A new quantum theory

Kunwar Jagdish Narain[a) b)]

(Retired Professor of Physics)

All electrons, nucleons, and other particles or quanta (because quantum mechanics is applied to all particles, these should be known as quanta) undergo a persistent spin motion without possessing any infinite energy source, and therefore, they should have a unique structure that provides their persistent spinning, as well as their other properties that they display. Additionally, because nothing in nature occurs without a reason or purpose, there should be an explanation for the persistent spinning motion. This study determines the purpose behind the persistent spinning motion of quanta, their unique structures, and properties. The results of the determination of the purpose, named "a new quantum theory", provide very clear and complete explanations for all the phenomena generated due to quanta. Some such phenomena included in this study are: 1) the interference and diffraction of photons and electrons; 2) spectroscopy; 3) transmittance T, which is finite for particles possessing energy $E < V_0$, when V_0 is the energy of the potential barrier; 4) rate reduction of increasing velocity in accelerating electrons after they have attained their relativistic velocity; 5) acquisition of elliptical orbits by orbiting electrons despite moving in a spherically symmetric field, and conservations of their energy, momentum, and spin angular momentum.

[a)] kjnarain@yahoo.co.in ; kjn.jaiswal@gmail.com

b) Former address: Department of physics, Govt. Bilasa Girls P.G. (Autonomous) College, Bilaspur (C.G.) 495001, INDIA

1. Introduction

It is known that nothing in nature occurs without a reason or purpose. For example, the human hearts beat persistently without an infinite energy source only because their beating serves an important purpose, and their unique structure provides their persistent beating, as well as their other properties that they display. Therefore, because all electrons, nucleons, and other particles or quanta (quantum mechanics is applied to all particles; thus, they should be known as quanta) demonstrate persistent spinning motions without possessing an infinite energy source, some reason or purpose should exist to explain this motion. Additionally, these quanta should possess a unique structure that provides their persistent spinning, as well as their displayed other properties.

It is known that all phenomena or activities relating to human hearts, including continuous blood circulation throughout the body, are consequences of the reason why the heart beats persistently, its unique structure, and properties. Similarly, all phenomena and activities related to electrons, nucleons, and other particles should be the consequences of the purpose behind their persistent spinning motion, unique structures, and properties.

Therefore, the purpose why all electrons, nucleons, and other particles display a persistent spin motion (Section 2, [1]), their unique structures and properties (Section 3, [1]) have been determined.The results of the determination of the purpose behind their persistent spinning motion [bullets 1), and 2), Section 2], named “a new quantum theory”, provide very clear and complete explanation of all the phenomena generated due to them, including those, which were previously poorly explained or unexplained. Some phenomena of particular importance included in this study are:

1) Interference and diffraction of photons and electrons (Section 3.1),

2) Spectroscopy (Section 3.2),

3) Transmittance *T*, which is finite for particles possessing energy $E < V_0$, when V_0 is the energy of the potential barrier (Section 3.3),

4) Rate reduction of increasing velocity in accelerating electrons after they have attained their relativistic velocity (Section 3.4),

5-i) Acquisition of elliptical orbits by orbiting electrons despite moving in a spherically symmetric field (Section 3.5.1),

5-ii) Conservation of energy, momentum, orbital angular momentum, and spin angular momentum of electrons during orbital motion along their elliptical orbits (Section 3.5.2).

All electrons, nucleons, and other particles are currently assumed to possess wave characteristics, and all related phenomena are assumed to occur because of their dual nature (wave and particle characteristics). Their wave nature is assumed because this alone and not the other quantum idea can account for the phenomena of interference and diffraction of electrons and photons. However, the concept of their wave nature is untrue (verification: Section 1.1, [2]). It cannot cause the interference and diffraction phenomena (verification: Section 1.2, [2]). Moreover, the current quantum theory (quantum wave theory), which has been developed taking into account the wave nature of quanta, although has achieved significant success, but it fails to explain numerous highly important phenomena. For example:

1) Rate reduction of increasing velocity in accelerated electrons after attaining their relativistic velocity,

2-i) Acquisition of elliptical orbits by orbiting electrons despite moving in a spherically symmetric field (Section 3.5.3),

2-ii) Conservations of energy, momentum, orbital angular momentum, and spin angular momentum of electrons during orbital motion along their elliptical orbits (Section 3.5.3).

