@ ISSUE

Correspondence, conference threads and debate

Passing of Patrick Fleming

The untimely death of Patrick Fleming occurred in July 1998. Pat will be known to many who have attended International Conferences on Relativity.

He was what we call a 'gentleman' to his fingertips, always courteous, friendly and helpful. His early career was working in Thermal Power stations; latterly he worked in the National Standards Institute of Ireland. Pat's hobby was attending the Relativity Conferences and he devoted most of his holidays to that. He presented a paper on the Sagnac effect at the Athens Conference in June 1997, which is to be found in the recently published *Open Questions in Relativistic Physics*" published by Apeiron. We shall miss him.

Al Kelly

On the Gravitational Redshift

In *Apeiron* of July-October '98, Dr. Munera (p. 169) considers the gravitational redshift from the viewpoints of the Newton theory and the general theory of relativity (GTR). He emphasizes that taking into account the relativistic relation for energy $E = mc^2$, *i.e.* in the Newton relativistic theory, the frequency shift of a photon follows from the law of energy conservation.

When a free excited nucleus of mass M' emits a γ-quantum (photon) $h\nu$, we have a balance of energies

$$M'c^2 = Mc^2 + h\nu \qquad (1)$$

When the radiation process occurs in a gravitational field (with the Newton potential Φ), we have the corresponding energy balance

$$M'c^2 + M'\Phi = Mc^2 + M\Phi + h\nu_g \qquad (2)$$

Whence, taking Eq. (1) into account, it directly follows

$$\nu_g = \nu\left(1+\frac{\Phi}{c^2}\right) \qquad (3)$$

i.e., the gravitational redshift is a classical effect and does not require GTR.

What is more, the known GTR formula[1]

$$\nu_g = \sqrt{g_{00}}\nu \cong \nu\left(1+\frac{\Phi}{c^2}\right) \qquad (4)$$

is a consequence of the non-Euclideanness of 4-space (its time property). This is expressed by the dependence of the g_{00}-component of the metric tensor on the gravitational potential. Thus, according to GTR, "a clock goes slower the larger the mass of matter placed near it."[2]

However, attention should be given here to the following. As it follows from formula (4), the frequency of emitted and absorbed light increases with carrying atoms, say, in the direction of decreasing gravitational field. Besides, the carried clock must go synchronously with the "local" clock. It is evident that carrying the clock (atoms) can be replaced by the transportation of the radiation itself—light. "Thus, it is that the light ray emitted in the region with a definite gravity potential from S_2 and having at its emission the frequency ν_2, measured by a clock placed in S_2, has another frequency when it arrives in S_1."[1] For this

$$\nu_1 \cong \nu_2\left(1+\frac{\Phi}{c^2}\right) \qquad (5)$$

where $\Phi = \Phi_1 - \Phi_2$

Let the light be emitted on the Sun's surface, where its frequency is

$$\nu_2 \cong \nu\left(1+\frac{\Phi_2}{c^2}\right) \qquad (4a)$$

According to (5), this radiation has frequency n1 when it arrives at the Earth. Substituting formula (4a) in expression (5) we obtain

$$\nu \cong \nu\left(1+\frac{\Phi_1}{c^2}\right) \qquad (4b)$$

As the frequency of the arrived radiation coincides with the corresponding "terrestrial frequency," then according to GTR the shift of spectral lines should not be observed.

References

1. Einstein, A. – *Ann. Phys.*, 1911, 35, p. 898.
2. *Idem – The Meaning of Relativity*, Princeton, Princeton Univ. Press, 1921, Lecture IV.

General Relativity: Incompatibility of two formulae for frequency shift

In my previous note [1], I emphasize the following. The gravitational shift of spectral lines predicted by Einstein [2] is a consequence of the relativistic law of energy conservation in a gravitational field.

Below, attention is given to the fact that there are two incompatible formulae for the light frequency in the general relativity theory (GRT).

On the one hand, according to GRT [3]: "The radiation frequency of an atom on the surface of celestial body is a little bit smaller than the radiation frequency of the atom of the same element in free space .

This is expressed mathematically by the known Einstein formula

$$\nu_E \cong \nu_0\left(1+\frac{\Phi}{c^2}\right), \qquad (1)$$

where ν_0 is the frequency of free photon and, Φ the Newton gravity potential ($\Phi = -|\Phi|$)

On the other hand, according to GTR "a photon in a gravitational field has "kinetic energy" $h\nu$ and "potential energy" $h\nu\Phi$, and their sum remains constant"[4], where $c = 1$. The second quantity for very weak fields can be neglected. As a result, we have

$$h\nu_0 = h\nu + \frac{h\nu\Phi}{c^2}, \qquad (2)$$

whence it follows

$$\nu_W = \nu_0\left(1+\frac{\Phi}{c^2}\right)^{-1} \cong \nu_0\left(1-\frac{\Phi}{c^2}\right). \qquad (3)$$

"We see that the light frequency increases with rising the absolute value of the gravitational field potential, *i.e.*, when approaching the bodies creating the field; on the contrary, the light frequency decreases as a ray moves away from these bodies"[5].

It is quite evident that formula (3) is incompatible with equation (1) verified experimentally.

References

1. Strel'tsov V.N – *Apeiron*. This issue.
2. Einstein A. – *Ann.Phys.*, 1911, 35, p.898.
3. *Idem* – *Uber die specialle und die algemeine Relativitatstheorie* (Gemeinverstandlich) Druck und Verlag von Friedr. Vieweg & Sohn, Braunschweig, 1920, Appendix IIIc.
4. Weinberg S. – *Gravitation and Cosmology*. John Wiley & Son, 1972, Ch.3, p.5.
5. Landau L.D., Lifshitz E.M. – *The Theory of Fields*. Nauka, M., 1960, p.89.

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"Mass creation"

In Arp's paper (*Apeiron*, Vol. 5, '98) he introduces $m = at^2$, suggesting that particle mass is some function of time. Later, he confirms that "New mass is created…." To me, "creation" in any literal 'something from nothing' sense, is nonsense. And, while I am happy to see the Big Bang/Expanding Universe theory dethroned, I cannot buy into "Continuous Creation." Can H. Arp shed any light on his use of "creation"?

An alternative to these theories is the Cosmic Cycle, mentioned in M. Edwards' paper (also in this issue of *Apeiron*), a concept that I've been studying for some years and agree with. Unfortunately, Edwards proposes Tired Light as the cause of the Cosmological Redshift, but this is a rather tortured explanation.

As the stars of a galaxy burn and transform matter into energy, no mass is lost, *i.e.*, the newly formed energy acquires the mass according to $E=mc^2$. (By solving for c, in terms of permeability and permittivity, we get $E=m/(\mu\varepsilon)$, a formula which has possibilities. *E.g.*, it suggests that the E produced by transforming a given quantity of matter could be affected if the characteristics of space (μ & ε) were to change.)

In a Cosmic Cycle the "ashes" from the dying galaxies of stars must be re-assembled into new galaxies on a 100% basis, *i.e.*, the material debris and the energy from the one are the constituents of the other. This means that the energy, in the energy [$E=m/(\mu\varepsilon)$] of the one must become material mass [$m=E(\mu\varepsilon)$] of the other. One cannot escape the thought that the energy in question is not the energy of the em radiations.

Returning to the Tired Light hypothesis, consider matter-to-energy-to-matter *etc.*., *etc.*. cycles of the preceeding paragraph in context with an infinite universe in which an infinite number of such cycles are in process. Every star in a galaxy is spewing matter and energy into a space that is bounded on all sides by galaxies doing the same thing, which are, in turn, bounded by galaxies, *etc*., *etc*., to infinity. The result is that the debris and energy being sent into space is added to the debris and energy already occupying that space. Consequently, as there is no room into which to expand, the density of the space medium must increase to accommodate the added "ashes," and that at a constant rate, the sum of the stellar constants of the stars of all the galaxies near that space. This, in turn, causes the permeability and permittivity of that space to increase and the speed of light to decrease, also at a constant rate.

(In answer to the question "Is this not a one-way activity and therefore self-defeating?" the answer is "No" because this is only the dispersion half of the cycle. For each galaxy that burns up, a new galaxy is formed, but not at the same rate. *I.e.*, it may take a galaxy a trillion years to die, while a new galaxy may form in as little as a billion years, or less. This means that 1000, or more, times the volume of space is involved in burn-up than in re-assembly. The light in transit is thus more affected by increasing rather than by decreasing densities.)

Now, one may contrive an experiment wherein an Observer of some source radiation (SF), arriving from some fixed distance (D) through a medium which is increasing in density at some constant rate (R), will observe that radiation at a lower frequency (OF). From this set-up one may derive the formula:

$$OF = SF(1 - R)^D.$$

This formula provides a redshift which is a function of distance, and the average of any number of constant rates-of-change in the density of the space medium surrounding each galaxy.

