Problems in Quantum Physics

The editors, publisher and authors of the Special issue of *Apeiron* on "Fundamental Problems of Quantum Physics" (Oct., 1995) are to be congratulated for tackling such a difficult and important subject. This letter is to note certain aspects of quantum physics which was not touched upon or inadequately discussed.

First, and foremost, is the question: What is quantum physics? Most scientist will agree (I think) that it is the physics of Planck's constant, h (or better $\hbar$). On the next obvious question: What is $\hbar$ physically?, there is little information or agreement. Planck originally (*circa* 1900) identified h as a quantum of action, associated with a hypothetical linear harmonic oscillator postulated to exist in the walls of a black body cavity. Contrary to the assertions of many authorities, Planck did not associate h with a quantum of radiation—that was Einstein's specific proposal and Planck along with most of the physicists rejected that notion. It was only in the early 1920s with the experimental results of the Compton effect (Stuewer 1975) that there was a major change in outlook of most physicists towards the concept of the quantization of radiation. To date Planck's linear harmonic oscillator has not been physically identified, yet it is still widely used. Action, a quite mysterious physical concept, is treated as a non-conserved scalar. As such, one can find $\hbar \to 0$ and/or $N\hbar \to \infty$, describing how a quantized system goes over to a classical system, in literally thousands of papers, see (Deutsch 1990). In that paper it was proposed that "action" was in fact angular momentum and that "the principle of least action" was in fact the conservation of angular momentum. This author has yet to find a physical justification for the quantization of action in the literature. Planck's constant, along with *e,* the charge on the electron, and *c,* the velocity of electromagnetic radiation, are among the most accurately known *constants* where the values have never been observed to deviate significantly. By what flight of fancy is one justified to let $h \to 0$? One might as well let $e \to 0$ or $c \to 0$.

Dirac (1972) in presenting an overview of quantum mechanics and the key elements in its invention notes,

> *However, the one fundamental idea which was introduced by Heisenberg and Schroedinger was that one must work with non-commutative algebra. Noncommutative algebra means working with a mathematical scheme in which $x \cdot y$ is not the same as $y \cdot x$. Now people studying Bohr orbits from the axiomatic method would have never thought of introducing that kind of mathematics into their work. It seems to me that we are now needing some further developments as drastic as the one that Heisenberg and Schroedinger introduced, some development so unexpected that it is hopeless to try to think of it from a direct enumeration of the axioms of the present theory, even a critical enumeration of these axioms. A person would lack the necessary intelligence to make such a big jump as we need to get out of the present difficulties.*

and later in the same paper noted,

> *The great new idea of quantum mechanics is this noncommutative algebra which dominates the equations.*

h has the dimensions of angular momentum, **L**, a *conserved physical entity,* which can be represented mathematically as the vector product of the radial vector, **r,** about the point of rotation, and the linear momentum, **p, (**Goldstein, 1980)

$$\mathbf{L} = \mathbf{r} \times \mathbf{p} \qquad (1)$$

L is an axial vector and as such, usually comes in *two states* corresponding to right-handed or left-handed rotation. It is interesting to note that the *order* of the elements in Eq. (1) is critical—when reversed, $\mathbf{L} = -\mathbf{p} \times \mathbf{r}$ Further, when **p** and **r** are orthogonal to each other the vector product is equal to the simple algebraic product, $\mathbf{L} = -p \cdot r$ kg m^2 s^{-1}, but the sign is still reversed. Thus $\pm\hbar$ with its dimensions of angular momentum provides a *built-in* noncommutative algebra based upon the physical reality.

Therefore, the quantum of angular momentum should have the designation $\pm h$ (or $\pm\hbar$) unless one specific state is specified, as in the case of circularly polarized light. If the sign is not explicitly identified as $+h$ or $-h$ (or $\pm\hbar$) the reader can properly assume that the author was unaware that the phenomena dealt with involved angular momentum in either a left- or right-handed configuration.

