SunQM-6: Magnetic force is the rotation-diffusion (RF) force of the electric force, Weak force is the RF-force of the Strong force, Dark Matter may be the RF-force of the gravity force, according to a newly designed {N,n} QM field theory

Yi Cao

e-mail: yicaojob@yahoo.com

Abstract

1) We hypothesized that the strong force, the electric force, and the gravity force (named as S-force, E-force, and G-force) are the three primary forces that only exert in r-1D dimension. We also hypothesized that the magnetic force is the rotation-diffusion (RotaFusion, or RF) force of the electric force (named RFe-force), the weak force is the RF-force of the strong force (named RFs-force), and the dark matter is the RF-force of the gravity force (named RFg-force). These RF-forces are the orthogonal forces of the primary forces, and they (initially) only exert in θφ-2D dimension. In this way, we re-classified the four fundamental interaction forces into three pairs of forces: S/RFs force, E/RFe force, and G/RFg force. We also believe that the Dark Matter is originated from RFg-force (at least partly). 2) From the knowledge of electric field (E-force) and magnetic field (RFe-force), we tried to build a brand new {N,n} QM field theory, based on Schrodinger (or a similar differential) equation/solution. This new field theory is expected to seamlessly unify all forces in our universe. Only the framework of this newly designed field theory has been discussed. 3) We hypothesized that our universe is formed under the residue force of G/RFg force, similar as that an atom's nucleus is formed under the residue force of S/RFs force, and a molecule is formed under the residue force of E/RFe force. We imagined the large-scale structure of our universe based on the molecule of either a C60 Buckyball, or a rhodopsin, or a hemoglobin macro molecule.

Introduction

The SunQM series research articles [1] ~ [16] have demonstrated that the formation of Solar system (as well as each planet) was governed by its {N,n} QM, and the non-Born probability (NBP) can be used to describe many macro-world's phenomena [17] ~ [19]. The success of the SunQM study makes us to believe that "all mass entities (from the whole universe to a single quark) can be described by Schrodinger equation and solution" (see SunQM-11 section IX). If we can extend this idea to the force field, then we may be able to unify the mathematical description for all fundamental forces. In the current paper, I (as a citizen scientist) tried to throw all force field phenomena into the box of {N,n} QM, and shake the box around to push everything to fit in (even some are not perfectly fitted in). Note: for {N,n} QM nomenclature as well as the general notes for {N,n} QM model, please see SunQM-1 section VII. Note: Microsoft Excel's number format is often used in this paper, for example: x^2 = x^2, 3.4E+12 = $3.4*10^{12}$, 5.6E-9 = $5.6*10^{-9}$. Note: The reading sequence for SunQM series papers is: SunQM-1, 1s1, 1s2, 1s3, 2, 3, 3s1, 3s2, 3s6, 3s7, 3s8, 3s3, 3s9, 3s4, 3s10, 3s11, 4, 4s1, 4s2, and 6. Note: for all SunQM series papers, reader should check "SunQM-9s1: Updates and Q/A for SunQM series papers" for the most recent updates and corrections.

I. The hypothesis of the magnetic force is the rotation-diffusion (RF) force of the electric force leads to the design of a new {N,n} QM field theory

I-a. A hypothesis that magnetic force field is the rotation-diffusion (RF) of electric force field

From wiki "Magnetic field", "*Magnetic fields are produced by moving electric charges and the intrinsic magnetic moments of elementary particles associated with a fundamental quantum property, their spin*". In 2017, a few months after understood the rotation-diffusion concept (in 2016) of {N,n} QM, I suddenly realized that in electromagnetism, a magnetic field can be explained as the rotation-diffusion of an electric field, and this rotation-diffusion (or RotaFusion, or RF) is the same concept as we used for {N,n} QM!

Now let's using Figure 1 and Figure 2 to explain it. In Figure 1a, let's assume that a (static) positive point-charge (locates at the origin of a xyz-coordinate) temporarily has only a single electric field $\vec{\mathbf{E}}$ (open) line that pointing to the +z direction, and this point-charge's single electric field $\vec{\mathbf{E}}$ line produces a circular magnetic field $\vec{\mathbf{B}}$ (closed) line in x-y plane (follow the right-hand rule, as shown Figure 1a. Also see the next paragraph for detailed explanation). We know that a positive point-charge always has countless electric field $\vec{\mathbf{E}}$ (open) lines pointing to all (4π) solid angles simultaneously, therefore, the combination of many Figure 1a at all (4π) solid angles gives a perfect rotation diffusion (RF) of the magnetic field (as shown in Figure 1b).

Now we have to add more explanations to Figure 1a: First, the assumption of Figure 1a is largely based on Figure 2a, an electric current (the moving of the positive charge) produces a (right-handed) circular magnetic field $\vec{\mathbf{B}}$. It is also based on Figure 2b, an increasing $\vec{\mathbf{E}}$ produces a (right-handed) circular magnetic field $\vec{\mathbf{B}}$. Second, in Figure 1a, it is a (static) point-charge's single (open) $\vec{\mathbf{E}}$ line (with this point-charge) produces a circular $\vec{\mathbf{B}}$, it is not a (static) $\vec{\mathbf{E}}$ (without a point-charge) produces a circular $\vec{\mathbf{B}}$! Because according to Maxwell's equations (or the general form of Ampere's law), a static $\vec{\mathbf{E}}$ will not produces any $\vec{\mathbf{B}}$, only a changing $\vec{\mathbf{E}}$ will produces a $\vec{\mathbf{B}}$. Because Figure 1a always associated with Figure 1b, so the net result of Figure 1a is always Figure 1b. In this way, we slightly (but significantly) changed the expression of the Ampere's law in Maxwell's equations: a static point-charge's $\vec{\mathbf{E}}$ will not produces an <u>observable</u> $\vec{\mathbf{B}}$ (notice that the Maxwell's saying is: a static point-charge's $\vec{\mathbf{E}}$ does not produces a $\vec{\mathbf{B}}$ at all). In other words, a static point-charge's $\vec{\mathbf{E}}$ does produce the magnetic field $\vec{\mathbf{B}}$, although this magnetic field $\vec{\mathbf{B}}$ is completely locked-in in a complete RF state so that it is unobservable. Third, a point-charge has a zero-surface area on it, so its surface charge distribution is constant at anywhere on the surface. Therefore, at static, its countless electric field $\vec{\mathbf{E}}$ lines always evenly point to all (4π) solid angles simultaneously and produce net zero $\vec{\mathbf{B}}$ (due to RF, at least in its near surface space). Then in the case of a static +/- electric charge pair (see Figure 2c), both positive and negative point charges produce net zero $\vec{\mathbf{B}}$ in theirs near surface spaces (which satisfy Figure 1b). In the space in-between +/- electric charge pair, a strong (static) $\vec{\mathbf{E}}$ without point charge does not produce $\vec{\mathbf{B}}$ (which satisfy Figure 1a). Thus, according to Figure 1's explanation, Figure 2c does not produce observable $\vec{\mathbf{B}}$, and this result does not violate Maxwell equations (that says Figure 2c does not produce $\vec{\mathbf{B}}$ at all). (Also see Figure 7 for a more accurate description).

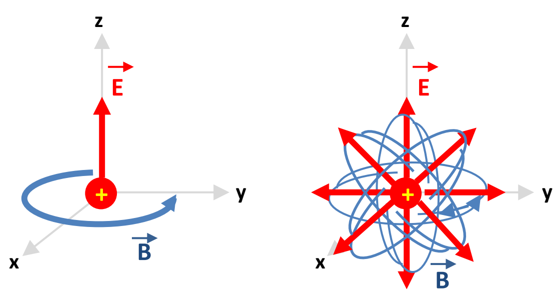


Figure 1a. Assumption: a static positive point-charge having its one electric field $\vec{\mathbf{E}}$ line pointing to the +z direction will produce a circular (closed) magnetic field $\vec{\mathbf{B}}$ line in x-y plane.
Figure 1b. For a static point-charge, the countless electric field $\vec{\mathbf{E}}$ lines in all directions causes the RF of magnetic field $\vec{\mathbf{B}}$, and produces net zero $\vec{\mathbf{B}}$.