It seems that the space medium (the material vacuum; the aether; the "?") must be a tangible entity, perhaps already having been 'felt' as the Dark Mass of Rubin, *et al*. It also seems that, if the cosmic cycle is real, there is but one candidate for that medium, namely, Energy. Not the em wave energy, but a fundamental entity having the characteristics of mass (thereby being gravitationally responsive) and charge (thereby being self repulsive). With such characteristics it would develop a density gradient in and around any mass concentration, from inter- galactic to intra-atomic.

Returning to Arp's ejected Quasars, they are described as expanding into galaxies as they recede from their parent galaxy, which implies that they were highly compacted objects at birth. If the energy (of the preceding paragraph) were highly compressed within the atoms of the Quasar, one might suppose that it is orbiting electrons would move at a less rapid rate than normal, and that as the new galaxy expanded and the compression became less their orbiting speed would increase. This would explain the initial high "intrinsic" redshift. One could also envision that the increase in orbital speed could occur in steps as the compression decreased, rather than gradually, due to the need for a certain amount of force to build up before the electron could change its speed. This could explain the quantization of z.

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A Solar System Symmetry

Several years ago, not long after commencing my theoretical study of the Solar System, I carried out the following steps using generally published data on the properties of the planets.

(i) determined the orbit distance from the Sun at which all planetary mass should be placed to give the same force of attraction on the Sun as the sum of the forces of the planets in their present orbits. The orbit distance comes to 5.3 AU and at this distance the orbit speed is 12.9 km sec^{-1}.

(ii) determined the ratios of the planet orbit speeds to 12.9 km sec^{-1}, and from them developed the formula: orbit speed = 12.9×1.23^n.

(iii) made up a table of orbit speeds as follows (km sec^{-1}):

Planet	No	Calculated speed	Measured speed	%age difference
Mercury	+6	44.7	47.9	–7.2
Venus	+5	36.3	35.0	+3.6
Earth	+4	29.5	29.8	–1.0
Mars	+3	24.0	24.1	–0.4
	+2	19.5		
	+1	15.9	—	
Jupiter	0	12.9	13.1	–1.5
	–1	10.5	—	
	–2	8.5		
Uranus	–3	6.9	6.8	+1.0
Neptune	–4	5.6	5.4	+3.6
Pluto	–5	4.6	4.7	–2.2

(iv) study of the table gave the following conclusions:

(a) there is a symmetry of the n numbers about Jupiter.

(b) the $n = +2$ and $+1$ values give the speeds of the inner and outer edges (from the Sun) of the asteroid belt, while the root mean square of the two speeds (19.5 and 15.9) gives 17.79 km sec^{-1}; *i.e.* about –0.5% less than the orbit speed of Ceres. (Putting $n = +1.5$ in the equation gives 17.60.)

(c) the root mean square of the speeds for the n values –1 and –2 gives 9.55 km sec^{-1}; *i.e.* less than –0.5% from the orbit speed of Saturn. (Putting $n = –1.5$ in the equation gives 9.46.)

(d) noting that the calculated speeds of Mercury and Pluto (farthest bodies on both sides from 5.3 AU) are less than the measured , and the calculated speeds of Venus and Neptune (nearer bodies) are greater than the measured, it is possible to refine the speed formula for these four planets as follows:

for Mercury and Neptune, $v = 12.9 \times (1.23 \times 0.98^{-1/2})^n$;
for Venus and Pluto, $v = 12.9 \times (1.23 \times 0.98^{+1/2})^n$.

These formulae give speeds –0.8, 0, –1.4, and +2.0% different from the measured values.

The above results were entered in my "book" written as a record of my studies in 1994 (pp. 263-265) and a very limited number of the "book" distributed.

I find it interesting that Neptune is not an exception in this equation, as it is in equations relating orbit distances.

The number 1.23 is, of course, a well known number in Universe formulae. 0.98 is very common in Solar System ratios and is a disguised form of 0.724 (= 0.9816), which is even more common. The reciprocal of 0.724 is 1.38.

Actually, the equation $v = 12.9 \times 1.2335^n$ gives on average better speed values for the planets (slightly worse for Venus and Pluto) and $1.2335^{3/2} = 1.37$, a number occurring occasionally in Universe formulae.

Again, if the total mass of the planets and satellites is multiplied by 12.9 the result is 35729.13×10^{24} kg km sec^{-1}, which can be written $1.19 \times 1.38013^{32} \times 10^{24}$. Deducting the mass of Saturn from the total mass and multiplying by 12.9 gives the number 28394.19×10^{24}, which in turn can be written $1.19 \times 1.37026 \times 10^{24}$. And $1.19 \times 1.23 \times 1.37$ is of course within 0.3% of the number 2.

Finally, I point out that 12.9, the speed of orbit at 5.3 AU, equals 1.37665^8 while 1.38^8 equals 13.15, very closely the speed of orbit of Jupiter.

Have the relationships given above any significance? Do they say something about the origin of the Solar System? Is there any physicist reader of *Apeiron* prepared to comment on the equation and the deductions developed from it?

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Recycling Radiant Energy to Material Particles

Matthew R. Edwards, in his excellent article "Evidence of a Cosmological Matter and Energy Cycle," *Apeiron*, vol 5, p.157 (July-October 1998), on the subject of an infinite steady state universe, cited the hypothesis of McMillan (1918) that starlight may be recycled back to hydrogen atoms directly, a highly unlikely process. But Edwards failed to cite three other papers which propose the conversion of starlight back to matter by an intermediate process under which photons of starlight emit tiny material particles which are later converted to electrons and protons, which in turn form hydrogen atoms. See F.C. Jelen, *The Toth-Maatian Review*, p. 1361 (October 1984); H.P. Dart, III, *Apeiron* No. 17, page 1, (October 1993); and Colin Walker, *Journal of New Energy*, vol. 1, No 6, p.88, (1996).

Jelen, in his paper, proposes that radiant energy moving through space "leaves in its wake a tenuous trail of mass" which later "coalesces to stars and galaxies." He does not postulate the production of discrete particles, nor does he explain the process further.

My paper (Dart, 1993), and that of Walker (1996) both postulate the ejection of discrete particles, each particle having an energy of *Hh* (the product of the Hubble constant multiplied by Planck's constant), and having a mass on the order of 10^{-65} gram. It would reguire 10^{38} of these particles to equal the mass of one electron.

I claim that my theory is superior to all others in that it not only fully explains the Hubble redshift on an exponential decay basis, but it also proposes that the small ejected particles, which I have renamed "ejectons," are drawn eventually into the into the giant central stars at the centers of most galaxies, where they are converted by pressure into electrons and protons, and thereafter ejected into outer space in the powerful jets that are observed. The electrons and protons later unite to form hydrogen atoms.

The problem raised by Edwards, that a complete recycling process requires that white dwarfs and neutron stars must be recycled back into hydrogen gas, is answered by a somewhat similar process that takes place in the centers of the giant stars that exist in the nuclei of most galaxies. Within the center of a giant central star, such as the one in M87, gravitational forces between particles on the atomic level that hold together super-dense stars, operate repulsively, thereby breaking up such stars into the hydrogen atoms of which they are composed. The central stars are so large they can swallow small stars as easily as they can swallow small pieces of matter.

The forces that operate in the central stars are size dependent. The same forces that operate to separate atoms in super-dense stars, operate to unite the very small ejectons, thereby creating electrons and protons. This may seem to be contradictory, but it is not when we consider that the universe is hierarchical in structure, from the microcosmic to the macroscopic. It is forces that separate one hierarchical level from another, and forces are vectors that differ only in direction and magnitude. A more complete study of the problem is required before any definitive conclusions can be reached.

Black Holes

In *Apeiron,* Vol. 5, Nr. 3-4, for July-October 1998, J.O. Campbell cites five ojections to black holes, but he failed to cite the most important objection, namely, that Newton's formula for escape velocity is invalid. Newton's formula for escape velocity is

$$v = \left(2GM/R\right)^{1/2}$$

where v is the escape velocity, G is the gravitational constant, M is the mass of the spherical body from which we want to determine the escape velocity, and

R is the distance from the center of that body from which the escape velocity commences.

Every astronomer will concede that the free fall velocity of a particle falling from outer space to a point near a massive body is identical to the escape velocity from that point to a point in outer space beyond the gravitational field of the massive body in guestion. Newton's formula predicts escape speeds greater than the speed of light. Therefore, Newton's formula predicts similar free fall speeds when the particle returns to the starting point. I say that any formula which predicts speeds greater than the speed of light is *ipso facto* void, which of course means that Newton's formula is void. And it should be pointed out here that the general relativity free fall speeds are identical to those predicted by Newton's escape velocity formula.

When one declares that a Newtonian formula is invalid, it is a good idea for that person to have an alternative formula on hand that does not suffer from the same defect. In this case the writer has in fact derived a formula for escape velocities (or free fall speeds) that never exceed the speed of light. The derivation of the formula and a comparison between the results predicted by that formula and those predicted by the general relativity (Newtonian) formula are shown in an article by the author entitled "Repulsive Gravity," published in *The Toth-Maatian Review,* Volume 13, No.2, 1996, pp.6049-69. See Table I on page 6052 of that article.

