DETERMINATION OF A NEW FORCE WITH CHARACTERISTICS OF NUCLEAR FORCE AND BOTH ATTRACTIVE AND REPULSIVE COMPONENTS

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Presently, a new force has been determined. It is generated due to interaction between magnetic fields of the interacting particles, e.g., between electrons in electron beams, between protons in proton beams, and between nucleons in deuterons, alpha particles and nuclei etc. It has three very important characteristics: (i) it is strong; (ii) short range; and (iii) charge independent, which are exactly the same as we speculate for nuclear force between nucleons to have. Due to this force, electrons, protons and neutrons etc. are all held together in their respective systems, e.g. in their beams, deuterons, alpha particles and nuclei etc. against the repulsive Coulomb force generated between those due to interaction between their charges. It has also been determined that due to interaction between magnetic fields of two particles, a repulsive force, much stronger than the repulsive Coulomb force, too is generated if the particles are moving parallel to each other but opposite in directions. Due to this repulsive force, the phenomena of alpha and beta decay take place from the nuclei.

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1. INTRODUCTION

We observe that despite repulsive Coulomb force between similar charges, electrons, protons, alpha particles etc. are held together in their respective beams. It means, there is generated a force of attraction too between electrons, between protons etc. in their respective beams, stronger than the repulsive Coulomb force generated between those due to interaction between their charges. The generated force of attraction keeps those bound together in their respective beams against the repulsive Coulomb force. But how this force of attraction is generated, currently no explanation is found anywhere.

We further observe that as soon as the electrons start flowing through the electric current carrying rods and in electron beams, there are simultaneously generated electromagnetism in those and magnetic fields around those in a plane perpendicular to the direction of flow of electrons through those. The generated magnetic field possess direction, i.e. anticlockwise (if the direction of flow of electrons through them is towards the face of clock). But currently no explanation is found anywhere as to how electromagnetism is generated in those, which type of magnetism is generated, how magnetic field is generated around those in a plane perpendicular to the direction of flow of electrons through those, and how that field possesses anticlockwise direction.

All the above observations lead to conclude that since the generation of force of attraction between electrons in their beams, generation of electromagnetism in electron beams and in current carrying rods and generation of magnetic field around those etc. all take place simultaneously, it means, the cause behind the occurrence of all the above phenomena/events is common/same. But what is that cause, is yet not known.

Currently, we know about the Yukawa's force[1] of attraction, stronger than the repulsive Coulomb force, acting between nucleons in nuclei. It is assumed generated due to the continuous exchange of virtual π mesons between nucleons (for detail, see Sec. 7). But

does/can the field of virtual π mesons occur between electrons in electron beams, between protons in proton beams etc and due to the continuous exchange of virtual π mesons between electrons in electron beams, between protons in proton beams etc., the electrons and protons etc. are held together in their respective beams? Can, due to the continuous exchange of virtual π mesons between electrons in electron beams and current carrying rods, electromagnetism be generated in those and magnetic field be generated around those?

Secondly, the concept of occurrence of the field of virtual π mesons and their continuous exchange between the interacting particles of the Yukawa's meson field theory gives raise to numerous very basic and fundamental questions too. For example: 1. Virtual means which does not exist physically, then how can the field of such π mesons occur? 2. How can such π mesons possess charge, that too positive or negative? 3. The real π mesons possess charge and mass both, while to virtual π mesons, only charge has been assigned and mass has not been assigned. Why is this double standard or inconsistency?

Therefore the possibility of Yukawa's meson field theory as that cause, mentioned above, is ruled out.

Presently, that cause (mentioned above) has been determined (see Sec. 2). Taking account of that cause, a new theory has also been developed (see Sec. 3). The present theory gives very clear and complete explanation as to how the force of attraction is generated between electrons (see Sec. 4.1), how electromagnetism is generated in electron beams (see Sec. 5) and current carrying rods (see Sec. 4.1, Ref. 2), which type of magnetism it happens to be (see Sec. 5 onwards and Sec. 4.2, Ref. 2), how magnetic fields is generated around those in a plane perpendicular to the direction of flow of electrons through those and how that field possess anticlockwise direction (see Sec. 5 onwards and Sec. 4.1, Ref. 2).

The generated force has both the components, attractive and repulsive depending upon the directions of motion of the interacting particles. If the interacting particles are

moving in the same direction and parallel to each other, the force happens to be attractive (see Sec. 4.1). And if the interacting particles are moving parallel but in directions opposite to each other, the force happens to be repulsive (see Sec. 4.2).

