

Modern or Einsteinian Physics Versus Indian Oriental Physics

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Abstract

The Modern Physics or Einsteinian Physics bases on two great ideas (assumptions) that firstly the light (radiation) though it is electromagnetic wave but in its course transfers in discrete amounts (photons), each of magnitude $h\nu$, that is light has dual nature, which on generalization it was applied to elementary particle electrons and they were attributed with appropriate matter-waves, secondly on the Special Theory of Relativity which considers the constancy of the velocity of light signals i.e., it is independent of the motion of light source as well as that of the receiver. With the help of this Principles a mass-energy relation has been derived in which any consideration has not been paid about the structure of the matter.

In the Indian Oriental Physics, they consider that the photon (tama) is the result of the annihilation by forming a pair of dhvanta dvaya (positron-electron pair). The author has analyzed tama as well as the structure of the photon as a self propagating oscillator. If photons are particles capable to propagate with velocity c in space and basically real particles, then the basis of modern physics will require reappraisal. Keywords: Electron, Theory of Relativity, Photon, Photoelectric Effect, 'Amsubodhini'

1. Essentials of Modern or Einsteinian Physics

United Nations Educational, Social and Cultural Organisation (UNESCO) has decided to celebrate the year 2005 AD as the International Year of Physics (IYP) to commemorate the 100th anniversary of the great work of Albert Einstein. Hundred years before 2005 AD i.e., 1905 AD, there evolved revolutionary thoughts in the field of Physics. In this year world famous scientist and philosopher Albert Einstein published epoch making two classical but technical research papers in the journal "Annal Der Physik", which completely changed then existing views of space, time, mass, motion and gravitation. Starting with his seminal papers in 1905, the magnitude of Einstein's contributions to Physics is vast and central that the era of modern physics started from him. Hence, Physics of post 1905 could well be known as 'Einsteinian Physics'.

The 1905 epoch making papers of Einstein are:

- (i) "The Photoelectric Effect", and
- (ii) "On the Electrodynamics of Moving Bodies" popularly known as "Special Theory of Relativity".

[The other contributions of Einstein include The Brownian Motion (1905), The General Theory of

Relativity, The Bose-Einstein Statistics, the idea of stimulated emission, EPR paradox, views towards Quantum Mechanics and above all the work on Unified Field Theory et. seq.]

(i) The Photoelectric Effect

This he explained on the basis of Max Planck's idea. According to Planck, light could be thought of as a hail of tiny particles (later called photons). This revolutionary concept concerning to the nature of light led to duality of electromagnetic waves. This explanation of photoelectric effect was accepted after a long pause when Milliken experimentally verified the equation derived by Einstein and Einstein received the Noble Prize for it in 1921.

(ii) The Special Theory of Relativity

Einstein in this paper, nicely explains how the measurements of space and time are affected by relative motion between observer and the observed. In a way, this revolutionary theory can be best regarded as a continuation of the great ideas that have been the basis of our description of the science of Nature by Galileo, Newton and all others. Einstein rules out the concept of absolute simultaneity and the space-time based on Galilean transformation laws and proposed Special Theory of Relativity, where the Galilean transformations are replaced by the Lorentz

transformation equations for space-time. The Special Theory of Relativity deals with inertial frames i.e., the systems moving with a uniform velocity and the whole theory is based in the stand point of the following two postulates.

(a) Principle of Relativity

The Physical (natural) laws of nature are same in all the inertial reference systems, i.e., they must preserve their forms relative to all the observers in a state of uniform relative motion.

(b) Principle of Constancy of the Speed of Light

The velocity of light in vacuum is a numerical constant, i.e., the velocity of light is independent of the velocity of an observer as well as the velocity of the light source itself.

Consequences of the Special Theory of Relativity (STR)

Some of the dramatic of the STR are length contraction, time dilation and twin paradox. The other consequences of STR are variation of mass of a body with its velocity approaching to speed of light and the mass energy equivalence ($E=mc^2$), i.e., matter can turn into energy and vice versa. Einstein further showed that the unified theory of the electricity and magnetism is consistent with STR, whereas it is inconsistent with Newtonian mechanics. STR is consistent with quantum mechanics. Dirac proposed the unified format i.e., Relativistic Quantum Theory, which further led to the concept of 'Antimatter'.