But the author went farther than merely showing that the free fall speeds never exceed the speed of light. The speeds which appear in Table I are not modified by gravitational time dilation, an effect ironically predicted by Einstein, and proven by experiment. When we modify those speeds by the time dilation factor, we find that free fall speeds increase until they reach 0.5 *c* at a distance of 1.207 Schwarzschild radii from the center of the massive body. Thereafter, the free fall speeds decrease toward zero.

The fact that free fall speeds decrease after the falling particle reaches a speed of 0.5 *c* at 1.207 Schwarzschild radii indicates that within that radial repulsive forces are at work which slow the particle down. Needless to say, the massive body must have a substantial portion of its mass located outside of the 1.207 Schw. radius where the mass is pushing inward, while the interior mass is pushing outward. This finding by the author is a very important discovery for it means that the theory of complete gravitational collapse is rendered invalid. The repulsive *gravitational forces* at the center prevent the collapse. I want to make it clear that these findings are entirely my own, and to the best of my knowledge no one from time of publication in 1966 to the present has taken any interest or cognizance of them, although the predictions are compelled by known principles.

Table I. SFT and GRT free fall speeds;
General Formula: $v/c = \sqrt{N^2 - 1}/N$

Dist. in Schw. Rad.	Speeds using SFT scale factor $N = 1 + GM/Rc^2$	Speeds using GRT scale factor $N = (1 - 2GM/Rc^2)^{-1/2}$
500	0.0447 *c*	0.0447 *c*
5.0	0.417 *c*	0.447 *c*
2.0	0.600 *c*	0.707 *c*
1.207	0.707 *c*	0.910 *c*
1.0	0.745 *c*	1.000 *c*
0.5	0.866 *c*	1.414 *c*
0.2	0.958 *c*	2.236 *c*
0.1	0.986 *c*	3.162 *c*
0.0	1.000 *c*	Infinite

The above figures are the terminal speeds of a particle falling from outer space to the distance indicated in Schwarzschild radii from the center of a massive body. The general formula from which these speeds are derived does not take into account the modification due to the gravitational time dilation factor. When we use the SFT scale factor, $N = 1 + GM/Rc^2$, free fall speeds never exceed the speed of light. But when we use the General Relativity scale factor, $N = (1 - 2GM/Rc^2)$ free fall speeds increase beyond the speed of light without limit.

Table II. SFT Speeds Modified by Time Dilation:
General Formula: $v/c = \sqrt{N^2 - 1}/N$

Dist. in Schw. Rad.	SFT: $N = 1 + GM/Rc^2$	SFT Speeds from Table I Divided by *N*
500	1.001	0.0447 c
5.0	1.100	0.379 *c*
2.0	1.250	0.480 *c*
1.207	1.414	0.500 *c* (max)
1.0	1.500	0.497 *c*
0.S	2.000	0.433 *c*
0.2	3.500	0.274 *c*
0.1	6.000	0.164 *c*
0.0	infinite	0.000 *c*

This table depicts repulsive gravity in graphic form. The speeds, modified for time dilation, increase to the distance 1.207 Schwarzschild radii, where scale factor $N = \sqrt{2} \approx 1.414$ at which point maximum speed of 0.5 *c* is attained. Thereafter, speeds decline indicating repulsive forces at work. Real stars cannot exist unless the critical scale factor, $N = \sqrt{2}$, lies inside the star, for if all the matter in the star were subject to repulsive gravity, the star would disintegrate.

Table III. GRT speeds modified by time dilation:
General Formula: $v/c = \sqrt{N^2 - 1}/N$

Dist. in Schw. Rad. $N = 1 + GM/Rc^2$	GRT: $^{2)-1/2}$	GRT Speeds from Table I Divided by N
500	1.001	0.0446 c
5.0	1.118	0.443 c
2.0	1.414	0.500 c
1.207	2.415	0.377 c
1.0	infinite	0.000 c
0.5		
0.2		
0.1		
0.0		

This table, by way of comparison, shows the free fall relativity speeds from Table I, modified by the relativity scale factor for time dilation. Curiously, the modification results in the speed reaching a maximum of 0.5 c, but it reaches that point at 2 Schwarzschild radii, rather than at 1.207 Schw. radii, while at 1 Schwarzschild radius, the black hole radius, the lling particle comes to a halt due to repulsive forces that begin at 2 Schw. radii.

TABLE IV. Conservation of energy in free fall speeds modified by time dilation factor:

Rest Energy Remaining = $\left(mc^2\right)_o\sqrt{1-\left(\beta/N\right)^2}$ **,**

where $\beta = v/c$; Kinetic Energy = $(mc^2)_o$ – Rest Energy Remaining

Dist. in Schw. Rad.	SFT $N = 1 + GM/Rc^2$	Modified Speeds from Table II	Rest Energy Remaining $\times (mc^2)_o$	Kinetic Energy $\times (mc^2)_o$
500	1.001	0.0447 c	0.999	0.001
5.0	1.100	0.379 c	0.925	0.075
2.0	1.250	0.480 c	0.878	0.122
1.207	1.414	0.500 c	0.866	0.134
1.000	1.500	0.497 c	0.868	0.132
0.500	2.000	0.433 c	0.901	0.099
0.200	3.500	0.274 c	0.962	0.038
0.100	6.000	0.164 c	0.986	0.014
0.000	infinite	0.000 c	1.000	0.000

Total energy, $(mc^2)_o$, is always constant. When the speed of the falling particle reaches its maximum at 0.5 c, the kinetic energy reaches its maximum at $0.134(mc^2)_o$. Just as a ball thrown above the earth loses speed, and gains potential energy, so particles here undergo the same experience. But in this case the particles are in the interior portion of the star, for a star whose entire mass lies in a region where the scale factor is greater than 1.414 is not stable.

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From the Cause of Gravity to the Revolution of Science

Newton's Law of Gravity involves a contradiction. On the one hand it states that gravity is dependent upon the mass of bodies and on the other it states that for bodies near the surface of the Earth, it is not dependent upon the mass of bodies. Only if gravity is caused by the absorption of radiation can this contradiction be overcome, and the best possible representation of this involves a revolution for science.

It is fundamental in Newtonian physics that $m = F/a$. However, with regard to a body subject to attraction the force and the acceleration are due to the body absorbing radiation within a context of the increasing density of radiation. The law of the conservation of mass states that a change in a body's mass is accompanied by the absorption or emission of radiation. The absorption of radiation gives rise to increasing mass, which gives rise to increasing absorption capacity, which gives rise to increasing mass, *etc*. Radiation is matter in the form of particles and is a process of dispersion, differentiation, collection, and radiation of particles. Only by a body subject to attraction increasing in mass through the absorption of radiation can the fact that the attraction involves acceleration and not merely velocity, be adequately explained.

Newton's law of gravity states that the attraction between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between the bodies: $F = m_1m_2/r^2$. In other words, the attraction between the two bodies increases as the distance between the bodies decreases, while the mass of the two bodies remains the same. Newton's law implies that if we stopped the two bodies from moving towards each other the force of attraction between them would still exist and be the product of their masses.

The application of Newton's law entails the constant of proportionality G so that his law takes the form of $F = G(m_1m_2/r^2)$. Thus G is the most fundamental unit of gravitational attraction. G is determined by measuring the attraction between bodies on a torsion balance. This means that the attraction of the bodies to each other on this apparatus is partially restrained. This supports my contention that "Newton's law implies that if we stopped the two bodies from moving towards each other the force of attraction between them would still exist and be the product of their masses." If physics sees gravity as the attraction between macro-scale bodies, then why is the fundamental unit of gravity determined by the attraction between bodies on a torsion balance? It is clear to me that the torsion balance measures electro-

static attraction, and that the mechanism of this attraction is the same as that for the gravitational attraction between macro-scale bodies, *i.e.*, the aborption of radiation. With this mechanism of electrostatic attraction in place, we can see that repulsion involves bodies pushing away from each other due to the equivalence in their radiation. More importantly we can see the absorption of radiation as the mechanism of attraction at the scale of molecules, atoms, particles, sub-atomic particles, and sub-sub-atomic particles, *etc.*

The torsion balance measurement of G is conducted on the surface of the Earth. When it is conduct below the surface of the Earth, in a deep mine shaft, the attraction between the bodies increases. This is not surprising given that in a deep mine shaft the decay of the surrounding rocks increases the density of the radiation impacting upon the bodies, thereby causing an increase in the rate of absorption and radiation (attraction) of the bodies. When Henry Cavendish first conducted the torsion balance experiment (back in the 1790's) he discovered, but didn't understand, that the attraction increased when he heated the larger of the two bodies on his torsion balance. Once again, this is not surprising because the increased radiation of the larger body is absorbed by the smaller body, giving rise to an increase in its radiation and a increase in the exchange of radiation between the bodies.