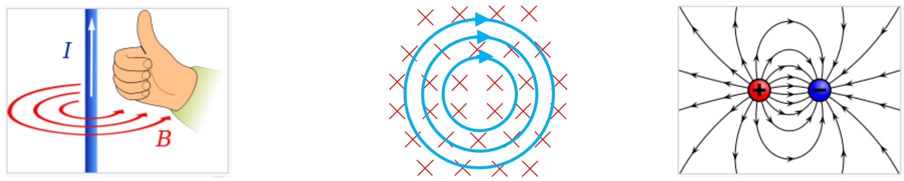


Figure 2a (left). Right hand grip rule: a current flowing in the direction of the white arrow produces a magnetic field shown by the red arrows. Copied from wiki "Magnetic field". Author: Jfmelero. Copyright: CC BY-SA 4.0.
Figure 2b (middle). An increasing $\vec{\mathbf{E}}$ (red, into paper) produces a (right-handed) circular magnetic field $\vec{\mathbf{B}}$ (blue circle with arrows). Also see Giancoli's text book (Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009, p815, Figure 31-4).
Figure 2c (right). Illustration of the electric field surrounding a pair of positive (red) and negative (blue) charge. Copied from wiki "Electric field". Author: Geek3. Copyright: CC BY-SA 3.0.

I-b. An electric charge moving in z direction decreased its $\vec{\mathbf{B}}$ field's RF level, and produced a net $\vec{\mathbf{B}}$ field in x-y plane

Because RF concept is part of the {N,n} QM, the new explanation (that the magnetic field $\vec{\mathbf{B}}$ is the RF of a static point-charge's $\vec{\mathbf{E}}$) means that a static point-charge's electromagnetism can be explained by the {N,n} QM. In electromagnetism, a (straight moving) electric current (equivalent to the moving of the positive charge) produces a (right-handed) circular magnetic field $\vec{\mathbf{B}}$ (see Figure 2a). Can we also explain it by using {N,n} QM? The answer is "Yes"!

Let's use a (over) simplified way to explain: when a static positive point-charge (Figure 1b) starts to move in z direction with speed $\vec{\mathbf{v}}$, its $\vec{\mathbf{E}}$ (or $\vec{\mathbf{B}}$) partially overlapped one on another (see Figure 3a). The net effect of Figure 3a (on the z-axis) becomes: at the +z direction, $\vec{\mathbf{E}} \rightarrow \vec{\mathbf{E}} + \boldsymbol{\delta}\vec{\mathbf{E}}$ which correlates to the (classical physics) speed of $\vec{\mathbf{c}} + \vec{\mathbf{v}}$ (because the electric field $\vec{\mathbf{E}}$ propagates at a speed of light c), and at the -z direction, $\vec{\mathbf{E}} \rightarrow \vec{\mathbf{E}} - \boldsymbol{\delta}\vec{\mathbf{E}}$ which correlates to the speed of $\vec{\mathbf{c}} - \vec{\mathbf{v}}$. Thus, it gives the point-charge a net $\boldsymbol{\delta}\vec{\mathbf{E}}$ at z direction that will produce a net $\boldsymbol{\delta}\vec{\mathbf{B}}$ (according to Figure 1a), and the intensity of the produced magnetic field $\boldsymbol{\delta}\vec{\mathbf{B}}$ (and $\boldsymbol{\delta}\vec{\mathbf{E}}$) correlates to the magnitude of $|\vec{\mathbf{v}}|$ (see Figure 3b). When this positive point-charge moves at the speed of light c, $\vec{\mathbf{E}} \rightarrow 0$ at the -z direction (because it correlates to the speed of $\vec{\mathbf{c}} - \vec{\mathbf{v}} = 0$), and the produced $\vec{\mathbf{B}}$ reaches maximum (see Figure 3c). In this way, (at a citizen scientist level) we can use Figure 1 to explain how a moving positive point-charge produces magnetic field $\vec{\mathbf{B}}$ around it. (Also see Figure 8 for a more accurate description).

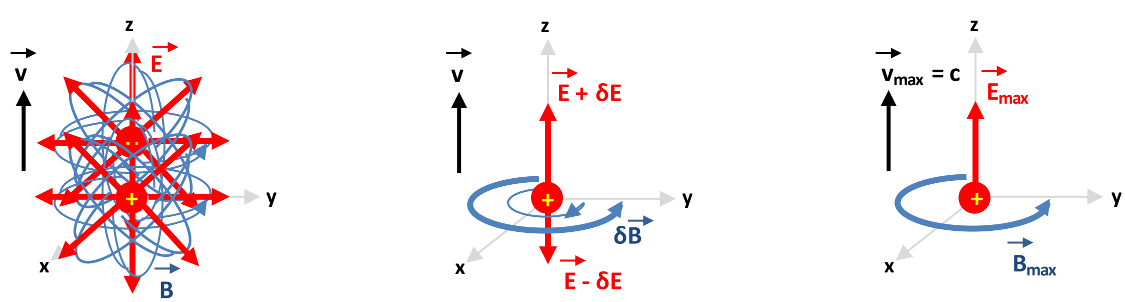


Figure 3a (left). When a positive point-charge starts to move in +z direction, its $\vec{\mathbf{E}}$ (or $\vec{\mathbf{B}}$) partially overlapped one on another.
Figure 3b (middle). The net effect of Figure 3a on the z axis (when $|\vec{\mathbf{v}}| > 0$).
Figure 3c (right). The net effect of Figure 3a on the z axis (when $|\vec{\mathbf{v}}| = c$).

Above explanation (in Figure 3) only qualitatively (not quantitatively) explained how a moving charge produced a magnetic field. Lorentz equation (see Douglas C. Giancoli, Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009. Page 717, eq-27-7) showed that a point-charge q moving with velocity $\vec{\mathbf{v}}$ in the presence of both a magnetic field $\vec{\mathbf{B}}$ and an electric field $\vec{\mathbf{E}}$, it will feel a force $\vec{\mathbf{F}} = q(\vec{\mathbf{E}} + \vec{\mathbf{v}} \times \vec{\mathbf{B}})$. Ampere's law (in Maxwell's differential equations, see wiki "Maxwell's equations") $\nabla \times \vec{\mathbf{B}} = \mu_0 \left(\vec{\mathbf{J}} + \varepsilon_0 \frac{\partial \vec{\mathbf{E}}}{\partial t}\right)$ showed how $\vec{\mathbf{B}}$ relates to a time changing $\vec{\mathbf{E}}$ and the electric current density $\vec{\mathbf{J}}$. We believe that by combining above two equations, a quantitative description on how a time-changing $\vec{\mathbf{E}}$ (as $\partial\vec{\mathbf{E}}/\partial t$, caused by a moving charge with velocity $\vec{\mathbf{v}}$) will produce a magnetic field $\vec{\mathbf{B}}$ should can be established under a single equation. However, at this time, I am not able to deduce out this equation (because my citizen scientist's math level is not good enough). Note: since this a ~150 years old subject, some previous scientists might have already found the solution. If so, readers please teach me.

I-c. A point-charge moving in z direction generates nLL QM effect for its $\vec{\mathbf{B}}$ force field (originally in RF) in x-y directions, and it may can be described by Schrodinger equation and wave function with |nlm> QM state at m > 0

How to use Maxwell equations to describe the RF of $\vec{\mathbf{B}}$ around $\vec{\mathbf{E}}$ is not our interesting. Our purpose here is to find that whether Schrodinger equation and solution (i.e., the wave function of R(r) * Y(θ,φ)) can be used to describe the RF of magnetic field $\vec{\mathbf{B}}$ around the electric field $\vec{\mathbf{E}}$. The reason is that the success of the SunQM study makes us to believe that "all mass entities (from the whole universe to a single quark) can be described by Schrodinger equation and solution" (see SunQM-11 section IX), and this may even apply to the force field.

