UNIFIED THEORY'S WAVE-QUANTUM UNITY OF LIGHT

Rati Ram Sharma
Professor & Head (Retired), Department of Biophysics, Postgraduate Institute of Medical Education & Research, Chandigarh, India; Mailing Address:
H. No. 615, Sector 10, Panchkula-134113, India; Phone: 0091-172-2563949;
e-mail: rrjss615@gmail.com ; website: http://www.physicsrevolution.com

Quantum Theory and Special Relativity stand apart because their authors were unclear about Wave-quantum Unity of light. In our Unified Theory light is propagated as a wave-quantum UNITY along transverse electromagnetic wave as per Poyinting vector in the 'sharmon medium' contiguously via 1-spin sharmons, which do not physically move. It appears as Quantum Theory's wave-or-quantum DUALITY for not observing both characters simultaneously. Sharmon comprises a positive *positrino* and negative *negatrino*, the two all-composing indivisible elements of diameter 1.6×10^{-33}cm, electric charge 1.3729×10^{-30} esu, mass 2.596116×10^{-48} gm, spin = 1/2. Copenhagen interpretation of Quantum Theory is reviewed and Uncertainty Principle replaced by new Principle of Null Action. A single experiment shows wave-quantum unity for low intensity light and moving electrons. Since spin of light-emitter does not fall and of absorber does not rise by one, NOT the 1-spin photon but 0-spin sharmon composed energy-quantum is emitted, absorbed and propagated. 'Contraction of space' and 'dilatation of time' are unrealistic. Constancy and invariance of light velocity c are explained, as also the observed variability, superluminality and subluminality which invalidate Relativity theories. Energized 1-spin sharmon replaces conventional photon and explains photoelectric effect and bending of light under gravity. Non-Doppler cosmological redshift supports non-expanding universe.

1. Introduction : the continuing confusion

Light is older than man but its true nature continues defying human comprehension. In 1678 Dutch physicist Christian Huygens wrote a treatise '*Traite de la Lumiere*' on the wave theory of light. But Corpuscular Theory of Sir Issac Newton (1643-1727) held that a luminous body continuously emits tiny, light and elastic 'corpuscles' in all directions. Newton's theory remained in force for more than 100 years and took precedence over Huygen's wave theory partly because of Newton's great position. Newton did not commit on aether. However when the corpuscular theory failed to adequately explain interference, diffraction and polarization of light Huygens' theory was favoured. But wave theory's need of an 'extremely more rigid than air' aether to propagate high-speed light (misconstrued as an elastic wave like sound) created a conceptual impasse. Moreover, it required the entire wavefront to shrink to a point for absorption and the 'bending of light round corners' like sound was not observed.

Quantum Theory and Relativity have remained the two prominent theories of light for the past over a century. But the authors of both had admitted their unclarity about the nature of light. Werner Heisenberg had argued [1] that the wave and particle are mutually too exclusive in properties for visualizing a thing to be both at the same time. Quantum Theory [1] was therefore formulated as a '*mathematical scheme*' to circumvent visualization and description of the intrinsic wave-quantum **unity**. Quantum Theory's wave-or-quantum **duality** arises from the limitations of language. And since words can describe only things which mind visualizes, one cannot even invent a new language to describe the objective reality in words [1]. The

Copenhagen interpretation of Quantum Theory had even put objective reality outside of Physics!

On 12 December 1951, Albert Einstein wrote to his close friend Michele Angelo Besso: "*All these 50 years of conscious brooding have brought me no nearer to the answer to the question: What are light quanta*?" Thus Einstein, like Heisenberg, remained unclear about the true nature of light throughout his life and even when he published three different but still popular theories of light [2-4]! First, to revive Newton's corpuscular theory in a modified form and explain the photoelectric effect he extended Planck's theory to postulate that light is not only emitted and absorbed but also propagated as quanta. However, this freely moving particulate 'photon' [2] could not avoid sharing the source-observer motion as against his own theory of Special Relativity [3] founded on the two postulates of light velocity's constancy and invariance to source-observer motion. A wave exists only in its propagating medium, which also composes the wave. But Relativity Theories [3, 4] replaced the physical medium for light-wave with mathematical 4-dimensional spacetime continuum bereft of physical existence.

This sums up the state of confusion and unclarity about nature of light and its propagating medium, which has existed during the twentieth century and still continues. Our Unified Theory [5], unifying physical concepts arising largely from the all-composing and all-pervading real physical '**sharmon medium**' as '**basic substance**', presents the Wave-Quantum **unity** of light propagated in the sharmon medium alongwith experimental verification.