As a conserved entity, angular momentum must be *quantitatively* accounted for—it can not evaporate like the morning dew and be ignored. If $+h \to 0$ at one place then the $+h$ must pop up somewhere else to conserve the angular momentum just like the conservation of energy and linear momentum. What can happen in many cases is the reaction $(+h) + (-h) = (0h)$. This happens when a hydrogen atom in its ground state is dissociated into a free electron and a free proton by a single photon. This is just the reverse of the formation of a hydrogen atom (in its ground state) from an electron and a proton with the creation of a photon which carries off a quantum of angular momentum $\pm\hbar$.

A rose by any other name will smell as sweet. By specifying $h = 6.6256(5)\times10^{34}$ J sec and $h = 6.6256(5)\times10^{27}$ erg sec (*The Encyclopedia of Physics*, Besancon, ed., Reinhold, 1965, p. 134 as an example), the units of h are energy × time and its proper physical nature as angular momentum has been completely subverted. One might quite properly say that the current description of h smells like fish left in the sun for three days. Is it any wonder that there are so many conflicting ideas about h and quantum physics in general?

In 1936 Beth, acting on a suggestion of Ruark and Urey (1927), experimentally demonstrated that every photon carries an angular momentum of $\pm\hbar$ (see Deutsch, 1989a). It was proposed (Deutsch, 1989b) that the photon was the physical entity responsible for the creation of the quantized orbital states in atoms through its creation and annihilation whereby energy, linear momentum and a quantum of angular momentum $\pm\hbar$ are transferred from the photon to the atom or from the atom to the photon. Had the fact that the photon possessed a quantum of angular momentum, $\pm\hbar$ been common knowledge in 1913 when Bohr first proposed his model of the hydrogen atom, there would never have been the need to invent quantum mechanics. Bohr's model would not have been based upon numerology as some claimed, but rather on simple classical physics. Thus, the photon, in plain sight of one and all, was proposed (Deutsch 1989b) as the "hidden variable" (psychologically hidden, unrecognized) responsible for low energy quantum physics.

Two specific cases are described below where the angular momentum of the photon, $\pm\hbar$, might have played a key role had it been taken into consideration. Physics might have taken a different turn had these facts been known and considered at the time.

A key factor in the acceptance of Einstein's general relativity theory of gravitation over the Newtonian model was the predicted and observed bending of light rays on passing near the sun. Einstein's model predicted exactly twice that of the Newtonian model and agreed with what was observed. The following facts of the

case deserve note: Newton's photon and Einstein's photon differed by a factor of exactly two. In Newton's case, $m = 2E/c^2$ while in Einstein's case, $m = E/c^2$ where m is the electromagnetic mass of the photon and E is the energy of the photon. To complicate the matter further, the photon possesses angular momentum; therefore it can be expected to possess *rotational energy,* (just as translational energy is always associated with linear momentum) a factor not taken into consideration in either the Newtonian or Einsteinian models. For a fuller discussion of the rotational energy of the photon see (Deutsch 1992). In the model of the photon (Deutsch 1989a, 1992) the energy of the photon was equally divided between translational energy and rotational energy.

In the construction of quantum mechanics the uncertainty principle was a key element which (Heisenberg, 1949a) formulated as $\Delta x \Delta p_x \geq h$, where Δx was the error in the measurement of the location of a particle (electron) in the x direction, Δp_x was the error in the measurement of the linear momentum of that particle in the x direction and h was Planck's constant. It should be noted that the uncertainty principle was derived in part from Einstein's equation for the photon, $p = h/l$ (Heisenberg 1949b) and that this analysis was also based upon photons passing through a microscope (Heisenberg, 1949c). Once h is recognized to be angular momentum there are two severe problems with Heisenberg's uncertainty principle. (1) If Δx and Δp_x are collinear, as was uniquely specified, then their vector product is precisely zero *for all numerical values of* Δx *and* Δp_x; therefore, Heisenberg's model cannot be valid. (2) Linear momentum is a conserved quantity and therefore must be quantitatively accounted for. This is not done in the uncertainty principle equation, as others have already pointed out.