2. Reappraisal of the views of Modern Physics

In general no theory should be considered as final one. In order to avoid stagnancy and to maintain the progressive nature of ever developing Science, it is essential that time to time without any prejudice every theory should be considered for appraisal of its jurisdiction, its logical base, merits and demerits. In this case to start with first we must enquire the state of knowledge regarding the matter and light (radiation) prevailed at the beginning of 20th century which has formed the basis for further investigation by Planck and Einstein. The inferences drawn on the basis of classical physics about the matter and radiation were :

(i) that the matter is composed of atoms of vari-

ous elements, where every atom possessed a heavy positively charged nucleus along with orbiting electrons, the electron as an elementary particle, which possesses negative elemental charge of definite mass; and

(ii) that the light (radiation) is an electromagnetic wave.

These inferences drawn from the classical physics have been accepted as such and have been used to lay base for the modern physics. Before analyzing Special Theory of Relativity and photoelectric effect, it is worth to acquaint ourselves first the views of Indian Oriental Physics and then to consider the probable structure of electron and photon as well.

3. The Indian Oriental Physics (1 to 6) and its relevance to Modern Physics

The modern science has started from the eighteenth century and has gained a shape in the twentieth century leaving unsolved problems for this next millennium. In reference to ancient India Indians were using proper units to measure the fundamental physical quantities which must have been used to mystery of Nature. It will be interesting to note that the laws of mechanics and gravitation, electrical charges, were well known to them. There were sophisticated instruments like spectrometer which they have at least used to measure the solar radiation and applied for the spectral classification as it is done in astrophysics. They were knowing the method of preparation and properties of the material used for infrared spectroscopy which is novel (Deokaran Award from Indian Glass and Ceramic Society, Kolkata, 2002). Note that the references 7 to 9 from Amsu Bodhini and presently owing to its importance we will give few details which are as follows :

From the library of Oriental Institute, Vadodara (Baroda) a rare work of Maharshi Bharadvaja titled 'Amsu Bodhini' with a commentary of Bodhananda was received. In the introductory passages, it is said that in the original text of Baharadvaja, the aphorisms of 'Amsu Bodhini' are divided into twelve chapters having one thousand sections. In order to make it understandable, Bodhananda wrote a commentary on it. Actually the available text is the first chapter of the work, having commentary over the first fifty apho-

risms of Maharshi Bharadvja. The title of this chapter is 'Śṛṣṭyādhikarah', i.e., 'The Evolution of the Universe'. As one goes through the literature, he/she finds that this commentary appears describing the details of evolution of universe right from the big-bang to sun of our solar system. A short summary is as follows:

Śṛṣṭyādhikarah begins with the following first aphorism (*sūtra*) of Maharshi Bharadvaja

Atha kalpasṛṣṭiratmatvāt suryeṇa. Am. Bo. Adhyāya I Sūtra 1.

This very evolution (*śṛṣṭi*) on the earth in the galaxy (*kalpa*) begins from Sun just similar to the formation of galaxies has initiated from *paramātmā* (Primal-atom).

Tatsṛṣṭirasangacciceaityābhyāmurṇa nādhivat. Am. Bo. Adhyāya I Sūtra 2.

As the spider (Basis-adhiṣṭana) that is the Primal-atom (*Paramātmā*), as the creator of innumerable galaxies with the material of low energy density quanta (*upādāna-Caityasakti*-muons) isolating high density energy quanta as material and instrument (*nimitta-cicchakti*-quarks & anti-quarks) from its own spinneret (*nabhi*), i.e., high density energy quanta weaves its web the Universe consisting of myriads of galaxies keeping itself confined within and keeps no attachment (*asangatveṇa*).

Tasyāmyadisatspandanamagnisomābhyām-taccaityasaktiriti. Am. Bo. Adhyāya I Sūtra 3.

Due to revolutions of low energy density quanta about *cicchakti* (*tasyām*), a small disturbance (*iṣatspandana*) evolves *agni* and *soma* which is known as *caityasakti* (muons- and).

