by Parson [9]. After the experimental determination of the $h/4\pi$ spin, the "Thomas precession" was thought to explain the missing factor $\frac{1}{2}$. For the low velocities ($\gamma \approx 1$) of atomic electrons, the retrograde ω_T turned out to be just one-half of the Larmor frequency ω_L:

$$\omega_L = \frac{eB}{2m_o} \tag{20}$$

with e and m_o the electron charge and rest mass, respectively, and $\vec{B} = \vec{v} \times \vec{E}/c^2$ the Lorentz magnetic field induced by the motion of the electron through the electric field $\vec{E}$ of the nucleus. The corrected fine structure became then:

$$\Delta E = \frac{h}{2\pi}(\omega_L + \omega_T) \cdot \mathbf{S} = \frac{h}{4\pi}\omega_{LS} \tag{21}$$

with $\mathbf{S}$ the spin vector and should have been a brilliant success, had Dirac never proposed his equation.

This equation delivered, one is tempted to say "deus ex machina", the correction (20) without any classical model of a rotating or precessing particle. Since Dirac's theory is presently the accepted one, the "Thomas precession" remains just a curious historical artefact. Finally, it is important to stress that Dirac's equation is not a necessary consequence of SRT [10]. It was obtained, actually, by a linearization procedure from the Klein-Gordon equation, which in turn was obtained from the basic relationship $E^2 = (m_o c^2)^2 + p^2 c^2$ via the operator substitution $\mathbf{p} \to -i(h/2\pi)\nabla$ and $E \to -i(h/2\pi)\partial/\partial t$ for momentum $\mathbf{p}$ and energy E. The $E(\mathbf{p})$ formula is, however, completely independent of the kinematics of motion and of LT in particular.

5. Conclusions and perspectives

The nonexistence of "Thomas precession" fixes the value of the constant μ in (7) as zero, thus reducing (7) to (2). However, the Galileian transformation itself holds only approximately, since in the presence of gravitation and/or radiation the isolation of local "closed" systems is impossible. In the presence of gravitation and/or radiation there is no "principle of relativity" at all.

Realizing that "Minkowski space-time" is unable to describe interactions between particles, Henri Bacry [11] has openly issued a call to give it up. Certainly no harm will be done to physics if $\mathbf{r} = \mathbf{r}(t)$ is again called "the law of motion of a point-like particle", rather than a "world line"... On the contrary, replacing the definition of "proper time" τ: $(c\tau)^2 = (ct)^2 - r^2$ by the scalar invariant $E^2 - (pc)^2 = E_o^2 - (p_o c)^2$—where the subindex zero refers to an observer moving with absolute velocity v_o—allows the derivation of physical changes:

$$p_{ox} = \gamma_o \left(p_x - \frac{E v_o}{c^2} \right) \tag{22}$$

$$p_{oy} = p_y \tag{23}$$

$$p_{oz} = p_z \tag{24}$$

$$E_o = \gamma_o (E - v_o p_x) \tag{25}$$

with $\gamma_o = (1 - v_o^2/c^2)^{-1/2}$ instead of (Lorentz) transformations. For massive particles, these changes are consistent with $E_o = m_o c^2$; $p_x = \gamma m_o v$; $E = \gamma m_o c^2$ (nota bene: γ contains the absolute velocity v of the particle, while γ_o is the factor associated with the observer moving with absolute velocity v_o), while the Planck-de Broglie conditions $\mathbf{p} = (h/2\pi)\mathbf{k}$ and $E = (h/2\pi)\omega$ allow the derivation of the Voigt-Doppler effect which accounts for all experimental results, including the Michelson-Morley null result [12].

Addendum

While discussing (Paris, March 15, 1996) the issue of "Thomas Precession" as a consequence of "special" relativity, Professor J.P. Vigier expressed the opinion that: "if the 'Thomas Precession' is not confirmed by the experiment, then it is not a consequence of special relativity". Professor Vigier takes the negative verdict of the experiment for granted. However, he maintains that: "if the changes of linear momentum during the motion along a closed polygonal path are 'properly'—i.e. using the three-dimensional complex rotation group—taken into account, no Thomas effect will occur".

This position encounters several difficulties:

1. The 3D complex rotations and the vector form of LT are mathematically isomorphous, therefore both contain the same physical information. An isomorphism cannot create or destroy a physical effect. The situation is reminiscent of the use of the (more elegant and versatile) complex notation in electrical engineering which cannot avoid taking real parts at the end of the calculations.

2. Einstein's "special" relativity was conceived as a purely kinematical theory. As such, the theory is not allowed to generate dynamical effects, and even less, to violate the inertiality of a transported system.

3. Although never included in the two postulates and/or in the axiomatic foundation of SRT, the thesis: "the special relativistic effects have nothing to do with acceleration (i.e. force or change of linear momentum, G.G.) per se", is implemented in all applications of SRT. For example, it is claimed that the functioning of any clock (spring, cesium-, meson-, biological,...) is affected only by its velocity in an inertial frame of reference. The details of the clock's internal and external dynamics are considered superfluous and completely irrelevant.