Further, if rigorous mathematical proofs for phenomena successfully explained by quantum wave theory are examined, it is found that, in order to arrive at the desired results, numerous logically and practically unbelievable assumptions have been accepted. For example:

1) The energy $E_f - E_i$ [where E_f = K.E. (kinetic energy) + P.E. (potential energy) of the orbiting electron when excited, and E_i = K.E. + P.E. of the orbiting electron after photon emission], or the

difference of K.E. + P.E. between the two energy states E_f and E_i of the orbiting electron, is assumed to be emitted from the orbiting electron as a radiation energy bundle $h\nu$ and the bundle behaves like a particle when the orbiting electron transitions down from the higher energy state E_f to E_i .

2) Packet wave nature has been associated with electrons, nucleons, and all other particles; however, photons (emitted from orbiting electrons) have been assigned an electromagnetic wave nature.

3) Photons were assigned an electromagnetic wave nature because first, electromagnetic waves require no medium for propagation, similar to photons that require no medium for their motion; and second, no concept other than the wave nature of photons and electrons can account for the interference and diffraction phenomena. Thus, i) there should be some evidence(s) of interference and diffraction in microwaves and radio waves (assumed to be electromagnetic waves), and ii) the electromagnetic wave nature should be associated with electrons as well because they require no medium for their motion. However, there is no evidence of interference and diffraction in microwaves or radio waves, and electrons are instead associated with a packet wave nature.

4) Bright interference fringe and bright diffraction band illuminations have been presumed owing to the wave nature of photons; however, no illumination of spectral lines has been assumed owing to the wave nature of photons because light emission and absorption phenomena have been assumed to occur because of the particle nature of photons rather than their wave nature. Conversely, the term ν (currently assumed to be the frequency of the wave nature of photons) is being used to express the frequencies of both interference fringes and spectral lines.

2. Present quantum theory

Because the purpose (see Section 2, [1]) behind the possession of the property of spinning motion in quanta is to generate in them:

1) linear velocities (v) along the directions of their respective spin angular momentum (L_S), where v varies with the spinning motion frequency (ω) (see Section 2.1, [1] for detail information);

2) motional energy E_M [= kinetic energy (E_K) + spin energy (E_S)], and motional momentum p_M [= linear momentum (p_{LIN}) + spin momentum (p_S)] (see Section 2.2, [1] for detail information);

quanta are always found in a state of linear motion oriented along their respective L_S directions. The energy(E_M), momentum (p_M), and spin angular momentum (L_S) of quanta are always conserved during their motions, even when the rate of velocity increase in electrons accelerated by a large voltage (see Bertozzi's experiment [3] for example) starts decreasing after they attain their relativistic velocity, or when electrons move along their elliptical orbits (see Section 2.2, [1] for details)

Because photons also possess spinning motion (verification: Section I A, [4]) and rest mass (verification: [5]), their spinning motion generates the energy E_M $(= h\nu)$ and momentum p_M $(= h\nu / c)$ within them (see Section. 2, [6] for details), and they are always found in a state of motion with velocity c oriented along their respective L_S directions.

NOTE: An effort is underway to develop an expression similar to Schrodinger's equation accounting for the purpose behind quanta spinning motions so that mathematical proofs may also be provided for all phenomena.

3. Present quantum theory applications

The important phenomena, those have been included in this study, are listed in Sections 3.1, 3.2, 3.3, 3.4, and 3.5.

3.1 Explanation for photon interference and diffraction phenomena

3.1.1 Explanation of why and how photons are deviated around the edge(s) of an obstacle and achieve different angles

1) Why and how photons are deviated and achieve different angles in a geometrical shadow (see Section 3.1.1, [2]).

