Did the Universe Have a Beginning?

The recent excellent article by Tom van Flandern on the evidence against the theory of the expanding universe stimulates an endeavour to get to the heart of the matter by logically reducing this complex problem to its simplest possible form.

The improved instrumental capacity available to astronomers in recent years has progressively refined the evaluation of the Hubble constant, and a stage is now being reached at which the "age" of the universe as computed from the cosmic expansion hypothesis with a "big bang" origin is in increasing conflict with its age as evidenced by other direct observations. The time seems, therefore, to have come when it is reasonable to take stock of this confused situation, and indeed to consider whether the concept of an expanding universe is valid, or whether it has been a magnificent sidetrack of mathematical thought, further attempted justification of which may only hinder further progress in knowledge. The acknowledgment that in an expanding universe, energy is continually not conserved, in any case hinders full acceptance by those to whom the conservation laws are sacrosanct.

If the cosmic redshift is assumed to be due to some process other than expansion, then the greatest weight should be given to the simplest practical hypothesis, and this should be strictly based on direct observational evidence. In this respect it is submitted that the spectral redshift of distant galaxies itself is the sole piece of direct evidence available; other evidence held to be in support of the expansion theory (*e.g.* the cosmic microwave background radiation, or the relative abundance of certain elements) depends on hypothesis for interpretation and must therefore take lower rank.

An alternative explanation for the redshift therefore demands either that: (1) photons emitted by changing atomic energy levels at some time in the past carried lower energy levels than they do at present; or (2) during the transit of the photon through space, some unknown process occurs which progressively lowers its energy content; and a number of conjectures of varying complexity have been made in this respect. The simplest proposition, which seems to have received scant attention, is that there is some mechanism inherent in the transit of a photon through space itself which progressively deprives the photon of energy.

This basic proposition is that a photon, constituting a wave-form of energy $h\nu$, encounters a reactance from space which dissipates a small fraction of its energy, and this constitutes a constant representing the fractional expenditure of energy so dissipated. Thus, if ν is the initial frequency, ν' the observed frequency, and k this constant, the relationship will be $h\nu' = h\nu - h\nu k$, or $h\nu' = h\nu(1-k)$ for one cycle, and approximately $h\nu' = h\nu(1-nk)$ for n cycles.

If the recent finding from the Hubble Space telescope, recording Cepheid luminosities in a distant galaxy, and deriving an up-dated figure for the Hubble constant at an apparent recessional velocity of galaxies of some 80 km s^{-1} per megaparsec distance, is valid, the energy-loss of light in transit over cosmological distances can be calculated. At this Hubble parameter, accepting $z = v/c$, $z = .000267$. Evaluating k as the fraction of energy lost per cm of light travel, $k = 8.65\times10^{-29}$. (If the energy loss is evaluated in terms of a single cycle rather than per cm, this is given by $hkc = 1.72\times10^{-44}$ erg. The evaluation of k will doubtless be refined by further observations. Should this proposition be valid, distances of distant objects can then be derived directly from z values (where $z = \Delta l / l$) without any requirement for an expanding universe. Taking nk = energy loss for 1 cm transit, then transit distance $D \approx z/k$ cm.

This appears to be the simplest proposition possible, and although the mechanism of the action of this constant is unknown, if the result corresponds to what is actually observed, it can be reasoned (on a par with other physical constants such as G, or the fine-structure constant, where the derivations of the actual values are unknown but are empirically determined) that the onus is on the skeptic to prove that such a constant—too small to register in any local laboratory experiment—cannot exist.

It may appear that the addition of a constant to the formulation of EM transmission is rather an *ad hoc* device, introduced only to make a theory agree with the observed facts. But this is not necessarily the case. For example, a situation might be tentatively postulated which is to some extent analogous to Newton's third law, concerning reaction when two bodies interact (noting that in inelastic collisions, a small proportion of the kinetic energy is dissipated as heat), and with a Machian background. The photon is viewed as a packet of energy ($h\nu$), which, traveling as electromagnetic radiation, carries with it orthogonal fields E and B, thereby creating an altered condition of its surrounding space (such detailed and problematic questions of the length of the wave-packet required to define the frequency, and the exact spatial localisation of the photon as a particle or a de Broglie wave, are here ignored as irrelevant to the essential theme). It is then assumed that at any given locality space is not a neutral void, but is in an altered state, stressed by the forces engendered by the resultant of all other surrounding electric potentials. This state will be one of equilibrium. During the cycle of EM transmission, the force arising from the rising potential of the E field is counteracted by the force required to displace the field potential of the spatial locality from its equilibrium state. Work therefore has to be done as the potential rises, and energy expended; the energy value $h\nu$ of the signal is lowered. On collapse of the E field to zero, equilibrium is restored. But such a suggested derivation—admittedly vague—of the origin of the constant is purely speculative, and it may well have some quite different causation; here the work of A. Ghosh on inertial induction might be apposite.