Tadvegoṭksepanattatsambhavastasyā dvipavat. Am. Bo. Adhyāya I Sūtra 4. Bodhananda vṛtti :

*Cillinapratibimbamśuprakasāṃśa matah param
Bālagraśatabhāgasya daśuikāṃśa pramāṇata
Kramatsuraṇamargeṇakarṣayantisvabhātaḥ
Pascāttacchaktisamyuktastegnisomiyamandalam.
Praviśantyativegena svanidamiva pṛkṣiṇāḥ
Tatratyāgniśomāsaktidvayam vyāpya dvidhā
kramāt. 13-16.*

The revolution of expelled *agni-somasakti* (muons) around the inner globe of *bimba* and *pratibimba* (probably the quarks and anti-quarks) which in turn may set a strong magnetic field about an axis passing through its centre. This may make a path of creation (*suranamarga*) of circular cross-section of radius = $(Balagra/1000)=2.54 \times 10^{-7}$ cm through which *pratibimba* enters into the enveloping shell of *caityasakti* separating it into *agni* and *soma* (muons- and) and gets itself sandwiched within.

Bhavatyasyāmtrigunasamyāccitpratibimbakarsanavadekonavimsnyayen.

Am. Bo. Adhyāya I Sūtra 5.

Thus we find that in the body of the Primal-atom (*paramātmā*) now the globe of *bimba* gets centered itself within *pratibimba* trapped shell. This shell is termed as *māyā*.

Tatsamyogādantyantabhramanastadgunanam Am Bo Adhyāya I Sūtra 6.

Under these circumstances the speeds of *agni* and *soma* are further gets increased.

Tasmāta cchaktisammelanam parasparamekādasānyāyena. Am. Bo. Adhyāya I Sūtra 7.

Yasminnatyantavegastasminyaryostadātmyat-svasaktyapakarsnam. syaccitrakavat. Svataḥ siddha nyayasūtram-II

Saktayoranyonyakarṣaṇādāvaraṇadvayam Prakasasya tasmadrudra iti.

Am. Bo. Adhyāya I Sūtra 8.

These aphorisms states that due to intermingled interactions between muons and anti-particles, muons decay into two types of *dhvantas*, first as *kancuka-dhvanta* and the next *tama-dhvanta* which now offer coverings (*āvaraṇa*) to anti-particles. Anti-particles, when are trapped between two *dhvantas*, they are termed as 'Rudra'. Beginning from the intervening covering between *bimba* and *pratibimba* is termed as *satvāvaraṇa-dhvanta* and the outer to *pratibimba* as *tamāvaraṇa-dhvanta*. These *satvāvaraṇa* and *tamāvaraṇa dhvantas* are conjectured as positron and electron plasmas and this is verifiable since *Sutra-10* clearly states that

Dhvāntadvayasamyoge citsānidhyāt traividhyam. tamasah.

Am. Bo. Adhyaya I Sutra 10.

Further these two dhvantas being close to high energy density particles interact of assimilate with each other and give rise to three kinds of tama i.e., infrared, visible and ultraviolet electromagnetic radiations. This suggests that *satvavarana* and *tamavarana dhvantas* should be conjectured as positron and electron respectively.

These views of oriental physics needs theoretical and experimental base. These views do not seem to fall exactly along the views of modern physics and that is why we want to investigate the investigate the structure of electron and photon.

4. Probable structure of electron and Special Theory of Relativity

The set of equations of Lorentz transformation was used by Larmor to explain the null result of the Michelson-Morley experiment, in his *Aether and Matter*, pp.174 to (Cambridge University Press, New York, 1900). Later the outcome of the Michelson-Morley experiment as a new principle as that the speed of light (electromagnetic radiation) is independent of the motion of, the light source or receiver formed the basis for the search of the equations of transformation for a frame of reference. These lead scientists to consider in two ways. (i) Lorentz considered a light wave spreading out from a point source at the origin in a reference frame. The space being attributed with the properties i.e., it is isotropic and homogeneous in nature, the wave front (surface of equal phase) will be a sphere. But according to new principle the wave front must also be a sphere when viewed in another reference frame which is in uniform motion with respect to the source. (ii) While as the bodies are perceived in Nature by light signals Einstein tried to resolve the problem, adhering to the principle of equivalence and the constancy of the velocity of light resulting to the same Lorentz equations of transformation for a frame of reference moving uniformly relative to the other frame of reference. These equations do not concern with the intrinsic nature of the objects. Even an electron which has charge and the spin both, how does vary in mass

while it is under relative motion? What happens to its structure? These are the questions which remains unsolved.

