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WAVE PULSE THEORY OF LIGHT (WPTOL) BASED ON THE BOHR MODEL

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ABSTRACT. The Bohr Model is an alternative theory of light to Maxwell's theory. It is extended to a wave pulse theory of light, WPTOL. It is a classical aether theory. When an orbital electron of an atom makes a quantum jump to a lower energy state, it emits a single polarization wave pulse of one wavelength in the aether. There is no neutron in the nucleus of the atom in the 'Simple Unified Theory', SUT; the neutron is replaced with a proton and an nuclear electron. As the nucleus of the atom has only proton and electron, WPTOL covers the emission of gamma-rays originating from the nucleus of the atom. The binding energy within the nucleus is also the Coulomb electric force; there is no strong force. All radiation consist of single wavelength wave pulses and the wave pulses are all separate wave entities; there is no 'train of light waves' in WPTOL. The train of light waves as found in Maxwell's theory has no physical basis. A light wave pulse has energy $E = h\nu$ and momentum $P = E/c$, the same energy and momentum relation of the relativistic photon. It is this single wave pulse of one wavelength that gives the illusion of light as particle. WPTOL eliminates the 'wave particle duality' hypothesis for light. The theoretical value of light speed in the aether is $c = \dfrac{m_e e^4}{8\epsilon_0 h^3 R}$. Newton's first law is extended to a light wave pulse in the aether which explains why light propagates in a straight line. There is no dissipation of energy of a wave pulse as it propagates in the aether. WPTOL does not need the concept of magnetism. The WPTOL is a much stronger theory of light as compared to the Maxwell's theory.

1. INTRODUCTION

The Bohr Model of the hydrogen atom was proposed in 1913 by Niels Bohr. It was presented as a quantum theory that explains how light radiation and absorption comes from changes in the electron states when it *jumps* from one permitted energy state to another. In the case of light emission, the electron jumps from a higher energy state to one lower thus releasing a pulse of energy as light with a specific frequency dependent on the difference of the energies of the

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two states. The hydrogen electron may absorb light energy which would cause it to make a jump to a higher energy state. The model was used to explain the Balmer series of the hydrogen spectrum that was then known. From then on, attention was focused on how it proved quantization in the atomic world and the need to resolve this with classical mechanics which allows dynamical quantities to take on any value in the real continuum.

Although the Bohr Model is clearly a wave theory of light, strangely it was never specifically presented as such. Even Niels Bohr himself did not mention how his model was actually another theory of light different to that of Maxwell's theory proposed by James Clerk Maxwell in 1865. No one has developed the Bohr Model further to be a complete theory of light as an alternative to the Maxwell theory. In the classrooms, light as an electromagnetic wave has always been introduced through Maxwell's theory. None seemed to have notice that the Bohr Model is actually an alternative theory of light different from Maxwell's theory. In fact, the Bohr Model of light is by far a stronger theory of light then Maxwell's theory. The only plausible reason why the Bohr Model was not developed further and presented as a stronger theory of light was because of the experimental confirmation of light as connected to electromagnetism when Hendrick Hertz generated and detected radio waves in the years 1886 - 1889, years before 1913. The attention then was focused mainly to explore Maxwell's theory. In this paper, it will be shown that there are fundamental differences between the Maxwell's theory and the Bohr Model of light.

2. The Bohr Model Of The Hydrogen Atom

Niels Bohr was led to his theory of the the hydrogen atom when he was shown the empirical Rydberg formula presented in 1888 by Johannes Rydberg which predicted the Balmer series of the hydrogen emission spectrum: $\frac{1}{\lambda} = R(\frac{1}{2^2} - \frac{1}{n^2}); n >= 3$, R being the Rydberg constant. The Bohr Model leads to this same formula. As the Bohr Model is fundamental to an understanding of how it may be developed to a full classical theory of light, it is best that there is a review of the details of the model. The derivation of the formula for the energy levels of the hydrogen atom is given here.

The Bohr Model may now be stated as containing three postulates for the hydrogen atom, h being the Planck constant:

(1) The angular momentum of the electron takes only discrete values $\frac{nh}{2\pi}$ for integer $n >= 1$.

(2) When the hydrogen electron *jumps* from a higher energy state to a lower energy state, a light wave pulse is emitted carrying away the energy difference between the energy states.

