A NEW QUANTUM THEORY

Kunwar Jagdish Narain [a) b)]

(Retired Professor of Physics)

As we know, in nature, nothing occurs unnecessarily, e.g., our hearts beat persistently, not unnecessarily; there is an important purpose as to why they beat persistently. Similarly, as electrons, nucleons etc. all the particles, i.e. quanta, possess persistent spin motion; there should positively be some purpose as to why they possess persistent spin motion. (The photons too possess spin motion which they derive from the orbiting electrons, for its confirmation, see inside the paper.) Further, as the phenomena/ activities related with our hearts, e.g., persistent blood circulation etc. taking place in our bodies etc. are the effects of the purpose of persistent beating of our hearts, similarly all the phenomena/activities related with electrons, nucleons etc. should be the effects of the purpose of their persistent spin motion. And therefore, presently that purpose has been determined, and taking that into account, the present quantum theory has been developed. The present quantum theory enables to give very clear and complete explanation of all the phenomena related with electrons, nucleons, photons etc, even the phenomena, e.g.: 1. Decrease in the rate of increase in velocity of accelerated electron after attaining relativistic velocity by that; 2. Interference and diffraction of photons and electrons; 3. Transmittance T = finite for particles possessing energy $E < V_0$ (where V_0 is energy of the potential barrier), while, currently it is claimed that the 2nd and the 3rd phenomena are entirely due to the wave nature of particles. In the current quantum theory (i.e. the quantum wave theory), no account of the purpose as to why electrons, nucleons etc. possess persistent spin motion has been taken. And consequently, though the current quantum theory has huge success to its credit, but if we examine it and the rigorous mathematical proofs of different phenomena, there we find numerous logically and practically unbelievable concepts. These concepts have been taken to arrive at the desired results; otherwise, the current quantum theory fails to give the desired results.

[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

As electrons, nucleons etc. all the particles, i.e. quanta (since quantum mechanics is applied to electrons, nucleons etc. particles, these should also be quanta) possess persistent spin motion without having any source of infinite energy; there should positively be some purpose as to why they possess persistent spin motion, and they should have some special structures, unlike simple balloons of charge, that keeps them spinning persistently and provides all the properties they possess. Similarly as our hearts beat persistently without having any source of infinite energy, not unnecessarily; there is an important purpose as to why they beat persistently, and they have special structure, unlike simple balloons of blood, that keeps them beating persistently and provides all the properties they possess. Further, as all the phenomena/activities related with our hearts, e.g., persistent blood circulation etc. taking place in our bodies are the effects of the purpose of persistent beating of our hearts, similarly, all the phenomena/activities related with electrons, nucleons etc. taking place should be the effects of the purpose behind their persistent spin motion and their special structure.

Presently, that purpose has been determined (see Sec. 2). [For the special structure of electrons and nucleons, see Sec. 3, Ref. 1.] Taking that purpose into account:

1. The true and complete interpretation of photons has been given, see Sec. 3. Because the current interpretation of photons is faulty and incomplete (see Sec. 1.1.3).
2. The present quantum theory has been developed, see Sec. 4.

The present interpretation of photons and the quantum theory enable to give very clear and complete explanation of all the phenomena related with electrons, nucleons, photons etc. (see Sec. 5).

But it is very unfortunate that, in the current quantum theory (i.e. the quantum wave theory), no account of the purpose as to why electrons, nucleons etc. possess persistent spin motion has been taken. Even in Schrodinger equation, where the term E is defined as the total energy of particle, but E contains no account of energy corresponding to spin motion of particle. And consequently, though the current quantum theory has huge success to its credit, but it fails completely to explain numerous very important phenomena, e.g.: i. Decrease in the rate of increase in velocity of accelerated electron after attaining relativistic velocity by that; ii. Despite moving in spherically symmetric field, how do the orbiting electrons acquire elliptical orbits (as planets of our solar system acquire) and they go on spinning and moving persistently in their elliptical orbits without having any source of infinite energy? iii. How do their energy, momentum, spin angular momentum etc. conserve, because when they move along their elliptical orbital paths, their velocity varies? iv How electromagnetism is generated in electron beams and current carrying specimens, and magnetic field is generated around them which possesses direction and occurs in a plane perpendicular to the direction of electrons through them. v. Properties and structures of deuterons, alpha particles and nuclei. And the phenomena, to which the current quantum theory succeeds to explain, if we examine their rigorous mathematical proofs, there we find that, in order to arrive at the desired results:

1. Numerous logically and practically unbelievable assumptions have been taken. For example:

i. To electrons, nucleons etc. all the particles, the packet wave nature has been associated, while to photons, which are emitted from the orbiting electrons, instead of associating the same packet wave nature with them too, the electromagnetic wave nature has been associated.

ii. We find that, when the light falls on any object, an illumination is observed on the object. The same illumination is observed with bright interference fringes, bright diffraction bands and spectral lines. The illuminations of the bright interference fringes and bright diffraction bands have been assumed due to the wave nature of light, but not the illumination of the spectral lines. Because, in the explanation of the phenomenon of emission of spectral lines, it has been assumed that, this phenomenon takes place due to the particle nature of photons, not due to their wave nature. While the term ν, which is currently assumed as the frequency of the wave nature of light and used to express the frequency of the interference fringes, the same ν is used to express the frequency of the spectral lines.

iii. Currently, it is assumed that the energy $E_f - E_i$ [where E_f = K.E. (kinetic energy) + P.E. (potential energy) of the orbiting electron when that is excited, and E_i = K.E. + P.E. of electron after emission of a photon from that] is emitted from the orbiting electron as a bundle of radiation energy $h\nu$. But how can energy $E_f - E_i$, which is the difference of K.E. + P.E. of the orbiting electron between its two energy states E_f and E_i, be emitted from the orbiting electron when it transits from the energy state E_f to E_i in the form of a bundle of radiation energy which starts behaving like a particle?

2. Several interpretations have been reinterpreted, e.g. the original interpretation of photons (see Sec. 1.1.1) has been reinterpreted (see Sec. 1.1.2). But the reinterpretation is faulty and incomplete (see Sec. 1.1.3) and hence gives rise to several negative consequences (see Sec 1.1.4). And therefore, in order to avoid/overcome the negative consequences, some assumptions have further been taken, but they too are not true and give rise to several more very fundamental questions (see Sec. 1.1.5).

3. Several terms have been misinterpreted (see Sec. 1.2).

The current quantum theory has been developed taking account of the speculated characteristic of the wave nature of particles. Because, currently, it is believed that the speculation of the wave nature of photons and electrons, not the other concept can account for the phenomena of interference and diffraction of photons and electrons. But the above belief is not true. Because:

1. The phenomena of interference and diffraction of photons and electrons cannot take place due to their speculated characteristic of wave nature (for confirmation of its truth, see Sec. 1.3), but take place due to the purpose as to why these particles possess persistent spin motion (see Sec. 5.1).

2. The speculated characteristic of the wave nature of electrons etc. particles and photons is not true because:

a). The sound energy, which also suffers the phenomena of interference and diffraction as the radiation energy suffers, does not possess itself the wave nature. The waves are generated in the medium when the sound is produced in the medium. Because, when the sound energy is produced, a disturbance is produced in the medium and that generates waves in the medium. Similarly as, when a piece of stone is dropped in a water tank, a disturbance is produced in the water and that generates waves in the water. The disturbance is produced in the water due to the kinetic energy of stone which does not possess wave nature. Similarly, the radiation energy also cannot possess wave nature.

b). For the time being, if the current assumption that the radiation energy possesses electromagnetic wave nature is assumed to be true because: i. The electromagnetic energy needs no medium for its propagation and it itself possesses wave nature; ii. Speculation of wave nature of photons and electrons, not the other concept can account for the phenomena of their interference and diffraction; then: a). There should be found some evidence of interference and diffraction of microwaves, radio waves etc (which are assumed to be the electromagnetic waves) too, but no such evidence has been found; b). For electrons too the electromagnetic wave nature should be assumed because electrons also need no medium for their motion. But for electrons, the packet wave nature has been assumed, not the electromagnetic wave nature. Why is this double standard?

c). In order to explain the phenomenon of interference, it is assumed that, due to superposition of the waves of photons/electrons and in accordance as the superposition happens to be- constructive or destructive, bright and dark fringes (black and white in the case of electrons) respectively are obtained on the screen/photographic plate. But, if the fringes are obtained on the screen/photographic plate due to superposition of the waves of photons/electrons, the screen can be used in the case of electrons too to obtain fringes, because the wave nature has been associated with both photon and electron. Why is screen not being used in the case of electrons? Suppose, if it is argued that screen or photographic plate is being used in accordance as the nature of the wave of particle is, and as the waves of photons produce illumination effect while the waves of electrons do not, the screen is being used in the case of photons. But this argument cannot be accepted. Because, if the waves of photons produce illumination effect, then if a source of radio waves or microwaves (which emit electromagnetic waves) is somehow enclosed in a chamber made of screen, illumination should be found on the screen of the chamber, similarly as if a source of light is enclosed in that chamber, illumination shall be found on the screen of the chamber. But will/can the illumination be found on the screen of the chamber if a source of radio waves or microwaves is enclosed in that? No. It leads to conclude that either the photons do not possess electromagnetic wave nature or the illumination of bright fringes is not obtained due to the wave nature of photons. Since the photons cannot have any wave nature other than the electromagnetic wave nature, and due to electromagnetic wave nature, no illumination is obtained; the illumination of bright fringes is not being obtained due to the wave nature of photons but obtained due to photons themselves. The use of photographic plate in the case of electrons too leads to the same conclusion, i.e. the interference fringes are obtained due to electrons, not due to their wave nature. Because, the fringes on the photographic plate are obtained due to the effect of charge, and the charge is possessed by the electrons.

1.1. Reinterpretation of photons, faults in reinterpretation, failures those arise due to faults in reinterpretation etc.

1.1.1 Original interpretation to photon

As we know, the concept of quantum came across the floor after the Planck's quantum theory to explain the energy distribution in the radiation chamber. In his theory, instead of assuming the radiation chamber to be full of radiation in continuous form, he assumed the radiation chamber full of radiation in quantized form (i.e. in the form of bundles). These quanta (bundles) of radiation were later on known as photons.

1.1.2 Reinterpretation of photon (i.e. the current interpretation of photon)

As photons suffer the phenomena of interference and diffraction, the photon was reinterpreted as: The photons are discrete quanta of radiation energy given by $h\nu$, which involve the frequency ν of radiation. These, unlike the light corpuscles of Newton, include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea can account for the phenomena of interference and diffraction, the explanation of which is precisely why wave theory was postulated.