The generated force happens to be very strong, short range and charge independent. These characteristics are exactly similar to the characteristics of nuclear force (for detail, see Sec. 7).

The attractive component of the generated force between nucleons enables to give almost the complete knowledge about the structures, properties etc. of deuterons, alpha particles and nuclei (for detail, see Sec. 4, 5, 6, 7, 8 and 9, Ref. 3). And the repulsive component of the generated force between nucleons enables to give the complete knowledge of how the emissions of alpha (α) and beta (β) particles take place from the nuclei during α and β decays (for detail, see Sec. 9.2, Ref. 3).

2. DETERMINED CAUSE

The electrons do not possess spin magnetic moment (μ_s) and magnetic field because of spin motion of their charge as currently being assumed (for detail, see Sec.1, Ref. 2). The electron possesses a bundle of magnetism too by the virtue of nature similarly as it possesses a bundle of charge ($-e$) by the virtue of nature (for detail, see Sec. 2, Ref. 2). This magnetism occurs in the form of a circular ring, shown by a dark solid line circle around the charge of electron where charge has been shown by a spherical ball, Fig. 1(a), as for example, there occur rings around the planet Saturn. Around the charge of electron, there occurs its electric field (which has not been shown in Fig.), and around magnetism of electron, there occurs its magnetic field shown by broken line circles, Fig. 1(a). The magnetism and charge of electron both spin, but in directions opposite to each other, shown by arrows in opposite directions, Fig. 1(b), where the ball of charge has been shown by quite a thick dark line circle and magnetism by comparatively a thinner dark line circle.

The spin magnetic moment (μ_s), which the electron possesses, arises due to the spin motion of this magnetism, and occurs in the direction of its (magnetism) spin angular momentum.

The proton too possesses a bundle of magnetism by the virtue of nature similarly as it possesses a bundle of charge $+e$ by the virtue of nature. (For detail, see Sec. 3.2, Ref. 4.) About the structure of neutron, see Sec. 2, Ref. 5.

The magnetism and charge of electron and proton etc. spin in directions opposite to each other because then their respective fields interact (electromagnetic interaction) with each other such that their spin motion in directions opposite to each other persists, which keeps electron and proton going on spinning persistently (for detail, see Sec. 3, Ref. 4).

3. THE PRESENT THEORY

The spin motion of electrons (and similarly of protons and neutrons) generates two very important properties in those (see Sects. 3.1 and 3.2). Further, since electrons possess magnetism; due to interaction between magnetic fields of electrons of the beam, a strong, short range and charge independent force is also generated between electrons (see Sec. 4).

3.1 First property

The spin motion of every 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. 6). Consequently, every spinning particle, e.g. electron, nucleon etc. possesses direction of its linear motion. By some means, e.g. applying some external force like electric or magnetic field on electrons, protons etc, if the particle is made able to move, the direction of L_s of the particle is oriented and aligned in the direction according to Lorentz force and then it starts moving along the directions of its L_s (for confirmation that the direction of L_s, i.e., the direction of motion of electron is oriented and aligned, see Sec. 4.4, Ref. 2 and Sec. 5.4.1, Ref. 7).

3.2 Second property

If the frequency of spin motion of particle increases 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, e.g., electron, proton etc. goes on increasing in accordance to expression

$$v^2 = h\omega / m \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

[where m, v and ω respectively are the mass, linear velocity and frequency of spin motion of particle and h is Planck's constant, and for the verification of the truth of expression (1), see Sec. I A, Ref. 6].

Due to spin motion, the particle obtains spin energy ($E_s = h\omega/2$, for detail, see Sec. II, Ref. 6) and spin momentum ($p_S = h\omega/v$, for detail, see Sec. II, Ref. 6) similarly as it obtains linear momentum (p_{lin}) corresponding to its kinetic energy (E_k). For the verification of truth of p_S , we can see Sec. I C, Ref. 6, and also can take the example of photons, where $h\nu/c$, which is currently defined as momentum of photons, is in fact p_S of photons (for its confirmation and detail information, see Sec. 2.2, Ref. 8). It is generated due to spin motion of photons which (spin motion) those (photons) derive from the orbiting electrons from which those are emitted (for confirmation of its truth, see Sec. I A, Ref. 6).

Therefore, the particles possessing linear motion together with their spin motion, those possess motional energy (E_m) $= E_k + E_s$, and motional momentum (p_m) $= p_{\text{lin}} + p_S$, and whenever comes the situation of conservation of energy and momentum of such particles (i.e. possessing spin motion along with their linear motion), E_m and p_m of particles actually conserve, not their E_k and p_{lin} (for verification of the truth of conservation of p_m , see Sec. I D, Ref. 6).