4. According to Mendel Sachs [13] the definition of "proper time" $\tau \equiv t(1 - v^2/c^2)^{0.5}$—where v is the uniform velocity of relative motion—cannot be generalized for variable velocity! "They then extend this transformation (relating τ and t, G.G.) by keeping its form but letting v become variable. They then integrate $d\tau = dt(1 - v^2(x,t)/c^2)^{0.5}$ over the whole closed path to get the proper time elapsed. But this is not a valid transformation for general relativity..." Sachs' resolution of the "twin paradox" is that the consequent and consistent application of "general relativity" leads to no asymmetric ageing of twins. This, however, is perfectly similar to Vigier's hope, namely that a rigorous—why not "general relativistic"?—treatment of the motion along a closed path will show up no "Thomas effect". Thus, a resolute adept of the passive interpretation of the Lorentz transformation (just a translation from "x, y, z, t language" to "x', y', z', t' language", without any physical consequences. G.G.) and a neophyte Lorentzian believing in absolute length contraction and absolute time dilation—as a result of motion relative to an absolute, preferred reference frame—find themselves in the same boat...

References

1. P. Mittelstaedt, *Der Zeitbegriff in der Physik* (BI Wissenschaftsverlag, Mannheim-Wien-Zürich 1992) p. 178
2. J.D. Hamilton, *Canadian J. of Physics* 59 (1981) 213
3. L. Silberstein, *The Theory of Relativity* (Macmillan and Co, London 1914)
4. A. Ungar, *Foundations of Physics* 19 (1989) 1385
5. H. Arzeliès, *Relativistic Kinematics*, (Pergamon Press, Oxford, 1965) p. 179
6. D.H. Weinstein, *Nature*, 232 (1971) 548
7. T.E. Phipps, Jr., *Lettere al Nuovo Cimento*, 9 (1974) 467
8. P.F. Browne, *J. Phys. A: Math. Gen.* 10 (1977) 727
9. A.L. Parson, *Smithsonian Misc. Collections* Vol. 65 No. 11, Publication No. 2371, Nov. 1915, pp. 1–80
10. G. Galeczki, *Physics Essays* 7 (1994) 83
11. H. Bacry, *Localizability and Space in Quantum Physics* (Lecture Notes in Physics, Vol. 308, Springer-Verlag, Berlin-Heidelberg 1988, p. 59)
12. P. Wesley, *Advanced Fundamental Physics* (Benjamin Wesley, Blumberg 1991)
13. M. Sachs, *Int. J. Theor. Phys.* 7 (1973) 281

G. Galeczki and P. Marquardt
Society for the Advancement of Physics
Rubensstrasse 29, D-50676 Köln

Reply by J.-P. Vigier

1. It is not true that two isomorphous groups contain the same information. The little group of Wigner is limited to one dimension only, so that the 3-D complex rotations contain more information.

2. The little group is certainly a kinematical theory, but this does not mean it does not imply restrictions on accelerated motions for the 3-D rotation group.

3. The postulate of isotropic light velocity c in all directions and the utilization of light in length and time measurement is an assumption which can be modified within the framework of Relativity Theory itself, if photons have a non-zero rest mass as assumed by Einstein-Schrödinger-de Broglie, etc.

4. Sachs has not resolved the twin paradox within the framework of Relativity Theory. In fact, the "paradox" of variable aging has been confirmed by clocks moving in satellites around the earth in opposite directions.

Jean-Pierre Vigier
Laboratoire de Gravitation
et Cosmologie Relativistes
Université Pierre et Marie Curie
Paris, France

Obscurities in the Theory of "Quantum Touching"

For the past forty years, V. Pope has been advocating a form of instantaneous action at a distance. The claim that this has something to do with $B^{(3)}$ theory is refuted as follows:

Let K' move at v in Z with respect to K. Let:

$$\gamma = \left(1 - \frac{v^2}{c^2}\right)^{-1/2}$$

Then from the Lorentz transform, for absolute values of t and Z:

$$t' = \gamma\left(t - \frac{vZ}{c^2}\right) \tag{1}$$

$$Z' = \gamma(Z - vt). \tag{2}$$

For the inverse transform (frame K moving at $-v$ with respect to K'):

$$t = \gamma\left(t' + \frac{vZ'}{c^2}\right) \tag{3}$$

$$Z = \gamma(Z' + vt'). \quad (4)$$

So we see that when $v \to c$, the retarded time $(t - Z/c)$ appears on the right hand side of eqn. (1). The electromagnetic phase is $\omega(t - Z/c)$ where ω is angular frequency, this quantity is non-zero at c in K. This Lorentz invariant is the phase of a plane wave moving at c in vacuo. There is no instantaneous action at a distance as asserted in the "quantum touching" theory of Pope [1]. Similarly, the advanced time $t' + Z'/c$ appears in eqn. (3); and $\omega'(t' + Z'/c)$ is also a Lorentz invariant. These phases also appear from eqns. (2) and (4) self consistently. However, at c, the quantity t'/γ in eqn. (1) is identically zero, so $(t - Z/c)$ is also zero, implying that ω is infinite in frame K if $\omega(t - Z/c)$ is a Lorentz invariant as required. The observable electromagnetic phase is always measured for finite ω with a prism or spectrometer [2–5].

The phase at c is finite in all frames for finite ω. The signal velocity is c in all frames. Thus $\omega'(t' - Z'/c)$ is finite at c and equal to $\omega(t - Z/c)$. This is the measurable electromagnetic phase. Therefore there is no instantaneous action at a distance because the propagation velocity of electromagnetic radiation or gravitation is always finite in all frames. There is no rest frame for a particle at c. The phase at the speed of light in all frames is the measurable:

$$\varphi = \omega(t - Z/c)$$

in which ω, t, Z and c are all non-zero. The q.t. theory asserts $t = 0$ (no interval) and infinite signal velocity ("c" = infinity) because the theory asserts instantaneous action at a distance. At the same time, the theory asserts that c is a scaling factor with value 3×10^8 metres per second, but at the same time Pope appears to reject measurement in natural philosophy. This mix of ideas is very obscure to me at present.