1.1.3 Faults in the current interpretation of photons

In the above current interpretation of photons, there are actually two statements:

1. The photons are discrete quanta of radiation energy given by $h\nu$, which involve the frequency ν of radiation.
2. These, unlike the light corpuscles of Newton, include in their very concept the wave nature also of radiation, because this alone and not the other quantum idea

can account for the phenomena of interference and diffraction, the explanation of which is precisely why wave theory was postulated.

As the concept of wave nature of photons and electrons etc. particles is not true and the phenomena of their interference and diffraction do not take place due to their wave nature, the second statement is ruled out. In the first statement, the portion "The photons are discrete quanta of radiation energy given by $h\nu$, which involve the frequency ν of radiation" is also faulty. It is incomplete and confusing. It gives rise to question: Is energy $h\nu$ whether of the amount of radiation contained in photon, or of photon as a particle that enables it to travel with velocity c, scatter electron colliding with that in Compton scattering and eject electron penetrating into metals in photoelectric effect etc.?

As photon travels with velocity c, scatters electron colliding with that in Compton scattering etc., for photon, two things are necessary: 1. A bundle of radiation energy that provides physical existence to photon as a particle, as, e.g. a bundle of charge -e (which is actually the electric energy) that provides physical existence to electron as a particle. 2. Some energy, that enables photon to travel with velocity c, scatter electron colliding with that in Compton scattering etc.

If energy $h\nu$ is of the bundle of radiation that provides physical existence to photon as a particle, the question arises, where is the energy that enables photon to travel with velocity c, scatter electron colliding with that in Compton scattering etc.?

And if $h\nu$ is the energy that enables photon to travel with velocity c etc., the question arises, where is the account of the bundle of radiation energy that provides physical existence to photon as a particle?

1.1.4 Failures, those arise due to the faults in the current interpretation of photons

As the current interpretation of photons fails to explain:

1. How can the energy $E_f - E_i = h\nu$, which is the difference of K.E.+ P.E. of the orbiting electron between its two states E_f and E_i, be emitted in the form of radiation energy, and in the form of a bundle that starts behaving like a particle?

2. Is energy $h\nu$ whether of the amount of radiation contained in photon, or of photon as a particle that enables photon to travel with velocity c, scatter electron colliding with that in Compton scattering etc?

the current interpretation of photons fails to explain the motion of photons with velocity c, the phenomena of Compton scattering and photoelectric effect etc.

And therefore, in order to avoid these failures, currently the following solution has been provided (see Sec. 1.1.5). But it too gives rise to several very fundamental questions (see Sec. 1.1.5).

1.1.5 Current solution that has been proposed to avoid/counter the above failures, but it too is not true

Currently, in order to enable the current interpretation of photon to explain the phenomena, e.g., Compton scattering, Photoelectric effect etc., the moving mass $h\nu / c^2$ and momentum $h\nu / c$ have been assigned to photon. Though $h\nu / c^2, h\nu / c$ succeed to explain the phenomena of Compton scattering etc., but give rise to several very fundamental questions. For example:

1. Does the moving mass of photons $h\nu / c^2$ provide physical existence to them as particles? And if provides, how? Otherwise photons cannot collide with electrons in Compton scattering and penetrate into metals in Photoelectric effect and hence these phenomena cannot take place.

2. What is physical interpretation of moving mass? As the name “moving mass (m_{mov})” has been assigned to $h\nu / c^2$, it should vary as the velocity of photon varies, while

it varies as ν (frequency) of photon varies, not as velocity of photon varies. But m_{mov} of electron varies as its velocity varies, not as its frequency varies. Why is this inconsistency?

3. If the moving mass $h\nu/c^2$ and momentum $h\nu/c$, depending upon the frequency ν of wave nature of photons have been assigned to photons, such moving mass and momentum, depending on the frequency of wave nature of electrons should be assigned to electrons too. But no such moving mass and momentum have been assigned to electrons. Why is this double standard?

4. In $h\nu/c^2$, since every term h, ν and c has finite value, $h\nu/c^2$ should also be finite. Whereas, if substituting in expression $m_{mov} = m_0/\sqrt{(1-\mathrm{v}^2/c^2)}$ [where m_0 and m_{mov} respectively are the rest and moving mass of particle moving with velocity v] the rest mass m_0 of photon to be = 0 (because m_0 of photon has been assumed to be = 0), m_{mov} of photon is obtained to be indeterminate. Why is this discrepancy?

5. The term ν, used in $h\nu/c^2$, $h\nu/c$ and $h\nu$, is assumed as the frequency of the wave nature of photon, i.e. ν is the characteristic of the wave nature of photon, while it is believed that the phenomena of Compton scattering, Photoelectric effect etc. take place due to the particle nature of photon. Then how do $h\nu/c$ and $h\nu$ succeed to explain these phenomena?

1.2 Terms, those have currently been misinterpreted/misinformed

1.2.1 Misinterpretation of the term ν

The term ν has been misinterpreted as the frequency of wave nature of photons, while ν is actually the frequency of spin motion of photons (for its confirmation, see Sec. I A, Ref. 2).

1.2.2 Misinterpretation of the term λ in the expression of de Broglie wavelength

If a particle, say electron of mass m_e moving with velocity v possesses wave nature and its wave length is defined as $\lambda = h/m_e\mathrm{v}$ (de Broglie's expression for wavelength of matter particles), the wave should possess frequency $f = \mathrm{v}/\lambda = m_e \mathrm{v}^2/h$. If we compare this expression with eqn. $\omega = m_e \mathrm{v}^2/h$ [where ω, m_e and v respectively are the frequency of spin motion, rest mass and velocity of electron, and h is Planck's constant, see eqn. (1.2), Sec. I, Ref. 2], we find that these are exactly similar except the difference that in eqn. $f = m_e \mathrm{v}^2/h$, f is the frequency of the wave nature of electron, while in eqn. $\omega = m_e \mathrm{v}^2/h$, ω is the frequency of the spin motion of electron.

The above description leads to conclude:

Either in expression $\lambda = h/m_e\mathrm{v}$, λ should not be the wavelength of electron, i.e. not the characteristic of wave nature of electron, but should be actually = v/ω, i.e. the characteristic of particle nature of electron.

Or in expression $\omega = m_e \mathrm{v}^2/h$, ω should not be the frequency of spin motion of electron, i.e. not the characteristic of particle nature of electron, but should be the frequency of wave nature of electron, i.e. the characteristic of wave nature of electron.

The later conclusion cannot be true, because:

1. The spin motion of electrons has experimentally been verified while their wave nature has been speculated, which is not true too.

2. There is evidence to confirm that ω is frequency of spin motion of electrons (see Sec. I A, Ref. 2).

Then obviously, the first conclusion should be true, i.e. in expression $\lambda = h/m_e\mathrm{v}$, λ should not be the characteristic of wave nature of electron, but should be the characteristic of its particle nature.

1.3 The phenomena of interference and diffraction of photons and electrons cannot take place due to their wave nature

Currently, as shown in Fig. 1(a), it is assumed that the wave fronts of radiation energy coming from two slits S' and S'' superpose, and in accordance as at points where superposition happens to be constructive or destructive, respectively bright and dark fringes are obtained. But it cannot be possible, because:

1. As has been assumed that the radiation energy of photons possesses electromagnetic wave nature, where (in electromagnetic waves) occur two types of vibrations- of electric field and magnetic field in two planes mutually perpendicular to each other, Fig. 1(b), not one type of vibration and in one plane, as shown in Fig. 1(a).

2. Somehow if the vibration of one field, say magnetic field is assumed to be negligible, even then the superposition of wave fronts and hence bright and dark fringes, as shown in Fig. 1(a), cannot be obtained. Because:

i. If we assume the superposition of wave fronts as shown in Fig. 1(a), number of fringes may be obtained even outside of both the ends of the geometrical shadow of the width between the two edges E_1' and E_1'', while all the fringes should be obtained inside the geometrical shadow, as e.g., fringes are obtained inside the geometrical shadow X Y, Figs. 3(a) and 5(a).

ii. According to the current interpretation of photon (see Sec. 1.1.2), the radiation energy, which possesses wave nature, is emitted from the orbiting electrons in discrete form (i.e. in the form of photons), not in continuous form. The production of wave fronts in the radiation energy and their superposition, as shown in Fig. 1(a), can be possible if the radiation energy is emitted in the continuous form.

The waves of photons can of course superpose and subsequently interference fringes may be obtained. But it can be possible only if the photons of every set of two photons, e.g. the photons P_1' and P_n'' of the set of two photons $P_1'\,P_n''$, photons P_2' and P_{n-1}'' of the set of two photons $P_2'\,P_{n-1}''$ and so on fall on the screen coming from the slits S' and S'' deviating round their (slits) respective edges E_1' and E_1'', Fig. 1(c), and during their fall on the screen, their waves are propagating parallel to each other and their vibrations are in the same plane, as shown in Fig. 1(d). But, as the two photons of every set are coming from two different slits S' and S'', their waves cannot be parallel to each other. Their vibrations too cannot always be in the same plane unless the light coming from the source is plane polarized. In the experimental setups, the light coming from the source does not happen to be plane polarized, but despite that the sustained interference fringes are obtained. It means the interference fringes are not obtained due to superposition of the waves of photons too.

The superposition of waves of photons gives rise to several questions too. For example:

a). What does happen to photons during superposition of their waves? Do they (photons) ever collide with each other or not? If not, why and how? And if collide, what does happen? Are the fringes then produced or not?

b). What does happen to radiation energy contained in photons when they fall on the screen and due to superposition of their waves, fringes are obtained on the screen?

c). How are the photons P_1' and P_n'', P_2' and P_{n-1}'',…….. deviated and at different angles from their respective paths turning round the edges E_1' and E_1'' of slits S' and S'' respectively as shown in Fig. 1(c)? Suppose if it is argued that, as the diffraction (i.e. the turning round the edges or corners of the obstacle) is a characteristic of wave motion, and photons are the quanta of radiation energy possessing wave nature, the photons P_1' and P_n'', P_2' and P_{n-1}'',……are deviated from their paths at different angles turning round the edges E_1' and E_1'' of slits S' and S'' respectively, this argument cannot be accepted unless a clear and complete explanation is found in the texts of diffraction as to how physically the waves are deviated turning round the edges of obstacles, and how and due to which reason or characteristic(s) of waves, the angles of their deviation vary. But no such explanation is found anywhere.

2. DETERMINATION OF THE PURPOSE AS TO WHY QUANTA POSSESS PERSISTENT SPIN MOTION

The spin motion of quanta, i.e. electrons, nucleons, photons etc. all the particles generate the following two properties in them:

2.1 First property

The spin motion of spinning particle generates the tendency of linear motion in it along the direction of its spin angular momentum L_S (for verification of its truth, see Sec. I B, Ref. 2). And as electron, nucleon etc. all the particles possess spin motion, a tendency of linear motion is generated in them along the directions of their respective L_S.