4. EXPLANATION OF HOW THE FORCE IS GENERATED BETWEEN ELECTRONS DUE TO INTERACTION BETWEEN THEIR MAGNETIC FIELDS

The force generated between electrons due to interaction between their magnetic fields happens to be attractive and repulsive both. It depends upon the position of the interacting electrons and accordingly attractive and repulsive types of forces are generated between the electrons (see Sects. 4.1 and 4.2).

4.1 Explanation of how and when the force of attraction is generated

Let us consider two electrons A and B moving with velocity v parallel and adjacent to each other lying in the same vertical transverse plane, as shown in Fig. 2(a). Due to the first generated property (see Sec. 3.1) in electrons, the directions of their L_s lie parallel to each other. Then the planes of their magnetism and magnetic fields lie in the same plane and the directions of their spin motion lie in the same direction. Let *r* be the radii of the outermost co-centric circular lines of force of the magnetic fields of electrons A and B. If the distance say d between their centers becomes $< 2r$, their lines of force start interacting, as shown in Fig. 2(b). Let the distance *d* be such that the outermost two lines of force a_1 and a_2 of electron A interact with the outermost two lines of force b_1 and b_2 of electron B.

In this situation, in the region of their interaction (i.e. in between the electrons A and B) since the directions of lines of force a_1 and a_2 of electron A are opposite to the directions of lines of force b_1 and b_2 of electron B, Fig. 2(b), those repel each other. Consequently, the lines of force a_1, a_2 of electron A, after their repulsion, are diverted towards the electron B and dragged along with its (electron B) lines of force b_3, b_4 etc. and pushed behind the electron B, as shown in Fig. 2(b). And the lines of force b_1, b_2 of the electron B, after their repulsion, are diverted towards the electron A and dragged along with its (electron A) lines of force a_3, a_4 etc. and pushed behind the electron A. Finally the lines of force a_1, a_2 of electron

A and b_1, b_2 of electrons B acquire the form, as shown in Fig. 2(b), and around point P, a neutral region is created (i.e. the region free from the effects of magnetic fields of electrons A and B). In the process of getting pushed behind, the lines of force a_1, a_2 and b_1, b_2 are expanded, and hence in order to obtain their original positions and form (i.e. shape) as those had before their interaction, those apply some pushing force on magnetic lines of force b_3, b_4 and a_3, a_4 respectively, which in turn apply pushing force on electrons B and A respectively. All these happen because, according to properties of magnetic lines of force, the magnetic lines of force are just like flexible strings and experience the longitudinal tension in its length, hence possess tendency to acquire their original form. In order to verify its truth, we can see Fig. 3, where the lines of force 3,4,5 and 6,7,8 of earth's magnetic field acquire their original positions and forms after coming out from the north pole of a bar magnet placed in magnetic meridian of earth's magnetic field. Consequently, a force of attraction ***F*** is generated between electrons A and B (for detail knowledge about force ***F***, see Sec. 6.1).

4.2 Explanation of how and when the force of repulsion is generated

If the two electrons A and B, are moving parallel to each other but opposite in directions, at some instant those may be adjacent to each other and lying in the same plane, Fig 4(a). In this situation, the directions of their L_s shall lie parallel to each other but opposite in directions and the planes of their magnetic fields shall lie in the same plane but the directions of spin motion of their magnetism and magnetic fields shall be opposite, as shown in Fig 4(a). If the distance *d* between their centers happens to be < 2r, their lines of force start interacting, Fig 4(b). Let the distance *d* between their centers be such that the two outermost lines of force a_1 and a_2 of electron A interact with the two outermost lines of force b_1 and b_2 of electron B, Fig 4(b).

In this situation, in the region of interaction between their magnetic fields (i.e. in region between the electrons A and B) their lines of force a_1, a_2 and b_1, b_2 are not repelled by each other but are dragged along with the lines of force of each other, as shown in Fig. 4(b). Because in this case, when their lines of force come close to each other, they are found moving along the same direction, while for their repulsion it is essential that those must be in opposite directions [as occurs in previous case, Fig. 2(b)]. Hence, when their lines of force are dragged along with the lines of force of each other (i.e. a_1, a_2 of electron A are dragged along with b_1, b_2 of electron B) and pass through the space between a_3 and b_3 lines of force of magnetic fields of electrons A and B respectively, those come very close to each other [for convenience, those have been shown overlapping in Fig. 4(b), while actually those do not overlap], because the space left between the lines of force a_3 and b_3 for those to pass through happens to be very narrow, as appears from the Fig 4(b). But, due to their properties (mentioned earlier), those do not pass through this space coming very close to each other but pass through maintaining their original positions and shape as those had before their interaction. Therefore, in order to pass through, maintaining their original positions and shape, the lines of force a_1, a_2 apply some pushing force on lines of force a_3, a_4 etc., which in turn apply pushing force on electron A towards our left; and the lines of force b_1, b_2 apply some pushing force on lines of force b_3, b_4 etc., which in turn apply pushing force on electron B towards our right. Consequently, a force of repulsion $\boldsymbol{F}$ between electrons A and B is observed (for detail knowledge about force $\boldsymbol{F}$, see Sec. 6.2).