Newtonian physics states that the gravitational force on a body near the Earth's surface is expressed by $F = mg$, where g is the acceleration of bodies towards the Earth and is the same for all bodies irrespective of their mass. This is merely another way of saying $F = ma$. As I have already pointed out both the force F acting on a body and the acceleration a of the body are the result of the body absorbing radiation, and if the body is on the surface of the Earth it has no acceleration towards the Earth. Newtonian physics deals with this by saying that the body is trying to accelerate towards the centre of the Earth, but that it is stopped by the solid nature of the Earth's surface. If we accept this, and then eliminate the acceleration factor we are left with $F = m$. This means that the body stays on the surface of the Earth because it is absorbing the radiation that emerges from the surface of the Earth and that is impacting upon the surface of the Earth, and exchanges radiation with the Earth. Of course, if the body on the surface of the Earth is not to increase or decrease in mass its absorption and radiation must be in balance.

The body's radiation converges with the radiation impacting upon the body, and this constructs the frequency of the radiation of the body. Frequency and wavelength are phenomena that can be best understood as constructed from the convergence of radiation. This process is represented by the attached structure of number and arrows which is the first part of what I call the materialist paradigm of physics.

The acceleration of gravity g can be determined from measuring the acceleration of bodies towards the Earth and near the surface of the Earth. It can also be determined from $F = GmM_E/r^2$ by eliminating the factor of m to change the equation to $g = GM_E/r^2$. In relation to a body on the surface of the Earth r^2 becomes the radius of the Earth squared (R_E^2), so we now have $g = GM_E/R_E^2$. This equation must represent, at least approximately, the fact that a body on the surface of the Earth absorbs radiation from all directions and exchanges radiation with the Earth. If we see G as representing the density of radiation on the surface of the Earth (the torsion balance measurement), M_E as representing the absorption capacity of the Earth (since the mass of a body is proportional to its absorption capacity), then what would R_E^2 have to represent to give $GM_E/R_E^2 = g$? The fact is that Newton's law cannot give adequate expression to the reality of attraction being caused by the absorption of radiation, and its use-by-date is approaching fast.

The density of radiation at any point on the surface of the Earth is constructed from the convergence of the radiation from the surface with that impacting upon the surface. Much of the radiation absorbed by the Earth is *via* the magnetosphere. $F = mg$ works to the extent that it does because m equals the absorption capacity of a body and g equals the density of the radiation impacting upon the body. As a body is attracted towards the Earth its absorption of radiation increases which increases its mass which increases is absorption of radiation, *etc.*, which (as I have already pointed out) is why the body has acceleration and not mere velocity. The point is worth repeating, because physicists ignore this irrefutable logic in favour of applying mathematics. Essentially, establishment physics is an abstractionist paradigm which stands and falls in relation to the materialist paradigm of physics.

The radiation density increases by the square with the decrease in the distance to the surface of the Earth. On my paradigm a radiation density of 12(1) equals a mass increase of 2, a radiation density of 22(4) equals a mass increase of 7, a radiation density of 32(9) equals a mass increase of 16, *etc*. This mass increase gives rise to the body's radiation increasing by doubling, *i.e.* 1,2,4,6, *etc*. An 'in principle' application of my paradigm at a single point in time is as follows. Let 9→16 represent a density of radiation near the surface of the Earth (9) causing an increase in mass (16) in a body accelerating towards the Earth. [4]←16 represents the increase in radiation of the

body subject to an increase in mass which is accelerating towards the Earth. (3)→9 represents radiation from the surface of the Earth and (1)→9 represents radiation converging with the radiation from the surface of the Earth which gives rise to the density of radiation 9. [5]→(3) represents the radiation from the surface of the Earth. [5]←(1) represents the radiation impacting upon the surface of the Earth. 22→[5] represents the radiation absorbed by the Earth via its magnetosphere.

Einstein believed that mass increased with acceleration. I'm sure he would be delighted to find out that this only occurs within the context of attraction. I'm sure he would also be delighted to find out that radiation is bent around the Sun through being partially absorbed by the Sun. The so called curvature of space in the vicinity of the Sun is the result of the density of radiation increasing with the decrease in the distance to the Sun. Einstein was clever, but he was stuck within the abstractionist paradigm.

A researcher by the name of Donald Kelly demonstrated that if the absorption capacity of a body is reduced it will be attracted to the Earth at a rate that is less than when it is has not been reduced, and at a rate less than *g*. Kelly referred to the reduction of absorption capacity as "energised." So, why is the measurement of *g* found so consistently? First, the reduction in the absorption capacity of Kelly's "energised" body would have been very brief. Second, the difference in the rate at which Kelly's "energised" body was attracted to the Earth relative to its "non-energised" state would have been very small. Third, when physicist measure g they do so in a controlled manner which includes not altering the absorption capacity of bodies from their usual state, *i.e.*, not doing what Kelly did. Fourth, any results which are not consistent with *g* are discarded as anomalous. When you are committed to applying a second rate paradigm, such as the abstractionist paradigm of physics, any results which can't be explained by the paradigm are best classified as anomalous.

The fact that *g* is not as consistent as the practitioners of the abstractionist paradigm think opens up the possibility of explaining phenomena that have hitherto been ignored or inadequately explained. Could it be that some bodies when struck by lightening are "energised" and that this can lead to them briefly countering the attraction of the Earth? Also there is the matter of UFO's. Could these be balls of radiation which generally follow the lines of radiation of the Earth, and sometimes are attracted to bodies with strong radiation such as aeroplanes?

The orbital motion of the planets can be accounted for by their absorption of the radiation of the Sun and this physical connection being responsible for the planets being pulled around the axial rotation of the Sun. The planets also absorb radiation from each other and the radiation called space beyond the solar system. The centrifugal force which results from the planets orbiting the Sun, together with their absorption of radiation from other than the Sun, is how their average orbital velocities around the Sun are maintained. Then there is the solar system as a whole absorbing the radiation called space beyond the solar system and this, along with the rotation of the Milky Way galaxy, accounting for why the whole solar system moves through the radiation called space. For the average orbital velocity of the planets to be maintained requires that the density of radiation impacting upon the solar system be increasing. So it must be increasing, and the solar system as a whole must be attracted to the nearest body or bodies which have a greater radiation than the solar system.

The Sun absorbs the radiation called space and this fuels its nuclear process. The second law of thermodynamic is presently inadequately expressed. Heat is conveyed by radiation and radiation flows from a warmer body to a colder, but also flows (to a much lessor extent) from a colder body to a warmer body. You could say that a warmer body warms a colder body much more than a colder body cools a warmer body. If you put a warm and a cold body on a torsion balance you will find that they their rate of attraction will decrease with the decrease in the temperature of the bodies.

This basic explanation of how the solar system works leads to the conclusion that the Sun and planets increase in mass over time. A practioners of the abstractionist paradigm might say that surely an increase in mass would lead to the planets slowing down. A which point I would point out that inertia is not an innate property of matter unconnected to the environment of radiation in with it exists. Inertia is caused by a body absorbing radiation and is proportional to its absorption capacity. The presently accepted definition of inertia is magic.

What about electrical and magnetic phenomena? The materialist paradigm sees electricity as a process of absorption or collection and differentiation and re-absorption or collection. That is, electricity is not seen as a flow of electrons but as a process of electrons interacting with the medium of their conveyance. Magnetism is see as involving radiation of different levels so that like poles repel through an equivalence of radiation and dislike pole attract through the exchange of radiation. The armature of a generator absorbs the radiation of the magnet, and the increase in the motion of the armature increases this

absorption and hence increases the electricity which is created.

What about particle physics? The materialist paradigm defines the formation of particles from sub-particles and their differentiation called decay. It defines the absorption of radiation which underpins the deflection of particles passing through an electromagnetic field. But just as the mass attributed to the bodies and the planets by the application of Newtonian physics does not represent the real mass of the bodies and the planets, the mass attributed to particles by particle physics does not represent the real mass of particles. As the mass of bodies subject to attraction from the micro-scale to the macro-scale is constantly changing it is nonsense to talk them having a particular mass. You can only talk about their increase in mass relative to the increase in the density of radiation in which they exist. The stabilisation of mass involves parameters of the density of radiation, so that stability it relative to those parameters. Of course, those parameters are defined by the materialist paradigm. You could say that the materialist paradigm is the real Relativity theory. But, as it defines a quanta of energy as a collection of particles which radiates, you would also have say that it is the real Quantum theory. Isn't always the case that things which can't be integrated at one level become integrated when seen from a higher level of conceptualisation and quantification.

The road that lead to the invention of the materialist paradigm begun from a flash of inspiration. The structure of the Universe is formed from the radiation of the structure of the Universe, and the cosmic red shift phenomena is indicative of the way in which radiation travels and not an expanding Universe. The Big Bang theory is dead. This leads to the idea that the Universe is infinite in all directions and finite in its construction possibilities. What can exist must exist an infinite number of times. Now there's an idea to knock the stuffing out of religion.