If the frequency of spin motion of such a particle is increased by some means, a stage comes when the particle starts moving itself along the direction of its L_S. Then after, as the frequency of spin motion of particle increases, the velocity of particle goes on increasing in accordance to expression[2]

$$\mathrm{v}^2 = h\omega / m \quad \text{...} \quad (1)$$

where m, v and ω respectively are the mass, linear velocity and frequency of spin motion of the particle, and h is Planck's constant [for verification of the truth of expression (1), see Sec. I A, Ref. 2].

Electrons, nucleons etc. all the particles probably possess such amount of frequency of spin motion that keeps them always moving with some linear velocity (v).

And consequently, they are found always in moving state, not in position of rest, and their motions are always oriented along the directions of their respective L_S. Their linear velocity (v) varies as the frequency of their spin motion (ω) varies, according to expression (1).

2.2 Second property

As a particle, due to its linear motion, obtains kinetic energy (E_K), and due its kinetic energy (E_K), obtains its linear momentum (p_{LIN}), similarly, due to its spin motion, it obtains spin energy ($E_S = h\omega/2$, for detail, see Sec. II, Ref. 2), and due to its spin energy, it obtains spin momentum ($p_S = h\omega/\text{v}$, see Sec. II, Ref. 2). [For verification of the truth that the particle obtains p_S due to its spin motion, see Sec. I C, Ref. 2.]

And therefore, electrons, nucleons etc. all the particles possess motional energy (E_M) $= E_K + E_S$ and motional momentum (p_M) $= p_{LIN} + p_S$. And whenever arises the situation of conservation of energy and momentum etc. of electrons, nucleons etc. during their motion, their E_M, p_M and L_S actually conserve, not their E_K and p_{LIN}. [For verification of the truth of conservation of p_M, see Sec. I D, Ref. 2. And for how E_M, p_M and L_S conserve, see Sec. 3.1.1, Ref. 1.] Due to conservation of E_M, p_M and L_S of electrons, nucleons etc., no violation of the laws of conservation of their energy and momentum etc. happens to be possible, even, e.g.: 1. During motion of electron along its elliptical orbit, where the velocity of electron varies; 2. During motion of electron (accelerated by a large voltage), after attaining relativistic velocity by it, when the rate of increase in its velocity starts decreasing (see Sec. 2.2, Ref. 1).

3 PRESENT INTERPRETATION OF PHOTON

As we know, the concept of quantum came across the floor after the Planck's quantum theory (see Sec. 1.1.1), where he interpreted the bundles of radiation energy as quanta. But as currently quantum mechanics is applied to electrons, protons etc. all the matter particles, electrons, protons etc. all the matter particles should be the quanta. The electrons should be the quanta of charge (–e). The protons should be the quanta of: charge (+e) + some material (see the structure of protons, Sec. 3.1.2, Ref. 1). The neutrons should be the quanta of: charge (-e) + charge (+e) + some material (see the structure of neutrons, Sec. 2, Ref. 3).

As the quantum of charge (–e) constitutes the electron and provides physical existence and rest mass m_e to it, the quantum of radiation energy too should constitute the photon and provide physical existence and rest mass $m_{ph} (\approx 3.38 \times 10^{-36} Kg)$ to photon. [For mathematical proof of $m_{ph} \approx 3.38 \times 10^{-36} Kg$, see Sec. IV B, Ref. 2.]

No escaping of light from the black holes verifies the truth of rest mass m_{ph} of photons. Black holes have very strong gravitational force and they do not let even the photons to escape from them, it means, photons have rest mass and are attracted by the black holes due to their very strong gravitational force. For further verification that the photon possesses rest mass, we can see Sec. I D, Ref. 2.

Furthermore, as according to mass-energy equivalence principle of theory of relativity, the matter is transformed into energy in equivalence to that's mass, that's mass is not being transformed into energy, somehow if the mass of the transformed energy is measured, that shall be found to be equal to the mass of the matter. And therefore, the bundle of radiation energy of photon too should have some rest mass.

But currently, m_{ph} has been assumed to be = 0. It is because, otherwise, according to Einstein's postulate of theory of relativity, as the velocity of photon has been assumed to be = c (constant), the moving mass (m_{mov}) of photon becomes infinite according to expression $m_{mov} = m_0 / \sqrt{(1 - v^2 / c^2)}$, which cannot be possible. However, giving plausible arguments and evidences, presently a justified solution has been determined such that the moving mass of photons may not become infinite despite having their rest mass to be finite (see, Ref. 4).

3.1 The true and complete interpretation of photon

The true and complete interpretation of photon is as: A photon = a quantum of radiation energy + energy $h\nu$, where

● **Quantum of radiation energy:** It is a bundle of radiation energy that constitutes the photon and provides particle like physical existence and rest mass m_{ph} to it. (How the radiation energy is emitted from the electron in the form of a bundle, see Sec. III B, Ref. 2.) This quantum of radiation energy provides intensity to spectral lines (see Sec. III F, Ref. 2), to the fine lines of fine structure of spectral lines (see Sec. III K, Ref. 2) in spectroscopic phenomena, and also to bright fringes (see Sec. 5.1.2) and bright bands (see Sec. 5.1.3) respectively in the phenomena of interference and diffraction, in accordance as the amount of radiation energy contained in quantum.

● **Frequency ν :** It is the frequency of spin motion of photon. As photon is emitted from the orbiting electron, which possesses spin motion, photon derives spin motion from that (for verification of its truth, see Sec. I A, Ref. 2). The frequencies of spectral lines are happened to be the frequencies of spin motion of photons (for verification of its truth, see Sects. I A and III E, Ref. 2).

● **Energy $h\nu$:** It is motional energy E_m [$= E_k$ (kinetic energy) + E_s (spin energy)] of photon (for detail, see Sec. III E, Ref. 2). It provides linear motion and spin motion to photon, and consequently photon becomes able to travel with velocity c, scatter electron in Compton scattering and eject electron in Photoelectric effect penetrating into metals.

● **Radiation energy contained in photon + energy *hν* :** It is the total energy of photon (for detail, see Sec. III G, Ref. 2).

As electrons possess spin motion, because of the second property (see Sec.2.2) generated in orbiting electrons due to their spin motion, the orbiting electrons possess energy = E_K + E_S + P.E. (potential energy) = E_M (motional energy = E_K + E_S) + P.E. The difference of energy E_M of orbiting electron between its energy states E_f and E_i is imparted to the emitted photon as its E_M and happens to be $= h\nu$ (for detail, see Sec. III E, Ref. 2). And the difference of P.E. of the orbiting electron between its energy states E_f and E_i happens to be equivalent to the quantum of radiation energy emitted in the form of a bundle that provides particle like physical existence and rest mass m_{ph} to photon (for detail, see Sec. III F, Ref. 2).

● ***hν*/c associated with photons:** It is actually the spin momentum (p_S) of photon, not the linear momentum of photon (p_{LIN}). Because, the spinning particles possess p_S (for confirmation of its truth, see Sects. I C and I D, Ref. 2), and as photons possess spin motion and the momentum $h\nu / c$ varies as ν varies which is frequency of spin motion of photon, $h\nu / c$ should be p_S of photons.

But in all the phenomena, it is used as the linear momentum of photon and it succeeds to explain all the phenomena. Why and how, that is as follows:

As photons possess spin motion, because of the first property (see Sec.2.1) generated in them due to their spin motion, they travel always along the directions of their respective L_S **.** And because of the second property (see Sec. 2.2) generated in them due to their spin motion, they possess always motional energy $E_M (= E_K + E_S)$ and motional momentum $p_M (= p_{LIN} + p_S)$. But, as photon moves always with constant velocity c (according to the postulate of theory of relativity), the E_K and p_{LIN} of photon become constant. And, as the rest mass of photon (m_{ph}) happens to be extremely small but frequency of its spin motion (ν) increases very rapidly as its energy increases, in p_M $(= p_{LIN} + p_S)$ of photon, $p_{LIN} (= m_{ph} c)$ of photon probably becomes negligible in comparison to its p_S. And consequently, wherever momentum of photon is used, it is used as $h\nu / c$ (i.e. p_S of photon) and it succeeds to explain the phenomena.

But in $E_M (= E_K + E_S)$ of photon, its $E_K (= m_{ph} c^2 / 2)$ probably does not become negligible in comparison to its E_S because of having c^2 in $m_{ph} c^2 / 2$, And hence, wherever the energy of photon is used, it is used as $h\nu$.

4. THE PRESENT QUANTUM THEORY

Due to the spin motion of quanta, i.e. electrons, nucleons and photons etc., all the quanta possess:

1. Linear velocity along the directions of their respective L_S which (linear velocity) varies as the frequency of their spin motion varies.
2. Energy $E_M (= E_K + E_S)$, momentum $p_M (= p_{LIN} + p_S)$ and L_S which (L_S, E_M and p_M) vary as the frequency of their spin motion varies

With quanta, possessing the linear velocity along the directions of their (quanta) respective L_S, energy $E_M (= E_K + E_S)$, momentum $p_M (= p_{LIN} + p_S)$ and L_S, the present quantum theory enables to explain all the phenomena related with them (see Sec. 5).

NOTE: Taking account of the above properties generated in particles, the process of development of an expression like Schrodinger eqn. is under way so that the mathematical proofs of all the phenomena may also be given.

5. IMPORTANCE OF THE PRESENT QUANTUM THEORY

There are two types of phenomena related with electrons, nucleons, photons etc.: 1. Caused due to their persistent spin motion. 2. Caused due to their persistent spin motion and their special structure. For the explanation of some of the important phenomena of type-1, see Sects. 5.1, 5.2, 5.3, 5.4 and 5.5. And for the explanation of some of the important phenomena of type- 2, see Sects. 5.1, 5.2, 5.3 and 5.4, Ref. 5.

5.1 Explanation of the phenomena of interference and diffraction of photons

5.1.1 Explanation of how the photons are deviated and at different angles from their paths turning round the edge of an obstacle

5.1.1(a) In the geometrical shadow

We observe that, when a ball B suppose moving with velocity v parallel to the plane of paper gets struck at point 1 or 2 or 3 or ……..located on its surface, Fig. 2(a), with the straight edge P of an obstacle PQ placed perpendicular to the plane of the paper, the ball is deviated from its path rolling round the edge of the obstacle in the geometrical shadow along the broken or dotted line paths, Figs. 2(b, c, d), depending upon:

1. At which point 1 or 2 or 3 or …. the ball gets struck by the edge of obstacle;
2. Momentum of ball with which the ball strikes with the edge of obstacle.

Suppose the ball is deviated along the broken line paths getting struck at points 1, 2, 3 located on its surface with the edge P of obstacle, as shown respectively in Figs. 2(b), 2(c), 2(d). If the momentum of ball is increased from p to p', the ball is now deviated along the dotted line paths, i.e. the angle of deviation is now increased. The angle of deviation of ball goes on increasing as the point at which it gets struck by the edge of obstacle shifts from 1 to 2, 3, 4,…….., n, or as the momentum of ball increases.