Figure 3 revealed that the process of generating a net magnetic field $\vec{\mathbf{B}}$ by a moving electric point-charge is a process of decreasing the RF level of $\vec{\mathbf{B}}$ and to make it become a circular force in x-y plane. In SunQM-3s1, we learned that nLL QM effect (caused by the spinning pre-Sun ball) can be used to describe the decreasing RF (or deRF) of a quantum collapsed pre-Sun ball's outer shell and to make it disk-lyzed in x-y plane. Here we hypothesized that the decreasing RF of a moving charge's $\vec{\mathbf{B}}$ field can also be described by using the nLL QM effect (that we used for the pre-Sun ball's disk-lyzation). If so, then $\vec{\mathbf{B}}$ field should can be described by the regular |n*l*m> QM state. In SunQM-3s1's Table 6 (copied here as Table 1), we defined a RF% value as: the difference of Bohr's angular momentum $|\vec{\mathbf{L}}| = n\hbar$ and Schrodinger's angular momentum $|\vec{\mathbf{L}}| = \sqrt{n(n-1)}\hbar$ divided by Bohr's $|\vec{\mathbf{L}}|$ (see column 4 of Table 1). Based on that, now we can define a decreasing RF% value (or deRF%) as deRF% = 1 – RF% (see column 5 of Table 1). The result showed that as the quantum number n increasing from 1 to 2, 3, 4, 5, 6, 36, the deRF% value increased from 0%, to 71%, 82%, 87%, 89%, 91%, and 99% correspondingly. In Figure 4, we illustrated that how a z-moving charge's $\vec{\mathbf{B}}$ field is deRF according to the spherical 3D plot of Y(*l*,m) wave function.

Table 1. Calculation of RF% and deRF%. Copied from SunQM-2's Table 6.

n	Bohr's |L| = n	Schrodinger's |L| = sqrt[n(n-1)]	% of RF =(B-S)/B	**% of deRF =1-(B-S)/B**
unit=	h/(2π)	h/(2π)		
1	1	0.0	100%	**0%**
2	2	1.4	29%	**71%**
3	3	2.4	18%	**82%**
4	4	3.5	13%	**87%**
5	5	4.5	11%	**89%**
6	6	5.5	9%	**91%**
36	36	35.5	1%	**99%**

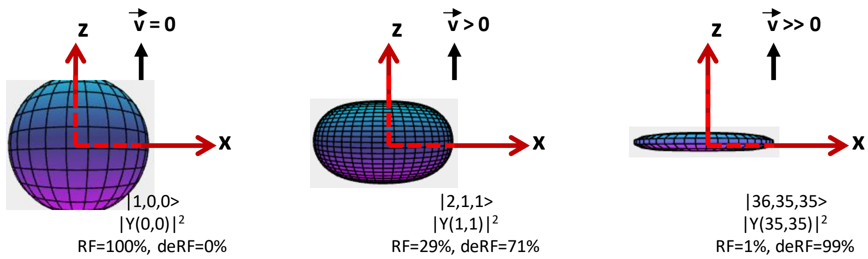


Figure 4. Illustrated the hypothesis that a z-moving charge's $\vec{\mathbf{B}}$ field can be described by the Y(*l*,m) wave function. Spherical 3D plot of the Born probability |Y(0,0)|^2, |Y(1,1)|^2, and |Y(35,35)|^2 is plotted by using MathStudio (http://mathstud.io/) software. Note: Here we use Born probability, and not use non-Born probability (NBP), because we only need to display $\vec{\mathbf{B}}$ field's θ-dimensional info, and omit φ-dimension's info.

I-d. A z-directional self-spinning charge's $\vec{\mathbf{B}}$ force field may also can be described by Schrodinger equation and wave function with |n*l*m> QM state at m = 0

The electrodynamics text book told us that when an electric current flow in straight line, it generates a circular closed $\vec{\mathbf{B}}$ field (see Figure 2a), and when an electric current flow in a loop line, it generates a (straight) opened $\vec{\mathbf{B}}$ field (see Figure 5a). After looking carefully, we found that if the $\vec{\mathbf{B}}$ field in Figure 2a can be described by a nLL QM state, then the $\vec{\mathbf{B}}$ field in Figure 5a should can be described by a n*l*0 QM state. (Note: more description on n*l*0 QM state can be found in SunQM-3s1's section VI). So, the same $\vec{\mathbf{B}}$ field line (in deRF QM state) of a positive charge is inter-changeable between nLL QM state or n*l*0 QM state depending on electric current (or charge)'s moving trajectory. It is interesting to see that the nLL (with m = max) QM state force field and n*l*0 (with m = 0) QM state force field are topologically inter-changeable.

Furthermore, we know that Figure 5a's $\vec{\mathbf{B}}$ field pattern is similar as a magnet's $\vec{\mathbf{B}}$ field pattern (see Figure 5b), and also a self-spinning charge's $\vec{\mathbf{B}}$ field pattern (see Figure 5c). So now we obtained a new and very interesting result: while a static point-charge's $\vec{\mathbf{B}}$ field is in a complete RF QM state and unobservable, a straight moving point-charge's $\vec{\mathbf{B}}$ field is deRF into a nLL QM state, and either a circular moving, or a self-spinning point-charge's $\vec{\mathbf{B}}$ field is deRF into a n*l*0 QM state (or |n*l*m> at m = 0, notice that this m is the $\vec{\mathbf{B}}$ field's quantum number, it is different than the real spin-quantum number $\vec{\mathbf{s}}$, and $\vec{\mathbf{s}}$ maybe correlate to n). In other words, a spinning charge (m = 0)'s $\vec{\mathbf{B}}$ field at |n*l*m>= |n,*l*,0> QM state produces a bipolar-outflow-type $\vec{\mathbf{B}}$ field, and this is exactly the magnet bar's $\vec{\mathbf{B}}$ field as we usually seen. Thus, we hypothesized that a spinning charge's $\vec{\mathbf{B}}$ field can also be described by using the Y(*l*,m) wave function.

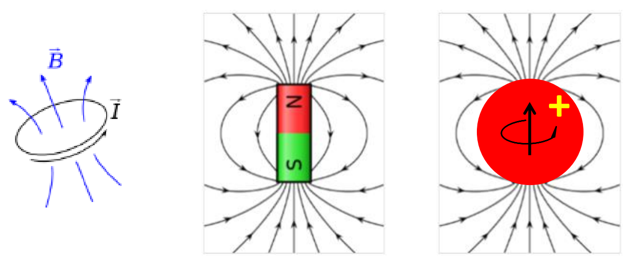


Figure 5a (left). Magnetic field (blue lines) of a current carrying loop (black). Copied from wiki "magnetic field (2016 old version)". Author: Sbyrnes321 (Steve Byrnes). Copyright: Public Domain.
Figure 5b (middle). Magnetic field (lines) of a magnet. Copied from wiki "magnetic field (2016 old version)". Author: Geek3. Copyright: CC BY-SA 3.0.
Figure 5c (right). Magnetic field (lines) of a spinning positive point charge.

I-e. Besides the repulsive (primary) E-force, a pair of (side-by-side) parallel straight moving charges will exert attractive RFe-force on each other, and a pair of (side-by-side) parallel spinning charges will exert repulsive RFe-force on each other

Here, let's first name electric force as "E-force", and name the magnetic force as "RFe-force" (due to magnetic force is the **RF**-force of **e**lectric force). Similarly, in the next two sections we will name the gravity force as "G-force", and name a (undiscovered) RF-force of G-force as "RFg-force"; also name the Strong force as "S-force", and name the Weak force as "RFs-force" (due to we believe that the Weak force is the RF-force of S-force).

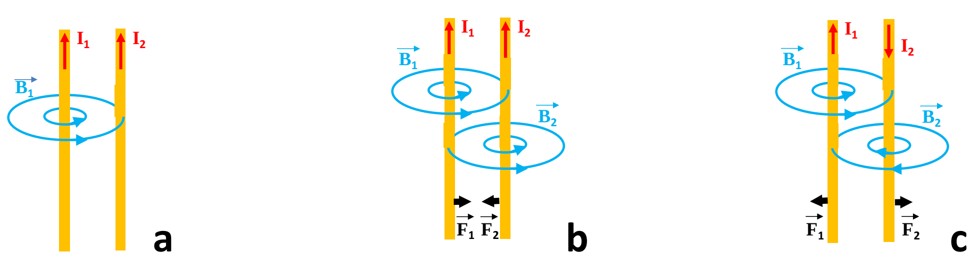
The electrodynamics text book told us that parallel electric currents in the same direction exert an attractive force on each other (see Figure 6b) through the circular closed $\vec{\mathbf{B}}$ field (see Figure 6a), and anti-parallel currents (in opposite directions) exert a repulsive force on each other (see Figure 6c). Since an electric current can be replaced by many (or even one) moving positive charges, we conclude that a pair of parallel straight moving charges exert an attractive RFe-force on each other through their $\vec{\mathbf{B}}$ fields (see Figure 6d) despite they exert a repulsive (primary) E-force on each other. Also, a pair of anti-parallel straight moving charges exert a repulsive RFe-force on each other (see Figure 6e) beyond they exert a repulsive E-force on each other. Note: In Figure 6a and 6b, I_2 does not feel I_1's primary E-force because the positive charges match the negative charges inside the I_1's wire.