If the electron (Reg.10) is a charged body - a sphere, the charge on its various parts should repel each other, and the sphere must expand till it blows off. To retain its shape, there must be some mechanism. It is the spin. Electrodynamics teaches us that a circulating charge produces a magnetic field along its axis. Now a play between the spinning charge and this induced magnetic field may be imagined to provide a dynamic equilibrium between the opposing forces and hence the stability of the shape and size of electron. Therefore, intrinsically an electron is not only a charge but it is also a tiny magnetic dipole as well. For the electron to be dynamically stable it should possess spin angular momentum and contain certain amount of electromagnetic energy and further we have seen that this energy appears as the inertial mass.

Consider an electron of mass m and as an electronic charge e smeared over on a spherical surface of radius r_e and say spinning with the average peripheral velocity $v_s = 2\pi r_e / T_s$ about X-axis as shown in the Figure 1. This spin motion of time period T_s will generate a magnetic field

$$H = \mu_0 (e/T_s) / 2r_e = (\mu_0 e v_s / 4\pi r_e^2)$$

along the X-axis which in turn due to electromagnetic interactions of magnetic field with the charge will keep the electronic spin motion sustained. In this case the Lorentz force will act as the centripetal force equal to $H e v_s$ which in turn must be equal to centripetal force $m_0 v_s^2 / r_e$. Equating these two we get

$$H e v_s = m_0 v_s^2 / r_e \text{ or } (\mu_0 e v_s / 4\pi r_e^2) e v_s = m_0 v_s^2 / r_e$$

The electrostatic energy is given by:

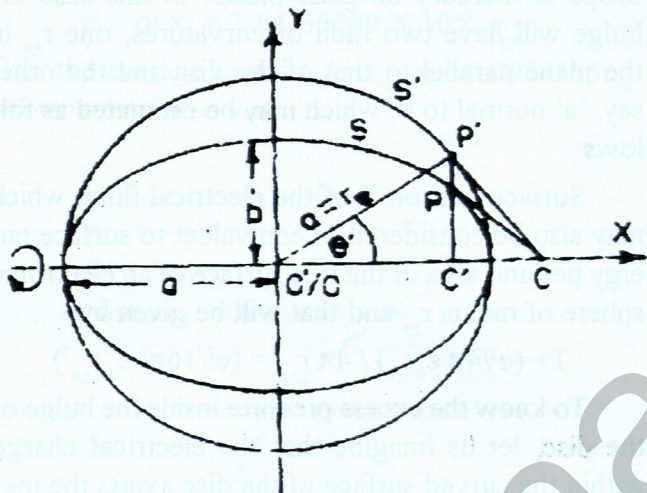
$$E = e^2 / 4\pi \epsilon_0 r_e = m_0 c^2$$

Obviously for this model the electronic mass appears as the equivalent mass to its net electrostatic energy, concluding that the electron the ultimate particle of electricity, has no mass in the material sense. Its mass is purely electrical.

Thus in this view and in accordance to J.J.Thomson as well, an electron possesses mass

solely by virtue of its electric charge and has no mass in the material sense. It is seen that there is the structural change of a spherical shell of electronic charge, when it is at rest to an ellipsoidal shell of the same charge moving with a uniform velocity v and it has been shown that the mass possessed by the electron in the frame of reference in which it is at rest gets increased in a natural way in the frame of reference in which the electron is moving with an uniform velocity. This relation is exactly the same as we get by the relativistic formula for the variation of mass as given below:

$$m_v = m_0 / (1 - v^2/c^2)^{1/2}$$



More over for this model so for the contraction in the radius of the charge sphere is concerned, it is perpendicular to the direction of motion. The theory of relativity derives the same relation for the variation of mass. In the relativistic formula the contraction takes place only in the direction of motion as in this case a sphere is carried by an observer in motion it will appear as a ellipsoid for an observer at rest with its minor axis along the direction of the motion, where the structure of the particle is in no way considered.

This very conclusion of Special Theory of Relativity bans entrance of even fast moving electron into the nucleus, β -particles (fast moving electrons) are ejected from the nuclei, but can not stay inside. It appears that this part of Special Theory of Relativity needs a fresh unprejudiced thinking.

5. Probable Structure of Photon and Photoelectric Effect

Plank later Einstein in the beginning of twentieth century without questioning that whether light (radiation) is really electromagnetic wave or not, crowned the light by dual nature, whereas our investigation probably clearly confirms that light consists of photon where photons are oscillators formed by pairs of electron and positron which will be described in this section.