If $t = 0$ and "c" is infinite, (instantaneous signal transmission, or action at a distance) φ is zero and there is no longer any defined electromagnetism, i.e. no field. The argument of q.t. starts with a field theory and finishes with no field, so action at a distance becomes erroneously instantaneous with no intermediating field with finite signal velocity. This is because the whole argument is based on the Lorentz transform of fields applied when $v \to c$. However, at $v \to c$, the Lorentz transform is singular mathematically, and physically the rest frame is indistinguishable from the moving frame. If so, how can a transform be applied from one to the other? This is the quicksand upon which the whole of q.t. is based. Or so it appears to me at present.

The speed of light exists in vacuo, has been accurately measured, and is not merely a "scaling constant" as suggested by q.t. Having ploughed through q.t.'s opaque theory many times, this is my current view. Experimental evidence for special relativity is given in texts such as the one by Marion and Thornton [2]. There appears to be no evidence for quantum touching, and the concept is ill-defined.

Mr. Pope is entitled to his views in philosophy and linguistics, but they are obscuring the theory and interpretation of $B^{(3)}$ [6–10]. His claim [11] that $B^{(3)}$ is an example of quantum touching is incorrect because $B^{(3)}$ propagates at c in vacuo in the opinion of Vigier and myself. If the photon has mass, $B^{(3)}$ propagates at less than c, and correctly worked out tachyonic theories may allow it to propagate at greater than c. The phase in the $B^{(3)}$ theory is finite, because there is present a propagating electromagnetic field. In vacuo, the signal velocity is c, and $B^{(3)}$ propagates at c because the conjugate product through which it is defined topologically propagates at c. Empirical evidence for $B^{(3)}$ is given in magneto-optics [6–10] and the theory of $B^{(3)}$ is CPT conserving and Lorentz covariant inter alia. This is alone sufficient to show that $B^{(3)}$ is a fundamentally novel magnetic flux density in vacuo.

A careful reconsideration by Chubykalo and Smirnov-Rueda [12] has shown that under well defined mathematical conditions, longitudinal solutions of the electromagnetic field equations appear in vacuo. These may provide a route to understanding Coulombic action at a distance as discussed by, among others, Dirac [13]. Work is in progress to relate these solutions to $B^{(3)}$, but the work of Chubykalo et al. [12] has been criticised by Rodrigues [14]. The present author finds no flaw in the logic of Chubykalo et al. In three papers, Munera and Guzman [15] have provided a rigorous and important reconsideration of the Maxwell equations, leading once more to longitudinal solutions.

There may be some way of reconciling the work of Pope to these developments in physics. However, Pope appears to reject fundamental concepts such as: 1) the need for empirical measurement in natural philosophy; 2) the d'Alembert equation; 3) the vacuum; 4) the speed of light. This is a very radical point of view, and perhaps I have misunderstood statements of his such as "a pox on the d'Alembert equation". Before reaching for the penicillin, I feel that Mr. Pope should publish his ideas in a book, explaining them for physicists.

If the electromagnetic field is gauged in vacuo, we find that $B^{(3)}$ is implied topologically, together with novel non-local effects in electromagnetism. There may be some way here of locking in to Pope's ideas, but after studying them many times I am unable to understand them. Gauge transformation of type two is again based on special relativity, and is meant specifically to avoid instantaneous action at a distance. It appears that the Aharonov-Bohm effects now known with precision experimentally contradict the assertions of quantum touching. It is not even clear to me however whether Mr. Pope means instantaneous action at a distance or not, so obscure is the verbal development in his theory. My own method is to respect received opinion until logic forces me to do otherwise: I do not use a theory which blatantly contradicts empirical data. Since Mr. Pope has no training in mathematics, it is difficult to see how he can develop his work without getting bogged down in a morass of verbiage. The d'Alembert equation still seems free of infection to me.

In summary, the standard equations of the Lorentz transform, on which Pope bases the obscure verbal assertion known as "quantum touching", mean that the square of the four-interval does not change from frame to frame. This implies, using the standard arguments [2], that the proper time does not change with Lorentz transformation, i.e. is "Lorentz invariant". If so, the proper time does not vanish, because then it would not be a Lorentz invariant. This remains true whether or not the photon is thought to have mass. If the photon's mass is zero, the four-interval vanishes, (the photon is "light-like"), but the proper time does not. Pope's error is due to lack of elementary training in physics and an inability to accept criticism. In view of his long history of erroneous verbal assertion, Pope will refuse to accept the description in this Letter of the standard Lorentz transformation, and therefore this will be my last communication on the subject.