I once asked a practitioner of the abstractionist paradigm what causes the four forces of physics. He thought hard for awhile and then replied: "We don't see the four forces as having a cause because we see them as the cause." The materialist paradigm defines the cause of the four forces of physics. The physics textbooks won't be re-written. They will be retained as historical documents.

In time the materialist paradigm will be seen as applying to the formation of atoms, the elements, and all possible compounds, *i.e.* chemistry. It will also be seen as applying to the formation, functioning, and evolution of biology. The reason for this is simple. The Universe is extremely complex but totally systematic. Chemistry and biology are constructed by the Universe as a consequence of the process of the Universe, and the process of the Universe is defined by the materialist paradigm. Of course, by that time the materialist paradigm will have changed its name to the paradigm of science. I think Thomas Kuhn would be pleased.

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"Pure Relativity"

The reply of Mendel Sachs (*Apeiron*, July-October, 1998) displays the philosophy of "special" relativity (SRT) in its extreme form (called sometimes "pure relativity"), proving its complete detachment from the physical world we are living in. (Einstein, on his part, was persistently inconsequent in his physics, as well in his philosophy and in his personal life.) As correctly pointed out by Sir Edmund (Whittaker), Einstein's SRT was, till the solar eclipse expedition of 1919, just an obscure form of a theory associated with the names of Lorentz and Poincaré. Einstein has captured public attention with strange predictions, by identifying Lorentz's "local time" with "time" and by seriously predicting a time-lag between a clock resting in an inertial frame of reference (IFR) and an identical one transported with constant velocity around a closed path. He might have realized—as quoted by Sachs—the absurdity of a non-reciprocal, absolute effect induced by reciprocal velocity.

Nevertheless, during half a century he kept puzzling laymen and professionals alike (R. Schlegel, *Superposition and Interaction*, The University of Chicago Press, 1980, ff. 100) and never retracted his prediction of "asymmetrical aging." He stubbornly denied the existence of a unique, preferential, physically determined global frame of reference which, without proving "asymmetric ageing," could have lift the stupid contradiction (not "paradox," please!) implied.

Mendel Sachs, in the closing paragraph of his polemical article of 1971 (*Physics Today*, Sept. 1971, p.29) said frankly:

> *Should future experimental evidence refute this conclusion (of asymmetrical aging, G.G.), then according to the analysis we have just seen, Einstein's theory of relativity would be refuted.*

Representatives of the majority view have promptly replied that "…we frequently transport beams of unstable particles over long distances, such

that no particles would be left without the help of Einstein's (gamma, G.G.) factor." (*Physics Today*, January 1972, p.11). The (in)famous Hafele-Keating experiment with airborn cesium atomic beam clocks has, supposedly, confirmed the prediction of the "combined SRT + GRT," although the random differences between individual, identical (by construction) clocks, were much larger than the expected "effects." (Alphonsus Kelly, Monograph 3, Febr. 1996, The Institution of Engineers of Ireland).

Recently, in a careful analysis (*Apeiron*, Oct. 1997, p.129), Tom Phipps argued convincingly "that the CERN evidence contradicts SRT," but Sachs ignores both facts and arguments, since he believes in a "pure" theory which has nothing to do with physical reality. Against the overwhelming majority of physicists, he rejects all "relativistic effects": "time dilation," "length contraction," "mass increase with velocity," "Thomas precession," a.s.o.. The Lorentz transformation is just "a scale change": an "observer" moving relative to a "system" has simply to use a modified "meter" and a modified "second" in order to formulate the covariant laws of nature! This is the way prominent relativists like McCrea justify *ex cathedra* the invariance of the velocity of light in relatively moving IFR's by "adjusting the measurement units": change "cm" and "s" into "cm*" and s* and c* will be numerically equal to c ! (By the same method one could easily prove that iron and gold have the same density: just change the definition of "gram" and of "cm" when measuring a piece of iron and you prove d(iron) = d(gold).)

Mendel Sachs made me sad when insinuating that I agree with the "Neo-lorentzians," which is tantamount to accusing me of being ignorant of the incompatibility between a unique, privileged frame of reference and the relativity (here reciprocity,G.G.) of reference frames according to "Einstein's principle of covariance." Sachs, like Einstein (and Infeld) rejects the preferential status of the Copernican system: the geocentric system is as good as the heliocentric one, therefore the Vatican had no reason to apologize for the trial of Galilei....

If Sachs wishes to remain a man of stature, he has to reply to the writings of Good and Phipps in this journal, rather than to the present letter.

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Reply from Mendel Sachs

I am flattered that Galeczki has put me in such good company—attacking me along with Einstein on our faulty understanding of the theory of relativity! He even attacked Einstein's personal life!—a nonsequitur if ever I saw one; what does this have to do with Einstein's physics? I am afraid that what Galeczki did was to set up a straw man and then to knock it down. His straw man is a set of misunderstandings of the meaning of Einstein's theory of relativity. His claim that "pure relativity" (whatever this means to him) is detached from the physical world is truly outrageous! Indeed, it is Galeczki, in his misunderstanding, not me or Einstein, who talks about "ideas that have nothing to do with physical reality"—a meter stick that is both shorter and longer than another meter stick, a man who is biologically both older and younger than his twin brother. Repeating my previous advice to Galeczki: consensus of opinion is not a criterion for scientific truth!

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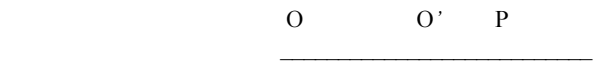
The Mathematics of Special Relativity

Dr. I.J. Good (July-Oct 1998, p.246) rightly challenges the notion that mathematics, including the mathematics of special relativity, could ever be found inconsistent. Unfortunately, consistency does not help us if we keep ignoring what the mathematics is trying to tell us when it insists that an equation works only if we introduce a correction.

J.O. Campbell (p.250) rightly chastises my rhetoric; let me therefore preface my response to Dr. Good with a reminder of the difficulties of exposition. For a number of reasons, physics journals are not the place for patient exploration; this is why I have started *SRL*, which I am prepared to distribute free among those (few) seriously concerned about the role of mathematics in modern physics. One reason is that we need to look into developments in mathematics, its philosophy and natural philosophy, and into ways in which mathematicians leading in these developments have reformulated SR kinematics. Here, for instance, lie the root of the tragic mistake of turning any element containing the 'time' into a fourth independent vector (an orthodoxy for theoretical physics), and the explanation of the inadequacy of conventional terms (*e.g.*, velocity and speed mentioned by Dr. Good). A second reason is that ASCII impedes arguments involving infuriating but unavoidable symbolic

jargon, especially in an area where work is in progress.

Here is an example of the way in which the remorseless consistency of mathematics works. Let us try to argue that $2 = 5(1–3/5)$ implies $5 = 2(1+3/5)$. The mathematics insists that we need a correction by 25/16. If we misunderstand what the mathematics is trying to tell us, we may be led to argue as follows. Both operations are equivalent; both therefore need correction by the geometric mean. So we get the 'true' but hidden quantities $2 = (5/4)5(1–3/5)$ and $5 = (5/4)2(1+3/5)$ which in this kind of operation appear to undergo reciprocal contraction; for as seen from the smaller and bigger bits respectively, the apparent quantities $5(1–3/5)$ and $2(1+3/5)$ are contracted in the ratio 5/4. Substitute $OO' = vt = 3$, $OP = ct = 5$, $O'P = ct'$, and you have the LT. Look at the figure.



If we put $OO' = vt'$, the LT works only if we introduce a correction (gamma).

Thus we see that Dr. Good is justified in his belief in the consistency of mathematics. (What is intriguing is that males tend to pile proof upon proof that a correction is needed, rush into attempts at physical verification or try to shout a case down by rhetoric, while females would ask what is the matter with an argument that requires correction. Indeed, among males the construction on demand of mistakes requiring correction, as fodder for physical experimentation, has become a highly prized skill. Females fed up with academic insistence that theirs is an outdated attitude rooted in our simian unconscious revile me for appearing to stray near the male section of the human zoo; that is why I hide behind the initial G.).

Finally, I may point out that Dr. Shaozhi's second proof (p.255) that the LT implies $y,z = 0$, like the reiterated one from $y = ct$, $y' = ct'$ (p.246), is also false. (As is common in correspondence among mathematicians, I omit superscripts; y^2, e.g., means y squared.) From $c^2t^2 – x^2 = y^2 + z^2$ we may eliminate y and z in the second equation for t' which then reduces to (1a). I may mention that recent and future discussions in *SRL* show how the implication $y,z = 0$ can nevertheless easily be demonstrated, even prior to resolving the paradox of the reciprocal gamma. So even though Dr. Shaozhi's proofs are false, his theorem is true.