Similarly, when photons are deviated rolling round the edges E_1' and E_1'' of slits S' and S'' respectively in their respective geometrical shadows in interference phenomenon, Fig. 3(a), or round a straight edge, Fig. 4, or round a thin wire, Figs. 5(a and b), etc. in their geometrical shadow in diffraction phenomenon, they are struck at their points 1 or 2 or 3 or…..and accordingly they are deviated at different angles. [The present concept of striking of the edge of obstacle at different points 1, 2, 3, …..on the surface of photon is very hard to accept/believe because of extremely small size of photon. But this concept cannot be ruled out. Because: 1. In the current explanation of the phenomena of diffraction and interference of photons, if the sharpness of the edges of slits and obstacles used in the experimental setups to demonstrate the phenomena of interference and diffraction can be assumed to be of the order of the wavelength of waves associated with photons, the present concept too can be taken. 2. In Compton's scattering, photons and electrons are scattered at different angles. It can be possible only if they collide with each other at different points on their surface. (Photons and electrons can be scattered at different angles if they collide with each other at different angles too.) If in Compton's scattering experiment, photons and electrons can collide with each other at different points on their surface, the present concept of striking of the edge of obstacle at different points 1, 2, 3, …..on the surface of photons too can be possible.]

If the source of light is not monochromatic but is of white light, there occur photons of seven different frequencies $\nu_1, \nu_2, \nu_3, \ldots\ldots$ and hence of seven different momentum $p_1 (= h\nu_1 / c)$, $p_2 (= h\nu_2 / c)$, $p_3 (= h\nu_3 / c)$,....... Then the angles of deviation of photons from their respective paths depend also upon their momentum. And consequently, suppose if a photon of momentum p_1 is deviated by an angle θ getting struck at point 4 on its surface, a photon of momentum p_2 or p_3 or p_4 or ….. (where $p_1 < p_2 < p_3 < p_4 \ldots..$) may also be deviated by the same angle θ getting struck at point 1 or 2 or 3 on its surface. Then obviously they (i.e. two photons of two different colors) overlap on each other when fall on some screen. Suppose if the photon of momentum p_2 or p_3 or p_4 or ….. is not being deviated exactly by angle θ but by an angle θ' (< or > θ), the photon of momentum p_1 shall not overlap completely on photon p_2 or p_3 or p_4 or …..but shall overlap partially. Consequently, when a source of white light is used, e.g., in the phenomenon of interference, there occur overlapping of photons and hence no clear and distinct fringes of different colors are obtained [for detail, see Sec. 5.1.2(b)].

5.1.1(b) In direction opposite to the geometrical shadow

In addition to deviation of some photons of the beam in the geometrical shadow of the obstacle, some photons of the beam, e.g. P_1, P_2, P_3,…. are deviated in direction opposite to the geometrical shadow too at different angles colliding with photon P, similarly as the balls B_1, B_2 and B_3 are deviated in direction opposite to the geometrical shadow at different angles colliding with ball B, shown in Figs. 2(a), 2(b) and 2(c) respectively. Because, when the photons are deviated in the geometrical shadow rolling round the edge of obstacle, during the course of their rolling, their surface may collide with the surfaces of some passing by photons. When the collisions take place, the passing by photons are deviated in direction opposite to the geometrical shadow. The angle of deviation of the passing by photon depends upon which portion of it strikes with which portion of the rolling photon and at which instant of its rolling process.

5.1.2 Explanation of the phenomenon of interference of photons

5.1.2(a) When the source of light is monochromatic

The photons coming from slit S when fall at the edge E_1' of slit S', they are deviated in the geometrical shadow rolling round the edge E_1' in accordance as at which point 1, 2, 3,…. on their surface the edge E_1' strikes with them [as has been explained in Sec. 5.1.1(a) and shown in Figs. 2 (b, c, d)]. Similarly, the photons coming from the slit

S when fall at the edge E_1'' of slit S'', they too are deviated in the geometrical shadow rolling round the edge E_1'' in accordance as at which point 1, 2, 3,…. on their surface the edge E_1'' strikes with them. The photons $P_1', P_2', P_3', P_4', P_5', P_6'$ deviated rolling round the edge E_1' when fall on the screen C at points Q_1, Q_2, Q_3, ….. respectively colliding respectively with photons $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$ deviated rolling round the edge E_1'', at every point Q_1, Q_2, Q_3, ….. on the screen, a bright fringe is obtained, as shown in Fig. 3(a). If the photons, e.g., P_2' and P_5'' had not fallen at point Q_2 on the screen colliding with each other, photon P_2' would have fallen at point somewhere in between Q_2 and Q_3, and photon P_5'' at point somewhere in between Q_1 and Q_2. Since the photons P_2' and P_5'' instead of falling respectively at point somewhere in between Q_2 and Q_3 and at point somewhere in between Q_1 and Q_2, fall together at point Q_2, a bright fringe is obtained at point Q_2 and blank spaces are obtained in between Q_2 and Q_3 and in between Q_1 and Q_2. These blank spaces act as the dark fringes. Similarly, at points Q_1, Q_3, …., also bright fringes are obtained, and the blank spaces in between every two points, e.g., in between Q_1 and Q_2, in between Q_3 and Q_4 and so on, act as the dark fringes.

5.1.2(b) When the source of light is non-monochromatic, say of white light

When a source of white light is used, the photons of seven different colors, i.e. photons of seven different frequencies $(\nu_1, \nu_2, \ldots\ldots)$ and hence of seven different momentum $p_1 (= h\nu_1 / c)$, $p_2 (= h\nu_2 / c)$,……. are emitted from the source.

Since the angle of deviation of photons depends upon their momentum too, and as their momentum increases, their angle of deviation increases [see Sec. 5.1,1(a)], therefore, when at point say Q on the screen, where suppose a photon of momentum p_1, turning round the edge E_1' getting struck at point say 3 on its surface, form a bright fringe colliding with a photon of same momentum p_1 coming turning round the edge E_1'', at the same point Q or just forward or backward to it, a photon of momentum p_2 (where $p_2 > p_1$), turning round the edge E_1' getting struck at point say 2 on its surface may also form a bright fringe colliding with a photon of same momentum p_2 coming turning round the edge E_1''. When two bright fringes are formed at the same point by the photons of two different momentum, i.e., of two different colors, they overlap. If they are not formed exactly at the same point but are formed at two different points, a little shifted from each other, they may not overlap or overlap partially. The bright fringe due to photons of momentum p_2 may be formed in the blank space between two bright fringes formed due to the photons of momentum p_1 too. Similarly, the fringes due to the photons of momentum p_3 may also be formed completely or partially over the fringes formed due to photons of momentum p_1 or p_2 and so on. So, due to overlapping of fringes of different colors, there are obtained no clear and distinct fringes of different colors, instead obtained fringes of mixed colors.

5.1.2(c) Mathematical treatment of interference phenomenon

To obtain situation such that photons $P_1', P_2', P_3', P_4', P_5', P_6'$ colliding respectively with photons $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$ may give rise to bright fringes on the screen C, as shown in Fig. 3(a), it is necessary that the group of photons P_1', P_2', P_3', P_4', P_5', P_6' and the group of photons $P_6'', P_5'', P_4'', P_3'', P_2''$, P_1'' should be deviated by the angles as shown in Fig. 3(a) rolling respectively round the edges E_1' and E_1''. Such situation is obtained by varying the distance D, Fig. 3(b), between the plane of two slits S', S'' and the plane of screen C, shifting screen C backward or forward as the situation demands for a given distance d between two slits S' and S''. Because, photons incident upon the edges E_1' and E_1'' not normally but incident making some angle with the normal on the surface of edges [as appear from Figs. 3(a and b)], consequently as distance d between slits S' and S'' increases, the region of geometrical shadow on the screen (i.e. XY) and the angles of incidence of photons (i.e. angles between normal and the directions of incidence of photons on the surfaces of edges E_1' and E_1'') increase. Due to increase in the angles of incidence of photons, the angles of their deviation in the geometrical shadow region of the width between edges E_1' and E_1'' are decreased. Therefore, photons $P_6'', P_5'', P_4'', P_3'', P_2'', P_1''$ fail to reach up to photons P_1', P_2', P_3', P_4', P_5', P_6' respectively and give bright fringes colliding and falling together at points Q_1, Q_2, Q_3, Q_4, Q_5, Q_6 respectively. And hence to obtain situation such that photons deviated from the edges E_1' and E_1'' colliding and falling on the screen may give bright fringes, as shown in Fig. 3(a), for every distance d between the edges E_1' and E_1'', the distance D is found out by shifting the screen C backward or forward as the situation demands. If the increase in distance d is continued, a stage comes when even the maximum deviated photon from the edge E_1' fails to reach up to the maximum deviated photon from the edge E_1''. Then no fringe is obtained by varying D to any value.

So, the situation, as shown in Figs. 3(a and b), is obtained for a particular set of d and D. And if the positions of fringes, e.g. Q_1, Q_2, Q_3,…. are determined, these should depend upon the combination of d and D. If we look at the existing determination of positions of fringes for a particular set of d and D, Fig. 3(b), we find exactly the same thing, e.g.:

$$\text{x (position of fringe at } Q_1\text{)} = \frac{D \times \textit{path difference between photons } P_1' \textit{ and } P_6''}{d}$$

$$= \frac{D c \times \textit{phase difference between photons } P_1' P_6''}{2\pi \nu d}$$

because phase difference = (2π $\times$path difference) / λ = (2π $\times$path difference) $\times$ ν /c.

But in the above expression, ν is not the frequency of wave nature of photon. It (ν) is in fact the frequency of spin motion of photon. And λ is not the wavelength of wave nature of photons. Because λ is defined as λ = c/ν, where c is constant and ν is characteristic of particle nature of photon, and hence λ should also be the characteristic of particle nature of photons. Therefore, the phase difference is between the frequencies of spin motion of photons, not between the wavelengths of the wave nature of photons.

The photons $P_1', P_2', P_3', P_4', P_5', P_6'$ can collide respectively with photons P_6'', $P_5'', P_4'', P_3'', P_2'', P_1'', P_6''$ and give bright fringes falling respectively at points Q_1, Q_2, Q_3, Q_4, Q_5, Q_6 on the screen if

the path difference between the colliding photons = $2n\dfrac{\lambda}{2} = 2n\dfrac{c}{2\nu} = n\dfrac{c}{\nu}$

or the phase difference between the colliding photons = n$\times 2\pi$

where n is a whole number and characterizes a particular bright fringe.

5.1.3 Explanation of the phenomenon of diffraction of photons

5.1.3(a) Diffraction at straight edge

Let A, Fig. 4, be a sharp straight edge of an opaque obstacle AB, S be a narrow rectangular slit and C be a screen. The sharp edge A and slit S both are parallel to each other and perpendicular to the plane of the paper along with the screen C. Let the slit be illuminated by a monochromatic source of light of frequency ν.