References

1. V. Pope, *Apeiron*, 1994; *Proceedings of the first Vigier Symposium Present Status of the Quantum Theory of Light*, edited by S. Jeffers, G. Hunter, and S. Roy (Kluwer, Dordrecht, 1996).
2. J.B. Marion and S.T. Thornton, *Classical Dynamics of Particles and Systems*. (HBJ, New York, 1988, Third Edition).
3. L.D. Landau and E.M. Lifshitz, *The Classical Theory of Fields*. (Pergamon, Oxford, 1975, Fourth Edition).
4. L.D. Ryder, *Quantum Field Theory*. (Cambridge Univ. Press, 1987, Second Edition).
5. P.W. Atkins, *Molecular Quantum Mechanics*. (Oxford University Press, 1983, Second Edition).
6. M.W. Evans and J.-P. Vigier, *The Enigmatic Photon*. (Kluwer, Dordrecht, 1994), Volume One.
7. M.W. Evans and J.-P. Vigier, *The Enigmatic Photon*. (Kluwer, Dordrecht, 1995), Volume Two.
8. M.W. Evans, J.-P. Vigier, S. Jeffers and S. Roy, *The Enigmatic Photon*. (Kluwer, Dordrecht, 1996), Volume Three.
9. M.W. Evans and S. Kielich (eds.), *Modern Nonlinear Optics*. (Wiley, New York, 1992, reprinted 1993), vol. 85(2).
10. A.A. Hasanein and M.W. Evans, *The Photomagneton in Quantum Field Theory*. (World Scientific, Singapore, 1994).
11. V. Pope, personal communications.
12. A. Chubykalo and R. Smirnov-Rueda, *Phys. Rev. E*, in press.
13. P.A.M. Dirac, *Proc. Roy. Soc.*, 209A, 291 (1951).
14. W.A. Rodrigues, personal communication.
15. H. Munera and O. Guzman, *Found. Phys. Lett.*, in press.

M.W. Evans
Rhyddwen Road, Craig Cefn Parc
Swansea SA6 5RA Wales, U.K.

Reply by N.V. Pope

A classic fallacy which logicians call *ponendo tollens* is to assume that a thesis can be refuted simply by asserting and reasserting its antithesis. Evans seeks to 'refute' any association between my theory of action-at-a-distance and his own $B^{(3)}$ theory simply by driving home to his public how mathematically watertight his own theory is. But that is like a Ptolemaic astronomer seeking to 'refute' Copernicus' heliocentric theory by stressing and restressing the mathematical intricacy and sufficiency of the Ptolemaic system.

However, Evans regards this as no more than 'a morass of verbiage' and he would want 'mathematics' to support it. However, that is a very unusual and hardly sustainable view, that a logical argument without intricate mathematics is no more than just words.

Moreover, I feel I should point out that it was Evans who first offered the view that my philosophical theory had 'foreshadowed' his $B^{(3)}$ theory, and my paper which specifically seeks to articulate this association by stressing the longitudinal character of instantaneous quantum touching, was invited by him on that understanding. So I am intrigued as to why he has now changed his mind.

In general, the basis of Evans' 'refutation' of my—or, rather, Gilbert Lewis'—concept of proper-time instantaneous quantum touching [1] is that he (Evans) assumes that the only question can be that of whether the speed of light is finite (i.e., time-retarded) or infinite (instantaneous). However, although it is a very subtle logical point, light may be both infinite and instantaneous. This, of course, is because light, like anything else, has two velocities. One is the distance from A to B traveled in the time registered by the clocks of the observer of the motion; the other is that same distance traveled in the time that the same observer of the motion sees to be registered by the clocks of the traveling body itself—the so-called proper time. The first of these velocities tends to the finite limit c, as in relativity theory; the second tends to an upper limit of infinity, as in classical or Newtonian physics. That upper limit on the speed of light is therefore both finite and infinite, without this involving any contradiction whatsoever.[2]

Now Evans says that there is no evidence for such instantaneous action-at-a-distance. However, as Mach, Tom Phipps, and Assis, et al. have pointed out, there has to be an instantaneous balancing-influence between bodies that are linked in paired and overall-conserved angular momentum relations. (Shades of d'Alembert, here!)[3] No galaxy, for instance, could hold together in the way it does if the balance between its component stars and so on took thousands of years to get from edge to edge at the speed c. Also, for some physicists the plainest evidence of instantaneous action-at-a-distance is provided by the Thomas Young two-slit experiment and all the recent developments upon it described by Professor Clive Kilmister and myself in the 1996 ANPA Newsletter. (Copies are available from myself as Secretary.)

However, Evans says that there can be 'no instantaneous action-at-distance because the propagational velocity of electromagnetic radiation or gravitation is always finite in all frames.' What he fails to see, as I say, is that although that is unarguably the case, the speed of the quantum elements of those finite-speed propagations may nevertheless be infinite.

For instance, in a cinematographic film (movie) each photographic 'still' is a complete picture—i.e., a pattern of instantly interconnected photographic grains from which three dimensions of distance are informationally projected. By definition, nothing moves in those photographic stills. All motion and change are generated out of temporal sequences of those stills. And since there is no logical contradiction in saying that, then, by the same token, neither is there any logical contradiction in suggesting that a light-wave (or a gravitational wave) may be a kinematical sequence, in relativistic time, of three-dimensional patterns of Lewisian, proper-time-instantaneous quantum touchings. The fact that this is not what Evans was taught is no argument against it.

I suggest, then, that the only valid way for Evans to refute my theory and its connection with his own would be by the method of *tollendo tollens*; that is, by falsifying my thesis, not by simply affirming and reaffirming his. This would accord with Popper's falsification criterion for sorting out scientific theories. Evans mentions that I have been at this for over 40 years. During that time, with the advice and cooperation of many professionals and, indeed, some very eminent, mathematicians, I have sought to make my thesis as logically and mathematically tight and therefore as falsifiable as possible. So I shall look forward to being shown by Evans, with specific reference to my various published texts, which of my arguments, logical or mathematical, he regards as false.