However, it is not our purpose here to attempt to derive the origin of this process, but rather to suggest that the observational evidence favours the existence of k as a genuine natural physical constant of nature, ranking with those other general physical constants, of which the values still have to be determined empirically.

This suggested process is, thus, an intrinsic feature of electromagnetic propagation through space, unassociated with any reaction between photons and material particles which might be encountered during transit, with the associated problems of scattering and dispersion which then arise. As we are unconcerned with relative velocities, the Lorentz transformation is not involved; any concern about the validity of Einstein's fundamental postulates is irrelevant. Were this conclusion to be accepted, the consequences for the current theories of cosmology and cosmogenesis would be revolutionary, and the concept of a "big bang" expanding universe relegated to the past as the grand myth of the twentieth century.

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John Watson,
Iddons, Henley's Down, Catsfield,
Battle, E. Sussex TN33 9BN

Relativity of Simultaneity: Reply to John Watson

From Mr. John Watson's considerations (Apeiron 2(1):42), we read with pleasure that:

> *The authors' contention that simple velocity addition or subtraction is not in accordance with the PIVL is surely correct...*
>
> *The determination of simultaneity is thus only a matter of the establishment of a spatial position at a specific time. The clock paradox now disappears, as does the ROS...*

If we do not misunderstand, we have the feeling that Watson agrees with our conclusion (*Apeiron* 16:10) that "the ROS is a false proposition", and "since the ROS is invalid, it provides no premise for Einstein to conclude that 'every reference-body (coordinate system) has its own particular time'."

Nevertheless, our differences must be discussed in order to achieve some clarity and promote the development of modern theoretical physics along a healthy path.

Perhaps it in not superfluous to point out that the ROS is of vital importance to the special relativity theory (SRT): it "is the conceptual foundation of SRT" (*Apeiron*, 16:8) and "plays a pillar-like role in the building of SRT." (Xu & Xu 1992). In other words, the validity of ROS is such a matter of life-or-death for Einstein's theory that without ROS, there would be no SRT. Thus, it seems reasonable to expect Watson to agree that "Einstein's ROS vanishes together with his relativity—immediately" (Apeiron, 19:34), while the clock paradox now disappears."

In a popular book (Einstein, 1926), Einstein establishes the basis for the ROS as follows:

> *Lightning has struck the rails on our railway embankment at two places A and B far distant from each other... Just when the flashes of lightning [simultaneously] occur, this point M′ naturally coincides with the point M...*

which differs from what Watson gives in his discussion, explicitly.

It seems improper for Watson, as a defender of the PIVL, to draw a parallel between a photon and a bullet, since the PIVL purports to differentiate between them by assuming that the former does not obey "simple velocity addition or subtraction".

In Watson's "considerations" we read that

> *Any velocity this emitting atom may possess... has no effect on the fixed transmission speed of the photon once it has been emitted. The same is the case when the photon is absorbed by the receiving atom, which may or may not be in motion.*

Yet, the above does not unambiguously represent the exact meaning of Einstein's PIVL, because: (1) equally, any velocity a (say) gun may possess has no effect on the fixed initial speed of the bullet once it has been "emitted" from the gun, due to the principle of inertia, despite the PIVL; (2) the PIVL may refer to one and the same source of light. Despite its various versions, the PIVL means (borrowing Watson's citation) that

> *For photons emitted from an emitting atom, their velocities (in vacuo) with respect to any inertial frames are constant and equal to c; viz., any velocity of a photon has been affected neither by motion of the emitting atom, nor by motion of a receiving atom, whatever the speeds of the emitting atom and/or the receiving atom may be...*

which means an infallible equivalence of all inertial frames for light velocity, wherever its source may be.

Concerning the basis of and evidence for the PIVL, Watson writes that

> *...there is ample reason to believe that the PIVL is valid not only on theoretical grounds, but in view of much supporting practical evidence, from the original Michelson-Morley experiment to the physical events recorded in high velocity particle accelerators.*

It is, however, well known that the PIVL is merely one of the two postulates made by Einstein. In that case, what are the theoretical grounds for the PIVL?