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Campbellian Reasoning

In this communication, I will again nag Campbell to nobly admit to error without beating about the bush. He claimed (Campbell, 1996) that a "stationary" rod of length L, pointing to an inertial observer Ω, who is traveling towards the rod, would appear to Ω to be shorter than L, while if Ω is traveling away from the rod it would appear longer than L. He thought this was "obvious to one only according to his gifts" (Campbell, 1997). (Just as I was about to send the present communication to *Apeiron*, I received a letter from Campbell in which he says that the expression "according to one's gifts" was intended to be jocular. I would call it, after *Mad* magazine, "humour in a jugular vein.")

Campbell's claim is contradicted by the LT (Lorentz transformation) as pointed out first by Good (1997). Xu & Xu (1997) said "Campbell's disproof [of the LT] is as ingenious, direct and clear, succinct and effective as we have ever seen." That was before they had seen Campbell (1997) where he says "when Prof. Good uses them [the LT equations], he can be absolutely certain they are correct." Xu & Xu saw that Campbell's claim was incompatible with the LT so they were enthusiastic about it because they have argued many times (incorrectly) that the LT is self-contradictory. Clearly Campbell must be absolutely certain that every one of those arguments by Xu and Xu is incorrect with no exceptions whatsoever. In all honesty Campbell should confirm that.

Campbell (1998) says "Prof. Good has demonstrated his brilliance: his knowledge of mathematics and physics is *par excellence* [I wish]; the problem is with his *understanding* of these subjects." Wel, at any rate I have understood his "obvious" claim well enough to prove that it contradicts the LT. Campbell says, further, that I should bear in mind "that those who reject Establishment physics [like Xu & Xu who reject the LT] do so solely because they are compelled to follow the dictates of Common Sense and Right Reason." How then does he explain the fact that he is certain of the LT whereas Xu and Xu are confident that it is self-contradictory? But of course it is *Wrong* Reason to regard the LT as absolutely certain and, in the same breath, to regard as obvious an argument that *contradicts* the LT. This contradiction was proved by Good (1997) and differently by Good (1998a). To equate *Right* and *Wrong* is Orwellian, as in *1984*, or is analogous to the modern slang usage of *Bad* meaning *Good*. Of course Campbell must agree with me that the dissident Xu uses wrong reason.

Campbell mentions evasively that mathematics is not the same as physics. Presumably he doesn't know

that in my first book on probability (Good, 1950, especially p. 31) I said "The trichotomy into axioms [and the abstract or mathematical part], rules [of application] and suggestions is perhaps the ideal form for any scientific theory." But that is a side issue in the present interchange. I will simply add that I don't equate STR with its kinematics, KSTR, but I have repeatedly argued that KSTR is self-consistent (for example, Good, 1998b).

Campbell enclosed with his recent letter an unpublished document containing his proof of the LT. It depends on the Doppler effect, as did Bondi's proof of more than thirty years ago (Bondi, 1964). But I prefer not to be distracted from the main issue: *is what Campbell regarded as obvious to competent people, compatible with the LT?* I have proved, in a couple of inches of print, that it is not (Good, 1997, the paragraph beginning "Let …"). If he doesn't agree he should lucidly point out the error without diversionary tactics. Whether I understand *other* physics is a red herring. My argument is correct, so my dear Campbell, please stop the cover-up and nobly confess.

In Good (1998a, p. 112, second column) I raised questions about Campbell's "time experiment" discussion (Campbell, 1996, Conclusions). There was no reply in Campbell (1998).

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I.J. Good

Attempts by Xu(s) to Refute the Self-Consistency of the Lorentz Transformation

Introduction

Readers of *Apeiron* know that Xu(s) believe(s) the usual "Lorentz transformation," LT, to be self-contradictory whereas I am confident that their arguments are fallacious. See the items mentioning *Apeiron* in the References. Our interchange has been plagued by misprints and by the obscurity caused at least in part by the incomplete mastery of English by Xu(s). (But their English is infinitely better than my Chinese!) Many of the misprints were listed in *Apeiron* **5**, pp. 134 and 256. (Note that the numbers of Sections 2 and 4 of Good 1998b were omitted. These sections begin with the words "Xu says" and "In Good" respectively.) Readers might have been further confused because we "spoke at the same time" in *Apeiron* **5** (3-4).

My purpose in this communication is to make as clear as I can, sometimes by citing the literature, that several of the arguments of Xu(s) are fallacious.

The simplest Xu argument

I first refute the simplest argument by Xu(s). I will use words that I believe cannot be misunderstood if they are actually read. In Xu (1998a, p. 124) (following Xu & Xu, 1996, p. 384), he states three equations or identities:

$$\begin{aligned} &(A1) \quad y' \equiv y \\ &(A2) \quad y' \equiv ct' \\ &(A3) \quad y \equiv ct. \end{aligned}$$

From these equations he infers that $t' = t$ and this appears, at first sight, to contradict the LT. Unfortunately, his notation is somewhat messy because the equations (A2) and (A3) do not refer to the same sequence of events. They refer to the event-sequences of one photon travelling up the y' axis and another one up the y axis. These axes are distinct and Xu (1998b, p. 246) nearly correctly says that "only fools contrived by Good would assume" otherwise. I contrived these "fools" because I knew that the alternative (the acceptance of the fact that the two axes are distinct when $t \neq 0$) would lead to the conclusion that Xu's argument is mistaken anyway. Indeed, to repeat, (A2) and (A3) refer to distinct sequences of events and *therefore are not related by the LT* whereas (A1) is one of the equations of the LT. The LT relates the space-time coordinates of an event (or event sequence) in one inertial system to those in another one, for the *same* event (or event sequence). In (A1) the symbol y' refers, in the "primed" system of coordinates, to the same event to which y refers in the unprimed system. But this is not the case in (A2) and (A3) which refer to two *distinct* events (or event sequences), namely the paths of two distinct photons. The meanings of the pair (y, y') in (A1) are therefore not the same as in (A2) and (A3). So the deduction $t = t'$ cannot be made and Xu's simple argument doesn't undermine the LT at all. Xu was misled by his somewhat messy notation, into believing that he had found a very simple self-contradiction in the LT. *Because of his mess, he should confess*. But I predict that he won't confess. I expect him either to change the subject or to reply

with great obscurity and with a few insults thrown in for good measure.

Actually I don't normally regard a person as a fool merely because he made *one* foolish mistake. Wishful thinking is an important source of error in controversies and doesn't necessarily imply foolishness. We all make mistakes, and when they are pinpointed they seem foolish. Is the mistake of my "contrived fools" any worse than Xu's overlooking that the equation or identity (A1) cannot be applied to (A2) and (A3)? Come my dear Xu, please confess.

The address by Xu & Xu in St. Petersburg

Xu & Xu presented two arguments in an address at a conference in St. Petersburg as reported in Xu & Xu (1998c). If these arguments were correct they would be of great importance. But they are incorrect. The first of the two arguments was previously presented in Xu (1998a, p. 126, left column) and was refuted by Good (1998b, Section 5, p. 245). The second of their St. Petersburg arguments was already refuted by Good (1998a, Section 7, p. 120). But Xu (1998b, p. 248) replied to that refutation by arguing in effect that the invariance of the relativistic squared interval

$$(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2 - c^2(\Delta t)^2 \qquad (1)$$

is unjustifiable, except when it vanishes. Xu claimed that the contradiction is expounded in Xu & Xu (1996). They argued there, and in Xu & Xu (1997b, 131), that the LT leads to such absurdities as

$$\mathrm{STONE}'^2 - c^2\mathrm{EGG}'^2 = \mathrm{STONE}^2 - c^2\mathrm{EGG}^2.$$

(Xu's joke)

Of course, in the LT equations, (x, t) and (x', t') are defined as the spatial and temporal coordinates in two inertial systems (in which the x and x' axes are parallel to the mutual velocity, and in which the space-time origins are chosen at the same event). Xu & Xu arrive at their joke by applying the LT to entities other than space and time. Their argument is like claiming that Newton's inverse square law of gravitation shows that rhubarb travels in an ellipse around a confession. Xu (1998b, p. 249) says that his "stone-egg" argument "is much far beyond Good's faculty." I think it is below my feet, not above my head.