Thus two electrons A and B, moving parallel to each other but in opposite directions such that the distance d between their centers $<2r$, are acted upon by a repulsive force $\boldsymbol{F}$. But, since the two electrons A and B come close to each other, as shown in Fig. 4(b), just for a moment, those receive a sudden kick type of repulsive force from each other.

5. EXPLANATION OF HOW ELECTRONS ARE BOUND TOGETHER IN THEIR BEAM AND HOW ELECTROMAGNETISM, MAGNETIC FIELD, WHICH POSSESSES DIRECTION, ARE GENERATED

According to first generated property (Sec. 3.1), since the electrons possess linear velocity along the directions of their spin angular momentum L_s (see Sec. 2), the directions of L_s of all the electrons of the beams are oriented and aligned in the direction of the external electric field applied to accelerate and collimate the electrons to form their beams (for its confirmation, see Sec. 4.4, Ref. 2). Then, the directions of their μ_s are oriented and aligned in direction opposite to the direction of the external magnetic field and the planes of their magnetism and magnetic field are oriented and aligned in planes perpendicular to the direction of motion of beam, or can say direction of motion of electrons of the beam. And the directions of spin motion of magnetism and magnetic field of electrons are oriented and aligned in direction anticlockwise (if the electrons of linear velocity of electrons in the beam are towards the face of clock).

Let us take, e.g., seven electrons of the beam moving with the same velocity v parallel and adjacent to each other lying in the same vertical transverse plane of the beam, as shown in Fig. 5. Their lines of force interact and consequently a force of attraction is generated between them, and their lines of force acquire the form as shown in Fig. 5. In similar manner, the lines of force of all the electrons, lying in every vertical transverse layer of the beam interact and consequently a force of attraction is generated between all the electrons of every vertical transverse layer of the beam and the lines of force of all the electrons of every vertical transverse layer acquire the form as shown in Fig. 6(a). And in this way finally a magnetic field is obtained in coaxial hollow cylindrical form around the beam all along its length, as shown in Fig. 6(b). [In Fig. 6(b), the lines of force, shown by vertical circles round the beam, each circle is in fact consisting of several co-centric circles, but for

convenience not shown in Fig.] Further, since magnetism and magnetic field of electron possess anticlockwise direction (if the direction of motion of electron is towards the face of the clock), the magnetism generated in the beam and magnetic field generated around and along the length of the beam also possess anticlockwise direction. The magnetism generated in the beam, happens to be diamagnetism (for its confirmation, see Sects. 4.2 and 4.3, Ref. 2).

In the beam, since the directions of μ_s of electrons are also oriented and aligned, the generated magnetism in the beam possesses spin magnetic moment in the direction of μ_s of electrons of the beam.

6. EXPLANATION OF HOW THE FORCE GENERATED DUE TO INTERACTION BETWEEN TWO ELECTRONS VARIES AS THE DISTANCE BETWEEN THEM VARIES

6.1 When the electrons are in position as shown in Fig. 2(b)

The force caused due to interaction between magnetic fields of electrons A and B, when those are in position as shown in Fig. 2(b), varies as

$$F \propto (M - e)^2 \, d^{-q} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where M and e respectively are the quantities of their (electrons A and B) magnetism and charge, d is the distance between their centers, $q = a\,d^{\,b}$, and *a* and *b* are the constants which depend upon their velocities etc..

Why and how do the constants *a* and *b* depend upon the velocities of electrons A and B is as follows:

The velocity v and frequency of spin motion ω of the electron vary according to expression $m\,\mathrm{v}^2 = h\,\omega$ [see Eqn. (1), Sec. 3.2] and hence when v of electrons A and B vary, their ω also vary accordingly. When ω of electrons A and B increase, the strengths of their magnetic fields and hence the strength of pushing force by the lines of force of electron A on

the electron B, and similarly the strength of pushing force by the lines of force of electron B on the electron A, Figs. 2(b) and 4(b), are increased. This increase in force is accounted in expression (2) by variation in the constants *a* and *b*.