2) Why and how photons are deviated and achieve different angles indirection opposite to geometrical shadow (see Section 3.1.2, [2]).

3.1.2 Explanation of photon interference phenomenon

1) Why and how bright and dark fringes are obtained with monochromatic light sources(see Section 3.2.1, [2]).

2) Why and how overlapping fringes of different colors are obtained with non-monochromatic light sources, such as white light (see Section 3.2.2, [2]).

3) Mathematical treatment of the photon interference phenomenon (see Section 3.2.3, [2]).

3.1.3 Explanation of photon diffraction phenomenon

a) Diffraction at a straight edge

1) Why and how intensity falls off continuously and rapidly with movement into a geometrical shadow until complete darkness is reached {see bullet a) of Section 3.3.1, [2]}.

2) Why and how bright and dark bands are obtained outside a geometrical shadow {see bullet b) of Section 3.3.1, [2]}.

3) Why and how bright bands of continuously reducing intensity and width, as their order increases, are obtained {see bullet c) of Section 3.3.1, [2]}.

4) Why and how a dark band is obtained after every bright band {see bullet d) of Section 3.3.1, [2]}.

b) Diffraction at a narrow wire

1) Why and how, with a thin wire, diffraction bands of unequal intensity and decreasing width are obtained on both sides of the geometrical shadow limits, and interference fringes are obtained inside the geometrical shadow {see bullet a) of Section 3.3.2, [2]}.

2) Why and how, with a sufficiently thick wire, interference fringes inside the geometrical shadow vanish {see bullet b) of Section 3.3.2, [2]}.

c) Diffraction at a single slit

Why and how a central bright band flanked symmetrically on both sides by a series of alternating dark and bright bands is obtained (see Section 3.3.3, [2]).

3.1.4 Discussion

The current approach (considering a wave nature for photons and electrons) regarding photons deviated at different angles from their respective paths turning around the edge(s) of an obstacle assumes, hypothetically, that turning around the edges or corners of an obstacle is a characteristic of wave motion, and as photons are radiation energy quanta possessing a wave nature, they deviate from their paths and turn around obstacle edge(s) at different angles. Conversely, the proposed approach (considering the property of persistent spinning motions for photons and electrons) provides a clear, complete, and logically convincing explanation for how photons are deviated and achieve different angles in a geometrical shadow (see Section 3.1.1, [2]), as well as how photons are deviated and achieve different angles in the direction opposite the geometrical shadow of the obstacle (see Section 3.1.2, [2]).

Regarding interference fringes, the present approach provides a clear and complete explanation as to how the bright and dark interference fringes are obtained (see Sections. 3.2.1 and 3.2.3, [2]), and how the overlapping of fringes of different colors are obtained when a white light source is used (see Sec. 3.2.2, [2]). The method by which these occur can be imaginatively visualized by the proposed approach, whereas by the current approach, assuming photons possess a wave nature, this cannot be visualized.

The proposed approach also provides a clear and complete explanation for how diffraction bands of unequal intensity and decreasing width are obtained beyond the limit(s) of geometrical shadows in various cases {see bullets b), c), and d) of Section 3.3.1, and bullets a), and b) of Section 3.3.2, [2]}, how and why their intensity falls off continuously and rapidly moving into the geometrical shadow{see bullet a) of Section 3.3.1, [2]}, how and why interference fringes are obtained inside the geometrical shadow of a thin narrow wire {see bullet a) of Section 3.3.2, [2]}, and why these fringes vanish once the wire is sufficiently thick {see bullet b) of Section 3.3.2, [2]}. The contemporary approach, assuming photons possess a wave nature, tries to explain the above phenomena using the logically and practically unbelievable concept that wavefronts are divided into half-period elements/zones. First, though this approach successfully explains the intensity variations in the diffraction bands, it fails to explain their width variations. Second, and most important, as radiation energy is emitted in a quantized rather than continuous form, wave fronts could not be generated (see Section 1.2, [2] for detail information), dismissing any question of their division into half-period elements/zones.