If and when it becomes generally recognized that action is in fact angular momentum and that the principle of least action is in fact the conservation of angular momentum, a quite different insight into quantum physics can be expected. What was an impenetrable dark mystery, quantum physics, suddenly becomes an integral part of ordinary physics. The photon, with its quantum of angular momentum $\pm\hbar$, becomes the specific agent, the "hidden variable," responsible for low energy quantum physics. Then the separation between classical and quantum physics should disappear. Physics as a whole may well take on a new direction, away from abstract mathematics and back towards physical reality.

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Science Criticism

Thomas Phipps, Jr. hits the nail on the head in his An Essay in Science Criticism (Vol 2, No. 4) when he states: "There is in any field theory only one central object of operational significance and this is the detector of the 'field.' The detector 'creates' the field ... a completion that never happens without a localizing absorber to make it happen." He then goes on to postulate in this, and in his previous *Galilean Electrodynamics* paper [1], as to the nature of Hertz' term $\mathbf{v}_d$, and states that this term "ought rightly refer to field-detector (sink) velocity relative to the observer..."

This statement contradicts the earlier one. The third-party "observer" plays no role here. It is clearly only the relative velocity between the source and the detector, or sink, which plays any role in this analysis. The observer, in fact, has no knowledge of the release of (say) a photon from the source and its absorption by the sink except as reported or recorded by the source and sink themselves. The only time the so-called observer is free to make any independent statement about the nature of this transaction is when the observer is himself either the source or the sink. To clarify, if a source releases one photon, ultimately absorbed by a sink, a third observer never witnesses anything. The only way one can observe the trajectory of a photon is for that photon to impinge on the eye (or co-located detector) of the observer. Even if the source releases two photons, one to be absorbed by a "detector" and one by the observer, the observer still cannot say anything about the photon absorbed by the detector, except, of course, as reported to him by that detector. This is the fundamental mistake Einstein made in his simultaneity "experiment" involving two flashes of light on a railroad embankment.

If one interprets the parameter $\mathbf{v}_d$ as the relative velocity between source and sink, the desired invariant form of Maxwell's equations may be obtained. To obtain such invariance, one other interpretation must be made. The parameter c becomes the velocity c as measured with respect to the sink. Thus, instead of time- and space-dilation due to motion of the sink with respect to the source, we have simply that a photon "field" leaves its source at all velocities from 0 to some undefined upper limit, which may, in fact, be infinite. Then, the "only central object of operational significance" becomes the ultimate sink for that photon. At the instant of absorption, the detector "creates the field, a completion that never happens without a localizing absorber to make it happen." Due to the measured values of e_o and m_o, the nature of the absorber ensures that only that component of the photon field which passes it at a relative velocity of c will cause this completion.

Thus, any detector is assured of collapsing the photon at a time after its emission given by the distance from the source (at the time of emission) divided by the velocity c. Conversely, after performing suitable measurements (measuring the distance from the source and the time since its emission), all absorbers will conclude that the photon traveled from its point of emission at the velocity c with respect to the absorber, independent of any relative motion of the source itself.

This discussion is explained more rigorously in terms of the development of a Galilean invariant form of Maxwell's equations in the January 1996 issue of Galilean Electrodynamics.[2]

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Gravitational Redshift

Tom Van Flandern, in his article, "Another Aftershock for the Big Bang" (*Apeiron,* Vol. 3, No. 1, January, 1996), refers to the possibility that much of the red-

shift of quasars may be accounted for by the gravitational redshift. Nor did he discuss the difficulty of distinguishing the gravitational redshift from other redshifts. The purpose of this letter is to show that, in at least two cases, Tom Van Flandern's statement is applicable to galaxies as well as to quasars.