The electrodynamics text book also told us that two side-by-side anti-parallel magnet bars attract with each other (through their $\vec{\mathbf{B}}$ fields). Therefore, the two side-by-side anti-parallel spinning charges must attract with each other (through their $\vec{\mathbf{B}}$ fields, or through the RFe-force, see Figure 6g), and the two side-by-side parallel spinning charges must repel with each other (see Figure 6f).

This analysis showed that RFe-force (maybe also RFg, RFs-forces) likes to be closed. In a complete RF state, the RFe-force is naturally closed (see Figure 1b). In the nLL QM state, the RFe-force is also naturally closed (see Figure 3c or Figure 8c). However, in the n*l*0 QM state, a single spinning charge opens RFe-force (like a pseudo r-1D in the polar dimension) so it is not comfortable (or at high QM energy state?), and two side-by-side anti-parallel spinning charges makes the RFe-force closed. This analysis also revealed that for nLL QM state RFe-force (that naturally in closed form), same direction (and side-by-side) circular force intended to overlap with each other and therefore become an attractive force to each other (see Figure 6d). For the n*l*0 QM state RF force (that naturally in open form), two (side-by-side) opposite direction forces will be attractive with each other (to become a closed force, see Figure 6g). However, we are not sure how much of this property can be transferred to RFg-force (or RFs-force) directly, (because E-force has a special property that two positive charges repel each other, and positive-negative charges attract each other).

Many micro RFe-forces (simultaneously either in RF state, or in nLL state, or in n*l*0 state) can be added to form a macro RFe-force field (either in RF state, or in nLL state, or in n*l*0 state). E.g., Sun's magnetic field, is the sum of many micro n*l*0 states' RFe-forces added together. In this case, the two head-to-tail lined-up n*l*0 states' RFe-forces (see SunQM-3s11 Figure 6b) attract with each other (because they are topologically equivalent to the two side-by-side anti-parallel n*l*0 states' RFe-forces).

It is interesting to see that RFe (in θφ-2D, RF) force spinning (in φ-1D) produces n*l*0 force in rθ-2D (in which the φ-component of RFe force is changed to r-dimension), therefore, the initial θφ-2D force now exert its component in r-dimension. Also RFe (in θφ-2D, RF) force moving in z-axis (in r-1D) produces nLL force in φ-1D (in which the θ-component of RFe force simply diminished).



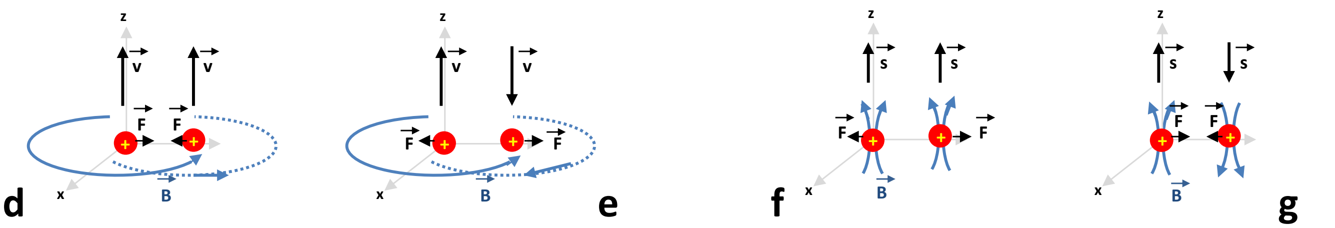


Figure 6a. In a pair of parallel currents I_1 and I_2, the magnetic field $\overrightarrow{\mathbf{B_1}}$ (produced by I_1) affects I_2 (also see Giancoli's Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009, p735, Figure 28-5b).
Figure 6b. Parallel currents in the same direction exert an attractive force on each other (also see Giancoli's Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009, p735, Figure 28-6a).
Figure 6c. Anti-parallel currents (in opposite directions) exert a repulsive force on each other (also see Giancoli's Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009, p735, Figure 28-6b).
Figure 6d. A pair of (side-by-side) parallel straight moving charges exert an attractive RFe-force (represented as $\vec{\mathbf{F}}$) on each other (despite they exert a repulsive E-force on each other).
Figure 6e. A pair of (side-by-side) anti-parallel straight moving charges exert a repulsive RFe-force (represented as $\vec{\mathbf{F}}$) on each other (beyond they exert a repulsive E-force on each other).
Figure 6f. A pair of (side-by-side) parallel spinning charges exert a repulsive RFe-force (represented as $\vec{\mathbf{F}}$) on each other (beyond they exert a repulsive E-force on each other).
Figure 6g. A pair of (side-by-side) anti-parallel spinning charges exert an attractive RFe-force (represented as $\vec{\mathbf{F}}$) on each other (despite they exert a repulsive E-force on each other).

I-f. To design a new quantum force field theory based on Schrodinger equation, wave function and {N,n} QM

Quantize force field by directly using Schrodinger equation/solution must have been tried in the 1920s by many early QM pioneers. However, the final theory turned out to be a completely unexpected form (at least to me): quantum electrodynamics (QED) and other modern quantum field theories (see John S. Townsed, A Modern Approach to Quantum Mechanics, 2nd ed., 2012. Chapter 14, but it is already beyond my current knowledge). My knowledge of QM is limited only to Bohr QM and Schrodinger QM (which I learned in 1981 as an undergraduate in Fudan University, using (part of) Zhuo Sixun (周世勋)'s QM text book (1979 edition, total 258 pages, 1/32 folio, total words < 200,000)). I don't have the knowledge of QED, or quantum field theory, etc. I am also very weak in the operator-based QM knowledge, or matrix-based QM knowledge. Even for David Griffiths' "Introduction to quantum mechanics", I only understand about half of it. This is one of the major reasons why I call myself "a citizen scientist of QM". While writing this paper, I tried to read David Griffiths' "Introduction to Elementary Particles", and found that it is too difficult for a 60 years old citizen scientist to learn this kind of theory. However, the success of the SunQM study makes me to believe that "all mass entities (from the whole universe to a single quark) can be described by Schrodinger equation and solution" (see SunQM-11 section IX). If we can extend this idea to the force field, then we can truly unify the mathematical description for the whole universe, including both the matter distribution and the energy (or field) distribution (under Schrodinger equation). As a citizen scientist of QM, nothing to lose for a try. So let's try to describe (or quantize) magnetic field and electric field by directly using Schrodinger equation and solution (i.e., wave functions, or at least based on them).

In our hypothesis, a single static point-charge (see Figure 1b)'s electric field $\vec{\mathbf{E}}$ has only the r-1D component (we named it as the **primary force**), and its magnetic field $\vec{\mathbf{B}}$ has only θφ-2D components and always in RF (we named it as the **RF-force** of the primary force, therefore, the RF-force is always the orthogonal force of the primary force). We can easily think that the $\vec{\mathbf{E}}$ should be described with a radial (wave) function R'(r), and the $\vec{\mathbf{B}}$ should be described with a θφ-2D (wave) function Y'(θ,φ). So a single static point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ should be described by a function of R'(r) * Y'(θ,φ). Furthermore, we hypothesize that this R'(r) * Y'(θ,φ) is the solution of Schrodinger (or a similar differential) equation, which means this single static point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ should be described by Schrodinger (or a similar differential) equation.

Because Y'(θ,φ) has to describe $\vec{\mathbf{B}}$ field's QM state not only at the RF (see Figure 1b), but also the deRF at either the nLL QM state (see Figure 3b) or the n*l*0 QM state (see Figure 5c), we have to choose the spherical harmonic function Y(*l*,m) as the Y'(θ,φ), simply because we don't know any other function can do that.

For the $\vec{\mathbf{E}}$ field's function R'(r), we really don't know what formula it is. We only know R'(r) must be able to describe the $\vec{\mathbf{E}}$ field formula $E = \frac{1}{4\pi\epsilon_0}\frac{Q}{r^2}$ in some way. Since the only radial function we (as a citizen scientist of QM) know is the Schrodinger equation's R(n,l) for hydrogen atom, we tested it, but no conclusive result was obtained (see section I-g for details). Even so, we still hypothesize that R'(r) can be described by quantum numbers n and *l*, so it can be written as R'(n,*l*). Therefore, we hypothesized that a single static point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ is able to be described by a Schrodinger (or a similar differential) equation with the solution of R'(r) * Y'(θ,φ) = R'(n,*l*) * Y(*l*,m), with R'(n,*l*) formula uncertain, and Y(*l*,m) is the regular spherical harmonic function. Or, we can also use |n*l*m> QM state to describe a single static point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$.

