@ issue...

Conference threads, debate and correspondence

Reply to comments by F.L. Walker (*APEIRON* 11**, 4**)

1.   The velocity dependent inertial induction is a "drag" force which always opposes relative motion and is quite different from a gravitational attraction depending on velocity. Thus, when photons graze massive objects, the velocity dependent inertial induction always introduces a loss in energy leading to a redshift. In the case of gravitational attraction, the "blueshift" during approach is neutralized by the equivalent amount of "redshift" when the photon recedes, yielding no resultant effect on frequency.

2.   Since in my proposal the universe has been assumed to be infinite, while the fluctuating random motion of gravitating objects will be continuously transferred, the infinite universe can never reach a state of "zero motion" (not even if the universe has an infinite existence).

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Velocity Dependent Inertial Induction: Further Testing of the Hypothesis

The model of velocity-dependent inertial induction was first proposed about eight years ago (Ghosh 1984). Subsequently, the model has

been used to explain a number of astronomical and astrophysical phenomena that remain either unexplained or ill-explained at this time (Ghosh 1986a, 1986b, 1988a, 1988b, 1990). In all these cases the model yielded very satisfactory results. Since most of the phenomena to which the model has been applied are unconnected, and belong to different classes, the positive results give the hypothesis a considerable degree of credibility.

In addition to the satisfactory explanations it offers for the phenomena mentioned above, the model also leads to an exact equivalence between gravitational and inertial masses, and provides a tired-light mechanism that can explain the cosmological redshift both quantitatively and qualitatively.

In this article, another approach to testing the validity of the model is suggested. The main difficulty in experimentally verifying the hypotheses is the extremely small order of magnitude of the effects produced by the mechanism. However, it has been shown (Ghosh 1990) that when electromagnetic waves graze past dense and very massive bodies, a detectable amount of redshift is produced. Such effects have been reported (Sadeh *et al.* 1968, Merat *et al.* 1974), though the explanations given for the phenomenon are of a more conventional nature. Furthermore, insofar as the solar system is concerned, only the Sun can produce a fractional redshift of the order of 0.0000001, which is just barely measurable. It may therefore be desirable to make observations of electromagnetic waves grazing past objects like white dwarfs and neutron stars. Since the chance of observing an occultation of a source by such objects is very small, a practical method may be to observe binary systems with either white dwarfs or neutron stars (pulsars) as companions.

Observation of light (or an electromagnetic wave) when the source passes behind the companion and measurement of the resulting redshift may indicate whether a large proportion of the shift is

produced by the drag of the companion or not. It is interesting to note that a very large-scale attenuation of the signal from the binary pulsar *PSR1744-24A* has been observed which cannot be explained by direct eclipsing of the pulsar by its companion (Thorsett and Nice 1991). The pulsar light curve was measured at a frequency of 1.67 GHz, and it is possible that a large amount of redshift of the signal is responsible for the decrease in intensity, which is now attributed to attenuation by the very dense solar wind present. A large redshift can shift the whole spectrum, and the receiver can get a much lower intensity as it is tuned to a fixed frequency. It is proposed that a detailed study of the redshift of this signal be done, in order to determine whether the predicted amount of shift is present or not.

Other suitable binary systems may be selected to study the redshift of light when the companion is about to occult the source. This will be possible if the plane of the binary system is almost along the line of sight. There are actually quite a few such systems. It should also be noted that the fluctuating component of the redshift is due in part to the orbital motion, and in part to the mechanism of velocity dependent inertial induction. Thus, the deduced information about the masses and orbital separation must be corrected. In many cases, the corrected results may be more acceptable. However, the best results can be obtained if the system contains a neutron star.

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Redshift periodicity: reply to Napier, *APEIRON*, 11, 6

I am fully behind Napier that cosmic redshift periodicity must be due to the combined motion fo the Earth and the Sun. But there is one possible exception for quasar redshift periodicity when the latter is measured as a function of the distance from the spawning galaxy, in accordance with Arp's theory. If Arp's idea is right, then quasars must be born from certain typical galaxies at regular birthing intervals. And they should age with a corresponding change of redshift, at a tegulare time-rate, because of which a statistical average birthing rate can be measured *via* redshift intervals between subsequent "births".