(3) The energy of the wave pulse is given by the relation : $E = h\nu$, ν being the frequency of the pulse.

The third postulate originates from Max Planck's theory of black body radiation which required Plank to assume that the energies of the charge oscillators in black body radiation are quantized; the energies may only take discrete values: $E_n = nh\nu$, $n = 1, 2, 3...$, h is what is now the Planck constant, ν the frequency of the oscillator.

Most introduction to the Bohr formula derives it based on the electron making a circular orbit around the hydrogen nucleus, the single proton. The derivation here would be more general for 'hydrogen-like' atoms. If Z is the atomic number of an element X with mass number M, then the hydrogen-like atom would be the nucleus of $_Z^M X$ with a single orbiting electron, i.e. an ion $X^{(Z-1)+}$, with all but one of its orbital electrons removed. The reference frame for motion would be the center of mass of the atom. The electron would then make an elliptical orbit around the nucleus.

Let the charge and mass of the nucleus of the hydrogen-like atom be $+Ze$, M and that of the electron be $-e$, m. The distance between the nucleus and the electron is a and the distance of the electron from the center of mass is l. Let the speed of the electron be v and that of the nucleus be V. It will be shown that the angular momentum L of the system is mva.

$$L = mvl + MV(a - l)$$

As $ml = M(a - l)$, we have:

$$L = mvl + mVl = ml(v + V)$$

If the angular velocity of the electron is ω, then $v = l\omega$, $V = (a - l)\omega$ and $v + V = a\omega$ giving:

$$L = ml(v + V) = mla\omega = mva$$

From Bohr's angular momentum postulate, we have:

$$mva = n\hbar \tag{1}$$

$\hbar = \dfrac{h}{2\pi}$, n being an integer and $n \geq 1$.

The Coulomb force acting on the electron is equal to its mass times its centripetal acceleration; noting that $l = \dfrac{Ma}{M + m}$:

$$\frac{Ze^2}{4\pi\epsilon_0 a^2} = \frac{mv^2(M + m)}{Ma} \tag{2}$$

If v is eliminated from equations (1) and (2), the radius for the nth orbit could be obtained:

$$a = \frac{4\pi\epsilon_0 \hbar^2 n^2}{Ze^2 \mu} \tag{3}$$

where $\mu = \dfrac{mM}{M+m}$. The quantity represented by the symbol μ is called the reduced mass of the electron.

If a is eliminated from equations (1) and (2), the velocity of the electron for the nth orbit could be obtained:

$$v = \frac{MZe^2}{4\pi\epsilon_0(M+m)\hbar n} \tag{4}$$

Ignoring the motion of the center of mass, the total energy of the atom is the sum of the potential energy of the atom plus the orbital kinetic energies of the two particles:

$$E = -\frac{Ze^2}{4\pi\epsilon_0 a} + \frac{1}{2}mv^2 + \frac{1}{2}M\left(\frac{mv}{M}\right)^2 \tag{5}$$

Making use of equation (2), the total energy in equation (5) is now:

$$E = -\frac{1}{2}m\left(\frac{M+m}{M}\right)v^2 \tag{6}$$

Substituting v from equation (4) to equation (6) :

$$E = -\frac{\mu Z^2 e^4}{2(4\pi\epsilon_0)^2\hbar^2}\left(\frac{1}{n^2}\right) \tag{7}$$

The above equation is for the permitted discrete energy for the hydrogen-like atom corresponding to the various stable orbits of the electron and the nucleus; this quantization in the Bohr Model is in contrast to classical mechanics which allows the atom to have any value in the energy continuum. If we substitute the electron mass m for μ with $Z = 1$, then the equation would be the one which Niels Bohr first obtained treating the electron as making circular orbit about the single proton of the hydrogen nucleus:

$$E = -\frac{me^4}{8\epsilon_0^2 h^2}\left(\frac{1}{n^2}\right) \tag{8}$$

When the analysis does not require including the motion of the center of mass, we will use equation (8) for simplicity.

We may now replace E in equation (8) with E_n for the corresponding energy for the quantum states $n = 1, 2, 3...$

$$E_n = -\frac{me^4}{8{\epsilon_0}^2 h^2}\left(\frac{1}{n^2}\right) = E_1\left(\frac{1}{n^2}\right) \tag{9}$$

$E_1 = -\dfrac{me^4}{8{\epsilon_0}^2 h^2}$ being the ground state, the lowest energy state possible for the hydrogen electron. $E_2, E_3, E_4...$ would be the the higher *excited* energy states.