It is clear from the above that the "theoretical grounds" of the PIVL, if any, are just Einstein's infallible equivalence (of inertial frames). Yet, it is groundless, because there are numerous empirical and logical facts that negate it. The (radial) Doppler effect is one example, since two observers at different (inertial) frames have different observational results. The ROS itself is another example... and so on.

Anyone who realizes that the PIVL is based on Einstein's infallible equivalence (of inertial frames) for light velocity would never believe that "the PIVL is valid.... on theoretical grounds."

As for empirical evidence for the PIVL, we should point out that, to our knowledge, the PIVL has not been tested experimentally, at least "one-way". Many major mistakes and confusion in basic physics have not been clarified or rectified, and theoretical physics cannot be expected to make healthy progress unless a distinction is made between "purely observational" and genuine electrodynamic effects. The problems of the so-called "electrodynamics of moving bodies" (Einstein 1923) should be separated into to: (a) Pure observational effects, such as the Michelson-Morley (1887) experiments, Doppler shifts, stellar aberrations, etc., and (b) those which involve mutual action.

Only the latter problems involve the fact of interaction and belong to (genuine) dynamics, the former not. The experiments of the latter sort should be examined from and interpreted via dynamic processes of interaction. Accordingly, it is a glaring error to ascribe the effect of (genuine) electrodynamics of moving bodies to relative motion of an observer or to his observation, while disregarding mutual action, as Einstein did.

As for the first class of phenomena, there is sufficient evidence for us to conclude that, contrary to Watson's belief, none of the experiments claiming to have confirmed the PIVL is convincing evidence, because all "confirmations" of the PIVL are either untrue or wrongly interpreted, or obtained from experiments that violate Einstein's postulates.

In view of the limited space available to us, a full discussion will have to await a later article.

Suffice it to say that Einstein's PIVL makes his alleged relativity an *absolutism* of light velocity! But this is only superficially claimed. In fact, Einstein never took it seriously. For example, various values for the velocity of light, such as $(c - v)$, $(c + v)$ and $\sqrt{(c^2 - v^2)}$, *etc.*, appear in Einstein's arguments and his 1905 derivation of the Lorentz transformation (Einstein 1923).

Today, most physicists concur that the Ritz theory (note: henceforth we confine it to the realm of "pure observation", in vacuo) is wrong. This conclusion, however, lacks tenable evidence, since there are still many mistakes and much confusion at the fundamental level in theoretical physics, astrophysics and cosmology, *etc.*

We welcome comments from Mr. Watson and others.

Xu Shaozhi and Xu Xiangqun
P.O. Box 3913, Beijing 100854
P.R. of China

Physical Magnitudes and the Fundamental System of Units

With this 23rd brief to the Academy of Sciences (Paris), I think it is time to wrap up the work I began fifteen years ago (see also Pesteil 1991, 1994).

Before presenting the latest results that follow directly from what I set forth before, I would like to remind readers that my thoughts were guided at first by my aversion for the "big bang" and the requirement of subparticles—*e.g.* quarks, which are supposed to be the (ultimate?) constituents of matter—to which physicomathemeticians have given such whimsical (as Weisskopf calls them) names. I would also add that, for a long time, I had questions about the 5 international units (S.I.): the meter, the kilogram, the second, the Coulomb (or Ampere) and the degree Kelvin. This system, which is tied to the movement and dimensions of the earth and the physical properties of water, seemed marred by a pre-Copernican stamp. One could just as easily have chosen other units, which would have been just as convenient and equally incapa-

ble of helping us to better understand the world or discover new laws.

These, admittedly unorthodox reflections led me directly to a numerical series for the masses of elementary particles, such as the electron and the nucleons. The criterion I chose to gauge the merit of these formulae was their utility in calculating properties other than mass (I chose magnetic moment) and the equilibrium of elementary nuclear reactions. Obviously, these formulae gave me the mass unit. A hypothesis ($m = d^2$) connecting the mass to the radius of action of the particle gave me the unit of length, and the hypothesis $c = 1$ gave me the time unit. These units are:

$$m_o = 4.395 \times 10^{-33} \text{ kg}$$
$$l_o = 3.9094 \times 10^{-16} \text{ m}$$
$$t_o = 1.304 \times 10^{-24} \text{ s}$$

Equipped with this new system of mechanical units, I had to take care of two remaining units, Q and Θ. I eliminated Q easily by assuming my system was electrostatic and electromagnetic (*i.e.* by setting $e_o = m_o = c = 1$. The problem of finding the temperature was more difficult and will be dealt with below. However, I had indicated earlier that the unit of temperature should be inversely proportional to the unit of length, since, in S.I., hc is close to K (h is Planck's constant and K is Boltzmann's constant). The dimension equations for hc are, therefore: $hc \equiv ml^3t^{-2}$; and for K: $K \equiv ml^2t^{-2}\Theta^{-1}$.