From the experimental evidences, (i) the conversion of a particle and its antiparticle into radiation called annihilation radiation on collision, which occurs when an electron and positron collide resulting to give the annihilation radiation, which consists of two photons of gamma radiation with each of energy 0.511 MeV and (ii) the pair production i.e., the formation of positron and electron from a photon. It occurs when an high energetic gamma ray photon (>1.02 MeV) passes close to an atomic nucleus. In fact the afore said facts are sufficient to consider a photon as vibrating electron-positron pair and it seems that such a mechanism is possible in which the mass of this system vanishes in mechanical sense, and it remains only as the carrier of electromagnetic energy.

Let us consider a collision of a positron and an electron. Before the collision took place, they were far apart and heading towards one another with high velocities. As the hollow shells of positron and electron approach closer and closer the potential energy of each particle will decrease at cost of the intrinsic electrical energy $E = e^2/4\pi\epsilon_0 r_e = m_0\epsilon^2$, of them, till they approach a distance z so that the loss in their potential energy equals to their energies of these colliding particles, which may be supposed as the latent energy needed for the formation of a photon. As we know that the electrical energy manifests itself as the mass, for this system the rest mass will become zero. It is natural to assume that the spherical shell of radius r_e of the electron and positron at rest begins to shape into ellipsoidal form as they approach one another till at the limiting position, where they may form a shape of spinning discs of radius r_e each.

If we assume that the volume of a proton repre-

sents that of an elemental charge when it is fully compact and has no void within then the thickness t of such a disc may be easily estimated. Considering the volume of such a disc and that of the volume of the proton are equal one may calculate it as follows:

The thickness of the disc = $\{(4\pi/3) r_p^3\} / \pi r_{\pm e}^2 = r_{\pm e} / 5$.

If we assume that the volume of a proton represents that of an elemental charge when it is fully compact and has no void within.

For the equilibrium between the force of attraction and that of repulsion acting between two discs of opposite electronic charges spinning in the same sense, which may also account the spin value 1 for a photon, may be considered as two current loops having currents in opposite sense, repelling each other. The force of repulsion will be given by (213-214, D.N. Vasudeo, Electricity and Magnetism):

$$F = (2\mu_0 i_1 i_2 / z) (2\pi r_{\pm e}) = (4/r_{\pm e}) (e^2 / 4\pi \epsilon_0 z).$$

Since $i_1 = i_2 = ec / 2\pi r_{\pm e}$ and as the charge discs have no mass in mechanical sense, the peripheral velocity may be taken as c and $\mu_0 = 1/\epsilon_0 c^2$.

If at a distance z , there is equilibrium between the force of attraction of elemental charges and the repulsive force arising due to current loops having currents in opposite directions, then

$$e^2 / 4\pi \epsilon_0 z^2 = (4/r_{\pm e}) (e^2 / 4\pi \epsilon_0 z) \text{ or } z = r_{\pm e} / 4$$

As the pair of the positron-electron only succeeds to approach to a distance $d = r_{\pm e} / 4$, the pair transforms their net electrostatic energy into latent intrinsic energy equivalent to $(2m c^2)$ to form a photon, as if the positive and negative elemental charges will get localized into the respective disc geometry. This may be considered as equilibrium or rest position of the positive and negative elemental charges.

If the latent energy or the energy of formation of a photon be E^* , then $E^* = 2(e^2 / 4\pi \epsilon_0 r_{\pm e}) = 2m_0 c^2$, and the force of attraction acting between the positive and negative elemental charges at $z = (r_{\pm e} / 4)$ may be considered as centripetal force given by the expression:

$$\text{Centripetal force} = e^2 / 4\pi \epsilon_0 z^2 = 8 \times 2 (e^2 / 4\pi \epsilon_0 r_{\pm e}) (1/r_{\pm e}) = (2m_0 c^2) / (r_{\pm e} / 8), \text{ which is in mechanical}$$

sense equal to the centrifugal force.

Thus the elemental charges keep rotating with velocity c , on a circular path of radius $(r_{\pm e} / 8)$, the centre being located at the mean position of the positive and negative elemental charges. For such a system of a pair of alike spinning discs of opposite elemental charges separated by the distance $r_{\pm e} / 4$, of latent energy $(2m_0 c^2)$ forming a photon may be considered as a system of zero rest mass to travel by itself with the velocity of light c in space.