Quasar spawning seems logical for a selected type of galaxies, of which the centre is excessively fed by the spiral arms, which have grown too massive. Galaxies with less solid spirals are producing cosmic ray particles, radiation and clouds of hydrogen which subsequently develop into protostars. Because of their low density and relatively large surfaces, these are pushed outward by radiant pressure. Excessive inflow of spiral matter (call it the galactic recycling rate) inevitably results in a boiling-over effect that may be behind the birthing of quasars.

Ergo, quasar redshift periodicity cannot be ruled out.

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Action-at-a-Distance: reply to Phipps, *APEIRON*, 11, 2.

I apologize to Phipps for having inadvertently given the impression that my letter "Action-at-a-Distance and Modern Field Theory", in response to his article in *APEIRON*, **8**, 8, should be specifically directed to his ideas and his article. My views on this had been boiling for a long time and Phipps's article was but the last drop to make me submit.

I am not boggled by action-at-a-distance because it is still a visualizable concept, though with a touch of the miraculous from religion. Advanced theory always becomes conceptually complicated, like Maxwell's advanced solutions. Why should I object to such unavoidable complication? But strangeness and charm emerge from quantum mechanics totally devoid of physicality. As such, they are merely different kinds of numbers to which only mathematical significance can be assigned. Erik Trell, "On Rotational Symmetry and Real Geometrical Representations of the Elementary Particles" in *Physics Essays*, June 1991, presents a plausible case for a physical interpretation of quantum results. But can it give us the certainty that he is right? I don't believe it with the number of variables involved. We need more than that, and I am convinced that we can have it. The arguments and counter-arguments between Phipps and myself adequately prove that it is highly debatable and speculative to translate a whole series of quantum numbers all at once into an equal number of physical properties, even though I admire Trell's achievement.

Phipps refers to the Summerfield-Dirac Lagrangian

$$L = -m_0 c^2 \left(1 - \frac{\boldsymbol{u}^2}{c^2}\right)^{\frac{1}{2}} + \frac{k}{r} \qquad (1)$$

and his own relativistic Lagrangian

$$L = \left(-m_0 c^2 + \frac{k}{r} \right) \left(1 - \frac{\mathbf{u}^2}{c^2} \right)^{\frac{1}{2}} \tag{2}$$

both of which represent the total energy of the system, in the negative so that negative potential energy can be treated as a positive.

My own version of the total energy is

$$E_{tot} = \frac{m_* c^2}{n^2} \tag{3}$$

$$m_* = \frac{m_0}{\left(1 - \frac{\mathbf{u}^2 n^2}{c^2} \right)^{\frac{1}{2}}} \tag{4}$$

$$n = 1 + \frac{2GM}{c^2 r} \tag{5}$$

$$m_0 = \frac{m_{00}}{\sqrt{n}} \tag{6}$$

For terrestrial gravity conditions, (3) and (4) can be simplified to $c_1 = c/n$, where c_1 is the gravitationally reduced light velocity and c is the light velocity in zero gravity. The rest mass of the object in zero gravity is m_{00}.

The static potential energy referenced to zero-gravity cosmic space is

$$E_{pot} = (m_0 - m_{00}) c^2 = m_{00} c^2 \left(\frac{1}{\sqrt{n}} - 1 \right) = \frac{-GMm}{r} \tag{7}$$

The effective potential energy referenced to zero gravity, and with $(m_* - m_0)$ included, is

$$E_{pot} \cong \frac{-GMm}{r} + \left(m_* - m_0\right)c^2 \qquad (8)$$

Observe how the kinetic mass increase $(m_* - m_0)$ is not linked to the potential energy, but it does contribute to the space refraction increment at M. In other words, when

$$n = 1 + \frac{2GM}{c^2 r}$$

stellar M should read M_*. The kinetic mass separation in (8) results from having the total potential energy quantitatively separated from the main mass.

Equations (3), (4) and (6) are approximately valid at the atomic level. Equation (5) is replaced by

$$n = 1 + \frac{2Z r_e}{r} \qquad (9)$$

where r_e is the classical electron radius and Z is atomic number. The refraction n represents the field that governs rest mass-conversion.