5.1.3(a1) Explanation of how the intensity falls off continuously and rapidly as we move into the geometrical shadow until complete darkness is reached

Out of photons coming from the source, some photons are deviated in the geometrical shadow of the straight edge at different angles accordingly as they get struck by the straight edge at points 1, 2, 3,….. located on their surface. In the beginning of the geometrical shadow, the difference of angle of deviation between two successive deviated photons falling on the screen happens to be very-very small, and as we proceed forward into the geometrical shadow (i.e. downward from the point O on the screen), the difference of angle of deviation goes on increasing. (The reason behind it shall be given latter on in my paper explaining exclusively the phenomena of interference and diffraction. Presently, it is beyond the scope of this paper.) Consequently photons fall on the screen partially overlapping on each other in the beginning of the geometrical shadow, and as we proceed forward into the geometrical shadow, the percentage of overlapping goes on reducing and finally they become separated from each other as shown in Fig. 4. And as the density of crowd of photons varies, accordingly the intensity falls off in the geometrical shadow, Fig. 4.

5.1.3(a2) Explanation of how the bright and dark bands are obtained outside the geometrical shadow

Above the limit of geometrical shadow of the straight edge on the screen, Fig. 4, the photons coming directly from the source, and those which are deviated in direction opposite to the direction of geometrical shadow region, like photons P_1, P_2, P_3,…. [see Sec. 5.1.1(b)], fall. Some of the deviated photons, before falling on the screen, may collide with some passing by photons coming directly from the source and they fall together on the screen moving in their resultant direction obtained after their collisions. Before falling on the screen, these groups of photons (formed due to collisions between the deviated and the directly coming photons) may collide with some other passing by photons too and fall together on the screen moving in the resultant direction obtained after their collisions. This process may go on and the photons may fall on the screen in groups of 2, 3, 4,……. photons.

So, due to deviations of photons coming from the source, they do not fall on the screen distributed uniformly, but fall on the screen distributed in number of groups, each group separated by a gap. How many photons fall in different groups and how much widely the photons are distributed in those groups, accordingly the intensity and the width of different groups are obtained. And how the photons are distributed in different portions of different groups- little separated from each other or touching each other or overlapping (partially or densely or very densely) on each other, accordingly intensity of different portions of different groups is obtained.

The deviated photons, while colliding with the passing by photons before falling together on the screen, do not collide with any arbitrary X, Y, Z passing by photons, but collide only with those photons which satisfy condition depending on their path or phase difference. That condition is to be determined.

5.1.3(a3) Explanation of why and how the bright bands of continuously reducing intensity and width, as their order increases are obtained

During the rolling process of every photon round the straight edge, as shown in Figs. 2(b, c, d), colliding with this photon, not only one but probably several passing by photons are deviated by different angles from their respective paths. The number of photons deviated depends upon how many photons collide with the rolling photon during the process of its rolling. And the angles of their deviations depend upon at which different instants of the rolling process of the rolling photon the deviated photons collide with that before their deviations. Thus, during rolling process of every photon getting struck at every point 1, 2, 3, , n located on its surface, due to collision with every such photon, a series of photons is obtained deviated at different angles. Supposing, during the rolling process of some photon getting struck at point 1 on its surface, colliding with this photon, a series of m_1 photons $P_{11}, P_{12}, \ldots P_{1m_1}$ are deviated respectively by angles θ_{11}, $\theta_{12}, \ldots \theta_{1m_1}$ from their path. During the rolling process of some another photon getting struck at point 2 on its surface, colliding with this photon, a series of m_2 photons P_{21}, $P_{22}, \ldots P_{2m_2}$ are deviated respectively by angles θ_{21}, $\theta_{22}, \ldots \theta_{2m_2}$ from their path. And similarly, during the rolling process of some photon getting struck at the last point n on its surface, colliding with this photon, a series of m_n photons P_{n1}, $P_{n2}, \ldots, P_{nm_n}$ are deviated respectively by angles θ_{n1}, $\theta_{n2}, \ldots \theta_{nm_n}$ from their path. Since the duration of rolling of photon getting struck at point 1 on its surface happens to be maximum, as we can observe from Fig. 2(b, c, d), m_1 happens to be maximum. And since the duration of rolling of photon getting struck at point n on its surface happens to be minimum, m_n happens to be minimum.

The angles of deviation θ_{11}, $\theta_{12}, \ldots \theta_{1m_1}$ of the series of m_1 photons probably happen to be such that all the m_1 photons colliding with photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the first bright band. And the angles of deviation θ_{21}, $\theta_{22}, \ldots \theta_{2m_2}$ of the series of m_2 photons probably happen to be such that all the m_2 photons colliding with the photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the second bright band. And similarly, the angles of deviation θ_{n1}, θ_{n2},…… θ_{nm_n} of the series of m_n photons probably happen to be such that all the m_n photons colliding with the photons coming straightly from the source and getting deviated along with them in their resultant directions fall all together on the screen C producing the last bright band. Further, since $m_1 > m_2 > \ldots\ldots > m_n$, the density of crowd of photons and the width of spreading of photons in different bands go on reducing successively as their order increases. And consequently the bright bands of continuously reducing intensity and width, as their order increases, are obtained on the screen, Fig 4.

5.1.3(a4) Explanation of why and how after every bright band, a dark band is obtained and the darkness and the width of that dark band go on continuously reducing as that's order increases

Since the groups of photons (P_{11}, P_{12}, ……. P_{1m_1}), (P_{21}, P_{22},…. P_{2m_2}),…….(P_{n1}, P_{n2},…., P_{nm_n}) are deviated by colliding with the photons rolling round the straight edge getting struck at their points 1, 2, 3,……., n respectively, there occurs no continuity between the groups (P_{11}, P_{12}, ……. P_{1m_1}), (P_{21}, P_{22},…. P_{2m_2}),…….(P_{n1}, P_{n2},…., P_{nm_n}), or can say between the groups of their angles of deviations (θ_{11}, θ_{12},….. θ_{1m_1}), (θ_{21}, θ_{22},….. θ_{2m_2}),………..(θ_{n1}, θ_{n2},…… θ_{nm_n}). But there occurs a gap after every group. Further, since the angles of deviations of photons, colliding with the rolling photons round the straight edge, go on reducing, the width of the gap between two successive groups of angles also goes on reducing as the order of the gap increases.

In these gaps, since no photons fall, because the photons coming straightly from the source, those had to fall in these gaps are deviated along with the different groups and fall in the bright bands, these gaps appear as dark bands. Further, since beyond the last bright band, the uniform light occurs, because of that’s effect, the darkness of the dark bands reduces as their order increases.

5.1.3(b) Diffraction at a narrow wire

Let AB be a narrow wire of thickness d, held parallel to narrow rectangular slit S placed perpendicular to the plane of paper, Figs. 5(a and b).

5.1.3(b1) When the wire is thin

As the diffraction bands of decreasing intensity and width are obtained above the limit of the geometrical shadow of a straight edge, discussed in Sects. 5.1.3(a2, a3 and a4) and shown in Fig. 4, similarly, above X and below Y, Fig. 5, the diffraction bands of decreasing intensity and width are obtained.

In the geometrical shadows of both the upper and the lower ends of the thickness d of the wire, i.e. below X and above Y, Fig. 5, the photons coming from the source are distributed in the same manner as are distributed in the geometrical shadow of the straight edge, discussed in Sec. 5.1.3(a1) and shown in Fig. 4. If the wire is thin, out of photons deviated in the geometrical shadow of the upper end of the thickness of wire, i.e. below X, those photons which fall on the screen in the region away from X, since are not happened to be overlapping or touching each other but are happened to be little separated from each other, become able to reach and collide with similar photons, coming after being deviated in the geometrical shadow of the lower end of the thickness of wire, i.e. above Y. After their collisions, when they fall on screen, at the places where they fall, bright interference fringes are obtained, Fig. 5(a), similarly as interference fringes are obtained, discussed in Sec. 5.1.2 (a) and shown in Fig. 3(a)..

5.1.3(b2) When the wire is thick

If the thickness of wire is increased, a stage comes when the thickness of wire becomes equal to say d', Fig. 5(b), even the maximum deviated photon in the geometrical shadow of the upper end of the thickness of wire fails to reach and collide with the maximum deviated photon in the geometrical shadow of the lower end of the thickness of the wire. Then no fringes are obtained on the screen and there are obtained continuously and rapidly falling intensities in the geometrical shadows of both the ends of wire, Fig. 5(b), as continuously and rapidly falling intensity is obtained in the geometrical shadow of straight edge, Fig. 4

5.1.3(c) Diffraction at a single slit

The case of diffraction at a single slit is equivalent to diffraction at two straight edges E_1 and E_2 placed in the same plane and facing to each other. In this case of diffraction, photons deviated in different groups of angles by photons rolling round the edge E_1 [as has been described in Sec. 5.1.3(a2)], when colliding and deviating the passing by photons (coming directly from the source) along with them, move onwards to fall on the screen, on their way, they collide with photons coming similarly from the opposite side getting deviated in different groups of angles by photons rolling round the edge E_2. Due to their collisions on their way, now when they fall on the screen, their distribution on the screen is being changed. In the centre of the screen (or can say, in the centre of edges E_1 and E_2), very large number of photons fall, i.e. the density of crowd of photons happens to be very high, and on both the sides of it, the density of crowd of photons symmetrically falls off rapidly. Apart from this central group, the photons are distributed in several groups also symmetrically on both the sides of the central group. These groups are obtained probably due to falling of: 1. Photons which are left from collision on their way and falling in the central group; and 2. Photons which do not become able to reach in the centre, and before that, they fall on the screen. The density of crowd of photons and the width of their spreading in different groups go on reducing on both sides of the central group.

As the density of crowd of photons in different groups, and the density of crowd of photons at different places of different groups vary; accordingly, the intensity of different groups and the intensity of their different portions vary. And as the range/width of spreading of photons in different groups varies, accordingly their width varies.

The blank spaces (i.e. gaps) of continuously decreasing darkness between every two groups are obtained accordingly as has been described in Sec. 5.1.3(a4).

NOTE: The detail explanation of the phenomena of interference and diffraction, their mathematical treatments etc. are beyond the scope of the present paper. These shall be given sometimes later on separately.

5.2 Explanation of spectroscopic phenomena

5.2.1 Present explanation

The accounts of v, L_S, E_M and p_M of the orbiting electrons (Sec. 4) and photons (Sec. 3.1) enable to, e.g.:

1. Deduce the expressions for both frequency of spectral lines (see Sec. III E, Ref. 2) and intensity of spectral lines (see Sec. III F, Ref. 2).