Now it may be assumed that these discs, which are formed of elemental electrical charge fluids, will have bulges somewhat similar to that of the large drops of mercury on glass plates. In this case the bulge will have two radii of curvatures, one $r_{\pm e}$ in the plane parallel to that of the disc and the other say, 'a' normal to it, which may be estimated as follows:

Surface tension T of the electrical fluid, which may also be considered as equivalent to surface energy per unit area of the free surface of an electronic sphere of radius $r_{\pm e}$ and that will be given by

$$T = (e^2 / 4\pi \epsilon_0 r_{\pm e}) / 4\pi r_{\pm e}^2 = (e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^3).$$

To know the excess pressure inside the bulge of the disc, let us imagine that the electrical charge within the curved surface of the disc exerts the mechanical force per unit area (pressure) on the afore-said surface. This pressure will be equal to σ^2 / ϵ_0 , where σ is the charge density. The curved surface bounding the charge e may be taken nearly equal to $2\pi r_{\pm e} \cdot 2 r_{\pm e} / 10$, then the excess pressure p will be given by

$$p = (100e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^4) = T (1/r_{\pm e} + 1/a), \text{ since the radii of curvatures are } r_{\pm e} \text{ and 'a'.$$

Substituting the value of $T = (e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^3)$ we get

$$p = \sigma^2 / \epsilon_0 (100e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^4) - (e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^3) (1/r_{\pm e} + 1/a)$$

$$\text{Therefore } a = r_{\pm e} / 99$$

[For an electron i.e., an hollow sphere of laminar electronic charge of two free surfaces the charge density $\sigma = (e4/\pi r_{\pm e}^2) + (e/4\pi r_{\pm e}^2)$, therefore $p = \sigma^2 / \epsilon_0 = (e^2 / 4\pi^2 \epsilon_0 r_{\pm e}^4) = (e^2 / 16\pi^2 \epsilon_0 r_{\pm e}^3) \cdot (4/r_{\pm e}) = T (4/r_{\pm e})$.]

Thus the section of the bulge normal to the plane

of the discs will be elliptical one with its major axis as $(r_{\pm e}/10)$ along the thickness and the minor axis as $(r_{\pm e}/99)$ in the central plane, which implies that the surface tension reduces the radius r_e of the disc, as we move from the central plane towards either of the outer planes forming the disc. The 'average radius $r_{\pm e}$ ' may be estimated as follows :

The equation of elliptical bulge will be $x^2/(r_{\pm e}/10)^2 + y^2/(r_{\pm e}/99)^2 = 1$. If x_c is the average distance of the centre of the semi elliptical part of the bulge the moment the area of semi-ellipse $\{\pi(r_{\pm e}/10)(r_{\pm e}/99)/2\}$ must be equal to the integral $y dx$ through the limits $x=0$ to $(r_{\pm e}/99)$. Thus we get :

$$\{\pi(r_{\pm e}/10)(r_{\pm e}/99)/2\} x_c = y dx \cdot x = r_{\pm e}^3 / 3 \times 99 \times 99 \times 10,$$

$$\text{or } x_c = 2.14335009 \times 10^{-3} r_{\pm e}.$$

Thus the 'average radius $r_{\pm e}$ ' = $r_{\pm e} - x_c = 0.9978565 r_{\pm e}$

Further if these charges are allowed to displace by a distance y (very small compared to $r_{\pm e}$) from their mean position equally on the either sides the forces of attraction and repulsion will be given by :