Magnitude	Symbol	Definition	Value (Fundamental System)
Rydberg	R_∞	$\frac{m_e c a^2}{2h}$	$m_e a_e^5$
Hartree energy	H	$2hcR_\infty$	$m_e a_e^2$
Josephson Constant	J	$\frac{2e}{h}$	$4a_e^2$
Magnetic flux quantum	Φ_o	$\frac{h}{2e}$	$\frac{a_e^{-2}}{4}$
Compton wavelength	l_C	$\frac{h}{m_e c}$	$\frac{a_e^{-3}}{2m_e}$
Bohr radius	r_B	$\frac{a}{4\pi R_\infty}$	$\frac{a_e^{-4}}{4\pi m_e}$
Classic electron radius	r_e	$a^2 r_B$	$\frac{a_e^{-2}}{4\pi m_e}$
Bohr magneton	m_B	$\frac{eh}{4\pi m_e}$	$\frac{a_e^{-4}}{8\pi m_e}$
Nuclear magneton	m_N	$\frac{eh}{4\pi m_p}$	$\frac{a_e^{-4}}{8\pi m_p}$
Thomson cross-section	s_e	$\frac{8\pi}{3} r_e^2$	$\frac{a_e^{-4}}{6\pi m_e^2}$
1st radiation constant	c_1	$2\pi hc^2$	πa_e^{-3}
Boltzmann constant	K	(see text)	$\frac{a_e^{-3}}{2}$
Stefan constant	σ	$\left(\frac{\pi^2}{60}\right)\left(\frac{8\pi^3 K^4}{h^3 c^2}\right)$	$\frac{\pi^5}{15} a_e^{-3}$
2nd rad. constant	c_2	$\frac{hc}{k}$	1

The next step was to calculate the chief magnitudes in microphysics. For example, it was found that $2h = a_e^{-3}$ and $e = a_e^{-1}$ (e is electron charge and a_e is the electron fine structure constant). The main purpose of this note is to suggest a table of important magnitudes and solve once and for all the question of the temperature unit.

However, before presenting the table, I will remind readers that I proposed to replace the big bang (forbidden by the relation $m = d^2$) by a continuous creation of matter: this led me to assume that l_o and m_o were fixed, and that the time unit, t_o, decreased exponentially (compared to a fixed unit). These latter hypotheses enabled me to study physical magnitudes in time: the speed of light, which remains constant in a given location, nevertheless varies from one place to another. From this I deduce that rays of light coming from distant galaxies follow curves, and that we can also expect a redshift of their spectral lines.

I would also like to stress the fact that the surprising values obtained for h and e in this "fundamental" system were not taken *a priori*, but follow from the numerical series (which is also capable of calculating π). For the remaining units, you need only consult the table below, which shows 14 different physical magnitudes, with their symbol name, definition and value in the fundamental system of units I propose, which is based only on a_e and m_e (one could even eliminate m_e owing to the relation $a_e^{-2} = 2\pi m_e d_e$).

There is nothing special to say about the first 11 magnitudes, since one need only replace h and e with their values ($h = a_e^{-3}/2$; $e = a^{-1}$ and $c = 1$.) A few remarks will be made about the last three magnitudes: K (Boltzmann), σ (Stefan) and c_2, the second radiation constant, which all contain the temperature in their dimensions.

K (Boltzmann): Because we did not find a way to use the Avogadro number, we have used the relation K/hc, which was mentioned above. In S.I., this ratio turns out to be equal to 69.5344. From this we deduce that $\Theta_o^{-1} = l_o \times 69.5344$. In the fundamental system, the value of K is given by:

$$K_f = \frac{K_{SI}}{m_o l_o^3 t_o^{-2} \times 69.5344}$$

Consequently, $K = 1285737 = a_e^{-3}/2$.

σ (Stefan): To obtain σ, one need only use the value of K obtained above.

c_2 (second radiation constant): Here too, all we need to do is introduce the value of K to obtain the astonishing result $c_2 = 1$.

Finally, the new temperature unit, which can be added to the other three mechanical units, is $\Theta_o = 3.6786 \times 10^{13}$ m^{-1}.