In the Bohr Model, the hydrogen electron for quantum state n_j may jump to a lower state n_i where $n_i >= 1$ and $n_j > n_i$. A light wave

pulse of energy E is then generated:

$$E = E_1 \left(\frac{1}{n_j^2} - \frac{1}{n_i^2} \right) \tag{10}$$

For a wave pulse with frequency ν and wavelength λ , the energy of the pulse is given by the relation $E = h\nu$. As $\dfrac{1}{\lambda} = \dfrac{\nu}{c}$:

$$\frac{1}{\lambda} = \frac{E_1}{hc} \left(\frac{1}{n_j^2} - \frac{1}{n_i^2} \right) \tag{11}$$

$$\frac{1}{\lambda} = \frac{me^4}{8\epsilon_0{}^2 h^3 c} \left(\frac{1}{n_i^2} - \frac{1}{n_j^2} \right) \tag{12}$$

The formula (12) shows that the hydrogen emission spectrum consists of discrete spectral lines. The Bohr Model agrees with the empirical Rydberg formula :

$$\frac{1}{\lambda} = R \left(\frac{1}{n_i^2} - \frac{1}{n_j^2} \right) \tag{13}$$

R being the Rydberg constant. The Rydberg constant was found to be in agreement with the theoretical value from the Bohr Model $\dfrac{me^4}{8\epsilon_0{}^2 h^3 c}$.

The Rydberg formula gives the line spectra of hydrogen classified according to the principal quantum numbers; the Lyman series for $n_i = 1$, Balmer series $n_i = 2$, Paschen series $n_i = 3$, Brackett series $n_i = 4$, Pfund $n_i = 5$. The Balmer series consists of four spectra lines in the visible spectrum with wavelengths 410nm, 434nm, 486nm and 656nm. The concept of quantization of the energies of the orbital electrons is now accepted to be applicable to any atom, not just that of hydrogen.

3. WAVE PULSE THEORY OF LIGHT, WPTOL

The Bohr Model may be developed to a *Wave Pulse Theory Of Light*, WPTOL. The Bohr Model shows the theoretical derivation of the empirical Rydberg formula which gives the line spectra of hydrogen. The Rydberg formula is explicitly for light as a wave, never as the light particle. It may be assumed that the light radiated in the Bohr Model is light as a wave. The WPTOL is therefore a fully classical wave theory of light.

It should be noted that WPTOL is an aether theory of light. In the author's paper *Simple Unified Theory* [1], the aether has mass and the very cause of mass is the electric charge. There is no need of an independent dimension for mass when Newton's theory is extended to a new *Electric Mechanics*. The dimension of an electric mass in *Electric Mechanics* is now $[C][L]^3$; C being the dimension for electric charge, L for length. The electric mass has the definition of $mass =$
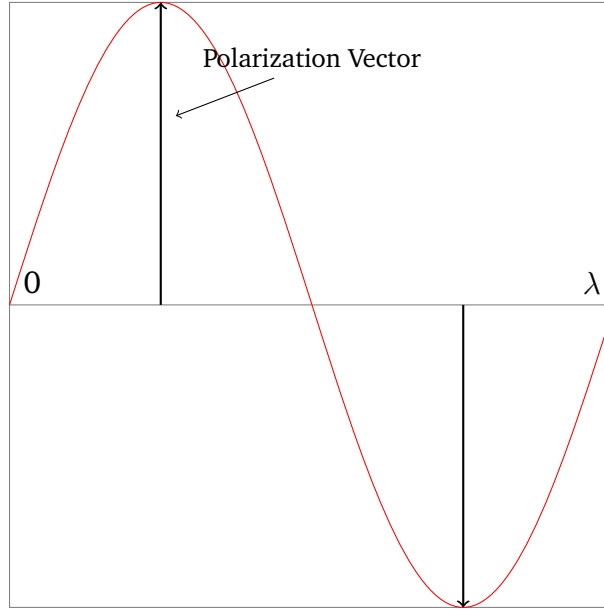
FIGURE 1. Sinusoidal electric polarization of the aether for one wave pulse.