For verification of the truth of increase in the strength of magnetic fields of electrons A and B due to increase in their velocity (v), we can take the example of increase in the strength of magnetic field around the current carrying rod when the current through the rod is increased. The increase in current through the rod means the increase in velocity of electrons through the rod.

Force F is actually the resultant of two forces F_1 (attractive force caused due to interaction between the magnetisms of the electrons A and B) and F_2 (repulsive force caused due to interaction between the charges of the electrons A and B), i.e. $\boldsymbol{F = F_1 - F_2}$, because electron possesses both electric and magnetic fields, and hence F should be generated as the consequence of interaction between their both electric and magnetic fields. As d decreases, both F_1 and F_2 increase but such that F, after attaining a maximum value at $d = D$ (where $d = e^{-1/b}\ and > d'$), it starts decreasing as d decreases because at $d = D$, $(dF/dd) = 0$ and $(d^2F/dd^2) = -\text{ve}$.

6.1.1 Evidences to confirm the truth of above equation 2

Though there is no mathematical proof to confirm the truth of equation (2) but there are numerous evidences from the well established existing knowledge to confirm its truth. For example, the electron, proton, α particle beams are obtained due to component F_1 of force F, but due to component F_2, the above beams do not persist for long time. (There are several more reasons behind non-persistence of electron, proton etc. beams, e.g. no uniform velocity of all the electrons, protons etc. in their beams, but the component F_2 plays an important role.) For more evidences, see Sects. 4, 5, 6, Ref. 3

6.2 When the electrons are in position as shown in Fig. 4(b)

The force caused due to interaction between electrons A and B when those are in position as shown in Fig. 4(b), does not vary according to expression (1), but varies as

$$F \propto (M+e)^2 \exp(-a\,d^b) \quad \text{.....} \quad (3)$$

In this position, since the forces F_1 and F_2 both are repulsive, the nature of variation of F with d happens to be different from expression (2).

5.2.1 Evidence to confirm the truth of above force (i.e. of eqn. 2)

To confirm the truth of the above expression (3) too, there is no mathematical proof, but the evidence is from the well established existing knowledge, e.g., the phenomena of. α and β emission from the nuclei (see Sec. 9.2, Ref. 3).

7. CONCLUSION AND DISCUSSION

As we observe from Figs. 2(b) and 4(b), since the force is generated when the interacting particles are very close to each other, the generated force should be short range. Further, since the force is generated due to interaction between magnetic fields of the interacting particles, the generated force should be charge independent. Furthermore, since the generated force happens to be stronger than the repulsive Coulomb force, the generated force should be strong force. All these lead to conclude that the generated force has three characteristics: 1. It is short range, 2. It is charge independent, 3. It is strong. These characteristics are exactly similar to the characteristics of nuclear force. Further, since the properties of electrons, i.e. first (see Sec. 3.1) and second (see Sec. 3.2) due which the characteristics 1, 2, and 3 are generated in these, nucleons too possess the same properties (i.e. first and second), the characteristics 1, 2 and 3 should be generated in nucleons too.

The attractive component of the generated force between nucleons gives almost a complete knowledge about the structures, properties etc. of deuterons, alpha particles and nuclei (for detail, see Sec. 4, 5, 6, 7, 8 and 9, Ref. 3). And the repulsive component of the

generated force between nucleons gives the complete knowledge of how the emissions of alpha (α) and beta (β) particles take place from the nuclei (for detail, see Sec. 9.2, Ref. 3).

Currently, according to Yukawa's meson field theory[1], a field of virtual π mesons is assumed in nuclei and their continuous exchange between nucleons is assumed as the cause of origin of nuclear force. But it gives rise to numerous very fundamental questions. For example: Virtual means which does not exist physically, then how can the field of such (i.e. virtual) π mesons occur? How can such π mesons possess charge, that too positive or negative? Further, the real π mesons possess charge and mass both, while to virtual π mesons, only charge has been assigned and mass has not been assigned. Why is this double standard or inconsistency? Furthermore, as far as the author's knowledge is concerned, it is believed that there exist only matter and energy in the universe which are inter-convertible. In which category do the virtual π mesons lie?

Secondly, does the field of virtual π mesons occur in electron, proton and alpha particle (α) beams and those are held together against the repulsive Coulomb force in their respective beams due the continuous exchange of virtual π mesons between those? If not, then how are those held together in their respective beams against the repulsive Coulomb force between those? And if yes, then:

1. The field of virtual π mesons should occur in electron beams too and due to the exchange of π mesons between electrons, the electrons should be held together in electron beams. Does it happen so? If not, then how are the electrons held together in their beams?