2. Explain how and why the intensity of spectral lines decreases as their frequency increases (see Sec. III H, Ref. 2).

3. Explain how and why the thickness of spectral lines decreases as their order increases (see Sec. III L, Ref. 2);

4. Give very clear and complete picture of why and how the fine structures of spectral lines are obtained (see Sects. III I and J, Ref. 2);

5. Deduce the expressions for number of fine lines in different spectral lines, for their frequency and intensity (see Sec. III K, Ref. 2).

The accounts of v, L_S, E_M and p_M of the orbiting electrons enable to explain several such phenomena/events too which are equally valuable and important, but their no explanations are found. For example:

1. How the radiation energy is emitted from the orbiting electrons in the form of bundles those provide physical existence to photons as particles, and how those bundles obtain energy $h\nu$ that enables them, i.e. photons to travel with velocity c, scatter electrons colliding with them in Compton scattering etc. (see Sec. III B, Ref. 2).

2. Why and how in atomic spectra of hydrogen atom, there are found several series of spectral lines, e.g., Lyman series, Balmer series, Paschen series etc., not a single series (see Sec. III D, Ref. 2);

3. How and why the orbiting electrons acquire elliptical orbits despite moving in spherically symmetric field (see Sec. III C, Ref. 2). [The orbiting electrons move actually in elliptical orbits (as the planets of our solar system move in elliptical orbits) not in circular orbits. The Bohr's theory fails to explain accurately the frequency of higher order spectral lines of every series (Lyman series, Balmer series etc.) because, in the Bohr's theory, the motion of electrons has been assumed in circular orbits. Somehow, if assuming elliptical orbits for the orbiting electrons, the expression for the frequency of spectral lines is deduced, that shall explain accurately the frequency of higher order spectral lines of every series.]

5.2.2 Current explanation (i.e. taking account of the speculated wave nature of the orbiting electrons and photons**), and faults in it**

The current theories enable to deduce the expression for frequency of spectral lines but fail to deduce the expression for intensity of spectral lines. The current theories fail to explain the decrease in intensity of spectral lines as their frequency increases;

decrease in thickness of spectral lines as their order increases and many more phenomena/events

Regarding explanation of the fine structures of spectral lines, the existing explanation (given by the current theories) has two very basic and fundamental faults:

1. The determination of μ_j is neither judicious nor meaningful (for detail, see Sec. 1, Ref. 10) because in expression $\mu_j = g_j(-e/2m)L_j$ where g_j is known as the Lande g factor, L_j = jh /2π is not true (for detail, see Sec. 1, Ref. 6).

2. j (= s ± l) can have only one value corresponding to each value of l, not more than one value (for detail, see Sec. 1, Ref. 6).

And therefore, the existing explanation of the fine structure of spectral lines cannot be set forth to be true.

These theories somehow manage to give only the number of fine lines, that too adopting very complicated and tedious procedure of assigning number of sub-energy states corresponding to different energy states of electron and putting some selection rules for the occurrence of its transition among them. And, if we look at the procedure followed to explain the fine structure of spectral lines in different cases, we find that, these theories are not capable even to explain the exact number of fine lines. In order to explain the exact number, further interpretations have been presented [for detail, see starting from the last paragraph, column-1, to paragraph-4, column-2 (page-66) of Sec. III M, Ref. 2].

5.3 Explanation of the phenomenon, transmittance T = finite for particles possessing energy $E < V_0$, where V_0 is energy of the potential barrier

5.3.1 Present explanation

Since the electrons, nucleons etc. all the particles possess spin motion, obviously they possess spin energy (E_S). And hence their total energy E should be $= E_K + E_S = E_M$, not $= E_K$. Then their total energy $E\,(= E_M)$ should be $> E_K$, and hence may be $> V_0$. Consequently the particle penetrates into the barrier, i.e. T = finite is obtained.

Further, as we know, for penetration of any particle into/through a potential barrier, it is necessary that the particle possesses momentum, and the magnitude of its momentum should be such that the energy corresponding to its momentum is greater than the energy of the potential barrier. Since the spin motion of particle generates both spin energy (E_S) and spin momentum (p_S) in it, the momentum of the particle is also increased from p_{lin} to p_M ($= p_{LIN} + p_S$) in addition to increase in its energy from E_K to E_M ($= E_K + E_S$).And therefore the particle succeeds to penetrate into/through the barrier and T = finite is obtained (for detail, see Sec. II, Ref. 2).

5.3.2 Current explanation (i.e. taking account of the speculated wave nature of particles**), and faults in it**

In the current explanation, it is claimed that the property of barrier penetration is entirely due to the wave nature of particles and is very similar to the total internal reflection of light waves. If two glass plates are placed close to each other with a film of air as medium between them, some light is transmitted from one plate to another even though the angle of incidence is greater than the critical angle. But, in the case of transmittance of light through the air film, some light is transmitted even though the angle of incidence is greater than the critical angle, while in the case of transmittance of particles through the potential barrier, T = finite is obtained even though their energy $E < V_0$, how can these be similar? In the case of transmittance of particles, we are talking about the dependence of their transmittance over their energy while in the case of transmittance of light, we are talking about the dependence of their transmittance over their angle of incidence, how can these be compared?

The claim that the intensity of transmitted light decreases exponentially with increase in thickness of the air film similarly as T decreases exponentially with increase in thickness of potential barrier (as obtained in the mathematical treatment of explanation of T = finite) can of course be accepted. But it does not approve the claim that the property of barrier penetration is due to the wave nature of particles. Because:

1. Does the wave nature of particles generate momentum in them that increases their momentum to $p'(> p_{LIN})$ such that the energy corresponding to this momentum (i.e. p') is greater than the energy V_0 of the potential barrier? Otherwise, the particles cannot penetrate through the barrier, i.e. T = finite for particles possessing $E < V_0$ cannot be obtained.

2. To explain the phenomenon of photoelectric effect, in order that the photons may penetrate into the metals, energy $h\nu$ and momentum $h\nu / c$ have been associated with photons, while to explain T = finite for particles possessing $E < V_0$, it is claimed that this phenomenon occurs due to the wave nature of particles. It is amazing.

3. The concept of the wave nature of particles is not true (see Sec. 1).

5.4 Explanation of decrease in the rate of increase in velocity of accelerated electron after attaining relativistic velocity by that

5.4.1 Present explanation

When the electron is accelerated by a large voltage up to $15\times10^6 V$ (Bertozzi's experiment[7]) and the rate of increase in its velocity (v) starts decreasing after attaining relativistic velocity by it, it's moving mass does not start increasing in order to conserve its E_K and p_{LIN} (for detail, see Sec. 5.4.2). Instead the rate of increase in frequency of its spin motion (ω) starts increasing in order to conserve its E_M , p_M and L_S . Because electron possesses E_M , p_M , L_S and hence its E_M , p_M , L_S should be conserved. [How E_M , p_M and L_S of electron conserve due to increase in the rate of increase in its ω , see Sec. 3.1.1, Ref. 1. And for evidence to verify that the rate of increase in ω of electron starts increasing in order to conserve E_M and p_M of electron, see Sec. IV C 1, Ref. 2]

Since the electron possesses energy $E_M = E_K + E_S$ and momentum $p_M = p_{LIN} + p_S$, if superposing the effects of E_S and p_S of electron on its E_K (= m_e v^2/2) and p_{lin} (= m_e v) respectively we try to write down the expressions for E_M and p_M of electron in the form/terms of its kinetic energy and linear momentum respectively, the expressions are obtained as: E_M = $(m_e)_{\mathrm{eff}}$ v ^{2}/2 and p_M = $(m_e)_{\mathrm{eff}}$ v respectively. The energy $(m_e)_{\mathrm{eff}}$ v ^{2}/2 and the momentum $(m_e)_{\mathrm{eff}}$ v shall produce the same effects as the energy E_M and the momentum p_M respectively shall produce. The term $(m_e)_{\mathrm{eff}}$ is the effective mass of electron. v

The moving mass $m_{mov} = m_e / \sqrt{(1-\mathrm{v}^2/c^2)}$ (where m_e is the rest mass of electron), the relativistic kinetic energy $E_K = [m_e c^2 / \sqrt{(1-\mathrm{v}^2/c^2)}] - m_e c^2$ and the relativistic linear momentum $p_{LIN} = m\mathrm{v}/\sqrt{(1\text{-}\mathrm{v}^2/c^2)}$ of electron are actually its effective mass $(m_e)_{\mathrm{eff}}$, E_M [= $(m_e)_{\mathrm{eff}}$ v ^{2}/2] and p_M [= $(m_e)_{\mathrm{eff}}$ v] respectively. How the expressions $E_K = [m_e c^2 / \sqrt{(1-\mathrm{v}^2/c^2)}] - m_e c^2$ and $p_{LIN} = m\mathrm{v}/\sqrt{(1\text{-}\mathrm{v}^2/c^2)}$ are obtained as the consequence of superposition of the effects of E_S and p_S of electron on its E_K and p_{LIN} respectively, see starting from the last but one paragraph (column-1, page-69) to the end of second paragraph (column-2, page-70), i.e., the end of Sec. IV C, Ref. 2.

5.4.2 Current explanation (i.e. assuming that after attaining relativistic velocity by the electron, its moving mass starts increasing in order to conserve its E_K and p_{LIN} **), and faults in it**

Currently, it is assumed that when the electrons are accelerated by a large voltage, after attaining relativistic velocity by them, their moving mass starts increasing in accordance to expression $m_{mov} = m_e / \sqrt{(1 - \mathrm{v}^2 / c^2)}$ in order to conserve their E_K and p_{LIN}. But this assumption cannot be true because it gives rise to several very fundamental questions (see Sec. IV C, Ref. 2). Two of them are as follows:

i. As the electron possesses spin motion, it should possess E_M , p_M and L_S . Further, since the frequency ω of spin motion of electron varies with its velocity v (see Sec. 2.1), after attaining relativistic velocity by it when the rate of increase in its v starts decreasing, E_M , p_M and L_S of electron should be conserved, not its E_K and p_{LIN} . Can E_M , p_M and L_S of electron conserve by increasing in its moving mass? And if can conserve, how?

ii. The evidence we have from experiments proving the existence of electrons suggests an indivisible entity having definite quantities associated with it: e and m_e. Then how can m_e increase? Suppose if it is argued that when the rate of increase in v of electron starts decreasing, it’s moving mass increases, not it’s rest mass m_e, this argument cannot be accepted, because it gives rise to several questions. For example: What moving mass actually is? What is its physical interpretation? Further, as the name it has “moving mass”, the moving mass of electron should start decreasing when the rate of increase in its velocity starts decreasing after attaining relativistic velocity by it, while on the contrary, the moving mass of electron starts increasing. How?

5.5 The explanation of phenomena:

5.5.1. How do the orbiting electrons, despite moving in spherically symmetric field acquire the elliptical orbits and they go on spinning and moving persistently in their elliptical orbits without having any source of infinite energy

For its explanation, see Sects. III C and D, Ref. 2.