The first case involves a galaxy known as "Malin I." This galaxy was studied by Chris Impey and Greg Bothun whose results are reported in *Astrophysical Journal*, Vol. 341, pp. 59-104 (June 1, 1989). This galaxy was found in the Virgo cluster while the authors were making a survey of low surface brightness galaxies. Had the redshift of this galaxy not been measured it would have been assumed that it lies where it appears to lie in the Virgo cluster of galaxies at a distance of about 62 million light years. But when the redshift was measured it was found to have a redshift of 0.083, and if redshift is a measure of distance alone, this places the galaxy at a distance of about 800 million light years, or 13 times farther away than the Virgo cluster. Impey and Bothun never considered the possibility of gravitational redshift. Instead they proceeded to project the galaxy to a distance of 800 million light years, which then made it the largest galaxy in the universe. And to emphasize the absurdity of this, the projection of Malin I to a distance of 800 million light years placed it in one of the great empty regions of the universe, where there are no other galaxies or even clouds of gas. Had the gravitational redshift been considered, it would have been found that about 92 percent of the redshift is gravitational, and only 8 percent Hubble shift if it lies in the Virgo cluster where it appears to lie.

The second case is that of a galaxy with a redshift of 2.7 discovered by K.C. Yee *et al.*, and described by Ron Cowen in *Science News*, Vol. 149, page 120, dated February 24, 1996. In that case the redshift of 2.7 would place the galaxy at a distance of 12.5 billion light years, were it entirely a Hubble shift. But the galaxy is 100 times brighter than it should be at that distance, which is consistent with a distance of only 1.25 billion light years. If its true distance is 1.25 billion light years, then it has a Hubble shift of only 0.139 at that distance and a gravitational redshift of 2.248.

What could produce such large gravitational redshifts? In both cases the galaxies contain an enormous amount of hydrogen gas that surrounds the entire galaxy, including the nuclear region. In the case of Malin I, the authors estimate the mass of the hydrogen to be more than 100 billion solar masses. Under such circumstances, any photons emitted within the shell of hydrogen surrounding the nucleus will be strongly redshifted by the high gravitational potential that exists within it. And under Isaac Newton's Proposition LXX, there will be no potential gradient within the shell to smear the spectral lines, even though the potential is very high. The only requirement is that the shell of hydrogen be so transparent that photons emitted within it will pass without hindrance to observers beyond the galaxy. And this will be the case, for the gas is extremely thin.

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Aarau Question, Bergman-Wesley Electron, Mass-Frequency Relation: Response to G. Galeczki

I was surprised to find my review (Wilhelm 1995a) of Galeczki's article (l995a) on the *Aarau Question* together with his rebuttals (l995b, 1996) published in *Apeiron*. My comments (1995) refer to an earlier version of Galeczki's paper submitted to an other journal and, therefore, do not adequately scrutinize his later publication (1995a).

Galeczki's attempted rebuttals (1995b, 1996) of my criticism consist of untenable and unjustifiable assertions, for the following reasons:

1. The 'freezing of an EM wave' in a hypothetical, comoving (c) reference frame does not 'imply' Einstein's nonlinear velocity addition, $c \oplus v = c$, nor is such a *'law'* obeyed by EM radar velocities. Nor do EM waves with a wavelength $\sim$1 m represent an 'unmeasurable microworld' (see undergraduate EM laboratory experiments).

2. After I demonstrated (1995) that de Broglie's mass-frequency relation, $h\nu_o = m_o c^2$, for a particle with restmass m_o leads to physically untenable large frequencies ($\nu_o \geq 10^{46}$ s^{-1} for macroscopic particles with $m_o \geq 1$ gr), Galeczki (1995b) restricts this equation *without physical explanation* to fundamental particles such as electrons, protons, neutrons, *etc*. This indicates that Galeczki does not understand the equation which he promotes.

3. Based on his 'common sense' Galeczki (l995a) claims that 'any clock, has to be a public clock, having a built in periodic, cyclic process, an integrating mechanism, and a dial (digital display).' Galeczki asserts (1995a) that every elementary, microscopic particle contains such a clock, which by his definition must be a macroscopic system with a dial or digital display. Thus, Galeczki contradicts himself since a macroscopic clock cannot be contained in a microscopic particle.