2. **Quantum theory and its Copenhagen interpretation**

The Quantum Theory was developed by Werner Heisenberg and Niels Bohr from1924 to 1927. Its Copenehagen interpretaion gave it the final form. The theory deals in what can be known about, and not in what there actually is in, the micro cosmos. It regards objective reality as a metaphysical speculation out side the scope of Physics, hence does not recognize things as they really are. Relativity, likewise, is also based on the observed magnitudes of governing parameters. Unified Theory [5], in contrast, proposes to develop a "realistic Physics" providing a realistic description of the objective reality as it exists. It therefore deals in the objectively actual parameters because the physical phenomena are governed by NOT the observed/measured but actually objective parameters. Whereas Quantum Theory deals in the Wave-or-Quantum **Duality** of light [1] the Unified Theory [5] presents the Wave-Quantum **Unity** vide sec. 10 below.

Heisenberg [1] advocated the formulation of physical laws using only the observable or measurable parameters. But the very processes of measurement uncontrollably alters the measured magnitudes as given by relations (1) and (2) below. So he was against even assuming a definite value of any objective parameter. Every determination of some numerical quantity renders the knowledge of others uncertain since the uncontrollable perturbation of the observed system alters the magnitude of previously determined quantity. It was shown [1] that energy and time (E, t) or momentum and distance (p, x) cannot be simultaneously observed less imprecisely or uncertainly than the limits set by the relations (1) and (2) with h as Planck constant:

$$\Delta E \cdot \Delta t \geq h/2\pi \ \dots (1); \quad \Delta p \cdot \Delta x \geq h/2\pi \ \dots (2)$$

This is because the measurement of E ($ih\partial/\partial t$) after measuring the t or of p ($-ih\partial/\partial x$) after measuring x, throws the observed system uncontrollably out of the state left at the end of t or x measurement due to $\partial/\partial t$ or $\partial/\partial x$ variation. The Heisenberg relation (1) with $\Delta t = \Delta x/c$, or the relation (2) with $\Delta p = \Delta E/c$ gives the relativistic energy-distance uncertainty relation

$$\Delta E \cdot \Delta x \geq ch/2\pi. \quad \dots (3)$$

The *perceptual* (not objective) relations (1), (2), and (3) were essentially deduced for the

uncertainties in the magnitudes of *observed* parameters. The confusion arose which still continues when ΔE, Δt, Δp, Δx were misconstrued to represent actual variations or spontaneous fluctuations in the objectively actual parameters of the observed physical object or system. The confusion got confounded when these relations were given the status of natural laws more basic than even the established laws for the conservation of energy and momentum. Violations, within the limits set by the relations (1) and (2), of otherwise inviolable conservation of energy and momentum, were thus introduced or validated which wrongly implied the unrealistic concepts of "objective indeterminism" and "non-causality".

Relations (1) and (2) led to the unrealistic concepts of the spontaneous creations and annihilations of "virtual" (i.e. unreal) energy-quanta and particle-antiparticle pairs in Nuclear Physics and of the '*initial creations of matter out of nothing*' in the Big Bang [6] and Steady State [7] theories of expanding universe. Relation (3) put into disarray all the classical concepts of location, boundary and trajectory, and even of the size and composition of micro particles. It led to the bizarre notion of a micro particle being constituted and bound by more massive sub-particles because in confining to small Δx the uncertainty ΔE in energy E becomes larger than E itself. A radius of Planck length 1.6156×10^{-33} cm got linked with the Planck mass 10^{-5} gm yielding a mass density of 10^{94} gm/cm^3. That is how Dehmelt's cosmon, Markov's maximon, Stanyukovich's planckion, and Pati-Salam's preonic substructures of quarks became massive.

However, the natural conservations of energy E and momentum p ordain the conservation also of the action (ΔE . Δt or Δp . Δx) with its quantum as Planck constant h. During a real physical change any variation ΔE in energy E or Δp in momentum p generates the action:

$$\Delta E \,.\, \Delta t \;=\; nh \quad \text{.... (1a)} \quad ; \quad \Delta p \,.\, \Delta x \;=\; nh. \quad \text{.... (2a)}$$

Here ΔE and Δp are the objectively actual increases, in contrast to the subjectively observed uncertainties of Heisenberg Uncertainty Principle. However, the above relations are equivalent to Heisenberg uncertainty relations (1) and (2).

In Chapter-15 of the 2010-book [5], the relations (1a) and (2a) lead to a new **Principle of Null Action** according to which *the path chosen by an isolated closed system during a real physical change is such that the summation or integration of action covering all variations of energy or generalized momentum is zero or null*. It is conceptually superior to the Hamilton's Principle of Least Action and has universal applications. Our Unified Theory thus rejects the Heisnberg Uncertainty Principle as 'unrealistic' and replaces it by new Principle of Null Action [5] with NO '*matter's creation from, or dissolution into, nothing*'.