5.5.2. How do their energy, momentum, spin angular momentum etc. conserve (because, during their motion along elliptical orbits, their velocity varies)

For its explanation, see Sec. III J, Ref. 2.

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FIGURE CAPTIONS

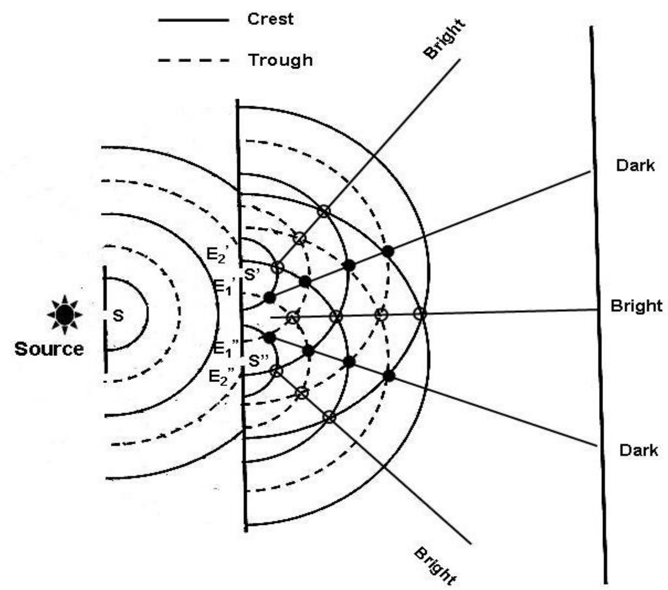
Fig. 1: (a): Interference of two wave trains; (b): Vibrations of electric and magnetic fields of electromagnetic waves during their propagation; (c): Production of bright and dark fringes due to superposition of waves of photons (photon waves and their superposition have not been shown in Fig. to avoid complication in it).

Fig. 2: (a): Ball B on the surface of which the points 0, 1, 2, 3. …, n are located. (b, c, d): Deviation of ball B at different angles in the geometrical shadow of obstacle PQ depending upon its momentum p and p' and point 1, 2, 3 on its surface, getting struck respectively at which by the edge P of the obstacle, it is deviated; and deviation of balls B_1, B_2, B_3 at different angles in direction opposite to the geometrical shadow getting struck by the ball B during its (ball B) rolling round the edge P of the obstacle PQ

Fig. 3: Intensity distribution due to collisions of photons and their falling on the screen in interference phenomenon using two slits, e.g. in Young's experiment.

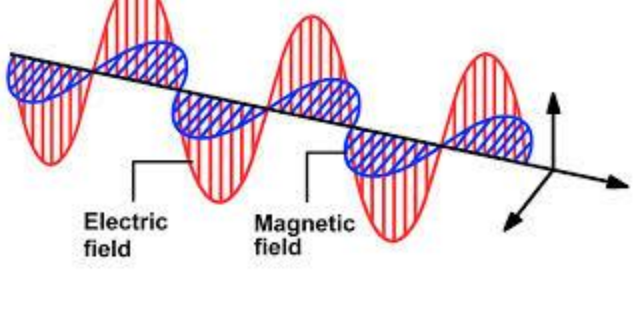
Fig. 4: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at straight edge.

Fig. 5: Intensity distribution due to collisions of photons and their falling on the screen in diffraction at a wire: (a) When the wire is thin; (b) When the wire is thick.



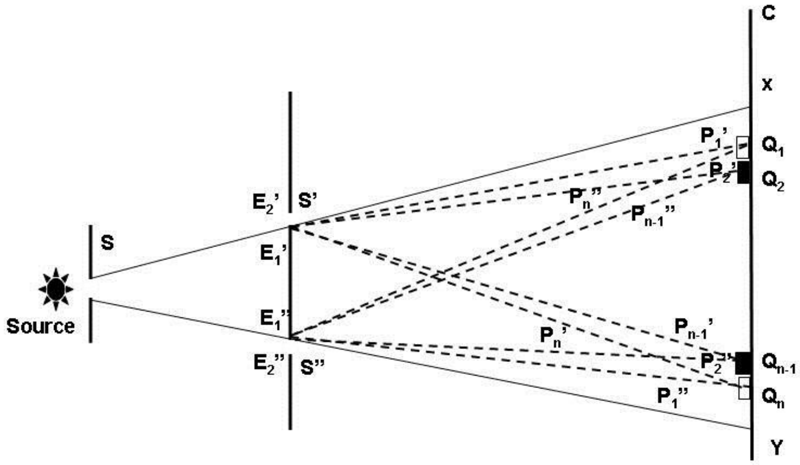
Crest
Trough
Bright
Dark
Bright
Dark
Bright
Source
S
S'
S''
E_2'
E_1'
E_1''
E_2''

(a)



Electric field
Magnetic field

(b)



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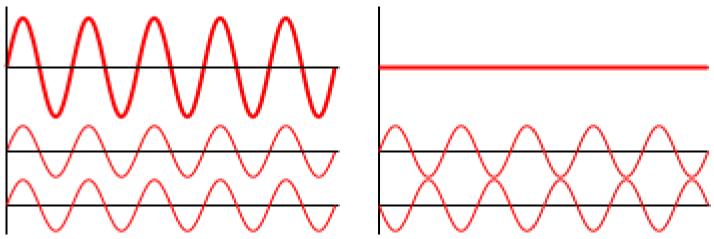

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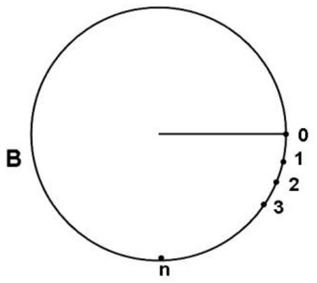
Fig. 1



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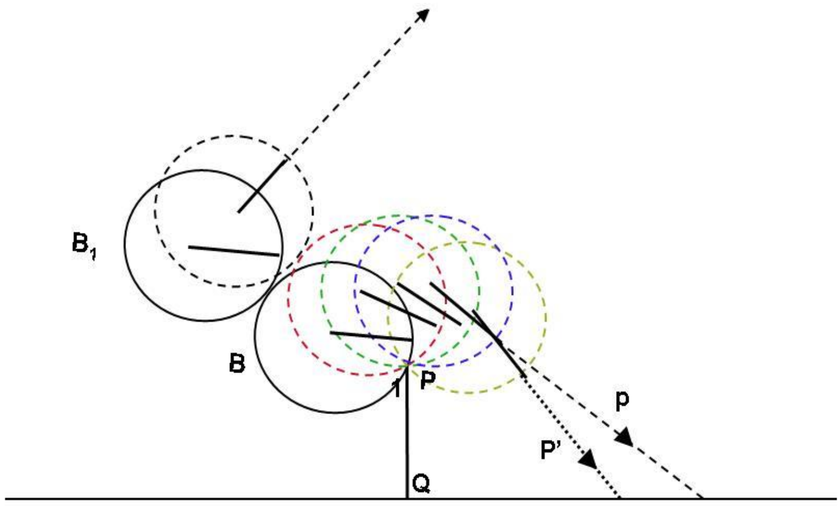

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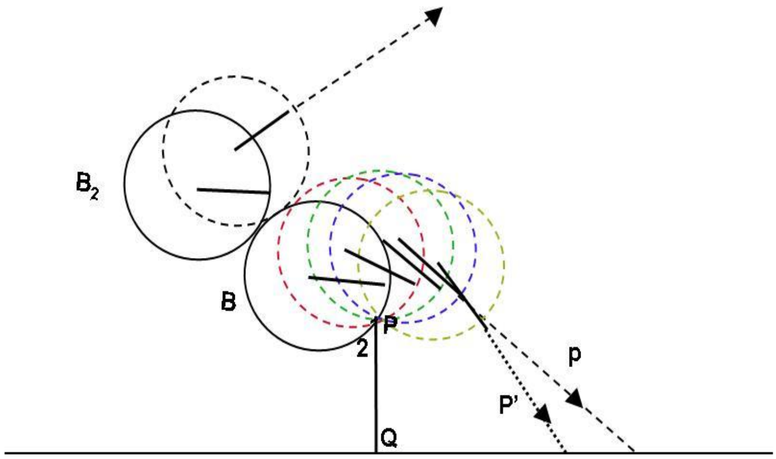

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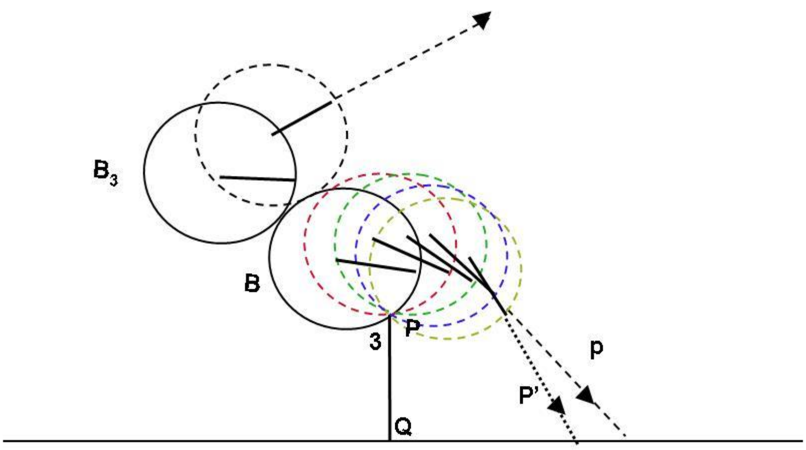