Notes and References

1. G.N. Lewis, 'Light waves and Corpuscles'. *Nature* 117 (1926), p. 256.
2. See e.g., N.V. Pope and A.D. Osborne. 'Instantaneous Gravitational and Inertial Action-at-a-Distance' *Physics Essays*, Vol. 8, 3, September issue., 1995 pp. 384–397; also, N.V. Pope and A.D. Osborne 'Instantaneous Relativistic Action-at-a-Distance, *Physics Essays*, Vol. 5, No.3, 1992, pp.409–421.
3. My remark 'A pox on the d'Alembert equation!' was made to Evans in an impromptu discussion, at the Swansea Astronomical Society, filmed by a freelance TV journalist, Mr. John Blay. The remark was by no means meant to signify any disrespect of d'Alembert but was simply an expression of irritation at Evans' insistence, as in his communiqué to which I am now responding, on keeping the argument grounded in its familiar but stultifying historical groove.

N.V. Pope
Llys Alaw, 10 West End
Penclawdd, Swansea
West Glam SA4 3YX, U.K.

Length Contraction and Time Dilation?

Reference is made to the recent exchange of letters between Wilhelm and Li (*Apeiron* July 1995) on the subject of length contraction and time dilation. This letter describes a couple of conceptual experiments that address these matters and provide a basis for judging who is correct, Li or Wilhelm.

Length Experiment

Mark two points O' and O" on a straight line a great distance apart. Mark a segment of length L on the line between points O' and O" and place photon emitters, one green and the other orange, at the ends of segment L and synchronize them so that they periodically emit photons at the exact same time in both directions towards O' and O".

Now observers at O' and O" can determine the length of this segment by measuring the difference in arrival times of the green and orange photons and multiplying by the velocity of light c. In Figure 1a, the two observers and segment L are all at rest with respect to one another, and the observer at O' measures a length L' and the observer at O" measures a length L'' where $L' = L'' = L$.

Next let the two observers move with the same velocity $\beta = v/c$ and $0 < \beta < 1$, as shown in Figure 1b. It is evident that the two observers will obtain different measurements for segment L and $L' \neq L'' \neq L$. The observer at O' will perceive segment L to have expanded, and the observer at O" will think the segment has contracted.

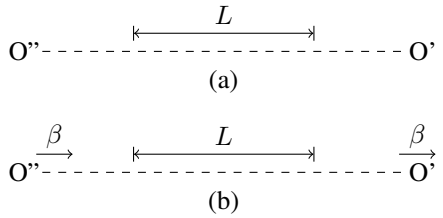

Figure 1

Time Experiment

Consider three identical monochromatic light sources, having a wave period T_G (Color GREEN), located at points O, O' and O" along a straight line with point O being between points O' and O" (Figure 2: The two arrangements are equivalent).

Let points O' and O" move along this line with the same uniform motion so that point O' is "receding from" point O and point O" is "approaching" point O at the same speed. Points O' and O" are at rest with respect to one another. The observers at O, O' and O" will perceive the following:
a) The observer at O will detect a wave period T_G (Color = green) from the source at O, a wave period T_R (Color = red) from the source at O' and a wave period T_B (Color = blue) from O".
b) The observer at O' will detect a wave period T_G from the sources at O' and O" and wave period T_R from O.
c) The observer at O" will detect a wave period T_G from the sources at O' and O" and wave period T_B from O.

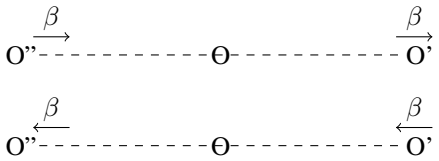

Figure 2

Since these monochromatic light sources are ideal clocks, what has been demonstrated for wave periods is also true for clock rates.

Conclusions

If it is true that (i) a single rod will both expand and contract at the same time just to accommodate two observers, one receding and the other approaching, and (ii) a single monochromatic light source can emit red, blue and green light at the same time, then, of course, Wilhelm is correct.

John Owen Campbell
P.O. Box 2092
North Hills, California 91393-2092

Daniel H. Deutsch: Flights of Fancy

In his discussion of the meaning of Planck's constant, Daniel H. Deutsch (*Apeiron* Vol.3 Nr. 2, p.52) asks by what flight of fancy is one justified to let $h \to 0$; he suggests that one might as well let $e \to 0$ or $c \to 0$. Readers might be interested to learn that the proposition that $c = 0$ has been used in a recent landmark article on SR kinematics [1].

The authors, a philosopher of science and a theoretical physicist, begin the technical part of their discussion with the rigorous derivation of the reciprocal speed, in substantiation of the so-called principle of reciprocity according to which the speed v' of the origin of the stationary system S, in terms of the relativistic time of the moving system S'(v), equals $v' = -v$. In admirable scholarly fashion they set upon their task as follows. They adduce the weak principle of relativity (PR) according to which the speed c' of light in S' may differ by a scale factor from the speed c in S, so that $c' \neq c$; only in the later part of their discussion do they impose the restriction of the strong PR where $c' = c$. From the general matrix equation for the Lorentz transformation beloved by modern theorists they obtain

$$x' = ax - avt$$
$$t' = dx + et$$

where a, d and e are subsequently found to be

$$a = e = \left(1 - \frac{v^2}{c^2}\right)^{-1/2} \quad \text{and} \quad d = -av/c^2.$$

For signals moving with the general speeds u and u' along the x-axes of S and S' we have $x = ut$, $x' = u't'$, so that $u' = a(u - v)/(du + a)$ where subsequently $u' = c$ and $u = c$.