3. Space, time & spacetime continuum reappraised

Einstein's theories of Special [3] and General [4] Relativity replaced the physical medium with 4-dimensional spacetime continuum to propagate light. But a deep intuition reveals that the *abstract* concept of space evolves from our direct perceptions of spatial successions "there, here, there" and that of time from those of temporal successions "then, now, then" all arising from the successive motions and changes of surrounding objects. The percept of 'only-forward, never backward', movement of the 'time-arrow' arises from the non-reversibility of the basic natural processes. If a baby were to grow with no relative motions and changes around i.e. all standing still in the surroundings, he/she would have no perceptions of successive 'there, here, there' and 'then, now, then' and hence no concepts of space and time, with otherwise perfectly developed senses notwithstanding. The two concepts of space and time, being so intangible and abstract, cannot fuse into any substantive "spacetime continuum", to propagate light and gravitation.

In the universe with complete ubiquity of granularity throughout right up to the micromost levels, the existence of a non-granular continuous infrastructure is inconceivable. If existent, the continuum would retard or prevent the motion of heavenly bodies and even of the photon across or through it, which is not actually observed. A non-composite static continuum would not undulate to propagate the transverse light waves. So, all the four and higher-dimensional spacetime continua, basic to relativity and/or other theories, are mere mathematical constructs bereft of real physical existence. The "wrapped up extra dimensions of space", which the Geneva based Large Hadron Collider has been ambitiously planned to investigate, thus dot not exist. But the existence of a particulate space medium is not in doubt.

4. Existence of a light propagating medium in space

According to the 17th century view, creation of an absolute vacuum was distinctly possible by removing all solids, liquids, and gases [8]. In the 19th century, removal of the radiation (by cooling) was also additionally required, but considered to be possible. This view could not hold in the 20th century. In 1948, Casimir theoretically showed [8] that the electromagnetic radiation caused an attractive force to act between two conducting plates placed in vacuum. On cooling the void to absolute zero the thermal radiation, and with it the Casimir force, should disappear. But actual experiments in 1958 by Sparnaay revealed [8] that instead a "residual" attractive force persisted even at absolute zero. Therefore the "vacuum" even at absolute zero temperature is not completely empty but has some real physical medium that cannot be removed by any means.

Moreover, a medium is needed for the electric, magnetic and gravitational fields to exist in space and for these forces to act at a distance. The electromagnetic and gravitational waves in vacuum do need a medium to undulate. Maxwell's displacement charge and current, like Casimir force, call for a physical carrier. The zero point energy and frequency at the absolute zero temperature need physical oscillators in space.

The work of Young and Fresnel by 1827 and of Sagnac in 1913 on interference and/or diffraction of light established the wave nature of light, suggesting a physical medium to propagate it. This is confirmed by the practical experiments on interference and diffraction of light routinely performed by the postgraduate students of Spectroscopy. Dayton Miller's (1866-1941) observed ether-drift support the existence of a light medium as reviewed by James DeMeo (http://www.orgonelab.org/miller.htm).

5. Space medium as the basic substance

The inter-conversions of the radiant and other forms of energy among themselves are well documented. So are the inter-conversions of photonic energy and electron-positron pair of material particles. Compositionally the radiation-wave, like any other wave, and its propagating medium are one. The equation $E=mc^2$ for the inter-conversion of energy and mass points to the existence in real Nature of some entity subtler than and composing all forms of both energy E and mass m. This is analogous to the possible inter-conversions of solid ice, liquid water and gaseous steam because all the three are made of the same water molecules. These suggest the basic composition-unity of all forms of mass, energy, radiation and light propagating medium.

The light propagating space medium, as the subtlest entity in Nature, emerges as the micromost '**basic substance**' composed by the new particle *sharmon*, named in 1988 after this author (Sharma) to indicate that the real physical '**sharmon medium**' with its exclusively unique properties is not an ad hoc assumption but a deduction from scientific logic applied to the facts of observation and it is not the old ether, nor the 'physical vacuum' of Quantum Theory. Propagation of the transverse electromagnetic waves requires the Sharmon as made of the new micromost 'basic elements', electrically positive *positrino* & negative *negatrino*.