Conclusions: It is not for me to judge this work, which raises many questions that physicists have lost the habit of asking themselves since the disappearance of the presocratic philosophers, and especially since the recent triumph of the big bang and its growing family of subparticles, all justified by the cascade of the SU(n). I therefore leave it to the young physicists who follow me to separate the wheat from the chaff. But it is obvious that adopting my analysis will have serious consequences for the jobs of mathematicophysicists (who would no longer have to look for new particles) and for governments, which could save millions of billions of dollars each year, money that could be put to more pressing uses.

I would add another defect in my analysis: the collapse of all physical magnitudes in a_o makes my system of units absolutely useless to engineers and laymen alike.

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Paul Pesteil
23, rue de Rivoli
06000 Nice, France

Light Speed Limits Revisionism?

A response by P.J.E. Peebles *et al.*, (Peebles 1995) to a letter in *Scientific American* seems to presume major revisions to Einstein's concepts of light speed limitations in special relativity. It was in answer to a letter (Williamson 1995) questioning their interpretation (Peebles 1994) of the Big Bang expansion from very compact matter and energy, in the volume of about a dime to 1000 times the size of our solar system in one second. Williamson (1995) correctly noted that outward speeds of mass and energy would have been 1000's of times light speed. In justifying their assumptions, the authors (Peebles, Schramm, Turner and Kron 1995) said:

> *The faster than light speed expansion of space in the young universe does not violate Special Relativity, which only says that "information" [their emphasis] cannot be transmitted faster than light.*

I've found no such interpretation in Einstein's works. Instead, I find such statements as, "velocities greater than that of light have ... no possibility of existence" (Einstein 1905) and "velocity c ... can neither be reached or exceeded by any real body" (Einstein 1916), and his derived equations showing that mass increases to infinity at c.

The Peebles *et al.* interpretation seems to be that it's OK for mass and energy to travel at "superluminal" speeds, as long as intelligence about that motion travels no faster than light speed. I applaud their search for more logical interpretations of Special Relativity and its 2nd principle.

While I was at the 3rd international conference sponsored in May, 1994 on "Space, time, and gravitation", I found a surprising diversity of ways in which special relativity can be questioned. Other references provide a growing number of instances in astronomy of "superluminal" speeds observed for nova luminosities [ejecta?], such as the apparent speed of 25*c* for SN 1987A (Malin 1990) and radio source "blobs" passing at speeds of 3.5c (Sheldon 1990).

But, by rejecting limits of mass and energy to light speed, Peebles and co-authors not only reject today's concepts of special relativity, but they remove the basis for a finite universe—the basis for the BB theory in the first place. If superluminal light speeds are possible, there could be many stars [perhaps an infinite number] beyond and within the visible portions of the universe which are unseen because of their speeds greater than *c*.

Rejecting limits of mass and energy to light speed also rejects the derived equations for mass increase to infinity when velocity *v* reaches *c*, as well as the conclusions of experiments which supposedly showed that mass increase with velocity confirmed special relativity.

I wrote to *Scientific American*, and presume they must be receiving a large quantity of mail on this. Perhaps, any one of those letters will serve the purpose of bring these issues to the attention of the scientific community, and perhaps ... just perhaps ... will trigger the long overdue serious discussions of special relativity and the BB. I've also written to each of the authors, though I doubt that I will receive an answer. But they certainly must realize by now what their response to letters questioning their article has stirred up. They conclude their response letter with support for their concept of the BB:

> *The current flood of observational and experimental results makes this an exciting time for cosmology; as in the past, we will no doubt need to refine or even to revise our theories as the data improve. Still, the basic picture of the big bang has proved remarkably robust when confronted with new puzzles.*

... while ignoring the dilemma raised by their assumptions. Readers of this column may wish to add their own thoughts to this emerging discussion.

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Neil E. Munch
9400 Five Logs Way
Gaithersburg, MD 20879
email: 70047.2123@compuserve.com

Revelations about Pulsars

From time to time the mass media inform us about astronomers' discoveries of planets beyond the solar system. The person who claimed a discovery of the first planet outside the solar system was the contemporary astronomer Peter van de Kamp of Swarthmore College. He concluded from the observed wiggling movement of the visible Barnard's star that the dark companion of the star is a large planet. In 1991 three scientists Lyne, Bailes and Shemar (L.B.S.) (1991) from the Jodrell Bank Observatory (England) announced a planet orbiting the pulsar PSR 1829-10. This announcement was greeted with great and authentic interest in England. A similar reverberation was created by Taylor's discovery of the double pulsar, which earned him the Nobel Prize in 1993. In the last few years, information in the mass media about discoveries of planets has grown drastically. This "state of affairs" is, however, not accidental. It reflects tendencies in contemporary astrophysics. The search for planets outside the solar system and also for evidence of existence of life on these planets has become very much in vogue. In the powerful scientific corporations (*e.g.* NASA and CIT in the USA, the Herzberg Institute in Canada) special scientific groups have been organized to carry on research in this direction. In the search for planets beyond the solar system, amateurs are also active, especially in the USA, and they also are successful, as reported even in the professional scientific journals.