$charge \times volume$. The mass for the electron would then be eV_e, that of the proton eV_p, V_e, V_p being two new universal constants for the volume of the electron and proton needed in the *Electric Mechanics*. A volume element dV of the aether has a mass of $2\rho dV^2$; ρ being the uniform *neutral* charge density of the aether.

In the Bohr Model, an electron at quantum state n_j may jump to a lower state n_i; an amount of energy E is transferred from the hydrogen atom to light as created in the quantum jump; the equation is:

$$E = h\nu = E_j - E_i \qquad (14)$$

It is rather strange that when the the Bohr Model was proposed, no one at the time thought of it as an alternative light theory to the Maxwell electromagnetic light theory. It was right in front of the eyes of every physicist of the time that the Bohr Model was a light theory but based on the electric force of the Coulomb's law and the Planck theory; it was an alternative theory without the need to invoke the archaic analytical concept of the magnetic field.

Light is a wave in the aether and the aether fills the whole universe and has material mass. The aether is the neutral electric material background of our physical world. The WPTOL proposes the very mechanism of how a light wave pulse is created in the aether according to the Bohr model and that light consists only of discrete wave pulses in the aether. There is no continuous *train of light* as in figure (3) routinely depicted in textbooks whenever Maxwell's wave theory is introduced in the classroom.

A light wave pulse is created whenever the hydrogen electron does a quantum jump towards a lower state releasing energy that would be carried off by light. It is proposed that for a quantum jump, a single light pulse of one wavelength is created. Figure (1) shows polarization of a small region of the aether within the hydrogen atom. When not polarized, a spherical volume dV of the aether would have the uniform charge density ρ of the aether. Electric polarization of the aether occurs when the charge densities of $+\rho dV$ and $-\rho dV$ are no longer the uniform density ρ of the aether. It is this separation of the positive and negative charges that gives the polarization vector as shown in figure (1). As polarization of the aether needs energy, a single wave pulse has electric potential energy.

In a quantum jump creating a single wave pulse, we may consider that there is an average force F acting in the aether for a distance λ, F being the force due to the quantum jump. The average force acts over a distance λ giving the work done as $W = F\lambda$. The elemental amount of energy E of polarization in a single wave pulse would then be:

$$E = W = F\lambda \tag{15}$$

As the aether has mass, the energy of the wave pulse having energy E would have a corresponding momentum P as required in classical mechanics; P acts in the direction of motion of the wave. As the time of action of the force F takes the period of the wave $\dfrac{1}{\nu}$, the momentum P is:

$$P = \frac{F}{\nu} \tag{16}$$

Substituting F from equation (16) into equation (15), we have the energy momentum relation of a single wave pulse:

$$E = P\lambda\nu = Pc \tag{17}$$

c being the speed of the light wave pulse in the aether. As the wave pulse has momentum P, the hydrogen atom would recoil with a small velocity v where $v = \dfrac{P}{M}$, M being the mass of the hydrogen atom.

Coincidentally, this energy-momentum relation (17) of a single wave pulse happens to be the same as that in the photon model of quantum mechanics. In the photon model, this relation is obtained from the relativistic energy momentum relation of a mass particle $E^2 = (Pc)^2 + (m_0c^2)^2$ by setting the mass of a photon as zero; i.e. the photon is a *particle of zero mass*. Though both the photon and the wave pulse of WPTOL share the same energy-momentum relation, the former is based on the relativistic mechanics of special relativity whereas the latter is based fully on classical mechanics.

We have shown that a single light wave pulse of energy E and momentum P has dynamical properties:

$$E = h\nu$$
$$E = Pc \tag{18}$$

It is this dynamical properties (18) of a single light wave pulse - being exactly the same as that of a photon - that gives the illusion of light as a particle. But there is nothing particulate in a single light wave pulse; it is a wave in the aether. As the current electromagnetic wave of light cannot be reconciled with light having a definite amount of energy and momentum as dictated by the Bohr Model, quantum mechanics makes a forced *reconciliation* by introducing the add hoc concept of *wave-particle duality*. This relativistic wave-particle nature of light conveniently adopted the concept of the particle which is a classical concept as old as classical mechanics itself since the time of Newton. A classical particle has to have mass, but the photon has no mass; neither does the electromagnetic wave have any particulate nature. This shows that the concept of *wave-particle duality* rose out of an impasse that the relativistic physicists during the 1930s had no way to overcome. Just postulating a new concept to reconcile what cannot be reconciled does not seem to be much in the tradition of the scientific method.