2. The neutron beams should exist in nature similarly as nuclei exist in nature, and even with more strong stability. Because in neutron beams, there occur no protons and hence no repulsive Coulomb force comes into play. But on the contrary, the neutron beams do not survive even as long as the proton beams survive. Here some people may argue that it

happens because neutrons start decaying after their mean life time and consequently neutron beams are destroyed. This argument is true but it gives rise to questions: Then why and how do neutrons not decay in nuclei where due to the presence of protons, the repulsive Coulomb force also comes into play? What does happen with the presence of protons in nuclei or what do the protons do in nuclei such that the neutrons of nuclei stop decaying and those become stable? For example, the presence of one proton in deuteron (D) makes the neutron of D stable. If one more proton is added in D, the resultant system (i.e. He^3) becomes more stable, but if one more neutron is added in D, though the binding energy per nucleon (E_b) of the resultant system (i.e. H^3) is increased in comparison to that of the system He^3 but the system (i.e. H^3) becomes unstable and decays into He^3 through β decay. Despite $(E_b)_{H^3} > (E_b)_{He^3}$ [where $(E_b)_{H^3}$ is the binding energy per nucleon in the nucleus of H^3 and $(E_b)_{He^3}$ is the binding energy per nucleon in the nucleus of He^3], why and how does H^3 decays into He^3? Further, if one neutron is added in He^3 or one proton in H^3, the resultant system (i.e. α particle) becomes so strongly stable that it starts behaving like a particle. While if one proton is added in He^3 or one neutron in H^3, the resultant systems, i.e. isotope Li^4 (half life time $=9.1\times10^{-23}$ s) and the synthesized isotope H^4 (half time = $=1.39\times 10^{-22}$ s) respectively become extremely unstable. The isotope Li^4 is though found in nature but the isotope H^4 is not found in nature. It is obtained by synthesis. (For detail, see Sects. 4, 5, and 6, Ref. 2.)

Therefore, the Yukawa's hypothesis of occurrence of a field of virtual π mesons between nucleons in nuclei and the current origin of nuclear force cannot be set forth to be true.

The presently determined cause of origin of nuclear force gives very clear and complete explanation of each and every phenomenon/event mentioned above (see Sects. 4, 5, and 6, Ref. 3).

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FIGURE CAPTIONS

Fig. 1: (a) Spherical ball, dark solid line circle and concentric broken line circles respectively represent the charge, magnetism and magnetic field of electron. (b) Cross sectional view of electron where, in order to introduce arrow marks with the ball of charge to show the direction of its spin motion, the ball of charge has been shown by a dark thick solid line circle.

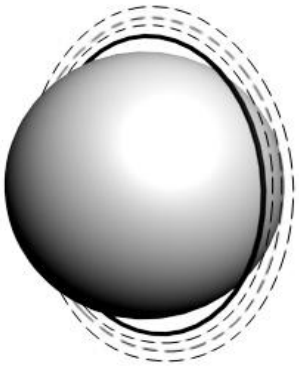
Fig. 2: (a) Transverse cross sectional view of two electrons A and B moving with same velocity v parallel and adjacent to each other at distance *d* apart lying in the same vertical plane; (b) Transverse cross sectional view of interaction between their magnetic fields when the distance *d* between them is reduced to < 2r.

Fig. 3: Longitudinal cross sectional view of interaction between the earth's magnetic field and the magnetic field around a bar magnet, placed in magnetic meridian.

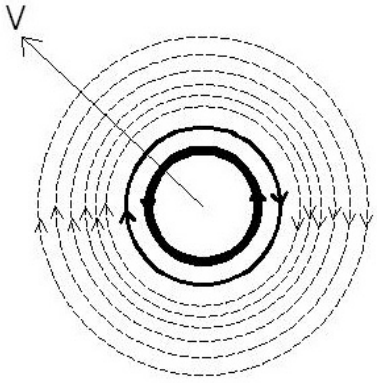
Fig. 4: (a) Transverse cross sectional view of two electrons A and B at the instant when they are in the same plane and at distance *d* apart while moving parallel to each other with same velocity v but opposite in directions. (b) Transverse cross sectional view of interaction between their magnetic fields when the distance d between them is reduced to < 2r.

Fig. 5: Transverse cross sectional view of interaction between the magnetic fields of 7 electrons lying in the same vertical plane while moving parallel to each other in the same direction with the same velocity v.

Fig. 6: (a) Transverse cross sectional view of magnetic field created around the electron beam. (b) Longitudinal view of magnetic field created around the electron beam.