6. Micromost basic elements

Propagation of transverse electromagnetic waves in the sharmon medium points to

sharmon's polarizability and composition by the two micromost basic elements, one electrically positive (*positrino*) and the other negative (*negatrino*), with common name '*cosmino*', for composing 'all' forms of energy E and mass m in the Cosmos to allow their inter-conversion via equation $E=mc^2$ [5]. So our theory, with the highest economy of concept, has only two elements, positrino and negatrino, which mark the end of subtlety in the universe. Since endless infinite divisibility of matter is un-intuitive the two cosmino elements are indivisible. As against these none of the over hundred elementary particles in the Modern Standard Model of quarks and leptons and twice that number in Super Symmetry satisfies the definition of 'element' that composes other particles but itself is non-composite. Mutual repulsion among their constituent cosminos with same kinds of electric charge, however, makes the structures of quarks loose and fragile. The quarks were also observed to be compressible [9] and assembleable [10, 11] indicating their compositeness. Therefore Unified Theory regards the quarks as non-existent and color charge is not taken as a basic cosmino charge. The weak is also not a basic cosmino charge as it does not conserve. Cosmino elements thus have only two basic charges: mass and electric charge. See appendix-3 in the 2010-book [5] reroducing interview of 4 November 1990 to Press Trust of India contesting claims of 1990-Physics Nobel laureates.

Computations in Chapter-4 of 2010-book [5] show that a cosmino has the diameter lp = 1.6×10^{-33} cm, electric charge = 1.3729×10^{-30} esu, mass = 2.596116×10^{-48} gm, spin = $1/2$.

A cosmino being an element has to be non-composite and hence singly charged with isotropic homogeinity because multiple charges imply as many constituents. A massless charged particle and an attractive force between mass and electric charge are inconceivable. Yet the two are inseparably blanded together in a charged particle suggesting that the cosmino's mass and electric charge are two different manifestations of a single entity, the *gravitoelectric* charge or the cosmino itself, into which they inseparably unite and unify.

The neutral mass m of a particle is composed of the 0-spin sharmons. It manifests as gravitational mass m_g ($\equiv m$) under a gravitational force F_g (= $m_g.a_g$) producing the gravitational acceleration a_g and as an inretial mass m_i ($\equiv m$) under a mechanical force F_i (= $m_i.a_i$) to produce the inertial acceleration a_i changing the state of rest or uniform motion. Thus m, m_g & m_i are identical and equal (m $\equiv m_g \equiv m_i$). Manifestation of electric charge is mediated via the electric field/force feeling and felt by the charge. Since mass is innate and inseparable *substance* of a particle the concept of separate Higgs boson(s) imparting mass to 'massless' elements is flawed [5]. Both massless and mass-generating particles like Higgs boson are non-existent and hence will not be found by the Large Hadron Collider. See appendix-5 in the 2010-book [5] giving the Press Statement dated 15 September 2005 doubting the success of LHC.

7. **The sharmon**

The neutral sharmon comprises a positrino and a negatrino. Its mass 5.192232×10^{-48} gm [5] is double the mass of a cosmino. In its 0-spin state, the opposing ½ -spins are attractive to give a positrino-negatrino contact pair 1.616×10^{-33} cm across and 3.23×10^{-33} cm long. Repulsive co-directional ½ -spins in the 1-spin sharmon keep the cosmino surfaces lp apart. Both the scalar 0-spin sharmon and the vector 1-spin sharmon are stable and dynamic structures and can inter-convert. Their constituent cosminos not only spin but also vibrate along the common axis, imparting an electric as also a magnetic dipole moment to the sharmon. The electromagnetic properties of the cosminos and sharmon generate those of the material particles, photons and the sharmon medium, which they compose. Bosonic condensation of sharmons is supported by close distance attractions among the masses and opposite eletcric charges of the constituent cosminos to impart gregarious properties to 0-spin sharmons, which can aggregate to compose energy and neutral mass of material particles. Electrically positive or negative charged mass of the charged particles is composed by the positive or negative cosminos. No particle or

energy quantum is therefore massless, dimensionless or "virtual"(i.e. unreal). The neutrinos, photon, graviton &c all have more than zero definite mass, size and spin.

8. **The sharmon medium**

The sharmon medium, consistent with 20th century view of vacuum, is irremovable by any means since the tiny 10^{-33} cm sharmon can pass through spaces between molecules and atoms and also between orbital electrons. Due to its nature as a kinetic gas, the sharmon medium fills all space and rules out the existence of absolute vacuum for any significant period of time. Its time-averaged inter-sharmon distance $\sim 10^{-5}$ cm [5] compares well with the Mean Free Path for real gasses (e.g. for Hydrogen 1.12×10^{-5} cm, Oxygen 0.64×10^{-5} cm, Nitrogen 0.595×10^{-5} cm).

The sharmon medium contains $\sim 10^{15}$ sharmons per cm^3 [5]. And its average mass density is 0.519×10^{-33} gm.cm^{-3}, vis-a-vis 3×10^{-31} gm.cm^{-3} for the Steady State Cosmology. These 1-spin sharmons energized with 0-spin sharmon packet carry the zero-point energy in vacuum at absolute zero of temperature.