Information in the mass media about discoveries of the planets has, in general, a sensational character. The discoveries of the planets appear and disappear like ephemera; one might say that the discovered planets live *in statu nascendi.* But in addition to observations, some published information bears on serious theoretical work as well. Here belong undoubtedly the investigations of the Polish astronomer Wolszczan. Wolszczan has reported the discovery of two planets orbiting the pulsar PSRB 1257+12 in 1992. In the past 2-3 years he has carried on the systematic observation of this object. These observations confirmed the earlier observed regularities and authorized the researcher to formulate hypotheses as to the existence of 3 planets, and later even of 4 planets. Wolszczan did not stop his observations. He subjected the observational data to a detailed analysis. He published the results and the conclusions drawn from this analysis in the American weekly *Science* (Wolszczan 1994). Wolszczan claims that he has proved, with his analysis of the observational data, the existence of the planets around his pulsar.

The analysis of the observational data made by Wolszczan is undoubtedly a serious theoretical development. A "serious" elaboration does not, however, mean that it is adequate to reality. What Wolszczan offers has as much in common with the truth as the truth has in common with Wolszczan's views. At the root of his analysis lie at least two assumptions: 1) the Einstein postulate about universality of the velocity of light is sacred, which in this case means that the postulate applies also to a light originating from stars; 2) neutron stars exist. The author of this article is of an opinion that both are false.

We are in a possession of a new theory of the brightness of distant variable stars (Kosowski 1990). The theory does not resort to introducing hypothetical entities such ones as neutron stars, and it does not require focusing a rotating star's radiation in a some region of solid angle, as a result of which a neutron star behaves like a lighthouse (a rotating source of a light sending a light in a one direction only).

Our theory is based upon the distant source acceleration effect (the D.S.A. effect) which was discovered by us in 1987.

The essence of the effect is the phenomenon of competition of particles originating from an accelerated source. The particles emitted by a source at different time moments, thus having different velocities, compete on their way from a source to a receiver. As a result of the particles' competition, a time interval of their emission differs from a time interval of their arrival at a receiver. The assumption of this effect means a rejection of the Einstein's dogma about the constancy of the velocity of light. A fundamental result of the new theory of the brightness of distant variable stars is a dependence of a star's apparent brightness on its acceleration and its distance. If an acceleration acting on a star is directed toward the Earth, then the acceleration factor modifying the brightness of a star increases with distance; if an acceleration acting on a star is directed away from the Earth (*i.e.*, toward a star) then the acceleration's factor

decreases with distance. Another very important result of our theory is a shortening or lengthening of the period of a periodical star system (*e.g.* of a double star or a star-planet system) which occurs when a constant external acceleration acts on the system. An acceleration acting on a star system directed toward the Earth causes a shortening of its period which increases with the distance; an acceleration directed outward the Earth causes a lengthening of the period which increases with distance.

The common feature of the Lynne, Bailes and Shemar and Taylor, and Wolszczan observations is that the length of the pulsar pulses undergoes periodical or multiperiodic or quasi-periodical perturbations, and that the periods of these perturbations are similar in magnitude to the periods of the planets in the solar system. The three British scientists (L.B.S.) have interpreted their observations as proof of the existence of a planet orbiting their pulsar. Wolszczan proceeded along similar lines. According to them, the regular (cyclically repeating) changes of the pulsar's period are a result of the planet(s) motion around the pulsar. Taylor has interpreted his observations as proof of the existence of a double pulsar. According to him, the evolution (*i.e.* a very slow variation) of the period of his double pulsar is a result of interaction of the component pulsars of the double system and of emission of the gravitational waves.

On the basis of our new theory of the brightness of distant variable stars we can offer the following interpretation of their observations.

The regular (cyclically repeating) changes of the pulsar's pulses are a result of an encounter between light particles and a periodical system on the way from their source to the earth,. Or, they are result of the pulsar's participation in the motion of its host galaxy (an interaction of the pulsar with the maternal Galaxy). The periods of the cyclical changes of length of the pulsar's pulses would correspond to the period(s) of a one-period or multiperiodic pulsar's motion in a region of the maternal Galaxy (one-period in the case of the L.B.S. observations and multi-periodic in the case of the Wolszczan observations).