Xu's attack on my first Bingo argument (1997)

Consider the "Proof" in Xu (1998b, p. 247). He attempts to refute my first "Bingo" argument by generalizing it and thereby deriving a contradiction by means of some perfectly correct algebra. I will now show that his generalization is based on a mistake in geometry so it is not surprising that it leads to an incorrect conclusion. My formula (Good, 1997a, p. 126; 1998b, p. 245) was

$$(x'^2 + y'^2)^{1/2} = (\gamma^2 v^2 t^2 + c^2 t^2)^{1/2} \qquad \text{(Good 3)}$$

(based on the LT and on Pythagoras's theorem) which applies to a photon travelling up the y axis, and therefore for which $x = 0$. This led neatly to the "Bingoid" result that the speed of that same photon is c also in the "primed" inertial system, thus corroborating one of Einstein's basic premises. (*Corroborate* is less ambiguous than *confirm*.) Xu's attempted generalization of (3) to the case of an arbitrary event [or event sequence] is his (3a):

$$(x'^2 + y'^2)^{1/2} = \left[\ \gamma^2(x - vt)^2 + c^2t^2\ \right]^{1/2} \quad \text{(Xu3a).}$$

The term c^2t^2 here shows that the particle is supposed to be a photon that passed through the space-time origin. Now the path of Xu's photon is not necessarily at right-angles to the x and x' axes, so the usual form of Pythagoras's theorem is inapplicable in Xu's attempted refutation. Pythagoras's theorem refers to a *right-angled* triangle. The formula (Xu3a) is a mistake unless the photon is going up the y axis in which case $x = 0$ and we are back to my formula (3). So Sec. 1 of Xu (1998b) is totally invalidated, including the three insults.

There are seven further insults in that article, and eleven in Xu (1998a), making 21 in all—and counting. The number of mistakes is not large—when compared to the number of insults (unless the insults are counted as mistakes)! The use of insults is a political device for diverting attention from the insulter's own weaknesses.

Indeterminate forms

Xu (1998b, 247) produce an argument that the LT leads to expressions of the indeterminate form 0/0, as in Xu (1998a, 126-127). The argument was answered in Good (1998b, Sec. 7).

Some flaws in Xu & Xu (1996)

Xu & Xu (1996, p. 380, formula (4)) exhibits a pair of "events" (in the standard terminology) such that to go from one to the other requires a speed greater than c. This doesn't contradict Einstein's contention that no particle travels faster than light; it merely shows that there are pairs of events such that no particle can get from one to the other. (In the jargon of STR, their separation is "space-like.") A simpler example would be a pair of events simultaneous in a given inertial frame of reference! I think even Xu and Xu will agree with me about this. (But they might not admit it explicitly in print.)

The next (stone-egg) argument was refuted after equation (1) of the present communication. Then they present their argument about their matrix U which I

have refuted in two different ways: see my remarks about Xu's Postscript. Their first argument on their page 381 was answered in Good (1998a, p. 118). In their Lemma 1 on the same page they claim that x and t cannot be independent because $x = vt$. But this equation applies only to events on the path of a particle at rest in the primed system, not to all events. The argument is obviously mistaken.

In their Sec. 4 they first correctly point out that when $(x, t) = (0, 0)$ then $(x', t') = (0, 0)$, from the LT equations

$$x' = \gamma\,(x - vt),\ t' = \gamma(t - vx/c^2)\,.$$

They then argue that "the alleged space-time symmetry vanishes." They think that from $(x', t') = (0, 0)$ we cannot infer $(x, t) = (0, 0)$. Their point is that $(x', t') = (0, 0)$ leads to

$$x = vt,\ t = vx/c^2, \qquad (4)$$

which at first sight is more general than $(x, t) = (0, 0)$. But it is not more general. For (4) leads to $x = v^2x/c^2$ which implies either $(x, t) = (0, 0)$ or $v = \pm c$, which is ruled out by definition. Thus the "space-time symmetry" doesn't vanish after all. Indeed the space-time symmetry is plainly exhibited by expressing (x, t) in terms of (x', t'). The inverse of the Lorentz transformation happens to be the same but with v replaced by –v. This familiar fact is a matter of simple algebra.

On their page 383 Xu & Xu imply that there cannot be (direct) communication between observers separated by a space-like interval. I think they are right that Einstein's famous relativity paper of 1905 doesn't cover this case. But the backward light cones of such events do intersect, as do their forward ones, so the existence of one observer from the point of view of the other one is not purely metaphysical. Cosmologists have to assume these facts three times before breakfast.

The Appendix of Xu & Xu (1996) is basically what I called here their "simplest argument," and was refuted above.

The Postscript in Xu(1998b)

Xu (1998b, p. 249) mistakenly says that equations (13) of Good (1998a), namely

$$\Delta x' = \gamma(\Delta x - v\Delta t),\ \Delta t' = \gamma(\Delta t - v\Delta x/c^2),$$

do not follow from the LT. He says this because he overlooks that, for a given value of v, the LT is a linear transformation. Again his item (b) in his Postscript is meaningless. Next take his (*c*) which refers to the matrix U in Xu & Xu (1997a). They say it is not necessarily a Lorentz matrix or transformation. But consider a particle P at rest at the spatial origin in the "unprimed" system S. It has $x \equiv 0$ and by definition has speed $|v|$ relative to the primed system S'. For P, the equation (B) of Xu & Xu reduce at once to

$$x' = -KBct,\ t' = Ke^{B}t.$$

Therefore P in S has velocity $x'/t' = -Bce^{-B}$ in system S', that is $|v| = cBe^{-B}$ and U reduces to the Lorentz matrix after all (incidentally with $v < c/e$). This refutation of Xu's claim is simpler than the one I gave in Good (1997b), although that one is also correct.

It doesn't help Xu's reputation to argue that $v = \beta c$. For that is merely the definition of β! Xu says that "the more truth is debated, the clearer it becomes." That is true if the debate isn't too full of mistakes as in the items by Xu and by Xu & Xu as listed here in the References.

Max Born

Max Born, according to Dingle (1972, p. 43), refused to read a certain letter from Dingle because he regarded Dingle's anti-relativistic arguments as no good at all. It is now clear that Xu will continue to persist in his errors and delusions. I cannot prevent Xurian irrational exuberance, and I wonder whether I should stop trying, as did Born. As I said in Good (1998c) just before the Conclusions, with some exaggeration, "I am Born again."

Conclusion

All attempts to show that the LT is self-contradictory are fallacious, including those of Xu and Xu. This is basically because the LT is self-consistent. Whether it is physically correct or approximately so, is a separate issue and is not discussed in the present communication.

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Good, I.J. (1998c) *Physics Essays* **11**(2), 248-263.

Xu, S. (1998a) *Apeiron* **5** (1-2) 123-128; (1998b) **5** (3-4) 246-249.

Xu, S. & Xu, X. (1997a) *Apeiron* **4**(2-3) 86, second letter on the page; (1997b) **4**(4) 130-131; (1998c) **5** (3-4) 254-255.

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Again on Good's "Refutations"

I A Typical Argument In Circle

Prof. I.J. Good has spent a great effort [1a] to refute the irrefutable proof that the LT is self-inconsistent and useless. Is his refutation "Bingo" as he believed?

The basis of linear algebra tells us that it is impossible to arrive at

$$t' \quad \gamma\ t - vx\ \ c \tag{1}$$

from

$$t' = r'/c = \sqrt{x'^2 + y'^2 + z'^2}\ /c$$
$$= \sqrt{\gamma^2 (x - vt)^2 + y^2 + z^2}\ /c, \tag{2}$$

when $y \neq 0$ or/and $z \neq 0$. The reason is simple: y or z term in (2) cannot be canceled by any expression which contains x or/and t only, because of y or z orthogonal to x or t. That's all. Any further step is redundant, and any deduction from (2) to (1) must resort to a circular argument.

It is not surprisingly to me when I read [1a] that Good puts

$$x' \quad y' \quad z' - c\ t' = x^2 + y^2 + z^2 - c^2 t^2 = (F) \tag{3a}$$
$$\text{or } x^2 + y^2 + z^2 = c^2 t^2 \tag{3b}$$

into (2) to "reduce " to (1), for his knowledge displayed in his "refutations" has already told us that he mostly would do so. Why Good's is a circular argument? This question leaves for Good himself. By the way, Good's "photon confirmation" [1b] is, at the best, also a circular one. No wonder, Good is not better than Einstein who is a well-known adept in making circular arguments.

Now, if Good's refutation were "Bingo," a Good-mode Theorem could be established as: the E-L group would equally be a n-D group, only by augmenting the so-called 4-D with such components as $q'_1 = q_1$, $q'_2 = q_2$, … $q'_{n-4} = q_{n-4}$ following $y' = y$ and $z' = z$, where n is an arbitrary integer.

Proof (of Good-mode, of course) Taking $n = 5$, substituting

$$x^2 + y^2 + z^2 + q^2 = c^2 t^2 \tag{4a}$$

which stems from the supposed 5-D invariant equation

$$x'^2 + y'^2 + z'^2 + q'^2 - c^2 t'^2$$
$$= x^2 + y^2 + z^2 + q^2 - c^2 t^2 \tag{4b}$$

into

$$t' = r'/c = \sqrt{x'^2 + y'^2 + z'^2 + q'^2}\ /c$$
$$= \sqrt{\gamma^2 (x - vt)^2 + y^2 + z^2 + q^2}\ /c$$

would equally yield

$$t' = \gamma (t - vx / c^2)\ .$$

Similarly, the above could expand to $n = 6, 7\ldots$. QED.

As Chinese saying goes, "many are the magicians, but each has his own tricks." Undoubtedly, Good has, at the best, made an empty effort due to a lack of *orthogonality*, a basic concept, in his one-sided mind.