9. **Unreality of Lorentz Transforms**

Einstein in his theory of Special Relativity (SR) wrongly replaced the physical medium for light-wave with 4-dimensional spacetime continuum and re-deduced the Lorentz Transformation formulae [12] to support its postulated constancy of the light-velocity c in an inertial frame moving at a velocity v.

For an observer moving with the speed v along the X-axis of the stationary frame, the space and time coordinates x and t appear on the moving frame as x' and t', given by the so-named Lorentz formulae:

$$x' = \beta (x - vt) \qquad \ldots (4)$$
$$\text{and } t' = \beta (t - vx/c^2), \qquad \ldots (5)$$
$$\text{where } \beta = 1/(1 - v^2/c^2)^{1/2}. \qquad \ldots (6)$$

The velocity v of a material particle or of the primed frame X'Y'Z' [2] is caused by an externally impressed force in accord with Newton's laws of motion but the light velocity c is that of the self propagated photon along an electromagnetic wave. The light velocity c is constant and invariant to source-observer motion but that of the material particle v is not so. The Lorentz transformations in effect relate to a factitious motion of a hypothetical particle with too exclusively different dual kinematics of v and c. Since such a particle does not exist, the Lorentz transformations do NOT describe any motion in the real Nature. Their leading conclusions on the 'contraction of length' and 'dilatation of time' are the unrealistic demands on Nature to change to fit the mathematics of Special Relativity theory. Even otherwise, the actual lengths and objective time intervals in an object or a physical phenomenon, viewed by say, 100 differently moving observers cannot undergo 100 different objective distortions at the same time, making the 'contraction of length' and 'dilatation of time' as unreal concepts. In fact the light velocity becomes (c-/+ v) for the observer moving at a velocity (+/- v) relative to the light propagating sharmon medium, ruling out constancy of light velocity c over the inertial frames.

10. **Wave-quantum unity of light propagated in the physical sharmon medium**

In Unified Theory [5] the light-wave energy quantum, after emission from the source is initially received by a 0-spin sharmon in the sharmon-medium, which rises to its 1-spin state and marks the effective "*origin*" of the light-wave. And the last 1-spin sharmon of the medium, which finally transfers the wave energy quantum as a 1-spin photon to the target and itself returns to the 0-spin state, marks the *"terminus"* of the wave. From origin to the terminus, the 0-

spin sharmon-packet energy quantum per unit frequency cycle is propagated as a wave-quantum UNITY along a transverse electromagnetic wave in the sharmon medium contiguously via 1-spin sharmons, which do not physically move but only provide a physical carrier.

The propagation mechanism, however, is essentially electromagnetic. The mutually sustaining orthogonal electric and magnetic fields are normal to the direction of propagation as per the Poynting vector and vary at the frequency of the electromagnetic wave.

Due to creative beginning of the light-wave at the "origin" in the sharmon medium, the light velocity c in the sharmon medium is invariant to the source velocity S (uniform or variable/ accelerated) relative to the light propagating sharmon medium and vanishing end of the light wave at the "terminus" in the sharmon medium makes c independent of the target-velocity T (uniform or variable/accelerated) relative to the sharmon medium. Constancy and invariance to source-target motion of light velocity $c = (e_o.\mu_o)^{-1/2}$ in the sharmon medium also follow from the fact that the electric permittivity eo and magnetic permeability μ_o of the sharmon medium are constant and not affected by the motion of the source or target. Even the observed variability [13], superluminality (light velocity exceeding c) [14] and subluminality (light speed below c) [15] which invalidate the theories of Special and General Relativity, also follow in the Unified Theory [5] by merely affecting the electric permittivity e_o & magnetic permeability μ_o and refractive index of the propagating sharmon medium *locally.* Sharmon medium as a kinetic gas composed by sharmons provides for *local* variations in its number density sharmons/cm^3, mass density gm/cm^3, e_o, μ_o, $c = (e_o. \mu_o)^{-1/2}$ and also in the gravitational constant G.

The light does not use or need an atomic or molecular material medium because it is propagated in the sharmon medium, whether it is in the free space or within a transparent refractive medium. The experimental conditions to achieve superluminality [14] and sub-luminality [15] therefore ultimately affect and manipulate the electric permittivity e_o and magnetic permeability μ_o and refractive index η of the propagating sharmon medium within the experimentally created material medium.

However, for the observer moving at velocity (-/+ u) relative to the light propagating sharmon medium the light velocity appears as U = c +/- u. This rules out the constancy of light velocity c in Relativity's inertial frames. *Propagation of light in the sharmon medium is an absolute motion; it is NOT affected even by the motion of the source and/or target/observer.*

Thus in this context one has to differentiate and be clear about the nature of the six velocities c, S, T, v, u, U. Einstein's Special Relativity had confined its consideration only to c and v in the context of its inertial frames.