4. I informed (1995a) Galeczki that the Bergman-Wesley (1990) electron model assuming a hollow vacuum torus of cross section πr^2 and central inner radius R with a *vacuum* surface $2\pi r \times 2\pi R$ ($r \ll R$), (i) carrying *massless* surface charges of density σ and (ii) rotating with *superluminal* velocity, $v(s) > c$ for $s > R$, is physically untenable. *Inter alia*, these authors misunderstand the physics of surface charges; disregard the *centripetal* forces (equivalent to denying the *centrifugal* forces in a corotating reference frame) on *real* surface charges and the EM mass distribution, for *subluminal* ($s < R$) and *superluminal* ($s > R$) velocities $v(s)$ of rotation; assume the rotating EM energy density to be responsible for the mass m_o of the torus electron; whereas they permit only the rotating magnetic mass to produce the angular momentum or spin ($\frac{1}{2}\hbar$, *etc.*).

5. Nevertheless, Galeczki (1995a,b) uses the Bergman-Wesley theory of an impossible electron model as sufficient evidence 'defining' the physical nature of ν_o in the de Broglie relation 'unambiguously as the (mechanical) frequency of the rotating (electron) ring'. This claim reveals Galeczki's ignorance of the low velocity annihilation of an electron (m_{o+}) with a positron (m_{o-}), or other particles with their anti-particles, into EM energy: $h\nu_{o\pm} = m_{o\pm}c^2$. Hence, ν_o in the de Broglie relation is interpretable as an EM frequency of photons $h\nu_o$ by experimental fact, but not as a mechanical rotation frequency.

6. Galeczki's (1995a) claim that the 'proper mass m_o of the electron is accounted for by the purely classical EM energy ($= m_o c^2$) of the charged spinning ring' is untrue since Bergman & Wesley (1990) disregard the kinetic energies of subluminal and superluminal rotation of the surface charges, which are not massless. Furthermore, no 'proper' EM mass m_o exists in their theory since the EM mass field (outside the torus) is assumed to rotate with *superluminal* velocity $v(s) > c$ in the region $s > R$. *Note that neither surface charges nor EM masses can rotate (absolute G-invariant motion) with a superluminal velocity.*

7. The experiments of R. Hofstaedter (1957-1961) prove that elementary particles such as neutrons, protons, *etc.* have an internal positive and/or negative *volume* charge structure. These experimental facts independently refute the rotating ring particle model with *surface* charges of Bergman & Wesley (1990). In addition, their theory is a put-on since the correct

magnetic moment of the electron is fabricated by the *ad hoc* assumptions that (i) the radius $R = h/m_o c$ *inside* the vacuum torus is the Compton wave length and (ii) the velocity of rotation *(of the vacuum!)* at R is $wR = c$. *Note that there are no experiments which confirm that the radius of a particle is given by the Compton wave length* $l = h/m_o c$.

8. In (8)-(16), Bergman-Wesley (1990) achieve (without using toroidal coordinates) a balance between the outward electric pressure and the inward magnetic pressure on the rotating electron torus, by forgetting about the inward centripetal force! In (17)-(24), the authors achieve by means of an incompetent application of the Ampère force between moving charges a (nonexisting) balance between electric ($f_e > 0$) and magnetic ($f_m > 0$) forces, *which are now both outwards (!),* and an *inward, luminal* acceleration force ($f_a < 0$). Thus, both force balances are false and contradict each other. Moreover, the authors confuse *force-balance* with the *stability* of the (unstable) rotating electron torus against arbitrary EM and surface charge perturbations.