In nuclear physics, it is assumed that the emission of gamma-rays follows the analogy as in the Bohr Model. Within the nucleus of an atom, the nucleons - the protons and neutrons - have discrete energy states just as the orbital electrons in the Bohr Model have discrete energy states. The emission of gamma-rays occur when a nucleon within the nucleus of an atom makes a quantum jump from a higher *excited* state to the ground state. In nuclear physics, a new strong force has to be introduce to explain how it binds the nucleons within the nucleus. Thus the energy of a gamma-ray comes from the strong force. On the other hand, the SUT theory [1] has no neutron within the nucleus of an atom. Instead, the neutron is replaced with a proton and a nuclear electron. With nuclear electrons, there is no need of a strong force as the binding energy within the nucleus; the binding energy within the nucleus is still the Coulomb electric force. The Bohr Model may also be easily adopted to explain the emission of gamma-rays within the nucleus of atoms. In this manner, the emission of all radiation is reconciled in just one theory.

4. THE LARMOR FORMULA IS INVALID

When Maxwell's theory was first introduced, it could only show that light was an electromagnetic waves that propagates in space. The theory could derive the propagation of electric and magnetic fields in space, but it had no information about the source nor the

mechanism for the emission of light radiation - just that light propagates as an electric magnetic wave in space. There was of course a need to extend the theory of light to include an explanation for the source of electromagnetic waves. There was finally a confirmation of Maxwell's theory when Hendrick Hertz generated and detected radio waves in the years 1886 - 1889. The experiments seemed to suggest that electromagnetic waves are generated when electric charges oscillate; the frequency of the transmitted radio waves is the same as the electrical oscillation frequency of the transmitter. So it is not surprising that there was a search to prove that radiation comes from oscillating electric charges or when an electric charge accelerates.

J. J. Larmor in 1897 derives a formula - the Larmor formula - which shows that an accelerating electric charge radiates energy. It was subsequently assumed that this energy is carried away by electromagnetic waves as predicted by Maxwell's theory. So it seems the Maxwell's light theory would be complete with a mechanism which explains the source and generation of electromagnetic radiation. Since its introduction, there have been controversies about the validity of the Larmor fomula. Quoting from Thayer Watkins [6]:

> Richard Feynman in his Lectures on Gravitation says "we have inherited a prejudice that an accelerating charge should radiate." He argues that the Larmor formula giving the power radiated by an accelerating charge as proportional to the square of the acceleration "has led us astray." Feynman maintains that a uniformly accelerating charge does not radiate at all.

J.J.Thomson gave a classical derivation of the Larmor formula. His derivation requires the assumption that the Coulomb electric interaction propagates at the speed of light. This assumption is clearly wrong and refuted empirically. When Einstein introduced his theory of special relativity in 1905 with the postulate that the speed of light is a universal constant, there was this scientific habit to raise light to a mysterious status - that the speed somehow acquires some universal significance. Through human prejudicial habit, the speed of light was assumed to be the universal speed limit to all physical information propagation in the universe. J.J.Thomson was just having a ride on this popular trend when he assumed the Coulomb electric interaction propagates at the speed of light. The trend has no justification whatever except through the preferences of some quarters in the physics world.

When Newton introduced his inverse square law of gravitation, he could show that the planets orbit the sun in stable elliptical orbits. His gravitational interaction between mass bodies acts instantaneously at a distance (IAAAD); nowhere was there a need to introduce a delay in the gravitational force between the planets and the sun. So

this constitutes the simplest direct refutation that the speed of light holds any special universal significance; its only significance is nothing other than that of a universal constant - the constant speed of light in the aether.

Furthermore, in the authors paper [1], gravity is simply due to an excess of the Coulomb electrical attraction over repulsion. So this means the Coulomb interaction is an IAAAD phenomenon and not limited to the speed of light as J.J.Thomson assumed. This invalidates his derivation of the Larmor formula.