The force of attraction elemental charges =

$$-e^2 / 4\pi \epsilon_0 (z+2y)^2$$

And the force of repulsion of elemental charges =

$$(4/r_{\pm e}) e^2 / 4\pi \epsilon_0 (z+2y)$$

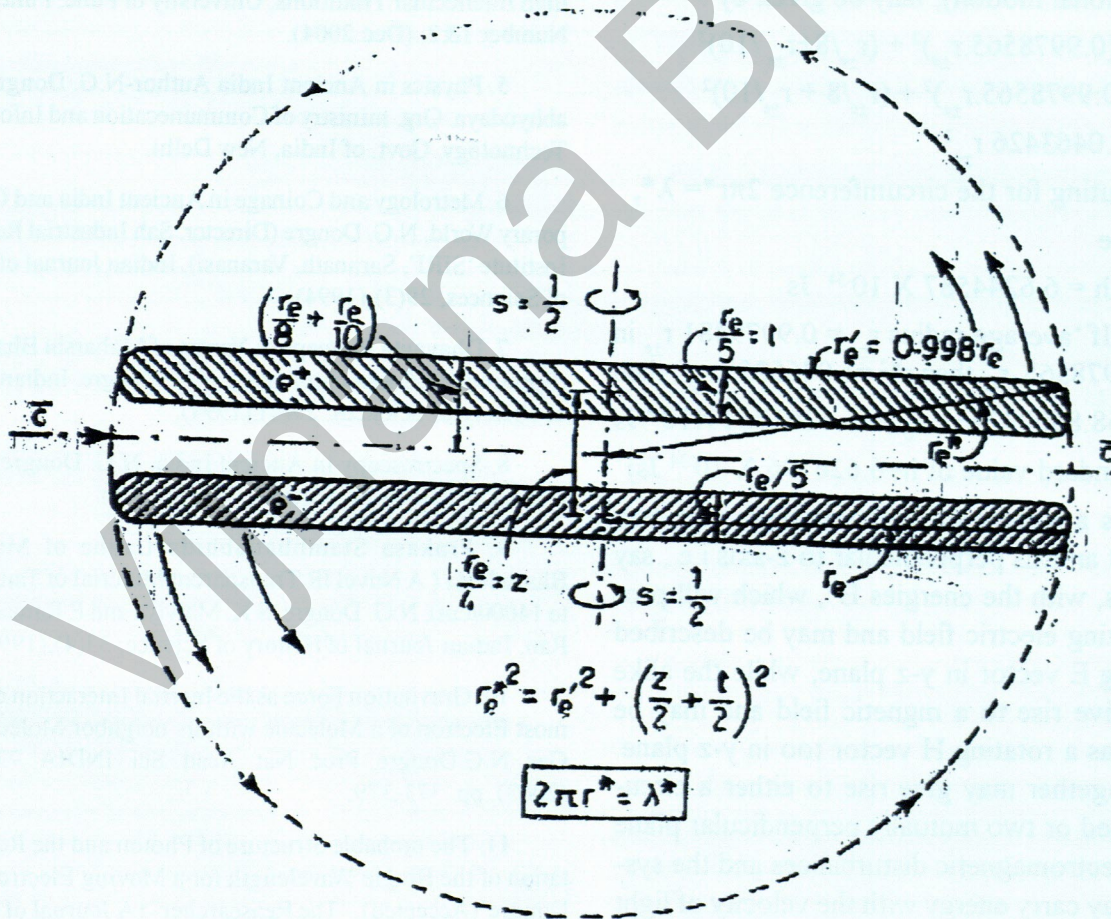
Thus the net force on the system =

$$(4/r_{\pm e}) e^2 / 4\pi \epsilon_0 (z+2y) - e^2 / 4\pi \epsilon_0 (z+2y)^2$$

$$= - \{e^2 / 4\pi \epsilon_0 (z+2y)^2\} (8y/r_{\pm e}) = - \{128 e^2 / 4\pi \epsilon_0 r_{\pm e}^3\} y = (E^* / c^2) (d^2 y / dt^2),$$

$$\text{or } (d^2 y / dt^2) = - (c^2 / E^*) \{128 e^2 / 4\pi \epsilon_0 r_{\pm e}^3\} y,$$

where E^* is the energy of the oscillating system. Here we find that force is proportional to the



displacement, which may set the simple harmonic motions in the system. The periodic time and hence the frequency ν^* of the vibration may be given by

$$4\pi^2 \nu^{*2} = (c^2/E^*) (128 e^2/4\pi \epsilon_0 r_{\pm e}^3).$$

$$\begin{aligned} \text{or } E^* &= (c^2/4\pi^2 \nu^{*2}) (128 e^2/4\pi \epsilon_0 r_{\pm e}^3) \\ &= \{(128 e^2/16\pi^3 c \epsilon_0 r_{\pm e}^3) \cdot \nu^{*2}\} \cdot \nu^* \\ &= h \cdot \nu^*, \end{aligned}$$

where h may be identified as the Plank's constant as we find that the energy of this oscillator is proportional to its frequency, where the magnitude of the proportionality constant h is given by

$$h = \{(128e^2/16\pi^3 c \epsilon_0 r_{\pm e}^3) \lambda^{*3}\}.$$

Since the disc edges have semi-elliptical shapes, we have determined the 'average radius $r_{\pm e}$ ' of the discs is 0.9978565 of $r_{\pm e}$, and we also know that the equilibrium distance is $r_{\pm e}/4$ and the thickness of the discs is $r_{\pm e}/5$, the peripheral radius r^* of the sphere, (which envelops the whole photon-structure while it is in rotational motion), may be given by :

$$\begin{aligned} r^{*2} &= (0.9978565 \cdot r_{\pm e})^2 + (r_{\pm e}/8 + r_{\pm e}/10)^2 \\ &= (0.9978565 \cdot r_{\pm e})^2 + (r_{\pm e}/8 + r_{\pm e}/10)^2 \\ &= 1.0463426 r_{\pm e}^2 \end{aligned}$$