Now let's use a new way to explain a single static point-charge's electric field lines $\vec{\mathbf{E}}$ in Figure 1. In QM (and also in classical mechanics), a particle doing circular orbital motion (in x-y plane) has an angular momentum $\vec{\mathbf{L}} = \vec{\mathbf{r}} \times \vec{\mathbf{p}}$, where $\vec{\mathbf{p}}$ is the momentum vector of this particle, and $\vec{\mathbf{r}}$ is the distance vector from the orbit center to the particle. We can use $\vec{\mathbf{L}}$ vector to represent $\vec{\mathbf{E}}$ vector, and use the particle's trajectory (or the $\vec{\mathbf{p}}$ vector) to represent $\vec{\mathbf{B}}$ vector, so that Figure 1 (a and b) is represented as Figure 7 (a and b). Figure 7 (a and b) tells us that a particle's momentum $\vec{\mathbf{p}}$ vector doing RF motion in θφ-2D caused angular momentum $\vec{\mathbf{L}}$ vector (that points to all 4π solid angle directions) is equivalent to a single static point-charge's electric field $\vec{\mathbf{E}}$ vector points to all 4π solid angle directions and causes its $\vec{\mathbf{B}}$ vector doing RF motion in θφ-2D. In the QM text book, the former one (the $\vec{\mathbf{L}}$ vector distribution) is often depicted as in Figure 7c. (Note: although the true $\vec{\mathbf{L}}_z$ vector can never overlap the z-axis, while the $\vec{\mathbf{E}}$ vector can). By comparing with Figure 7c, we immediately know that a single static point-charge's $\vec{\mathbf{E}}$ in Figure 7b can be described with |n,*l*,m> = |1,0,0> QM state. Its radial wave function R'(1,0) is a perfect sphere, correlates well to the radial spherical shaped electric field $\vec{\mathbf{E}}$'s intensity. Its θφ-2D wave function Y(0,0) is also a perfect sphere (and *l* = m ≡ 0, meaning it is in a complete RF), correlates well to a θφ-2D enclosed spherical shaped and complete RF state magnetic field $\vec{\mathbf{B}}$. Besides |1,0,0> QM state, it can also be described by a complete set of |n,*l*,m> QM states at any n state (with *l* = 0 ... n-1, and m = -*l* ... +*l*), e.g., |2,*l*=(0,1),m=(-*l*..+*l*)>, or |3,*l*=(0,1,2),m=(-*l*..+*l*)>, etc. It can even be described by a complete sub-set of |n,*l*,m> QM states at any specific *l* state under any n state (where *l* equals to any specific number, and m = -*l* .. +*l*, e.g., |2,*l*=1,m=(-1,0,+1)>, or |3, *l*=1,m=(-1,0,+1)>, etc). For a complete (vector bases) description, we should use the combination of all possible |n,*l*,m> states to describe both $\vec{\mathbf{E}}$ field and $\vec{\mathbf{B}}$ field simultaneously:

$$\sum_{n=1,l,m}^{\infty} a_{nlm} \, |n, l, m\rangle \qquad \text{eq-1}$$

where *l* = 0 … n-1, and m = -*l* … +*l*. When all coefficient a_{nlm} =1, a sum of all |n,*l*,m> states describes a perfectly spherically radiated $\vec{\mathbf{E}}$ field plus a perfectly spherically RF $\vec{\mathbf{B}}$ field simultaneously (un-normalized, see Table 2 column 6 through column 10). The advantage of using a complete set of n(s), *l*(s), and m(s), rather than a single QM state like |1,0,0>, or |2,0,0>, or |2,1,m=(-1,0,+1)> is that, now we can use the high-frequency (or multiplier) n quantum number to pinpoint any 3D (r, θ, φ) coordinate for the $\vec{\mathbf{E}}$ or $\vec{\mathbf{B}}$ field to interact with (just like in SunQM-4's Table 1, or eq-68, or eq-80, the Sun's gravity force field interacts with Earth at r = 1.57E+11 (± 7.89E+6) meters, at θ = π/2 (± 5E-5) arc, and at φ ≈ ωt (where ω is Earth's orbit angular frequency), and with a high-frequency quantum number n' = 5 * 6^11 ≈ 1.81E+9. Also see SunQM-7 for more explanations). This pinpoint technology, together with the non-Born probability (NBP), solved the infinitely expansion problem of R'(n,*l*) * Y(*l*,m) at high n. Notice that in {N,n//q} QM, the r_1 (of n = 1) can be moved inward to n = 1/q^j (which equivalent to {-j,n=1//q}, where both q and j are positive integers). If apply this to eq-1, then the SUM of n (in eq-1) should be from n = 1/q^j (at j → ∞, or n → 0) to n → ∞.

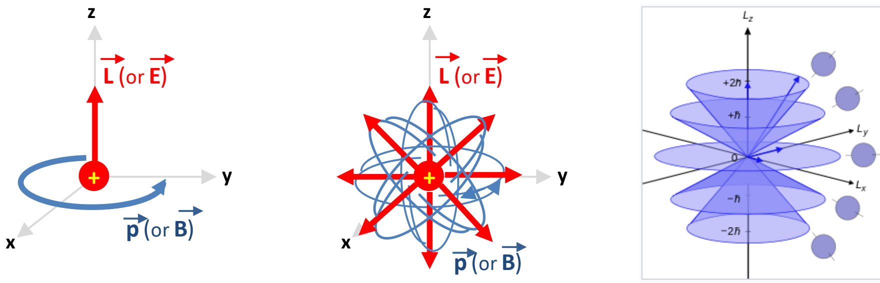


Figure 7a (left). Illustration of using $\vec{\mathbf{L}}$ vector to represent $\vec{\mathbf{E}}$ vector, and using the particle's trajectory (or the $\vec{\mathbf{p}}$ vector) to represent $\vec{\mathbf{B}}$ vector.
Figure 7b (middle). Illustration that a particle's trajectory (or the $\vec{\mathbf{p}}$ vector) doing RF and causing $\vec{\mathbf{L}}$ vector points to all 4π solid angle directions, is equivalent to $\vec{\mathbf{E}}$ vector points to all 4π solid angle directions and causes $\vec{\mathbf{B}}$ vector doing RF.
Figure 7c (right). Illustration of the vector model of orbital angular momentum. Copied from wiki "Angular momentum operator". Author: Maschen. Copyright: Public Domain.

Now let's see how to use the eq-1 kind field theory to describe a (z-directional) moving point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ fields. First, we draw Figure 8 to replace the over simplified Figure 3. Figure 8a shows a static ($\vec{\mathbf{v}}$ = 0) point-charge's $\vec{\mathbf{E}}$ with the orange ring (or a 3D ball) to depict the contour line of $\vec{\mathbf{E}}$ vectors' strength, with $\vec{\mathbf{B}}$ field in RF and unobservable (i.e., the number and intensity of the right-hand rotation $\vec{\mathbf{B}}$ field lines equals to that of the opposite $\vec{\mathbf{B}}$ field lines). When $\vec{\mathbf{v}}$ > 0, the $\vec{\mathbf{E}}$ vectors' strength changed just like the orange ring (or 3D ball) is shifted up in the direction of $\vec{\mathbf{v}}$ (see Figure 8b) with a net $\vec{\mathbf{B}}$ showed up (or deRF and increased nLL QM effect, or the right-hand rotation $\vec{\mathbf{B}}$ field lines are greater than the opposite $\vec{\mathbf{B}}$ field lines). When $\vec{\mathbf{v}}$ reaches the maximum speed (i.e., the speed of light c), the $\vec{\mathbf{E}}$ vectors' strength changed in such a way that they all point upward (see Figure 8c), and with $\vec{\mathbf{B}}$ maximized (or nLL QM effect maximized, or only the right-hand $\vec{\mathbf{B}}$ field lines exist). Using eq-1, it can be described by (mainly) increased nLL QM states (for one n or all n(s) quantum numbers). In Table 2 (columns 11 through 20), we give some purely guessed values for all a_{nlm} coefficients that may roughly describe Figure 8b. The main point is, all m < 0 (meaning the opposite $\vec{\mathbf{B}}$ field)'s a_{nlm} are diminished; all m = n-1 coefficients are increased the most; m = n-2 coefficients are increased a little bit; and so-on so-forth. Also as $|\vec{\mathbf{v}}|$ increases, we need to use higher n to describe. So, its $\vec{\mathbf{B}}$ field's QM state can be (mainly and roughly) described by first |2,1,1> at low $|\vec{\mathbf{v}}|$, then by |3,2,2> at a higher $|\vec{\mathbf{v}}|$, then by |4,3,3> at an even higher $|\vec{\mathbf{v}}|$, and so-on so-forth.