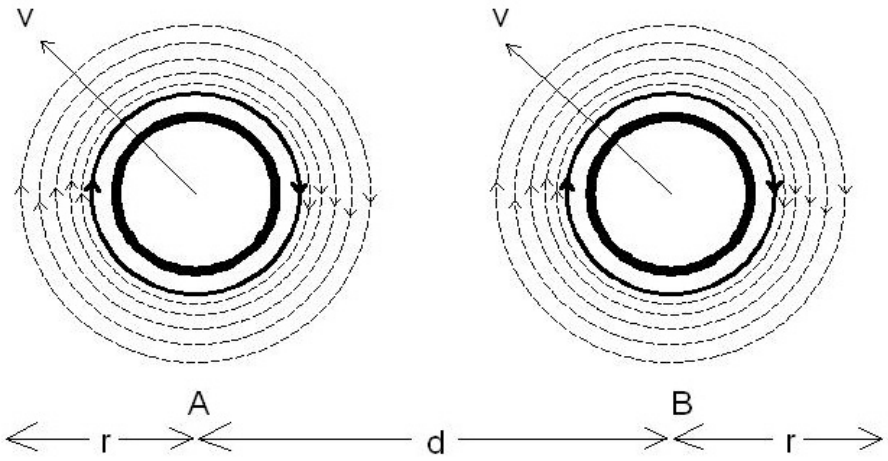


(a)

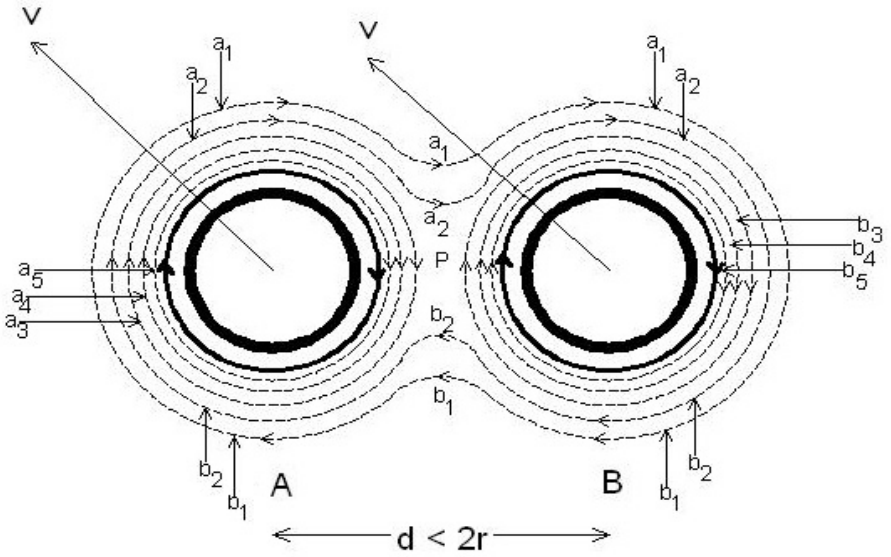


(b)

Fig. 1


V
V
A
B
r
d
r

(a)


V
V
a1
a2
a1
a2
a1
a2
b3
b4
b5
P
a5
a4
a3
b2
b1
b2
b1
b2
b1
A
B
d < 2r

(b)