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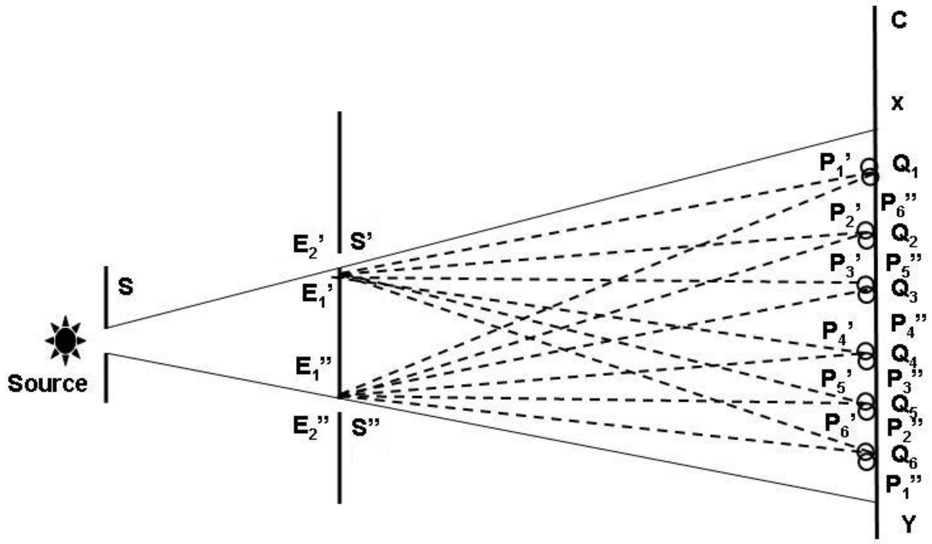
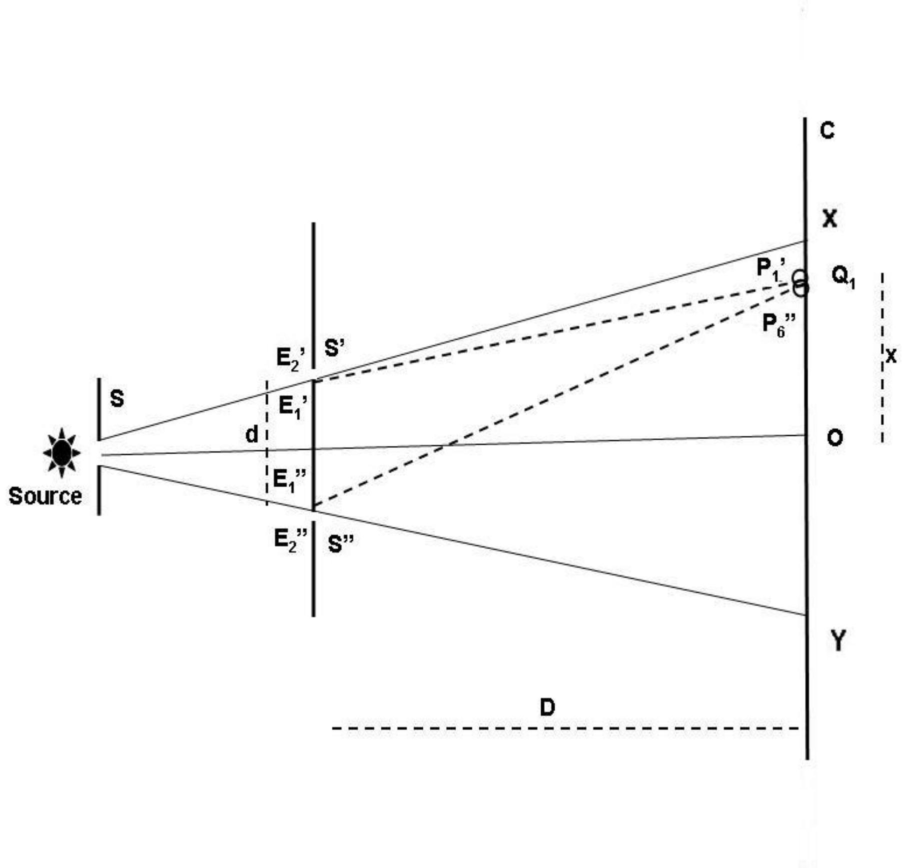
Fig. 2


C
X
Y
S
Source
E2'
S'
E1'
E1''
E2''
S''
P1'
Q1
P6''
P2'
Q2
P3'
P5''
Q3
P4'
P4''
Q4
P5'
P3''
Q5
P6'
P2''
Q6
P1''

(a)



(b)

Fig. 3

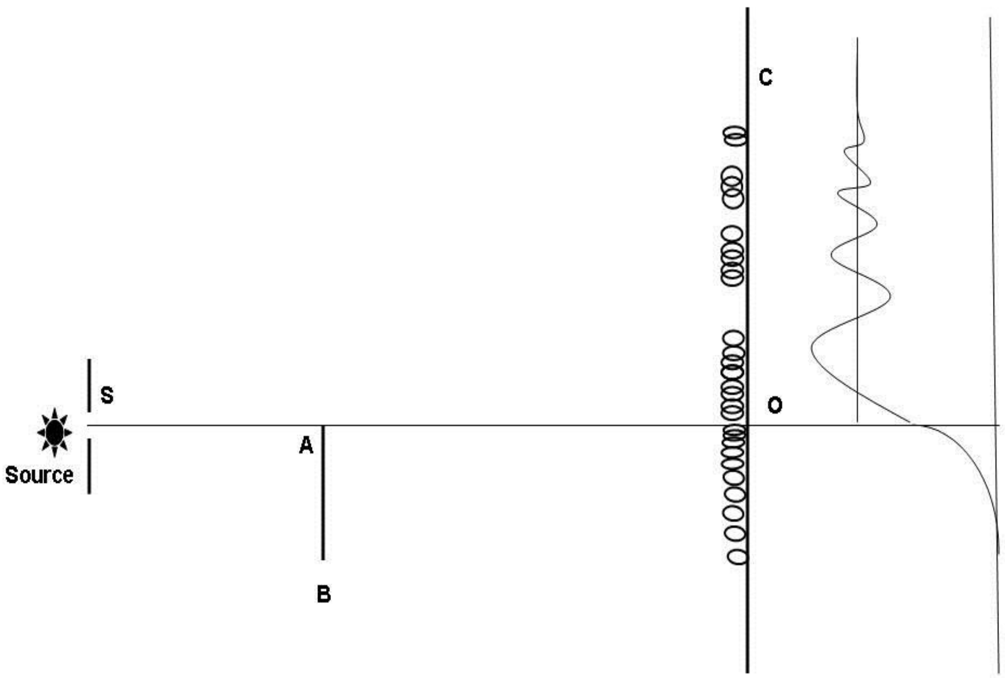
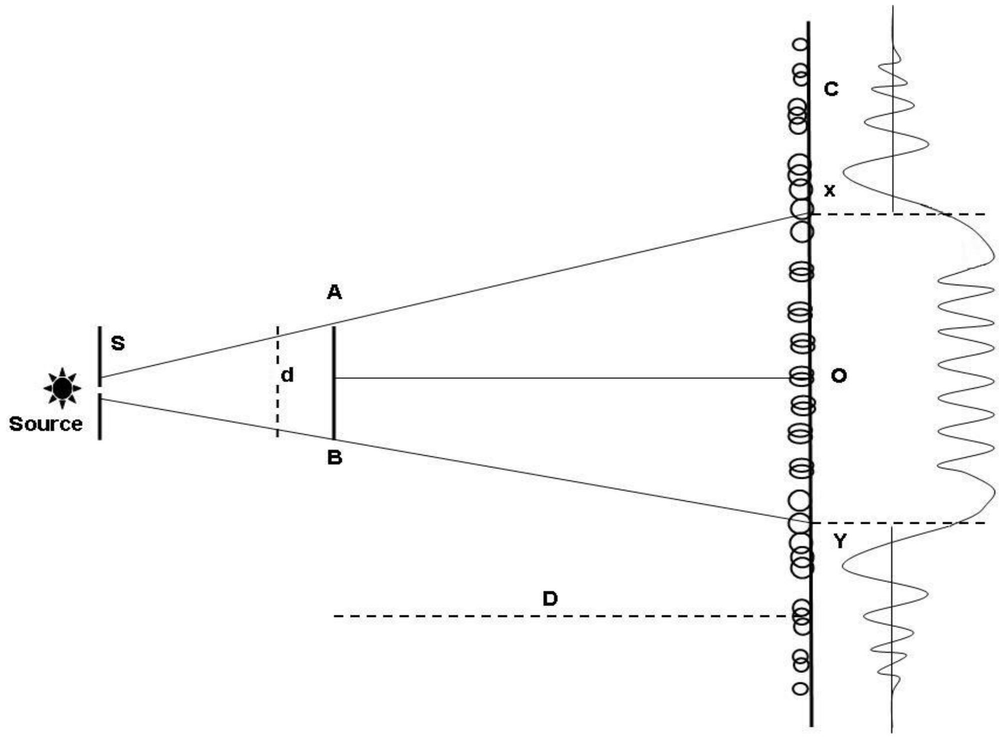
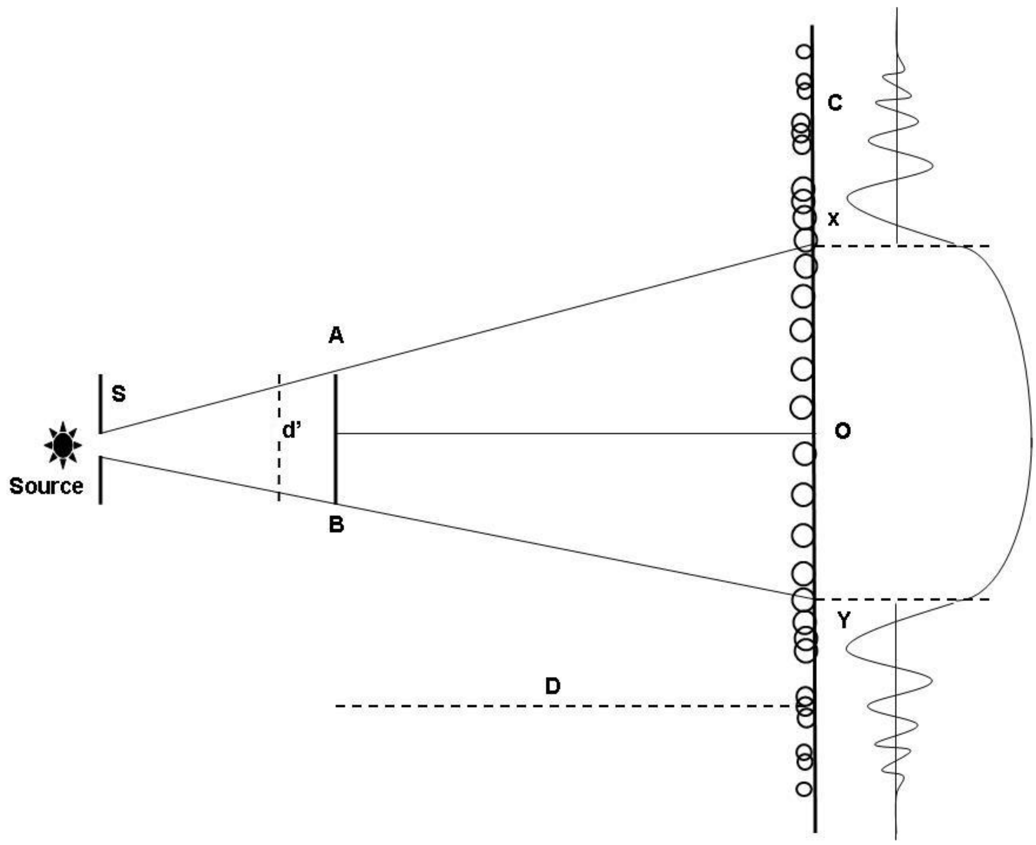


Fig. 4



(a)



(b)

Fig. 5