3.2 Explanation of spectroscopic phenomena

3.2.1 Deduction of spectral line frequency and intensity expressions

1) Deduction of expression for spectral line frequencies (see Section III E, [4]).

2) Deduction of expression for spectral line intensities (see Section III F, [4]).

3.2.2 Explanation of phenomena/events, which could have never been explained before

The important phenomena/events that have been included in the present study are as follows:

1) How radiation energy is emitted from orbiting electrons in the form of bundles (i.e., photons), providing physical existence to photons as particles, and how those bundles obtain the energy $h\nu$ that enables them to travel with the velocity c; additionally, scatter electrons colliding with them (electrons)in Compton scattering, and eject photoelectrons penetrating into metals in the photoelectric effect (see Section III B, [4]).

2) How and why spectral lines intensities decrease as their frequencies increase (see Section III H, [4]).

3) How and why the thickness of spectral lines decreases as their order increases (see Section III L, [4]).

4) How and why several series of spectral lines, such as the Lyman, Balmer, and Paschen series, are found in atomic spectra (for example, of a hydrogen atom), instead of a single series (see Section III D, [4]).

3.2.3 Explanation of fine structures of spectral lines

1) Why and how the fine structures of spectral lines are obtained (see Sections III I and III J, [4])

2) Deduction of expressions for the number, frequency, and intensity of fine lines in the fine structures of different spectral lines (see Section III K, [4])

In addition to above explanations (Sections 3.2.2 and 3.2.3), several more phenomena/events have also been explained (see all subsections in Section III, [4])

3.2.4 Discussion

The current theories explaining spectroscopy phenomena succeed in deducing an expression for spectral line frequency, but they fail to deduce an expression for their intensity. These current theories also fail to explain: 1) the decrease in spectral line intensity as their frequency increases; 2) decrease in spectral line thickness as their order increases; 3) how radiation energy is emitted from orbiting electrons in the form of bundles, which provide physical existence to photons as particles, and how these bundles obtain energy $h\nu$,enabling them to travel with velocity c, scatter electrons colliding with them in Compton scattering, and eject photoelectrons penetrating into metals in photoelectric effect; 4) how several series of spectral lines, such as Lyman, Balmer, and Paschen series, are found in atomic spectra (for example of a hydrogen atom), instead of a single series.

Contemporary theories provide no explanation for why and how the fine structures of spectral lines are obtained, but they have somehow managed to give only the number of fine lines in different spectral lines by adopting a highly complex and tedious procedure of assigning numbers of sub-energy states corresponding to different electron energy states and placing some selection rules for the electron transition occurrences between them. Furthermore, if the procedure explaining the fine structures of spectral lines in different cases is inspected, it is revealed that these theories are incapable of explaining the exact number of fine lines. Further interpretations have been presented (see Section III M, [4] for details) to explain their (fine lines) exact number.

3.3 Explanation of the phenomenon of finite transmittance for particles possessing energy $\mathbf{E < V_0}$, where $\mathbf{V_0}$ is the potential barrier energy

As electrons, nucleons, and all other particles possess energies $E_K + E_S = E_M$, the total energy E of particles transmitting through the potential barrier should be E_M rather than E_K , whereas, in current theory (i.e., quantum wave theory), E is assumed to be $= E_K$. Therefore, as E ($= E_M$) $> E_K$, E may be $> V_0$, and consequently particles can transmit through the barrier and T = finite can be obtained.

Furthermore, it is known that any particle penetrating or transmitting into/through a potential barrier requires momentum, and because the spinning motion of a particle generates both spin energy (E_S) and spin momentum (p_S) in the particle, the momentum of the particle is also increased from p_{LIN} to p_M (= $p_{LIN} + p_S$). Consequently, particles successfully transmit through the barrier and T = finite is obtained (see Section II, [4] for details).