The evolution (*i.e.* a variation) of the pulsar's "big period" is a result of an encounter between light particles, on the a way from their source to the earth, and a periodical system (*e.g.* a double star) in motion in a direction perpendicular to the line of observation (or in motion having a marked component in a direction perpendicular to the line of observation).

The planets probably exist but for confirmation of their existence, other evidence is necessary. I suppose that this evidence already exists in earlier observations. But one needs know what observations ought to be chosen, what ought to be sought and how to interpret them.

It is important how the "discoverers" estimated the distance to their pulsars. Among astronomers there is a great controversy about determining the distance to variable objects such as quasars and pulsars and some supernovae. the "discoverers" have assumed that the observed "radio waves" from pulsars are not a result of the cosmological redshift of radiation emitted by pulsars, but that it is the pulsar's original radiation. A pulsar, in their view, as in the view of the majority of modern astrophysicists, is a neutron star.

Acceptance of a this assumption explains why the distances to pulsars are relatively small. A spectral shift for the radio emission resulting from the Hubble law can be neglected at this distance. Many astrophysicists (including myself) assume that a spectral 'image' of distant objects is the result of the cosmological redshift.

If one assumes that the observed radio emission from pulsars is a result of the cosmological redshift of the visible radiation or of radiation close to the visible (*e.g.* infrared radiation originating from a cold star, or a planet, or a satellite), then the distance due to the cosmological redshift is enormous, at least 10 times greater than in the case of the original (not shifted) radiation from "neutron" pulsars.

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S. W. Kosowski
ul. Pereca 2 m.
121400-849 Warsaw, Poland

Science, Power and Religion

The rejection of new concepts by the scientific establishment in spite of experimental verification, is an unusual case of polarization of the scientific community into two opposite sides. The reasons for this splitting become clear if we simply change the word science to religion.

Let us examine the parallels between modern science and religion: First, science, like religion, is composed of three categories of people: two small groups and a silent majority. The first small religious group are purists who engage in religion because of strong and sincere beliefs. They are mirrored in science by the dreamers who love science for itself and work with it for pleasure. They are like the true believers of the church who spend most of their time serving God.

The second small group are the people only interested in power. The source of their power is not important to them. What they want, aspire to, and conspire for is to climb the hierarchical ladder as high as possible. They are the *apparatchiks* of the system. They become scientists, not because of their love of science, but because they are good at math, physics, or chemistry. Science is the easiest way they can fulfill a desire for power. This also holds true for the small group of priests in religions where politics plays a vital role and where the structure itself is more important than the message.

But for the large group of scientists, the vast majority, science is a job, an assignment, whose primary goal is to feed one's family, go on vacations and enjoy a quiet life. The majority of people in religion also behave the same way. They do it as a habit, for mental security, and just like their counterparts in science, they follow the mainstream without questioning.

Another striking resemblance between science and organized religion, at least in the western world, is the need for economic-political power on the part of the science establishment. There is a symbiotic relationship between science and politics. Similarly, in the past, kings needed religion because the kings claimed their authority came from God. Accordingly, the church and the state helped one another. Priests were the ones who could read the sacred books and interpret them for the benefit of the rulers. Control of power and religion was economically important to both: therefore, those in power did not approve of ordinary people reading the Bible by themselves.

Since religion supposedly contained all truths, the priests could defend the political powers of the time. The kings needed religion as a protection for themselves against any new ideas which contested their power. The Galileo episode is striking. He challenged the interpretation of the truth given by the priests, and we know what happened to him. Similarly, in our modern society the economico-political powers use science as a protection. Like the Bible of medieval times, only a small fraction of modern society can understand or analyze scientific data. Thus, politicians use official science to interpret facts. In their symbiotic role the present day priests of science maintain the stability of official science for the benefit of themselves and the politicians. Once a fact is scientifically explained nothing can be allowed to dispute it. There is an official dogma claiming that "Science holds the truth" and therefore its conclusions cannot be questioned.

Just as religion needed the kings for military and political protection, modern science needs financial support. In older times, religious groups that were not associated with the kings were treated as heretics. Paralleling the religious heretics, new scientific movements

today are quickly labeled "pathological science" by the modern church of science.