The authors write: "If we now put $u = 0$, then u' will be the 'reciprocal' velocity of frame S as measured to move along the positive x'-direction in S'." Not surprisingly, they find that $v' = -av/e$.

It never occurs to them to consider that this important finding may not be valid if u' merely differs by a scale factor from u, and if we proceed to put $u = c$, $u' = c' = c$, and $d = -ev/c^2$. (Incidentally, has it occurred to anybody to consider that the reciprocal speed v', in terms of the redefined time of the system S' moving with speed $\pm v$, namely $t' = \gamma t(1 + v/c)$, might not be the same as under the Galilean transformation where $t' = t$?)

For consider the following case; to make it particularly easy put $v = c/2$; compare the distances ct, ct', etc. measured along the x-axes of S and S'.

Now consider a point P moving with speed $v' = -v$; it clearly cannot be adjacent to the origin of S.

The assumption that $v' = -v$, tacitly taken for granted by mathematicians and elevated to a fundamental principle by philosophers, is responsible for the paradox that, if we put $ct' = ct(1 - v/c)$ and $ct = ct'(1 + v/c)$; ct seems to have become contracted. In reality, of course, $v' \neq -v$; for $v't' : vt = ct' : (c \pm v)t$ so that $|v'| = |vc/(c + v)|$, and, as common sense would dictate, $ct = ct'(1 + v'/c) = ct$ because $(1 + v'/c) = 1/(1 - v/c)$.

Perhaps one might hope that the failure to spot this incredibly stupid error represents at least some small dent in the triumphalist relativistic armour.

References

1. Harvey R. Brown and Adolfo Maia Jr., "Light-speed Constancy Versus Light-speed Invariance in the Derivations of Relativistic Kinematics," *The British Journal for the Philosophy of Science* 44(3): 381–407, September 1993.

G. Walton
18 St. Swithun Street
Winchester SO23 9JP (UK)

Reply to Wilhelm

Wilhelm (1996) misrepresents the Bergman-Wesley (1990) spinning-ring model of the electron. I find too little physics in his complaints to warrant a rebuttal.

References

Bergman, D.L. & Wesley, J.P., 1990, *Gal. Electrodyn.* 1:63–67.
Wilhelm, H.E., 1996, *Apeiron* 3:54–55.

J.P. Wesley
Weiherdammstrasse 24
78176 Blumberg, Germany

Determination of Proton and Neutron Radii

The Newtonian gravitation formula has the following form:

$$F = -G\frac{M_1 M_2}{R^2} \tag{1}$$

We assume

$$G = K_o \rho_1 \rho_2 \tag{2}$$

where ρ_1 and ρ_2 denote the densities of both M_1 and M_2 separately. Using the Cavendish experiment we determine K_o. In (2) $G = 6.7 \times 10^{-8}$ cm^3/g sec^2 and the density of lead $\rho_1 = \rho_2 = 11.37$ g/cm^3. From (2) we have

$$K_o = 5.2 \times 10^{-10} \text{ cm}^9/\text{g}^3 \text{ sec}^2 \tag{3}$$

Thus, K_o is a new gravitational constant.

By using (2) we determine the proton radius ϱ_p. From (2) we have

$$\varrho_p = \left(\frac{9K_o m_p^2}{16\pi^2 G_S}\right)^{1/6} \tag{4}$$

In the nucleus the strong interaction prevails. We have [1]

$$\frac{\text{strong interaction}}{\text{gravitational interaction}} = \frac{G_S}{G} = 10^{38} \tag{5}$$

where $G_S = 6.7 \times 10^{30}$ cm^3/g sec^2. We know the proton mass $m_p = 1.67 \times 10^{-24}$ g. From (4) we obtain the proton radius

$$\varrho_p = 1.5 \times 10^{-15} \text{ cm} \tag{6}$$

In the same way we have the neutron radius

$$\varrho_n = 1.5 \times 10^{-15} \text{ cm} \tag{7}$$

The author is indebted to Prof. Zho Maoxiao for suggestions.

Reference

1. Elementary Particle Physics Panel et al., *Elementary Particle Physics (Physics Through the 1990s)* National Academy Press, 1986.

Jiang Chun-Xuan
P.O. Box 3924, Beijing
P.R. of China

Can Gravity be Explained in Classical Terms?

This question must deal with what gravity really is, whether our proposed understanding fits all observations, and would any differing explanation violate some of these observations.

The most profound ones are that gravity acts orthogonal to the surface of a body, that its effect diminishes with the square of the distance from the body and its effect is proportional to the respective masses. The not so obvious one is that objects of different mass fall at the same rate of acceleration (Galileo's experiment).

We know and experience that any smaller object falls towards a larger one and that no known material can shield the effects of gravity; further, as Einstein noted of the experience of a man falling from a roof, that a falling body experiences no discernible active force.

A falling body must then be considered at rest in its space and, given that it did not initiate the acceleration, we must assume that the enveloping space itself is moving towards the larger body. If the falling man let go of a tool at the start of his fall, then that tool would, enveloped in its own space, experience exactly the same acceleration and so its space also moves towards the larger body.

The fact that the man and his tool have mass means that they in turn will attract smaller masses in a suitable environment like in space, far away from large bodies, so they too have space flowing towards them: Gravity is a flow of space into an object of any mass and proportional to that mass.