9. Galeczki (1995a,b, 1996) promotes Beckmann's (1987) text, *Einstein Plus Two,* as superior to the recognized electrodynamics treatises of Jackson, Panofsky & Phillips, or Sommerfeld. Beckmann's book contains no sound new presentations of electrodynamics, but original misunderstandings and false physical explanations which are too numerous to be discussed here. *E.g.*, by using false physical arguments he comes to the conclusion that Maxwell's equations are G-covariant, while he admits also their Lorentz (L) covariance (which he discounts as nonphysical). Beckmann does not understand that the G-transformation is incompatible with Maxwell's wave equations (Wilhelm 1989).

10. Galeczki (1995a,b, 1996) justifies the promotion of Beckmann's book with the allegation that the recognized electrodynamics texts do not explain relative to what the velocity $\mathbf{v}$ is (i) in the current density $r\mathbf{v}$ of Maxwell's equations and (ii) in the Lorentz force $\mathbf{F} = e(\mathbf{E} + \mathbf{v} \times \mathbf{B})$. Through such confessions Galeczki (1995a,b, 1996) and Beckmann (1987) reveal that they do not comprehend covariant physical theories such as electrodynamics. *E.g.*, in G-covariant (Wilhelm 1985, 1995b) or L-covariant electrodynamics, all fields $\mathbf{E}(\mathbf{r},t)$, $\mathbf{B}(\mathbf{r},t)$, $r(\mathbf{r},t)$, and $\mathbf{v}(\mathbf{r},t)$ are defined relative to an arbitrary inertial frame (IF) S($\mathbf{r},t$). S is usually chosen as that IF in which the analysis of the experiment is the simplest [in most cases the (quasi) IF in which the experimental set-up is at rest].

11. In contrast, Beckmann (1987) defines the velocity field $\mathbf{v}(\mathbf{r},t)$ of the space charge density to be relative to the 'moving' EM field $\mathbf{E}(\mathbf{r},t)$, $\mathbf{B}(\mathbf{r},t)$, whereas the latter fields and $\mathbf{r},t$ remain defined relative to an IF S($\mathbf{r},t$). This definition of electrodynamic velocity is not only experimentally undesirable but physically untenable. Since he (correctly) believes in the Galilean velocity addition theorem, the velocity $\mathbf{v}(\mathbf{r},t)$ of the charge density would be subluminal or superluminal, depending on whether the charges move in or opposite to the propagation direction of an EM wave pulse! In particular, a charge resting in S($\mathbf{r},t$), would have a luminal velocity relative to an EM wave pulse in Beckmann's electrodynamics!

12. Galeczki's complaint concerning the ambiguity of the velocity $\mathbf{v}(t)$ of a charged (e) particle in the Lorentz force $\mathbf{F} = e(\mathbf{E} + \mathbf{v} \times \mathbf{B})$ is equally unfounded. Both $\mathbf{v}(t)$ and $\mathbf{E}(\mathbf{r},t)$, $\mathbf{B}(\mathbf{r},t)$ are defined relative to an arbitrary IF S($\mathbf{r},t$). This is possible since $\mathbf{F}$ is an L-invariant field. More important, the Lorentz field is also a G-invariant ether (°) excitation (Wilhelm 1985, 1994, 1995b): $\mathbf{E} + \mathbf{v} \times \mathbf{B} = \mathbf{E}^\circ + \mathbf{v}^\circ \times \mathbf{B}^\circ =$ G-inv and $\mathbf{B} = \mathbf{B}^\circ =$ G-inv, where $\mathbf{v}^\circ = \mathbf{v} - \mathbf{w} =$ G-inv. The asymmetry in the G-transformations of $\mathbf{E}$ and $\mathbf{B}$ results from the existence of electric charges and the non-existence of magnetic charges (Wilhelm 1985, 1994, 1995b).

13. Galeczki (1995a,b, 1996) and Beckmann (1987) suggest that Einstein's STR predicts motion of the wheel of a windmill in still air when the observer of the windmill runs relative to the air. Both appear to be not aware that the STR is a kinematic theory and is, therefore, inapplicable to *dynamical* phenomena, *e.g.* the transfer of momentum and energy from the wind to the wings of the wheel of a windmill. Since Galeczki is fascinated with Beckmann's (1987) misunderstood physics (of which only a few examples were given), I recommend that he studies next the neo-physics of T. Phipps, *Heretical Verities* (1986).