The long wave electromagnetic radiation, like the radio waves, is predominantly wavelike and the short waves like X- and gamma rays show corpuscularity. As the transition from one part of the electromagnetic spectrum to the other is continuous, its **"wave-quantum unity"** is inescapable. Due to experimental limitation to observe only one, not both, of the two co-existent and blended-together characters at a time, this **unity** appears as *"wave-or-quantum"* **duality** described by Quantum Theory. After emission and before absorption it is always the energized 1-spin sharmon, which in deference to convention and for continuity is still called the 1-spin **photon**. But sec. 11 below denies the existence of conventional "photon".

Since the spin of an emitter does not fall by 1 after emitting the photon and that of an absorber does not rise by 1 on absorbing the photon, what is emitted or absorbed is NOT the 1-spin photon/sharmon as a whole but only its energy of one wave-cycle comprising 0-spin sharmons. The 1-spin photon as such is **not** emitted, propagated or absorbed. However, the transmission, always and throughout, is of the energy of the 1-spin photon, composed by 0-spin sharmon, as an inseparable wave-quantum UNITY. The Wave-Quantum unit is a one wave-cycle 'pulse' set by the source ($\Delta E = E2-E1 = h\nu$) and is related to the wave frequency ν. The light-wave velocity $c (= \nu \lambda) = (e_o.\mu_o)^{-1/2}$ is determined by the electric permittivity eo and magnetic permeability μ_o of the sharmon medium. The two then fix the wavelength $\lambda (=c/\nu)$ of the wave

and the momentum p (= h/λ) of photon. A spherical wave-front or a lengthy electromagnetic wave comprises innumerable such Wave-Quantum pulses.

11. **The wave and particle nature of light in one experiment**

A. Tonomura et al. [16] set up experiments with beams of low intensity light or of electrons to observe both wave and particle aspects at the same time. For interference, explainable from the wave properties, the beams have two paths from the source to the detector (e.g. a screen). When the beam intensity is sufficiently low and the detector suitable, the impact of particles (photon or electron) one by one, can be observed. The energy quanta are then localized as if particles in space and time. The detector output is displayed on a TV-monitor in a set of frames. The first frame is early on and the last after a long time of impact collection. The interference pattern is slowly built up by impacts of individual particles. These experiments support and are supported by the Unified Theory's wave-quantum unity [5] for radiation and moving particles of matter.

12. **Non-existence of the conventional photon**

Planck-Einstein-Lewis photon of the modern Relativistic Quantum Theory is a 1-spin corpuscle or quantum of energy E (=hν and momentum p(=h/λ) emitted from the source uni-directionally and moving in the free space rectilinearly with constant velocity c = 2.9979×10^{10} cm/sec invariant to source-observer motion, ν being the frequency and λ the wavelength of its propagating electromagnetic wave. Its rest mass is zero. In fact it is never at rest, and disappears if and when stopped. The relativistic total energy E = c $(m^2c^2 + p^2)^{1/2}$ shows that the zero mass (m=0) particle like photon can exist but it moves always at the velocity c of light in vacuum with total energy E=pc. However, it is not clarified why the momentum p=mc and energy E=pc are not zero for m=0. Moreover this description is incomplete, flawed and internally inconsistent for other reasons as well [5].

First, the kinetic energy and momentum can conceivably be associated only with a material carrier, but there is no such core carrier in the photon.

Secondly, if the photon had any material core the Relativity would not have allowed it to move at velocity c because then its kinetic energy would have been infinite.

Thirdly, the Relativity postulates invariance of c to source-observer motion, but it is inconceivable how the velocity of a freely moving particulate photon, relative to an observer, could remain unaffected by the motion of the source and/or observer.

Fourthly, the particulate photon is inconsistent with the wave properties of electromagnetic radiation required to explain the phenomena of interference and diffraction.

Fifthly, the constancy and invariance to source-observer motion of c put the photon in a privileged class of particles without explaining the why and how of it.

Sixthly, it is not clear how photons of infinitely different and varied energy, corresponding to the infinite electro-magnetic spectrum are non-composite.

All the above arguments go against the existence of a real photon with the contemporary concepts and properties ascribed to it. Unified Theory gives the status of a 1-spin photon to the energized 1-spin sharmon and provides realistic explanations of the known properties of light including the explanation of the photoelectric effect which won Einstein [2] the 1921 Nobel Prize in Physics.

13. **Explanation of the Photoelectric Effect**

Einstein [2] explained the photoelectric effect by postulating that light is propagated as quanta and the energy of one particulate photon is imparted to one electron, which overcomes the force or energy binding it to the metal surface.