3.3.1 Discussion

The current explanation of the above phenomenon claims that the barrier penetration property is entirely due to the wave nature of particles, resembling the total internal reflection of light waves (for example, if two glass plates are placed close to each other with a film of air as a medium between them, some light is transmitted from one plate to the other even though the angle of incidence is greater than the critical angle). As the contemporary case claims some light is transmitted even though the angle of incidence is greater than the critical angle, and the proposed case of particle transmittance through a potential barrier where T = finite is obtained even though their energy $E < V_0$, the two are intrinsically dissimilar. The particle transmittance case discusses the dependence of particle transmittance on their energy, whereas the light transmittance case discusses the dependence of transmittance of light on its angle of incidence, and therefore, they cannot be compared.

The claim that the intensity of transmitted light decreases exponentially with increasing air-film thickness, which resembles the exponential decrease of T as the potential barrier thickness increases (observed in the mathematical treatment of the T = finite phenomenon in any quantum mechanics textbook), can of course be accepted; however, this does not validate the claim that barrier penetration properties are due to the wave nature of particle because:

1) The wave nature of particles can/does not generate momentum in them, and therefore, to photons, which are assumed possessing wave nature, the energy $h\nu$ and momentum $h\nu / c$ have been assigned in order that they may penetrate into metals during photoelectric effect phenomenon and scatter electrons colliding with them during Compton scattering phenomenon.

2) The concept of the wave nature of particles is untrue (verification: Section 1.1, [2]).

3.4 Explanation of the rate reduction of increasing velocity in accelerating electrons after their relativistic velocity is attained

When an electron is accelerated by a large voltage, up to $15\times10^{6}V$ (Bertozzi's experiment [3]), and the rate of increase in its velocity (v) starts decreasing after it attains its relativistic velocity, the rate of increase in its spin motion frequency (ω) starts increasing (verification: Sections IV C 1 and IV C 2, [4]), which increases its spin energy (E_S) and spin momentum (p_S). See Section I C, [4] for verification. The increases in E_S and p_S of the electron compensate for the decreases in its E_K and p_{LIN} ; thus, the E_M and p_M of the electron are conserved (verification: Sections IV C 1 and IV C 2, [4]). The increase in the rate of electron spin motion acceleration occurs in such a manner that the law of conservation of its L_S is not violated (see Section 3.1, [1]).

The current expression for the moving mass of electron, written as $\mathrm{m_{mov}} = \mathrm{m_e} / \sqrt{(1 - \mathrm{v}^2 / c^2)}$ (where v and $\mathrm{m_e}$ are the velocity and rest mass of the electron, respectively, and c is the velocity of light), is correct; however, $\mathrm{m_{mov}}$ is not the moving mass of the electron. Instead, $\mathrm{m_{mov}}$ is the effective mass ($\mathrm{m_{eff}}$) of the electron, obtained as a result of the superposition of the effect of the spinning motion of the electron on its $\mathrm{m_e}$. The relativistic kinetic energy $E_K = [m_e \mathrm{c}^2/\sqrt{(1 - \mathrm{v}^2 / c^2})] - m_e c^2$ and relativistic linear momentum $p_{LIN} = m_e \mathrm{v}/\sqrt{(1 - \mathrm{v}^2 / c^2})$ of the electron respectively represent its E_M (= $m_{\mathrm{eff}}\, \mathrm{v}^2/2$) and p_M (= $m_{\mathrm{eff}}\, \mathrm{v}$), and they are obtained from the superposition results of the effects of the E_S and p_S of the electron on its $E_K\,(=m\mathrm{v}^2/2)$ and $p_{LIN}\,(=m\mathrm{v})$, respectively. More detailed information on how these relationships are obtained is contained in Section IV C, [4].

3.4.1 Discussion

It is currently assumed that when the rate of velocity increase in electrons accelerated by a large voltage starts decreasing after they attain their relativistic velocity, their moving mass ($\mathrm{m_{mov}}$) starts increasing according to the expression $\mathrm{m_{mov}} = \mathrm{m_e}/\sqrt{(1-\mathrm{v}^2/c^2)}$ to conserve their E_K and p_{LIN}. However, this assumption cannot be accurate because

1) Experimental evidence proving the existence of electrons suggests an indivisible entity possessing definite e and $\mathrm{m_e}$ quantities. Thus, $\mathrm{m_e}$ cannot increase. The argument that the moving mass of an electron begins increasing and rest mass $\mathrm{m_e}$ remains static when its rate of increase in v starts decreasing, cannot be accepted because it gives rise to several questions. For example: What, actually, is the moving mass? and What is its physical interpretation?