Summary: The Aarau article (Galeczki 1995a) lacks original contributions, understanding of physics, and self-criticism. In particular, Galeczki (1995a,b, 1996) failed to make a case for de Broglie's mass-frequency relation, Beckmann's electrodynamics with velocity fields relative to moving EM fields, or the multiply flawed theory of the rotating electron torus of Bergman & Wesley (1990). For this reason, his well intended promotion article (1995a) failed its purpose.

Galeczki's (1995b) physics is once more obvious in his final sentence: *'The fact that some frequency is very large is no reason to declare that it cannot exist'.* Apparently, using such philosophy he (and possibly Bergman & Wesley) overlooked that the *superluminal* velocities of the rotating electron torus, its surface charges, and EM field are science fiction. Not even EM waves and photons exist for arbitrary large wave frequencies due to EM breakdown of the vacuum (ether).

Further misconceptions can be found in other papers of Galeczki (1994-1995). In particular, I was amazed that in their review Marquardt & Galeczki (1995) would attribute the well known hydrodynamic formulation of quantum mechanics and the quantum potential of Madelung (1926) to David Bohm, thus supporting the latter's unethical *'rediscovery'* three decades later.

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Measure of the Universe

The comments by Dr. Pesteil in the special edition of *Apeiron* (Vol. 2, No. 4) on the relationship between the numbers 1.228 and 210 is of particular interest. In his article, as in others I have read (*e.g.* by M. Kokus, *Apeiron* 20, pp. 1-5), the author does not appear to be aware that 1.228—or 1.23 to two decimal places as determined by me in a study of the Solar System—is in fact $(1.5)^{½}$ very closely. $(1.5)^{½}$ equals 1.2247449 and is a very good substitute when only low powers are used. In like manner, the number 1.19 is closely $2^{¼}$ (=1.1892071) and so assists in showing relationships between other formulae. For example, in Table 3 of Kokus:

$$2.3 \times 10^{39} = \frac{e^2}{G m_p m_e} = 1.2314930^4 \times 10^{39}$$

$$10.6 \times 10^{39} = \frac{m_e c}{e^2 H} = 1.23^8 \times 2.02332$$

$$\text{or} = 1.23^8 \times 1.19^4$$

within 0.889% of 10.6.

$$1.19 = \frac{m_2}{m_1} = 2^{1/4} \text{ very closely}$$

$$(1.8920712^4 = 2).$$

Where do these two numbers come from? Here I must digress a little before suggesting an origin.

It has been my pleasure over the past several years to have been intermittently studying the Solar System and its possible origin. The pleasure has not been because the study was intermittent but because of the many discoveries made. Rarely is it possible to make a definite statement in geological theoretical problems, and so it has been a most satisfying experience to be able to categorically state that the Solar System began by the ejection of a differentiated, relatively heavy core of a prolate ellipsoidal protostar. The remainder of the protostar collapsed to form the Sun and the core began orbiting the Sun, The differentiated prolate ellipsoidal core became increasingly elongated until its ellipsoidal eccentricity reached that of the first Jacobi bifurcation value. At this point the body broke up to form Saturn and a protoJupiter. This system was force unstable and correction was made by successive expulsions of protoJupiter inner core matter.

The method and argument for the above is not important here, but what I desire to point out is that the Jacobi bifurcation point occurred when the *a*-axis length of the prolate ellipsoidal core reached 1.5× (or very nearly so) the radius of the sphere containing the same volume as the ellipsoid. The relationships of the ellipsoid axial dimensions with its inner parts then gave ratios in powers of 1.23, 1.19 or 0.724 (= 0.98^{16} = 0.2741/4). 1.19/1.23 = 0.9674797 or within 0.73% of $0.724^{1/8}$. (Note $10 \times 0.724^2/1.23^8 = 1$ within 0.054%.) These ratios are reflected in and between the ejected parts because of their force, momentum, and energy relationships at the time of ejection.