Fig. 2

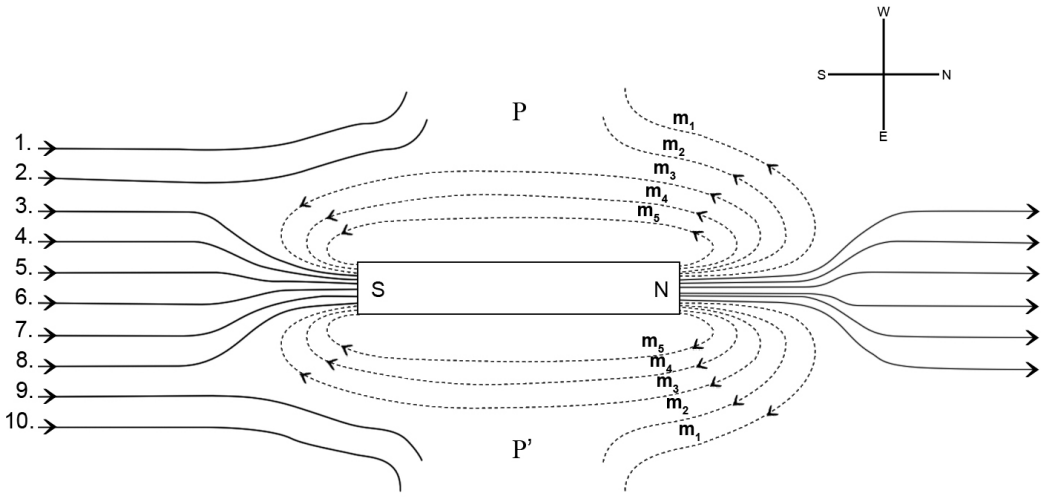
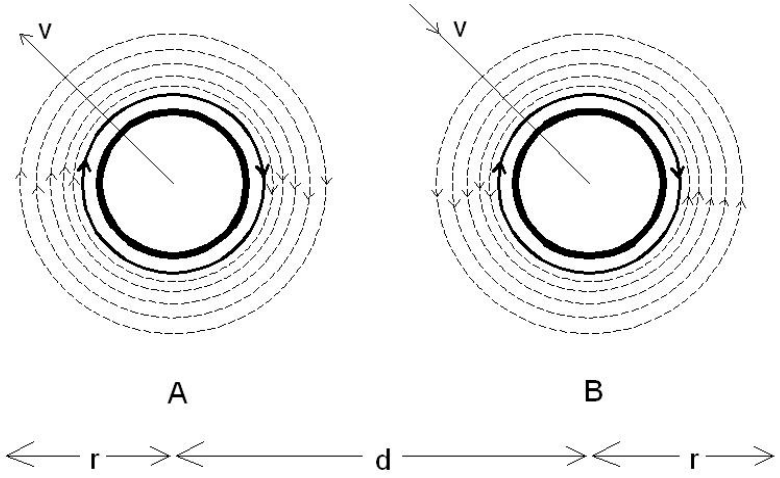
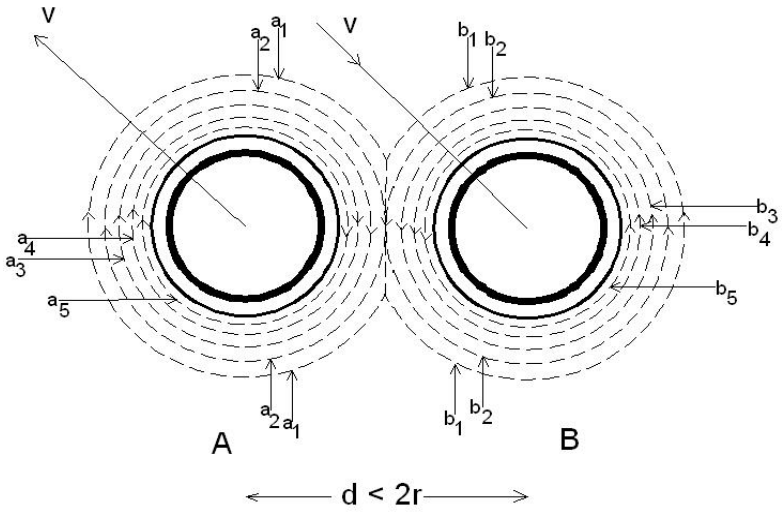


Fig. 3



(a)



(b)

Fig. 4

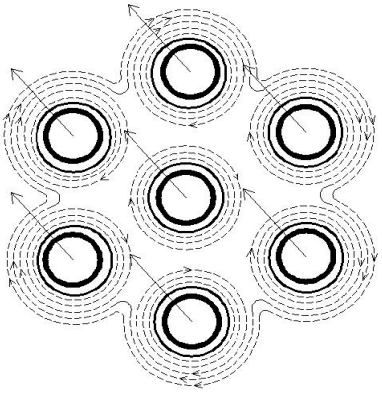
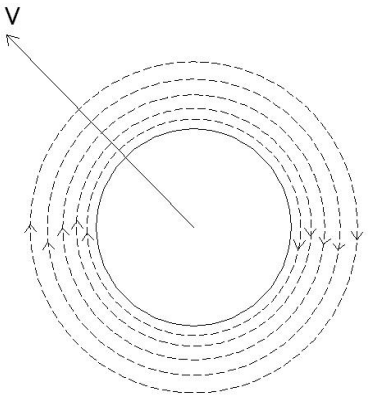
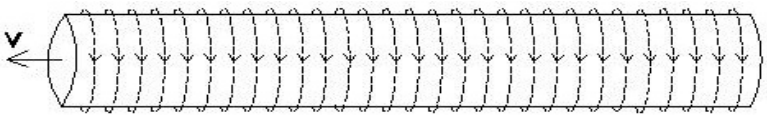


Fig. 5



(a)



(b)

Fig. 6