Phipps' electrical potential energy (k/r) can be understood as follows: k/r compares with

$$m_0 c^2 \frac{2Z r_e}{r}$$
$$k \cong \frac{Z e^2}{2 \boldsymbol{p} \boldsymbol{e}_0} \qquad (10)$$

where m_0 is the varying electron rest mass.

Comparing equations (5) and (9) leads us to the conclusion that $c^2 r_e / G m_e = e^2 / 4 \boldsymbol{p} \boldsymbol{e}_0 G m_e^2$ represents the exact ratio of the Coulomb force and the gravity force.

The static electrical potential energy is

$$E_{pot} = \left(m_0 - m_{00} \right) c^2 = m_{00} c^2 \left(\frac{1}{\sqrt{n}} - 1 \right)$$

$$\cong m_{00} c^2 \left(\frac{-Z r_e}{r} \right) = \frac{-Z e^2}{4 \boldsymbol{p} \boldsymbol{e}_0} \tag{11}$$

where m_{00} is the invariant electron rest mass in neutral space.

The effective electrical potential energy, equivalent to ionisation energy, is

$$E_{pot} = m_{00} c^2 \left(\frac{1}{\sqrt{n}} - 1 \right) + \left(m_* - m_0 \right) c^2 \tag{12}$$

The Vacuum Refraction version of atomic theory contains more details on fine structure which will not be divulged here, since this would take us beyond the potential energy debate, and I am not yet ready to present the added details. The general impact of these details is an increased ionisation energy for the '*s*' ground states, *i.e.* the formulae here are still approximate as regards fine structure.

Phipps acknowledges that potential energy can be seen to have a mass equivalent, and that it should be math-linked with the particle rest mass as in formula (2). He recognizes the illogicality of the potential energy math-dissociated from the particle mass as in formula (1). His next step should be to admit/recognize the *physical linkage*, because m_0 and its potential energy *are both inextricably part of the same object*.

The above arguments can be reduced by excluding velocity and effective mass by using static gravitation or static electricity. Neither a weightlifter nor a shining star needs a Lagrangian to do what Nature is urging.

To what is $E_{pot} \cong -GMm/r$ attached? Obviously to *m*!!!

Then why not state outright that potential energy *IS* the loss of rest mass due to the exposure of the object to a "field"? The theory is not yet complete, but at least then the potential is logically denied an independent existence, and is instead firmly associated physically with rest mass somehow. At the same time, ambiguity is removed, potential energy is physically divorced from "field" and the existence of field as a space-physical anisotropic property is accepted, which merely confirms the classical theory of optics and Maxwell's theory of space permittivity and permeability. And we are now better prepared than every to argue about the physical nature of field in space and about its role in the theatre of physical and gravitational phenomena.

Note: the term somehow in the foregoing paragraph is used for the reason that the *exact relationship between potential energy and rest mass is not relevant to the subject at hand*. I merely establish that they must be physically linked to zero order. For higher order accuracy, linking is impossible because of diverging theory and concepts.

The role of a field is not to supply force or energy. The supplier of energy is rest mass, as is proven by shining stars and falling objects. Force is then also supplied by rest mass. Is it the role of a field to supply curvedness of space? If that were true, we would have to believe General Relativity and forget about the possible existence of space permittivity and permeability, and of course drop optical and electrical theory in the dustbin.

When the potential energy is physically linked to the object mass, it is imperative to recognize the object's rest mass-variation due to changing field strength. Or else an effective mass variation due to the field, but *then* we are stuck with an invariant rest mass and with the conclusion that the stars shine due to some mysteriously supplied energy.

When potential energy is accepted as a rest mass phenomenon, while the effective mass m_* remains constant under non-dissipative conditions, it is inevitable to conclude that "field" is a physical anisotropy of space which exactly monitors the rest mass values of all massive particles. This space-physical anisotropy *has to be* associated with the space permittivity and permeability, because we do not know of any other space-physical property. These two are thus theoretically the most primordial, relevant concepts we have. They have to suffice until deeper, more advanced concepts arrive with full experimental confirmation and free from theoretical inconsistency. Deeper concepts will, I am sure, emerge when Vacuum Refraction Theory (in the making) is unified with Quantum Theory.

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