In Unified Theory [5], the energized sharmon replaces the photon. If w is the energy binding

the electron with the metal surface or the work function of the metal, ν the frequency of the incident ultraviolet light and hence $h\nu$ the energy of the energized sharmon, the kinetic energy E of the ejected photoelectron is given by

$$E = h\nu - w . \qquad\qquad .... \ (7)$$

This is exactly the well-known Einstein equation [2], already verified by experiments.

14. Bending of light in gravitational, electric & magnetic fields
The light ray should bend in all these three fields as they all affect the sharmons of the light propagating medium and also the photon which itself is composed by sharmons [5].

14.1 *In a gravitational field*
A photon comprising sharmons of non-zero mass, experiences the acceleration due to gravity $g = GM/R^2$ of the heavenly body of mass M and radius R. Light from a distant star goes past the body in time $t = 2R/c$, to fall by the distance $s = \frac{1}{2} gt^2 = \frac{1}{2} (GM/R^2).(2R/c)^2 = 2GM/c^2$. For a distance D the light bends by the angle

$$\theta = s/D = 2GM/Dc^2 \text{ radian.} \qquad\qquad ... \ (8)$$

This is the first Einstein formula for bending of light in a gravitational field which was later revised to $4GM/Dc^2$ radian. Since the actual gravitational influence-period on light far extends beyond the periphery of the mass body the above equation can as well give $4GM/Dc^2$ radian. These were verified by Eddington during total solar eclipse on 29 May 1919, providing support to Unified Theory without invoking the curvature of 4-dimensional spacetime continuum [4].

14.2 *In an electric field*
The angle of deviation θ for traversing a distance D in an electric field of intensity E and normal gradient $b = dE/dx$ is

$$\theta = \frac{1}{2} e_o Dbrq/mc^2 \sim Dbx10^{-37} \text{ radian.} \qquad\qquad ... \ (9)$$

Here r is the radius, m the mass of sharmon and q its dipole charge.

14.3 *In a magnetic field*
In a magnetic field H with normal gradient $b' = dH/dx$, the deviation angle θ for the light of wavelength λ (A^o) is given by

$$\theta = \frac{1}{2} \mu_o DHb'\lambda r^3/hc \sim DHb'\lambda x10^{-92} \text{ radian.} \qquad\qquad ... \ (10)$$

Here a dispersion of wavelengths λ is also present.

The bending of light in the electric and magnetic fields, though too small for experimental verification, are important conceptually because no other theory has them.

15. Cosmological red shift and non-expanding universe
Our Unified Theory [5] rejects the Quantum Theory's [1] Uncertainty Principle as 'unrealstic' because it validates violations of the inviolable conservation laws for energy-mass and momentum. In the non-expanding universe of our Unified Theory [5], the total mass-energy content of the universe is eternally conserved with NO "*creation of matter from nothing*", in a

single mega event (as in Big Bang theory [6]) nor as a continuous process (as in Steady State theory [7]). And the cosmological red shift does NOT arise as a Doppler effect from the receding motion of galaxies [6,7]. The combined non-Doppler effects of gravitational, electromagnetic and viscous losses deplete the energy $E=h\nu$ of the sharmon-composed spectral light photon by $\Delta E = h.\Delta\nu$, thereby shifting the wavelength $\lambda = c/\nu$ by $\Delta\lambda$ towards red end of the spectrum. Red shift

$$Z = +\Delta\lambda/\lambda = -\Delta\nu/\nu = \lambda.\Delta E/hc. \quad ... (11)$$

The gravitational and electromagnetic losses are negligible. But the viscous effect is significant.

According to Stoke's law the sharmon aggregate of energy quantum $h\nu$ of spherical radius r, in traveling a distance D through sharmon medium of viscosity η suffers a viscous loss $\Delta E = 6\pi r\eta Dc$. It produces a viscous red shift

$$Zv = 6\pi r\eta D\lambda/h = Kv D. \quad ... (12)$$

For sodium yellow light $\lambda = 5890 \times 10^{-8}$ cm, the $h\nu$ quantum has $ns = 3.6146 \times 10^{14}$ sharmons or $nc = 2ns$ cosminos each of a radius $rc = 0.8078 \times 10^{-33}$ cm. To simplify calculations we take the photon as a sphere of closely packed cosminos and its radius $r = rc.nc^{1/3} = 7.24 \times 10^{-29}$ cm. With $\eta \approx 6.5 \times 10^{-23}$ dyne.sec/cm^2 [5] the $Kv = 0.8344672 \times 10^{-27}$ cgs units. In the theories of expanding universe, Doppler red shift $Z=V/c$ and Hubble's law $V=HD$. It gives the constant

$$cKv (=H) = 1.84782 \times 10^{-17} \text{ cgs units or } 60.13 \text{ Km/s/Mps.} \quad ... (13)$$

This, in view of η 's local variability compares well with the earlier [6] value $H = 62.3$ Km/s/Mps and the later [17] values 58-73 Km/s/Mps.