Then, let's see how to use the same field theory in eq-1 to describe a (z-directional) spinning point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ fields. From section I-d and Figure 5, we know that its |n*l*m> can be describe at n*l*0 QM state. According to Figure 7c, we now know that it correlates to vector $\vec{\mathbf{L}}$ (or $\vec{\mathbf{E}}$) right-hand spinning in the x-y plane. Using eq-1, it can be described by (mainly) increased n*l*0 QM states (for one n or all n(s) quantum numbers). In Table 2 (columns 21 through 30), we give some (purely guessed) values for all a_{nlm} coefficients that may roughly describe Figure 5. The main point is, all m ≠ 0 's coefficients a_{nlm} are suppressed; all m = 0 coefficients a_{nlm} are increased. For each n, the higher the *l*, the more increased a_{nlm}. For the higher $|\vec{\mathbf{B}}|$, we need to use higher n to describe. So, its $\vec{\mathbf{B}}$ field's QM state can be (mainly and roughly) described by first |2,1,0> at low $|\vec{\mathbf{s}}|$, then by |3,2,0> at a higher $|\vec{\mathbf{s}}|$, then by |4,3,0> at an even higher $|\vec{\mathbf{s}}|$, and so-on so-forth.

In this way, we designed (a framework of) a completely new quantum field theory for a single charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ fields. We named it as the "**{N,n} QM field theory**". It can be mathematically described with the Schrodinger (or a similar differential) equation, and using the whole collection of the solutions of R'(r) * Y'(θ,φ) = R'(n,*l*) * Y(*l*,m) as shown in eq-1, and can also be described by the regular QM's |n*l*m> format. Although we still don't know the formula of R'(r), plus a detailed quantitative calculation still needs to be figured out. This {N,n} QM field theory is expected to match {N,n} QM mass distribution theory (see SunQM-7 for more explanations).

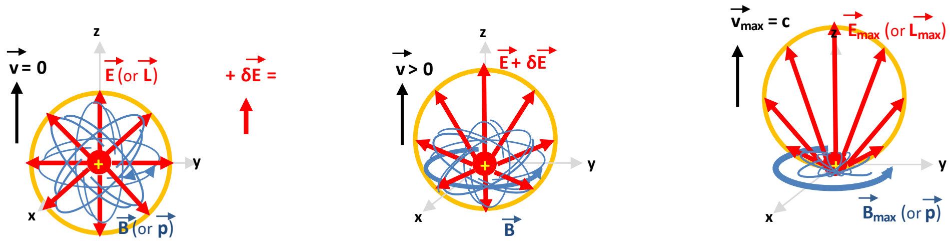


Figure 8a (left). For a static ($|\vec{\mathbf{v}}| = 0$) point-charge, the countless electric field $\vec{\mathbf{E}}$ lines in all directions cause the RF of magnetic field $\vec{\mathbf{B}}$, and produced net zero $\vec{\mathbf{B}}$.
Figure 8b (middle). Illustration of point-charge's $\vec{\mathbf{E}}$ lines and $\vec{\mathbf{B}}$ lines at $|\vec{\mathbf{v}}| > 0$. The right-hand $\vec{\mathbf{B}}$ lines are stronger than the opposite $\vec{\mathbf{B}}$ lines, and the net $\vec{\mathbf{B}}$ field lines are building up.
Figure 8a (right). Illustration of point-charge's $\vec{\mathbf{E}}$ lines and $\vec{\mathbf{B}}$ lines at $|\vec{\mathbf{v}}| = c$. Only the right-hand $\vec{\mathbf{B}}$ lines left, all opposite $\vec{\mathbf{B}}$ lines diminished. The net $\vec{\mathbf{B}}$ field lines get maximum.

Table 2. Purely guessed a_{nlm} values (at all n, l, m, for $n \le 5$) to illustrate a point-charge's $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ field theory as shown in eq-1. At v = 0, or v > 0, and/or s = 0, or s > 0. Note: all |nlm> with m < 0 are ignored in this table.

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I-g. Testing of using hydrogen atom's radial function R(n,l) as the possible $\vec{\mathbf{E}}$ field's radial function R'(r)

(Non-essential section, readers may disregard it). This test is a citizen scientist level's work. Here we tested to use 1) Σ[r^2 * |R(n,l)|^2]; 2) Σ[R(n,l)]; 3) Σ[R(n,l=n-1)] to describe either $\vec{\mathbf{E}}$ ($\propto 1/r^2$) or V ($\propto 1/r$). The formulas of R(n,l) for n=1, 2, 3, 4, and 5 were obtained from SunQM-3 (and they are essentially the same as hydrogen atom's radial function). The detailed calculation is not shown here, only figures of calculations and sums are shown in Figure 9. The result showed that both Figure 9a and Figure 9b do not match at all, Figure 3c at n → ∞ may (or may not) describe V ($\propto 1/r$).

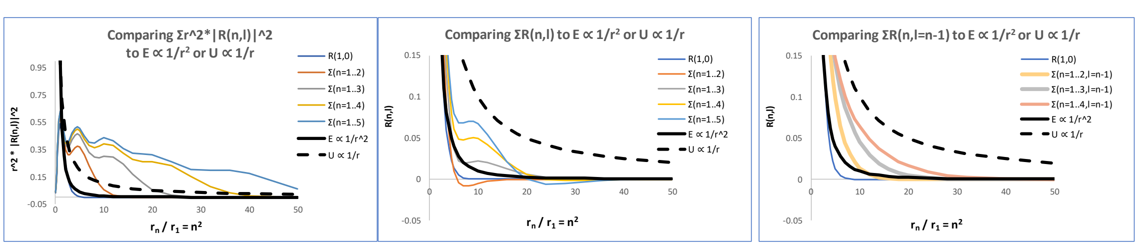

Figure 9a (left). Try to use Σ[r^2 |R(n,l)|^2] to mimic either $|\vec{\mathbf{E}}|$ ($\propto 1/r^2$) or V ($\propto 1/r$) curve.
Figure 9b (middle). Try to use Σ[R(n,l)] to mimic either $|\vec{\mathbf{E}}|$ ($\propto 1/r^2$) or V ($\propto 1/r$) curve.

Figure 9a (right). Try to use Σ[R(n,*l*=n-1)] to mimic either $|\vec{\mathbf{E}}|$ ($\propto 1/r^2$) or V ($\propto$ 1/r) curve.

I-h. Using the new {N,n} QM field theory to describe a photon …

Moved to SunQM-6s1.

II. A hypothesis that the gravity force should also have its RF-force (= the origin of the Dark Matter?)

In July 2020, while writing the section-I of this paper, I suddenly realized that if we treat the (r-dimensional only) gravity force as the r-1D electric force, and if we assume that there is a brand new θφ-2D RF-force for gravity force (just like magnetic force is a θφ-2D RF-force for electric force), then by using Figure 6b, we may be able to explain why galaxy's arms are orbital rotating much faster than the single gravity force's attraction.