Substituting for the circumference $2\pi r^* = \lambda^*$, we have

$$h = 6.6244587 \times 10^{-34} \text{ Js}$$

(Note: If 'average radius $r_{\pm e} = 0.9979481 r_{\pm e}$ in place of 0.9978565. $r_{\pm e}$ then $r^{*2} = 1.0465255 r_{\pm e}^2$, then

$$h = \{68.860032 e^2/c \epsilon_0\} = 6.6261962 \times 10^{-34} \text{ Js}$$

The standard value of $h = 6.626196 \times 10^{-34} \text{ Js}$)

Thus as a system of zero rest mass and may rotate about an axis perpendicular to z-axis i.e., say about x-axis, with the energies E^* , which will produce a rotating electric field and may be described as a rotating E vector in y-z plane, while the alike spins will give rise to a magnetic field and may be considered as a rotating H vector too in y-z plane. This two together may give rise to either a circularly polarized or two mutually perpendicular plane polarized electromagnetic disturbances and the system itself may carry energy with the velocity of light c in space. With all these attributes this system may be considered as a photon which is really a particle

and deceives as electromagnetic wave.

Therefore for the explanation of photoelectric effect no such an arguments as 'the energy of the incident radiation is transferred in discrete amounts (photons), each of magnitude $(h\nu)$ ' is needed. It is self evident that each photon absorbed will eject an electron provided that the photon energy $(h\nu)$ exceeds a certain value - the work function.

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सृष्ट्याधिकारः।

अध्यायः 1 अध्यायः, 1 सूत्रम्।

पृ.22 1 अध्यायः, -2 सूत्रम्।

पृ.27 1 अध्यायः, 3 सूत्रम्।

पृ.33 1 अध्यायः, 4 सूत्रम्।

बोधानवृत्तिः।।

अथ कल्प सृष्टिरात्मत्वात्सूर्येण।

तत्सृष्टिरसंगाच्चिच्चैत्याभ्यामूर्णनाभिवत्।।

तस्यायदीषत्स्पन्दनमग्नीषोमाभ्यां तच्चैत्य शक्तिरिति।।

तद्वेगोत्क्षेपणात्तत्संभवस्तस्या द्वीपवत्।।

चिल्लीनप्रतिबिंबांशुप्रकाशांशमतः परम्। बालाग्रशतभागस्यदशैकांशप्रमाणतः।।3

क्रमात्सूरणमार्गेणाकर्षयन्तिस्वभावतः। पश्चात्तच्छक्तिसंयुक्तास्तेग्नीषोमीयमण्डलम्।।3

पृ.29 प्रविशन्त्यतिवेगेनस्वनीडमिवपक्षिणः। तत्रत्याग्नीषोमशक्तिद्वयंव्याप्यद्विधाक्रमात्।।3-15।।

1 अध्यायः 5 सूत्रम्।।

भवत्यस्यां त्रिगुणसाम्याच्चित्प्रतिबिंबाकर्षणदर्पणवदेकोनर्विश्रयायेन।।

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11 स्वतस्सिद्धन्यायसूत्रम्।

यस्मिन्नत्यन्तवेगस्तस्मिन्यरयोस्तादात्म्यात्स्वशक्त्यपकर्षणस्याच्चित्रकवत्।

पृ.65 1 अध्यायः, 8 सूत्रम्

शक्तयोरन्योन्याकर्षणादावरणद्वयंप्रकाशस्यतस्माद्बुद्धिर्इति।।

पृ.68 1 अध्यायः, 9 सूत्रम्।

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पृ.83 स्वतस्सिद्धन्यायसूत्रम्।।83।।

यस्मिन्न्यूनधिकत्वं शक्तिद्वयस्य तस्मिन्नधिकान्यूनग्रहणं सहजम्।।

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ध्वान्तद्वयसंयोगेचित्सान्निध्यात् त्रैविध्यं तमसः।।