Observations on Ia type supernovae [18] have caused "amazement and horror" among the expanding universe theorists as high Hubble constants $H = V/D$ (expansion rates) imply an antigravity force permeating space and revive the Einstein's cosmological constant [2]. But in our theory an exploding supernova showers a burst of sharmons into its ambient environment that raises the viscosity η and the constant Kv of the light medium. The resultant rise in the observed redshift Z leads to overestimation of the source-distance D ($\propto Z$) and of the expansion rate of the universe $V/D=H$ ($\propto Z$). But the resultant rise in the $c Kv = H$ is a **local** effect [18]. It does not signify any generalized property of the whole universe so as to permeate space. Similarly, relativity disallows recession velocity $v \geq c$ and the redshift $Z = v/c \geq 1$. So the observed [19] $Z=4.92$ is inexplicable by theories of expanding universe [2,3]. But in our theory it is caused by **local** rise of the constant K, in $Z=KD$, due to viscous, electromagnetic and gravitational effects.

The non-expanding universe has no 'cosmological horizon' beyond which the galaxies disappear.

16. **The crucial test**

To test whether the universe is actually expanding, redshifts of individual galaxies need to be monitored. In the theories of expanding universe the redshift $Z=V/c$ and Hubble's law $HD=V = dD/dt$, giving

$$Z/Zo = \exp(Ht), \text{ Zo being the starting value.} \quad ... (14)$$

So the redshift Z increases exponentially with time. But for a non-expanding universe

$$Z = KD, \text{ D being constant,} \quad ... (15)$$

redshift Z does not change with time.

Published observations do not show exponential increase with time and hence support the Unified Theory [5]. See appendix-4 in the 2010-book [5] of 10 October 2006 contesting the basis of the 2006 Physics Nobel Prize.

References

1. W. Heisenberg, *Physical Principles of Quantum Theory*, C.Eickort & F.C.Hoyt (Trans), Dover (1930).

2. A. Einstein, *Ann. d. Physik* **17** (1905) 132; **20** (1906) 199.

3. A. Einstein, *Ann.der Physik.* **17** (1905) 891; in *The Principle of Relativity*, Dover (1923) 35.

4. A. Einstein, *Ann.der Physik* **49** (1916); in *The Principle of Relativity*, Dover (1923) 109.

5. R.R. Sharma, *Unified Physical Theory*, COSMO, New Delhi, January 1990; *Realistic Foundations of Physics & Cosmology* (The Beginning of Realistic Science), Abhishek Publications, SCO 57-59, Sector 17 C, Chandigarh, June 2002; *THE UNIFIED THEORY: A complete paradigm shift in Physics & Cosmology*, Lulu, USA/UK, 2010: URL: http://www.lulu.com/content/paperback-book/the-unified-theory-a-complete-paradigm-shift-in-physics-cosmology/8347654

6. G. Gamow, *The Creation of Universe*, Viking, New York, (1952); A. Einstein, *Preuss. Akad .Wiss. Berlin Sitzber* **142** (1917); W. De Sitter, *Proc. Kon. Ned. Akad. Wet*.**19** (1917) 1217, **20** (1917) 229; A.Friedmann, *Z.Phys.* **10** (1922) 377.

7. F. Hoyle, *The Nature of the Universe*, Harper & Bros, New York, 1950; *Mon. Not. R.Astr. Sci.* **108** (1948) 372.

8. T.H. Boyer, S*ci. Amer.* **253** (Aug. 1985) 56.

9. J. Schmiedmayer, et al, *Phys. Rev. Lett.* **66** (1991)1015.

10. D-Zero Collaboration, S. Abachi et al, *Phys. Rev. Lett*.**74** (3 April 1995) 2632.

11. CDF Collaboration, F. Abe et al, *Phys. Rev. Lett.* **76** (22 April 1996) 3070.

12. A. Lorentz, in *The Principle of Relativity,* Dover, (1923) 1, 9.

13. K. Scharnhorst, *Phys.Lett.*B **286** (1990) 354; G. Barton, *Phys.Lett.*B **237** (1990) 552

14. L.J. Wang, A. Kuzmich & A. Dogariu, *Nature* **406** (2000) 277; J. Marangos, *Nature* **406** (2000) 243.

15. L.V.S. Hau et al., *Nature*, **397** (18 Feb 1999) 594-598.

16. A. Tonomura et al., *Amer. J. Phys.* **57** (1989) 117.

17. A. Watson, *Science* **279** (1998) 981.

18.. J. Glanz, *Science* **278** (1997) 799*, 279* (1998) 651, 1298; S. Perlmutter et al., *Nature* **391** (1998) 51.

19. K Lanzetta, *Nature* **390**, 115 (1997).