Now let's make detailed analysis. First, we need to hypothesis that the gravity force is an r-1D primary force (equivalent to the electric force), and it can be described by Schrodinger (or a similar differential) equation and the r-1D wave function R'(r), as we have explained in section-I. Let's use $R(r)_g$ for gravity force's R'(r), and use $R(r)_e$ for electric force's R'(r). Then, we have to hypothesis that there should be a (new and undiscovered) RF-force for the (primary) gravity force that only exert in θφ-2D dimensions (just like magnetic force is a θφ-2D RF-force for electric r-1D force). Here we name this new force as **RFg-force** (**RF** component of **g**ravity force), similar as the **RFe-force** = magnetic force (**RF** component of **e**lectric force). For electric-magnetic force, we see (in section-I) that when a charge is in static ($\vec{\mathbf{v}}$ = 0, and $\vec{\mathbf{s}}$ = 0), its RFe-force is fully in RF and no net RFe-force shows up. We believe this is also true for RFg-force: when a mass ball is in static ($\vec{\mathbf{v}}$ = 0, and $\vec{\mathbf{s}}$ = 0), its RFg-force is fully in RF and no net RFg-force shows up. Therefore, similar as that of RFe-force, RFg-force should also can be described by the spherical harmonic function Y(*l*,m). Furthermore, it is hypothesized that the whole set of G-force and RFg-force should also can be described by Schrodinger (or a similar differential) equation with the solution of R'(r) * Y'(θ,φ) = $R(n,l)_g$ * Y(*l*,m), with $R(n,l)_g$ formula uncertain, and Y(*l*,m) is the regular spherical harmonic function. It is hypothesized that we can also use |n*l*m> QM state to describe a single static mass ball's G-force and RFg-force.

Following are some properties of this RFg-force that we are not sure:

1) We hope to see that two side-by-side mass balls parallelly spin in the same direction will produce attractive force through RFg-force interaction between each other (see Figure 10a). Because if this is correct, then we can use it to explain (at least partly) why all galaxy's arms are orbital rotating much faster than the galaxy center's gravitational attraction (or the origin of dark matter).

2) We hope to see that two side-by-side mass balls parallelly moving in the same direction will produce attractive force through RFg-force interaction between each other (see Figure 10b). Because if this is correct, then we can also use it to explain (at least partly) why all galaxy's arms are orbital rotating much faster than the galaxy center's gravitational attraction (or the origin of dark matter).

3) So the total RFg-force is $\vec{\mathbf{F}}_{RFg} \propto a\vec{\mathbf{v}}_1 \cdot \vec{\mathbf{v}}_2 + b\vec{\mathbf{s}}_1 \cdot \vec{\mathbf{s}}_2$, where *a* and *b* are the coefficients. But from the analysis in section-I, we know that if Figure 10a is right, then Figure 10b must be wrong, or vice versa. The detailed analysis is a complete massy: some analysis support Figure 10a, others support Figure 10b, and we even don't want to present those analysis here. The only conclusion is, **we need to do the real experiment to determine whether Figure 10a, or Figure 10b, or both, or none, is right!**

Just to remember, the whole purpose of this RFg-force hypothesis is that we believe it may be (at least partly) the origin of dark matter.

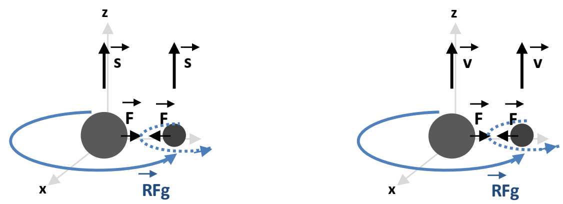

Figure 10a (left). We hope to see that two side-by-side mass balls parallelly spin in the same direction will produce attractive force through RFg-force interaction between each other.
Figure 10b (right). We hope to see that two side-by-side mass balls parallelly moving in the same direction will produce attractive force through RFg-force interaction between each other.

III. The Weak-force is hypothesized to be the RF-force of the Strong-force

At the same time I hypothesized the RFg-force, I realized that we should treat the (r-dimensional only) strong force as the primary force (like r-1D electric force), and treat the weak force as the RF-force of strong force. This is because as wiki "Weak interaction" explained: "*The weak interaction is the only fundamental interaction that breaks parity-symmetry, and similarly, the only one to break charge parity symmetry ... The weak interaction does not produce bound states nor does it involve binding energy – something that gravity does on an astronomical scale, that the electromagnetic force does at the atomic level, and that the strong nuclear force does inside nuclei*". To me, this is the direct evidence that gravity force, electric force, and strong force all belong to the r-1D type primacy force, and the weak force (as well as the magnetic force) belongs to a θφ-2D-RF type force. We believe that all stranger properties of the Weak force (in comparison to the r-1D type primary force, e.g., break of parity-symmetry, etc.) can be explained with RF effect.

Again, for electric-magnetic force, we see (in section-I) that when a charge is in static ($\vec{\mathbf{v}}$ = 0, and $\vec{\mathbf{s}}$ = 0), its RFe-force is in full RF and no net RFe-force shows up. We believe this is also true for RFs-force (or weak force): when a particle is in static ($\vec{\mathbf{v}}$ = 0, and $\vec{\mathbf{s}}$ = 0), its RFs-force is in full RF and no net RFs-force shows up. Therefore, similar as that of RFe-force, RFs-force should also can be described by the spherical harmonic function Y(l,m). Furthermore, it is hypothesized that the whole set of S-force and RFs-force should also can be described by Schrodinger (or a similar differential) equation with the solution of R'(r) * Y'(θ,φ) = R(n,l)$_s$ * Y(l,m), with R(n,l)$_s$ formula uncertain, and Y(l,m) is the regular spherical harmonic function. Meanwhile, it is hypothesized that we can also use |nlm> QM state to describe a particle's S-force and RFs-force.

IV. Re-classification of the fundamental forces, and the mathematical unification of all fundamental forces

In Table 3, we re-classified the original four fundamental forces (Strong-force, Weak force, Electric/magnetic force, and Gravity force) into three pairs of forces: Strong-force and RFs-force, electric force and RFe-force, gravity force and RFg-force. The primary force is the r-dimensional 1D only force. The corresponding RF-force is the orthogonal force of the primary force, exists only in θφ-2D dimensions (and these two dimensions are mostly diffused one with another). We hypothesized that all three pairs of forces can be described by Schrodinger (or a similar differential) equation and solution of R'(r) * Y'(θ,φ) = R'(n,l) * Y(l,m), with R'(n,l) formula for each (r-1D) primary force is uncertain, and Y(l,m) is the regular spherical harmonic function. In this way, we hypothesized that all fundamental forces can be unified under a single mathematical description.

In the future, if we find some new forces (e.g., "-1" force with the action length smaller than S-force's action length, or "+1" force with the action length larger than G-force's action length, see Table 3), we hypothesize that these potential new forces will also follow the description of R'(r) * Y'(θ,φ) = R'(n,l) * Y(l,m).

Note: Another way to name the magnetic force (other than the name of "RFe-force") is **Me**-force (**M**agnetic-**e**lectric force). Similarly, we can name RFs-force as **Ms**-force (**M**agnetic-**s**trong force), and name RFg-force as **Mg**-force (**M**agnetic-**g**ravity force).

Table 3. Re-classification of the fundamental forces.

	primary force, r-1D			RF-force, θϕ-2D					residue-force	
action range (m)			wave function			attract/ repel	deRF	wave function		
< 10^(-35)	-2			RF(-2)						
< 10^(-25)	-1			RF(-1)						
~ 10^(-15)	**S**	long attract?	$R(n,l)_s$	RFs (Weak force)	v parallel	?	?	$Y(l,m)$	nucleu force	long attract
		short repel (through RFs)?			spin parallel	?	?			
> 10^(-15)	**E**	(+ + repel)	$R(n,l)_e$	Rfe (Magnetic force)	v parallel	attract	nLL	$Y(l,m)$	chemical bond,	+/- attract
< 10^15					spin parallel	repel	nl0		van der Waals,	+/+ repel
	E	(+ - attract)		Rfe (Magnetic force)	v parallel	repel	nLL			
					spin parallel	attract	nl0			
> 10^0	**G**	attract	$R(n,l)_g$	RFg (Dark Matter)	v parallel	?	nl0?	$Y(l,m)$	galaxy-arm bond?	attract
< 10^20					spin parallel	?	nLL?			
> 10^20	+1			RF(+1)						
> 10^40	+2			RF(+2)						

Note: The action ranges of those unknown forces are purely from guess.