Another interesting comparison between science and religion is their inability to accept change. When a new religious prophet appears with new teachings, the powers of the time prefer to nail him to a cross. This is a natural response, since acceptance of a new prophet will result in a change of power which the priests do not want to give up. They reject him and try to destroy him. The same happens with scientists. The scientific priesthood has established what amounts to a bible-ordained power of truth. If they accept scientists from outside the fold who bring new theories, they will lose their credibility and the vital financial support from the political groups. Therefore they reject pioneer scientists and their theories.

The invention of the printing press by Gutenberg was the starting point of the political-economic reform movement, since ordinary people could now read the Bible. It was, in essence, the first information-age revolution. Printing gave everyone access to an important source of information, the Bible, which they could interpret in their own way. The second international-TV revolution, now underway, has just killed the Russian empire. Is this the writing on the wall for other religion-science-political systems? What transformation will the even newer Internet bring to us?

What happens when an information revolution occurs? First a small number of the purist group will adopt the new ideas because they are not interested in power but simply seek truth. This small group will be violently opposed by the power-holding group who will defend their power and their commitments to the political establishment by trying to destroy the new ideas. A vicious battle of words ensues because the priesthood fears the loss of their credibility in the eyes of the political powers. Finally, the vast silent majority, which has no opinions and cares even less about it, will wait and see who wins. If the new scientific ideas should appear to win, they will change their mind and side with the stronger concept. It may also happen that the power-holders will adopt the new ideas themselves in order to retain power. Science will only be slightly better off.

An interesting recent case is the lack of support for cold fusion energy from the environmentalist political power group. Cold fusion has all the attributes of the perfect ecological source of energy: There is no waste, no greenhouse effect, power is cheap and accessible to everybody. But the seeds of cold-fusion do not germinate in this political power group. The reason is quite simple. Every power group seeks ultimate power. The power-ecologists seek dominance over science. Ecologists wish to dominate and replace science by the force of a moral authority. They have claimed that the resources on Earth are limited and they are the leaders in a moral campaign not to waste them, the most important resource being energy. The existence of cold fusion energy undermines their moral authority because with cold fusion sources we can leave the lights on the time. No moral guilt is involved because the cold-fusion resource is unlimited. Thus, in this fight for power, cold fusion and science are winning and this is bad for ecology. Their most powerful argument is invalidated.

The scientific establishment has criticized Pons and Fleischmann for their disclosure of their discovery through a press conference instead of one of their own journals. They claim this casts doubt on the validity of their discovery . This is a false argument. It is as if—pursuing our religious metaphor—Christ would have to ask permission from the Church to teach!

A revolution in science is happening and we are witnessing it. Just let us enjoy it. It is easy to recognize dead prophets, but much more difficult to acknowledge living ones. It is easy to criticize or to approve of the people who spawned or resisted past revolutions: Galileo, Newton, Einstein, Lorentz, Maxwell, and so many others; but when it comes to our turn to choose the truth, we do not have the perspective of time to weed out wrong choices. It is more important to encourage freedom of thought, which gives us a wonderful experience even as a spectator. Freedom is the breath of luxury in our lives.

In terms of years, the world has changed: There are no more kings who claim to descend from the gods. But instead we have the bureaucrats of government who use science to justify their actions. The remaining priests of present day religion have little power, but established science has replaced them. Nevertheless, sooner or later the world will add new science bit by bit. Why does it take so long?

Jean-Paul Biberian
Université Aix-Marseille II
Faculté des Sciences de Luminy
13288 Marseille Cedex 2, France

Corrections

Volume 2, Nr. 1:

Page 5, line 18 of the abstract, read

$$w^2 = \left(m_o c^2/\hbar\right)^2 + c^2\mathbf{k}$$

Page 8, equation (10) should read:

$$U = \frac{\left(qq'\right)\left(1 - v^2/c^2\right)^{1/2}}{4\pi\varepsilon_o R} \approx \frac{\left(qq'\right)\left(1 - v^2/2c^2\right)}{4\pi\varepsilon_o R}$$

Page 9, line 5 of section 2.1, read:

$$j = \mathbf{kr} - \omega t$$

Page 11, equation (30) should read:

$$\nabla^2 u + \frac{2m}{\hbar^2}\left[\left(E - V\right)u\right] = 0$$

Page 11, line above equation (31) should read: "time-dependent".

Page 12, formula (35) should read:

$$\frac{\partial y}{\partial t} = \frac{i}{\hbar}\frac{\partial S}{\partial t}y$$

Page 12, formula (36a) should read:

$$\frac{\partial S}{\partial t} + \frac{\left(\nabla S\right)^2}{2m} + V - \frac{\hbar^2}{2m}\frac{\nabla^2 a}{a} = 0$$

Instructions to authors

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