The Lamor formula is refuted empirically. As it is accepted that the electrons orbit the nucleus of atoms, they should be radiating energy and would collapse into the nucleus. But atoms do not collapse. This is a trivial refutation of the Larmor formula.

There are other variations of proofs that an accelerating charge radiates energy, but they are all based on the relativistic mechanics of special relativity. The author has shown in various papers [2][3][4] that special relativity is repudiated. In the authors work, it is logical that only works based on classical physics are acceptable. So the authors conclusion is that there is no credible explanation for the generation of electromagnetic waves in Maxwell's theory of light. The theory has only the conclusion that light propagates as an electric magnetic waves in space. No other important information may be found in Maxwell's theory of light.

5. Universal Bohr Mechanism For Radiation Generation

In this paper, it is proposed that there is only one universal mechanism for radiation emission and it is the Bohr mechanism. All radiations within the full spectrum of the current electromagnetic spectrum, from the high energy gamma-rays to the other end of the long radio waves are all generated with the same Bohr mechanism. All radiations have the same Coulomb electric origin - there is no magnetism involved. For gamma-rays, the source is the quantum jumps in the nuclear electrons. For x-rays down to the radio waves, the radiation comes from the quantum jumps from the orbital electrons.

It is well known that the sun's spectrum is a continuous spectrum that is closely approximated by the blackbody radiation at about 6000 K, the temperature of the surface of the sun. The sun radiates x-rays as well as radio waves. It is possible for the Bohr mechanism to cover all wavelengths of the full radiation spectrum as there infinite number of sub-series within the atoms for each electron and an infinite number of combinations in quantum jumps. For the single electron hydrogen atom alone, the Bohr series for principal quantum number $n = 3312$ would be wavelengths greater than $1m$. When the hydrogen emission spectrum is examined in a gas discharge tube, only the four main spectral lines are easily detected as they are emitted with

the highest intensities. There are other spectral lines emitted, but the intensities are too low to be detected. It is possible that radio waves too are emitted, but it would not be possible to distinguished it from the background radio waves that envelopes the earth.

6. MAXWELL'S LIGHT THEORY VERSUS WPTOL

In 1865, James Clerk Maxwell published his seminal paper *A Dynamical Theory Of The Electromagnetic Field*. It is from this paper that he fully developed his famous Maxwell's equations. From the equations, he could derived that light is an electromagnetic wave. Maxwell in his time could only worked with what was known then about electricity and magnetism. Magnetism is now an anachronism as we know that what was the magnetic force due to magnetism is an electric force, the same Coulomb electric force between charge particles, but for particles with motion. In Weber's electrodynamics, there is an additional Coulomb term for the particles having relative velocities. Others have shown that Weber's electrodynamics is sufficient without the need of the dubious concept of the magnetic field. The magnetic field then was modeled after a permanent bar magnet assuming magnetism to be due to magnetic poles with the poles obeying, through analogy with the Coulomb's force, also an inverse square law. Maxwell was working with this magnetism which is now known to be wrong.

Maxwell's theory strictly is only a theory that governs how the electromagnetic wave propagates in free space. The electromagnetic wave equation in Maxwell's theory for the electric $\mathbf{E}$ and magnetic $\mathbf{B}$ fields may be derived from the four Maxwell equation. The vector wave equations are:

$$
\begin{aligned}
\nabla^2 \mathbf{E} &= \mu_0 \epsilon_0 \frac{\partial^2 \mathbf{E}}{\partial t} \\
\nabla^2 \mathbf{B} &= \mu_0 \epsilon_0 \frac{\partial^2 \mathbf{B}}{\partial t}
\end{aligned}
\tag{19}
$$

For the case of the electric field $\mathbf{E}$ which oscillates only in the plane of the x-axis, the speed is in the z-axis, the wave equation becomes :

$$
\frac{\partial^2 E_x}{\partial x} = \mu_0 \epsilon_0 \frac{\partial^2 E_x}{\partial t}
\tag{20}
$$