If we consider the space in the distance between the falling objects and the earth in our example, it can be seen that those falling objects subtract from the available space ahead in exact proportion to their masses resulting in the nullification of their mass difference and they will fall at the same rate, which is a simple and direct explanation for Galileo's experiment.

So far we have called gravity a flow of space, explained the observations in everyday terms, did not violate any available evidence and left all the external mathematics intact.

This is going to change however when we consider what is happening inside a massive body like the planets and stars etc. All indications so far are that bodies of all sizes are existing in their space, partaking of that space as required, and only fall towards a body of a greater mass when their space envelope is drawn towards that body.

When combining this with the fact that nothing known can shield gravity we must conclude that any freely moving particles at the center of a planet or star are subject to the same laws and will also move towards the greater mass which always surrounds them and that the true center of gravity of gaseous or partially molten planets and stars resides at the spherical border between equal masses, which is at approximately 72% of the radius from the center.

This view goes a long way in explaining exploding stars, jets, ring-galaxies and ring-nebulae: the inward pressure of

the outer shell is balanced by the outward pressure from within and it is understandable that the rate of rotation with its centrifugal force is an important factor that determines the stability; changes in the rate of rotation or internal pressure could have disastrous consequences (as observed).

It will be noted that in the foregoing the gravitational force is not considered to originate from the center of all bodies in spite of the fact that it is directed that way when observed from the surface.

The fact that the earth is thought to have a heavy solid core in order to explain the total mass, should have pointed to the solution proposed here, namely that the material is concentrated in a much larger area: the boundary of equal masses which can contain much more concentrated matter than a core could.

It is therefore clear that the proposal herein only presents problems for the present views and none at all with observations.

Leo VanderByl
29787 Zero Avenue
Abbotsford B.C. V4X 2J4

A Universe without a Big Bang

Nowadays, we can even see into black holes (Mészáros 1994). Nevertheless, some authors only know one side of the published results in cosmology. The big bang is actually dead. (cf. Mészáros and Molnár 1988, 1989a,b, 1990, 1991, 1992). As can be seen from these papers, the standard cosmology (i.e. the big bang) should be considered ideology, since it does not satisfy the requirements of exact physical theory. It lacks consistency, an exact mathematical description of phenomena and the possibility of verification and confirmation. For instance, in the big bang theory, it is correct to state that "the big bang happened if nine is greater than or equal to sixteen".

Furthermore, the big bang cosmology does not have a single solution compatible with its postulational basis. As a consequence of the violation of causality, it is probable that not one single relativistic model can be adapted to this situation. Therefore, the origins of the Hubble law and the 3K blackbody radiation remain unclear; moreover, they are not evidence of the big bang.

In addition, the above statements for the standard big bang are hereditary for inflationary cosmological models. Namely, in these models, which are based on the standard big bang, the evolution of the universe is completed in a short time interval of 10^{-43} s to 10^{-30} s only. Some prejudiced authors suggest that, after all, in the hot universe, the equilibrium state of photon gas $P =$ constant and $T =$ constant should be called the "adiabatic-isothermal changes of state" of the photon gas.

What is more, Friedmann did not know the 1892 and 1894 stability results of his compatriot Liapunov in 1922 and 1924. Therefore, Friedmann's stability results are entirely wrong. But, since then mathematical stability theory has been developed but not used in cosmology. So Friedmann's stability investigations are archaic from the modern mathematical viewpoint.

It can be seen from these references that the big bang model was a purely fictitious one for the dynamical universe model with an inadequate instrument-system for such a model. Consequently, the big bang or big crunch means the explosion or collapse of conceptual categories only, but not the gravitational explosion or collapse of the universe. As a result, after the often metaphysical optimism of a century, we again return to the fundamental questions.

The scientific merit of the Standard and inflationary model is that it connects the physical processes in such a way that the logical structure of the universe becomes related to its history. Furthermore, these models are dynamical cosmologies and so raise the notion of the genesis of the elements. "If some day the Standard Model is replaced by a better theory, it will probably be because of observations or calculations that drew their motivation from the Standard Model" (Weinberg 1977).

I propose that the authors involved should think about rewriting their texts completely, only if after an exhaustive open-minded search through the modern literature they still feel absolutely convinced that not everything in their papers has been properly treated in all the up-to-date texts. After their exhaustive and objective investigations it will be seen that the big bang is dead. Therefore, new models of the universe without the big bang are necessary.

References

Mészáros, M., 1994, *International Journal of Theoretical Physics* 33:1035.
Mészáros, M. and Molnár, P., 1988, *Annalen der Physik* 45:155.
Mészáros, M. and Molnár, P., 1989a, *Annalen der Physik* 46:153.
Mészáros, M. and Molnár, P., 1989b, *Annalen der Physik* 46:381.
Mészáros, M. and Molnár, P., 1990, *Physics Essays* 3:284.
Mészáros, M. and Molnár, P., 1991, *Indian Journal of Pure and Applied Physics* 29:34.
Mészáros, M. and Molnár, P., 1992, *Physics Essays* 5:463.
Weinberg, S., 1977, *The First Three Minutes*, Basic Books, NY., p. 11.