Now back to the Universe. Applying analogy of the above to the Universe, I would suggest that if there ever was a "Big Bang" it was not an explosion resulting in radial expulsion. Rather, the initial body was prolate ellipsoidal in shape, poorly differentiated (definitely differentiated to some degree), very densely compressed and revolving at very great speed. The body became increasing elongated until its *a* -axis attained a length of about $(1 + .22833302)^2$ = 1.5088020 times the radius of the sphere containing the same volume. This length marked the first Jacobi bifurcation point instability and the body disintegrated. It did *not* just break into two parts as differentiation would have produced a force field out of equilibrium with the field prior to break-up. Note that it would not have exploded. The matter would have been thrown out tangentially somewhat like a near 3-D catherine wheel fireworks; and the matter as it was thrown off would be rotating. This latter point I state with reasonable confidence as it is possible to calculate the rotations of Uranus and Neptune using the Solar System hypothesis outlined above and knowing the rotations of protojupiter and Earth.

In a like manner to the Solar System, the numbers 1.23 and 1.19 should occur throughout the Universe dimension ratios as occurs in the Solar System. This is because the original force, momentum, and energy relationships at the beginning of break-up depended on the axial relationships at break-up; and being in effect a closed system the relationships must remain constant.

A break-up of an initial body in this way, I suggest, will explain various phenomena. In particular, it seems to me that good arguments can be developed from it to explain the "tired light" hypothesis and to suggest that the speed of light from different parts of the Universe can be different, even if only slightly.

Anyway, this is getting off the subject, which is that the persistent ratios 1.228 and 1.19 occurring in Universe formulae can be explained using a slightly different initial Universe mass break-up to that currently in fashion.

Before closing may I remark that Pesteil's number

$$210 = 1.22833302^{20} \times 1.1927699^7$$
$$\text{or} = 1.23^{20} \times 1.1881571^7$$
$$\text{or} = 1.2296198^{20} \times (2)^{7/4}$$

In other words the equation, as an example, $p^{27} = A^{702}$ gives,
$1.2283302^{540} \times 1.1927699^{189} = 1.2283302^{702}$
thus $1.1927699^{189} = 1.2283302^{162}$,
and, of course, other variants on 1.23 and 1.22962.

The point I wish to make is that hidden in the figure 210 are the two approximate ratio numbers 1.23 and 1.19. These ratios are not good for very high powers but quite good for low ones. To me the "mystery" number is not 1.228 but 210.

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Reply by P. Pesteil

The purpose of my letter (*Apeiron*, Oct. 1995, p. 121) was to connect A = 1.2283 to P = 210, as suggested by Arp and myself, to obtain the masses of the objects that make up the Universe. It was absolutely necessary to find a relation between A and P, as these were supposed to explain the same phenomena.

I was not aware of the work on cosmology done by Dr. Lee (who gives no references) and I must apologize that I find A mysterious. I was able to explain the origin of P with reference to my article in Apeiron (1991, No. 11, p. 13). In my number system, the mass of the nucleon became

$$m_{nu} = 210^{1.5} \times 5^3 \quad (210 = 2\times3\times5\times7)$$

This formula enabled me to calculate the magnetic moments of both nucleons, and then provided the foundation for a system of units (ℓ, m, t) which has proven especially productive.

Nevertheless, I do agree that all this is very mysterious. But is this really so surprising?

We have reached the most fundamental level. The formulae I have obtained (valid only in one very specific system of units) cannot be explained by more general laws. To give an example: Kepler's laws are explained by more fundamental laws, *viz*. $F = dp/dt$ and $F = Gmm/r^2$, but the latter are not based on any other laws. The same holds for (210), (1.2283), (1.192) and (137.036).

I would be very happy if someone could show me how these laws arise *from more general laws*, which I, for one, would regard as a great step forward in our understanding of the Universe.

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Instructions to Authors

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