In Maxwell's theory, the speed of light c in free space is predicted to be $c = \dfrac{1}{\sqrt{\mu_0 \epsilon_0}}$, that of the wave speed in equation (20); it is in agreement with the measured speed of light. Light radiation propagates in a straight line as implied in Maxwell's wave equation. The propagation of the photon is also assumed to be in a straight line, but the photon is a massless particle. There is no natural principle that
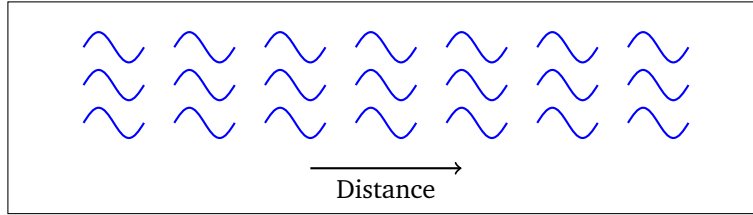
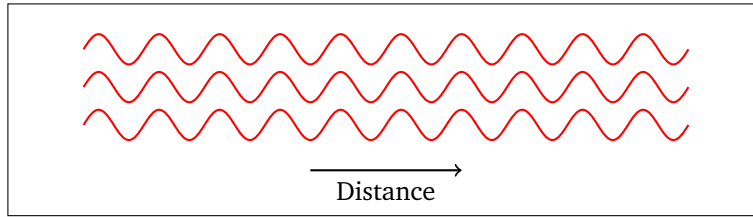FIGURE 2. Discrete wave pulses in the aether; only such exist in nature.

FIGURE 3. Continuous electromagnetic wave of Maxwell's theory; not a physical reality.

such a massless photon should propagate in free space in a straight line.

In WPTOL, the predicted speed of light in the aether is $c = \dfrac{m_e e^4}{8\epsilon_0 h^3 R}$, R being the Rydberg constant; this speed predicted by WPTOL, too, is in agreement to the measured speed of light. In electric mechanics [1], Newton's first law covers the inertial motion of material bodies with mass in space, but space in electric mechanics is the aether. The aether has mass and the origin of mass is the electric charge. The mass of the subatomic particles such as the proton and electron, too, are formed from the electric charge, the same material as the aether. Such inertial motion of material bodies indicates that the aether is frictionless to motion of particles whose material is similar to that of the aether. As a light wave pulse is a wave in the aether, Newton's first law may be extended to cover its motion in the aether. Thus, we have Newton's first law to explain why light propagates in a straight line; the light wave pulse will not change in direction unless there are external forces interacting with the wave pulse. As the aether is frictionless to motion of material bodies, it too is frictionless to the propagation of the wave pulse of light. It is this frictionless propagation of the wave pulse that enables it to maintain its energy as it propagates in the aether. A wave pulse would propagate without any loss of energy unless it meets with matter when its energy may be absorbed.

The Maxwell theory for the electromagnetic wave is a rather weak theory of light as compared with WPTOL. The only information that could be derived from its four equations is nothing except that light

is a wave in free space. It has no physical mechanism to explain how the electromagnetic wave is generated fundamentally; neither is there any explanation for the source of the electromagnetic wave. Even though electromagnetic theory has introduced the concept of the photon which carries a definite amount of energy as well as momentum, this quantization of the photon is not found in Maxwell's theory; the photon is only an ad hoc concept introduced through necessity. On the other hand, the WPTOL is complete in showing light to be a wave; not only as a wave, but that light radiation consist of discrete pulses of wave of one wavelength each, the wave pulses being separate one from another as in Figure(2) . This is born out empirically through the observation that light is quantized.

In introductory classes, the electromagnetic wave that is introduced is usually the simplest transverse electromagnetic wave with the electric field varying as a sinusoidal wave in one fixed plane. As there is no quantization when light radiation is considered as a wave, the wave would be shown to be a continuous *train of waves* as shown in Figure(3). But such a train of wave is not based on any physical law nor any natural principle; it does not exists in physical reality.

From the argument presented so far, it may be said that Maxwell's theory of light as an electromagnetic wave is a rather weak theory as compared to that of WPTOL. Furthermore, with WPTOL, there is no more the need of magnetism and the permeability constant μ_0. Eliminating the concept of magnetism from physics may be considered to be a huge step forward.

7. Conclusion

The Bohr Model has been extended to the *Wave Pulse Theory Of Light*, WPTOL. It is a much stronger theory then that of the Maxwell theory of light. The relativistic photon of light has been replaced by the single wave pulse of one wavelength in the aether. The basic construct of light is the wave pulse. WPTOL has no *train of light wave* as found in the electromagnetic wave theory.

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