2) Electrons possess E_M, p_M, and L_S, and therefore, these quantities should be conserved when their rate of velocity increase starts decreasing after they attain their relativistic velocity. Increasing the $\mathrm{m_{mov}}$ of electrons cannot conserve their E_M, p_M, and L_S (see Section IV C, [4] for details).

3.5 Phenomena explanations:

3.5.1. How orbiting electrons, despite moving in a spherically symmetric field, acquire elliptical orbits, and how their spin and orbital motions persist without possessing an infinite energy source

See Sections III C and D, [4].

3.5.2. How the energy, momentum, orbital angular momentum, and spin angular momentum of orbiting electrons are conserved in their elliptical orbits

See Section 3.1, [1], and Section III J, [4].

3.5.3 Discussion

Sommerfeld [7] introduced the idea of electron motion in elliptical orbits arguing thatbecausean electron is moving and under the influence of a massive central nucleus, similar to a planet around the central massive sun, it might describe elliptical orbits as well. He did so to modify Bohr's theory because Bohr's simple theory of circular orbits [8], in spite of its many successes, was found inadequate to explain certain details in the hydrogen spectrum. However, no explanation is found in Sommerfeld's theory (or anywhere)as to how an orbiting electron, despite moving in spherically symmetric field, acquires elliptical orbits. Since both electrons and planets move in spherically symmetric fields, they cannot describe elliptical orbits under the influence of central massive nuclei and suns, respectively, because then there arises question: how their E_M, p_M, and L_S conserve. They should have some positive reason(s) for their acquisition of elliptical orbits.

Sommerfeld also introduced the idea of consequent relativistic variation in electron mass. Although this can conserve the E_K and p_{LIN} of electrons, it cannot conserve their E_M, p_M, and L_S. As electrons possess E_M, p_M, and L_S, these values should be conserved.

4 Conclusion

As we know, properties of a person depend upon his physical and mental structures, and a work performed by him depends upon his properties, and condition(s) under which the work is performed. In the same manner, properties of quanta should depend upon their structures, and the phenomena, properties of their systems, and structures of their systems, generated due to them, should depend upon their properties, and the conditions under which the phenomena, properties of their systems, and structures of their systems are generated. Therefore, if a theory is developed to explain the phenomena, properties of their systems, and structures of their systems, generated due to them, that theory should be developed taking into account their properties [e.g., see bullets 1), and 2) of Section 2, and bullets i), ii), and iii) of Section 2, [9]], and condition(s) under which, for example: 1) presence of photons in substances, which colliding with free electrons of the substances produce resistance in their flow, in significant amount at their normal state(see Section 4, [10]); 2) presence of photons in substances in insignificant amount at their superconducting state(see Section 1.1, [11]); 3) no presence of photons in electron, proton etc. beams, and nuclei; the phenomena, properties of their systems, and structures of their systems are generated due to them. Otherwise, the developed theory, e.g., the quantum wave theory, and current quantum field theories cannot be true. Consequently, if the rigorous mathematical proofs of the quantum wave theory and current quantum field theories are examined, in both quantum wave theory (see Section 1) and current quantum field theories (see Sections 3.1.1, and 3.3.1, [9]), numerous logically and practically unbelievable assumptions have been accepted in order to arrive at the desired results. Further, despite accepting numerous logically and practically unbelievable assumptions, the quantum wave theory fails to explain numerous phenomena, e.g., see Section 1, and current quantum field theories fail to explain, for example: 1) properties listed in Sections 3.2, and 3.4 [9], and several properties of the list of Section 3.3, [9]; and 2) structures of deuterons, alpha particles, and nuclei, Section 3.4, [9].

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