No one has power capable of saving the LT.

II Concerning Null Set

While making a circular argument, Good does make an excellent and correct assertion that "for this model x, y, and z are *not independent* "[1a]. Unfortunately, he failed to, due to his dual-standards, reach the final conclusion that Eq.(3a) is a spurious 4-D but genuine 3-D quadratic and the E-L group is not a 4-D group [2]. Here, what I want to add is: there are only three independent variables in (3a) *in any case* within the SRT framework, but not only "for the model" Good refers to.

After all, I must thank Good for his helping me to, now much more easily than previous, convince others that the E-L group is a null-set.

Since the E-L group vanishes, one can find different ways to invalidate the LT. Here I repeat the proof that the LT may give $t' = t$ [3], but in a bit different way.

It is clear that a non-zero constant C dividing two sides of $y' = y$ gives

$$y'/\mathrm{C} = y/\mathrm{C},$$

and replacing C by a speed (including c) quantity, say, $u \neq 0$, yields

$$y'/\mathrm{u} = y/\mathrm{u},$$

which means that the same speed quantity u divides the equaled distance quantities y' and y, so that

$$t' = t,$$

resting on the tenet that every "coordinate system has its own particular time" [4a]. The problem here is not relevant to photon, but to whether or not mathematical rules and basic definition of a speed or a distance, etc., ought to be respected.

One can readily find two anti-science tendencies in the SRT: (a) On the one hand, basic mathematical rules are wantonly trampled; and (b) On the other, mathematical axiomatics overwhelms reason so that physical meanings of symbols are often disregarded and shifted. Good's "refutations" have exposed his failure to keep out the rooted influence by the tendencies.

III The Meaning of the LT

Good's "refutation" [1a] displays that he does not seem to understand the meaning of the LT, false or not, though he taught us over and over that "it is important to hold in mind what the LT means"[1b].

Let us return to Einstein's seminal paper [4b], where we read that

> *by means of light signals in the manner indicated in [section]1... To any system of values x, y, z, t, which completely defines the place and time of an event in the stationary system, there belongs a system of values* ξ, η, ζ, τ *determining that event relatively to system k...*

Einstein has made it clear, despite symbols different, that:

- his so-called event means anything which occurs at a point in space with (x, y, z, t) of "stationary" system K and (x', y', z', t') of moving k, whether or not it may be photon, and whether it may be mobile or immobile;
- (x, y, z, t) or (x', y', z', t') are spatial and temporal coordinates of any observed event p_r;
- they are measured by means of light signals in the manner by which the time, say, t' is defined to be an interval for a signal, emitted at $t = t' = 0$ from the origins of the two coordinate systems in relative motion which coincide at $t = t' = 0$, to travel from the origins to the event, o'- p_r (or half round trip o'- p_r - o');
- they have no other meaning, whether in the LT or elsewhere within the SRT framework;
- all equations in the LT *en bloc* form a set of relations of coordinates of two systems for any given event (point), so that no relation such as $y' = y$ is allowed to be separated alone as Good did.

The above is what Einstein's original model, false or not, means. It follows that:

- the event should not in conception be separated into ponderable-particle event and photon event;
- coordinate y or y' (or relation $y' = y$) need not refer to a photon traveling up the y- or y'-axis as Good required;
- the set of coordinates (x', y', z', t') or (x, y, z, t) should have a certain meaning for, and apply to, any observed event, rest or moving, in the so-called 4-D world; and hence Good resorts to a grave misunderstanding of the LT to say "to assume that x and t, etc., have exactly the same meanings is logically on a par with a beginning student of coordinate geometry" [1a];
- the LT should obey the PIVL and hence the parameter F in (3a) should be zero, for a single event or (an interval between) two events; and
- Einstein's model provides a poor prerequisite that $x' = x = 0$ at $t = t' = 0$; vice versa. Clearly, Good's equations (2) and (10) in [1a] infringe the requirement.

Any different interpretation is irrelevant to the LT. The equation $y' = ct'$ is irrelevant to Good's photon, but rests on Einstein's tenet only, as mentioned; also, $y' = y$ or $y' = ct'$ is simply irrelevant to whether or not "the y' and y axes coincide" [1a].

Incidentally, Good does not seem to know that the relative speed v has, for the said LT, been specified along x-x'-axes, no matter whether (1+1)-D or not, and that it lacks any ground to say "y and z axes in the manner to force $y' = y$, $z' = z$" [1a]. Instead, both $y' = y$ and $z' = z$ are illegally got by embezzling classical coordinate relations (in Euclidean space).... And so forth.

I cannot but repeat that it does not seem to be serious for one, critic or defender, to comment on the LT, before carefully read the seminal paper [4b], false or not.

IV On Coordinate Transformations

Any *genuine* electrodynamics problems can never be resolved by any coordinate transformation alone. The reason is simple: they, differing from "purely observational" phenomena, involve the fact of interaction and should be described from, or interpreted *via*, dynamic processes of interaction. It hence is misleading when Einstein treats them as purely observational effects while disregarding mutual action.

Moreover, as it is proven [2], any difficulty due to finiteness of the light velocity cannot be overcome by any transformation of coordinates, because time-delay effect on signals unavoidably arises even when a moving object is generally observed in *a single* frame, whereas any coordinate transformation is useful only for *two* frames in relative motion and can of course never compensate or eliminate that effect (for the details see Ref.2). In other words, the insufficiency of classical mechanics under high-speed is not in Galilean transformation or Newtonian space-and-time notion; Galilean transformation remains valid under high-speed provided that time-delay effect on signals is considered or excluded in data procedure. It has been an epochal error to put effort on a substitution of Galilean transformation since W. Voigt (1887).

It is time to conclude that it is hopeless to continue hinting for any neat "confirmation" or "corroboration" for the LT, in which more profound errors and flaws will be dealt with by me in future, if need.

Although it is a waste of time to persuade Good, I suggest that before doing "refutation" more he had better read carefully: No one can save the LT.

References

[1] I.J.Good, (a) *Apeiron* 5(3-4), p244, 1998; (b) 4(4), p126; p130, 1997.

[2] Xu Shaozhi and Xu Xingqun, *Physics Essays*, 9(3), p380, 1996.

[3] Xu Shaozhi, (a) *Apeiron* 5(3-4), p247, 1998; (b) 5(1-2), p123, 1998.

[4] Einstein: (a) *Relativity: The Special and General Theory*, p26 (Methuen, London, 1936); (b) *Ann.Phys.* 17, 1905.

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ERRATA: Vol 5, No. 1-2

Page 116:

Left col. 2nd para., line 1: "Nobility" should read "Nobelity"

Right col., five lines below (1b): The meaningless expression should be (x',t').

Page 117:

Left col.: The misprinted formula should read: $\mathrm{d}x - v\mathrm{d}t = v'\mathrm{d}t - vv'\mathrm{d}x/c^2$

Page 119:

Left col., lines 7 & 8: Quote signs look like primes

Page 120:

Line 11: "is" should read "in"

Page 124:

Line 18, left column: Fig.1 should read Fig.2

Line 12, right column: $x' \neq x$ should read $x' = \gamma r(x - vt)$

Page 125:

Line 11, left column: in Eq.(A4): R(x')= R(x) read R(x') ≠R(x)

The same column, in Eq.(A6): R(y')0 R(y) should read R(y') ≠R(y)

Page 126:

Line 11, left column: Fig.1in should read Fig.2 in

The same column, in Eq.(C): $t' = \gamma r(t - vx)/c^2$ read $t' = \gamma r(t - vx/c^2)$

Line 14, right column: $t' = x/c$ should read $t' = x'/c$

The same column, the line above Theorem 2.2: theorem 3 read theorem 2

The next line: Theorem 2.2 should read Theorem 2

Page 127:

Last line from bottom, left column: acorn read scorn

Line 3, right column: IV should read V

Line 16, the same column: theorem 2 should read theorem 3

Line 18, the same column: Theorem 2 should read Theorem 3

Line 8 from bottom, the same column: physicist should read defender of the LT.

ERRATA: Vol. 5 No. 3-4

Page 214, line 16 from bottom:

"can be decresed" should read "can be increased"

Page 215, Eq (6):

$$L' = \Delta x \frac{1}{1 - v/c} + \frac{1}{1 + v/c}$$

should read

$$L' = \Delta x \left(\frac{1}{1 - v/c} + \frac{1}{1 + v/c} \right)$$

Page 248, line above equation (8b): on0 should read on;

Page 249, line next to equation (11d): 5.Within should read Within.

Page 255, 10 places in total: $'_r$ should read t'_r ; $_r$ should read t_r ; $'_x$ should read t'_x ; and $_x$ should read: t_x ;

Page 255, line 4 above section II: . . . QED should read QED .

Page 256, 3 places: <not equal to> means ≠;

Page 256, also 3 places: γr should read γ.

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