Milan Mészáros
Innovation Co. for Telecommunications
64-66 Ungvar Street
H-1142 Budapest, Hungary
email: Meszaros.Milan@tki.hu

Relativity Revisited

When Newton introduced his laws of motion, he based them on the concept of absolute space and absolute motion. Albert Einstein being aware of the "relative" constancy of c, the speed of light concluded that "motion is never observable as motion with respect to space". The concept that light must travel in something due to its wave nature was also abandoned when no ether drag was observed on Earth's passage around the Sun. This lack of any observed ether medium led to the concept of empty space between any "material" objects in a vacuum of the outer space and the extension of the so-called "Special Theory of Relativity" to encompass gravity in "The General Theory of Relativity". The main tenets of his gravitational theory are that space itself is curved in proximity of mass and therefore "the greater the mass then greater is the curvature of space in proximity of this mass". Many observational tests have shown agreement with this theory. Einstein himself came to the wrong conclusions about the passage of time with synchronised clocks placed on the equator and at the poles because according to special relativity, the clock at the equator sees the clock at the pole moving relative to it? (*New Scientist* 21 Oct. 95 p.58)[1]. The following inconsistencies with observations need to be addressed: 1. Difficulty of unifying gravity with other forces of nature. 2: Failure of detecting gravitational waves arriving on Earth. 3: Failure of detecting vector particles for the transmission of this force to make it compatible with quantum mechanics.

Have the wrong questions been asked for their solution? One such question for which answers will be examined in the following is: What is the "fuel" of the atoms?

First Postulate: All atoms need fuel to exist, the inward flow of the fuel entity is displaced and polarised by the wave function of radiation to become the gravitational force.

Comparing this idea with General Relativity brings forth both conflicting and complimentary agreements. One starting point is the question: Could Einstein's "curvature of space-time continuum" also be explained if an invisible "fuel" of the atoms was affecting all our observations? This distinct possibility must at least be examined if it could simplify our concepts of reality. Unification of the forces of nature could be started with gravity if all atoms needed this fuel to exist. Looking then at how the atoms would consume this "fuel"? The duality of all quantum phenomena could be explained if atoms were "breathing" this stuff and thus supplying their fuel deficiencies in the form of the gravitational flow. This at once conflicts with the existence of "gravitational waves" because the fuel input (in this theory) is always inward, but since no such waves have been observed to arrive on Earth, we can go on theorising. Extending the concept of breathing of all living beings to atoms will also help to change our illusion of the passage of time.

Second Postulate: All matter (protons) is conserved in a gravitationally contracting entity, hence it (protons) will decay in an expanding one.

The non decay of the proton here on earth may be environmental and the following chain of events can be postulated.

Third Postulate: The wavelength of a given frequency of radiation is the minimum volume in a given space required to reach a minimum density to "fire" one quantum h (Planck's constant).

Condensation theory is no longer viable for the initial birth of the stars and planets because there is up to 10^6 too much angular spin momentum in the star forming clouds to condense into stars. There may be a "continuous emission" from a high density gravitational entity at the cores of Galaxies.

Such substance is lacking in the General Theory of Relativity.

References

1. Referring to an error in Einstein's 1913 special theory of relativity by Gerald Pellegrini (*New Scientist*, Science, 16 Sept. 95) Herbert Dingle in *Science at the Crossroads* in 1972
2. Voids. *Astrophysical Journal* Sept.10 1990.
3. Dichotomy. *Sky & Telescope* Jan. 1992 p.105
4. Are Saturn's rings hiding mystery moons? *New Scientist* 21 Oct.1995. p.20. by Jeff Hecht, Boston
5. *Astronomy* May 86 p. 69.
6. *New Scientist* July 87 p. 26. *Sky & Tel.* Dec.91 p588
7. *Scientific American* April 1986. p.40. The Quantized Hall Effect
8. *Astronomy* Dec.1988 p. 10. Ice volcanoes on Uranian satellites.
9. *Astronomy* Jan.1990. Seeing the unseen Sun. p. 30. by Richard Talcott.

Karl Teppo
23 Rumrunner Street
Mermaid Waters 4218
Queensland, Australia

Corrigenda

Volume 3, No. 2:

Page 31 after equation (3) should read:

"... The gravitational field determines the property of the gravitational wave;..."

Page 31, col. 2, lines 13–14 should read:

"... obtained a four-soliton solution and the collision between two of them,..."

Page 31, after equation (9) insert:

$$R_{\alpha\beta} = -\frac{1}{2} g^{\mu\nu} \frac{\partial^2 g_{\alpha\beta}}{\partial x^\mu \partial x^\nu} + \Gamma^\mu_{\alpha\beta} \Gamma^\nu_{\mu\nu} \quad (10)$$

Page 32 after equation (13) should read:

"and if $j = k$,..."

Page 32 after equation (17) should read:

"...; then $h_{jj} = C_o^{-1/2}$ for $x_j \to 0$; $h_{jj} \to 0$ for $x_j \to \infty$."

Page 32, Section 4, lines 10–11 should read:

"…; the gravitational wave possesses the self-induced transparency and the self-focusing effect,…"

Addendum to Monstein and Wesley (Vol. 3, Nr. 2, pp. 33–37)

The value of the absolute velocity of the solar system v_o in Table 1 above was computed neglecting the Earth's orbital velocity about the sun; because the Earth's orbital velocity, being only about 10% the absolute velocity of the solar system is smaller than 1/4th the experimental error found. However, when the Earth's known orbital velocity is subtracted off (as it should be in principle), a discernable improvement is achieved. From the accumulated data to 11 April 1996, subtracting off the Earth's orbital velocity, yields a solar system velocity of

$v_o = 340 \pm 150$ km/s, $\alpha_o = 9.4 \pm 3.1$h, $\delta_o = -8.1 \pm 16.0°$.