V. The residue force of the primary forces, and it may form the large-scale structure of our universe

In Table 3, we also listed the residue force for each of three pairs primary forces. From the text book, we know that "*the nuclear force (or nucleon–nucleon interaction or residual strong force) is a force that acts between the protons and neutrons of atoms.*" (see wiki "Nuclear force"). So S-force mainly exists inside a nucleon (proton or neutron) to lock the three quarks. Only a residue part of S-force leaks out of this nucleon to become nuclear force (to bind many nucleons into an atomic nucleus, e.g., the nucleus $^{14}_{6}C$). At atomic level, E-force mainly exists inside an atom to bind electrons to the nucleus. Only a residue part of E-force leaks out of this atom to become the chemical bond force to form (the primary structure of) a molecule (by linking many different atoms, e.g., a C60 buckyball). An even smaller residue part of E-force leaks out of an atom (or from a molecule) to become the Van der Waals force and it is used to form the secondary and/or tertiary structure of a macro molecule (e.g., a rhodopsin, or a hemoglobin, etc.). Similarly, for the G-force, we expect it mainly acts in the Solar system range, and in a galaxy range, and even in a galaxy cluster range. Based on the previous analysis, it is reasonable to hypothesize that at the range of Virgo super cluster and beyond (up to the whole universe), our universe is dominated by the residue force of G-force. If this is correct, then we may use a nuclear force formed structure (e.g., the nucleus $^{14}_{6}C$) as the structural model for our universe. Similarly, we may also use a chemical bond force formed structure (e.g., a C60 buckyball), or use a Van der Waals force formed structure (e.g., a rhodopsin, or a hemoglobin) as the structural model for our universe.

The re-classified three pairs of fundamental forces plus their residue forces can be used in any universe model (including the big bang model and other models). Here we explore the possibility of one special model. It is based on a (relative) static (or steady state) model, but also mimics the (current dominant) big bang model with the time-zero point (of the time course for our universe) as:

a) when the $^{14}_{6}C$ to $^{14}_{7}N$ beta decay just happened;
b) when a C60 buckyball chemical structure is just formed or broken;
c) when a rhodopsin just absorbed a photon and start to change its conformation;
d) when a hemoglobin just binds (or releases) an oxygen molecule and start to change its conformation.

Here we name this class of model as the "**rhodopsin-type**" universe model. It is a (relative) static (or steady state) universe with a (functional) event-trigged time-zero point, and this event is a repeated process.

If using the bio-functional rhodopsin (or hemoglobin) as the model, then our rhodopsin-type universe may work as:

Step-1, accept a "photon/O_2" of energy/mass from the outside (of the universe);
Step-2, process the energy/mass inside the universe,
Step-3, release the transformed energy/mass to the outside (of the universe), and
Step-4, reset the rhodopsin-type universe ready for the next cycle.

Here is one example of how the rhodopsin-type model works: let's assume that our (relative static, or steady state) universe (in step-4) has total 100% mass/energy, with the atomic number (Z) spectrum as: 0% mass/energy in Z < 1, 75% mass in Z = 1 (as hydrogen), 23% in Z = 2 (as helium), ≈ 2% mass in 2 < Z < 118, …, and 0% mass in Z >> 4.8E+56 (see SunQM-1s1 Table 7b bottom line). In step-1, a "photon" with 10% of our universe's total mass/energy (and with 0 < Z < 1) is absorbed by our universe, causing its Z-spectrum changed to: 10% mass/energy in Z < 1, 75% mass in Z = 1, 23% mass in Z = 2, ≈ 2% mass in 2 < Z < 118, …, and 0% mass in Z >> 4.8E+56. In step-2, the 10% of newly absorbed (Z < 1) mass/energy quickly transformed into 7.5% Z = 1 mass (hydrogen) and 2.5% Z = 2 mass (helium, according to the big bang theory), thus, our universe's Z-spectrum now become: 0% mass/energy in Z < 1, 82.5% mass in Z = 1, 25.5% mass in Z = 2, ≈ 2% mass in 2 < Z < 118, …, and 0% mass in Z >> 4.8E+56. Then the Stellar nucleosynthesis (see wiki "Stellar nucleosynthesis") gradually shifts our universe's Z-spectrum from low Z to high Z, and eventually to: 0% in Z < 1, 75% in Z = 1, 23% in Z = 2, ≈ 2% in 2 < Z < 118, …, and 10% mass/energy in Z >> 4.8E+56 (this equals to a super-super large black hole). In step-3, the produced super-super large black hole (Z >> 4.8E+56, with 10% of our universe's total mass/energy) is released to the outside (of the universe). In step-4, our universe is reset to: 0% mass/energy in Z < 1, 75% in Z = 1, 23% in Z = 2, ≈ 2% in 2 < Z < 118, …, and 0% in Z >> 4.8E+56, and ready for the next cycle. So the net result is: a "photon" (Z < 1) with 10% of our universe's energy/mass is absorbed, processed, and released (as a super-super large black hole with Z >> 4.8E+56) by our (relatively static) universe. As a (former) biophysicist, we have seen many this kind of bio-functional molecules (e.g., rhodopsin, GPCR, enzymes, etc.).

Then how should we explain the cosmological redshift and the cosmic microwave background in a rhodopsin-type universe? Some discussions based on {N,n} QM will be given in the paper SunQM-6s1. Note: in comparison to the big bang model, we understand that the rhodopsin-type universe model is a citizen scientist leveled model. But we still believe it is worthwhile to explore.

VI. Rotation Diffusion, or RotaFusion, or RF (also see SunQM-2, SunQM-2s1, and SunQM-4s3)

In {N,n} QM, we used Rotation Diffusion (or RotaFusion, or RF) concept a lot. So far, RF is still a hypothesis. In 2013, Takahisa Okino first deduced out "*that the diffusivity* (of Schrodinger equation) *corresponds to the angular momentum operator in quantum theory*" [20] (although I am not able to understand his deduction simply because my math level is not good enough). For years, I tried to use Heisenberg's uncertainty principle (e.g., $[L_x, L_y] = i\hbar L_z$, $[L_y, L_z] = i\hbar L_x$, $[L_z, L_x] = i\hbar L_y$, etc.) to deduce out the RF, but failed (again due to my math level is too low). Therefore, the paper of SunQM-2s1 has not come out so far. Could SU(3) × SU(2) × U(1) type of method be useful? Right before I publish current paper SunQM-6, I saw wiki "Uncertainty principle" was updated on 4/9/2020 [21] by "EfimovSP", (Efimov, Sergei P. ?), and he posted a new formula

$$\left\langle (\delta\hat{L}_x)^2\right\rangle \left\langle (\delta\hat{L}_y)^2\right\rangle \left\langle (\delta\hat{L}_z)^2\right\rangle \geq \frac{\hbar^2}{4}\sum_{i=1}^{3}\left\langle (\delta\hat{L}_i)^2\right\rangle \left\langle \hat{L}_i\right\rangle^2$$

based on V. V. Dodonov's method [22~23]. Could this formula be useful? All these are beyond my knowledge. We suggest readers to read these papers, and to make your own deduction.

VII. Using {N,n} QM and Simultaneous-Multi-Eigen-Description (SMED) to describe our universe

Moved to SunQM-7.

Summary:

1) We hypothesized that the magnetic force is the rotation-diffusion (RF) force of the electric force, the weak force is the RF-force of the strong force, and the dark matter is the RF-force of the gravity force. In this way, we re-classified the four fundamental interaction forces into three pairs of forces: S/RFs force, E/RFe force, and G/RFg force. We also hypothesized that the Dark Matter is originated from RFg-force (at least partly).
2) From the knowledge of electric field (E-force) and magnetic field (RFe-force), we tried to build a brand new {N,n} QM field theory, based on Schrodinger (or a similar differential) equation/solution. This new field theory is expected to seamlessly unify all forces in our universe. Only the framework of this new field theory has been discussed.
3) We suggested that our universe is formed under the residue force of G/RFg force, similar as that an atom's nucleus is formed under the residue force of S/RFs force, and a molecule is formed under the residue force of E/RFe force. We imagined the large-scale structure of our universe based on the molecule of either a C60 Buckyball, or a rhodopsin, or a hemoglobin macro molecule.

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SunQM-5: A new version of QM based on interior {N,n}, multiplier n', |R(n,*l*)|^2 * |Y(*l*,m)|^2 guided mass occupancy, and RF, and its application from string to universe (drafted in April 2018).
SunQM-5s1: White dwarf, neutron star, and black hole re-analyzed by using the internal {N,n} QM (drafted in April 2018).
SunQM-6s1: Using the new {N,n} QM field theory to describe a photon …
SunQM-7: Using {N,n} QM and Simultaneous-Multi-Eigen-Description (SMED) to describe our universe.
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Microsoft Excel, Power Point, Word.
Public TV's space science related programs: PBS-NOVA, BBC-documentary, National Geographic-documentary, etc.
Journal: Scientific American.

Many thanks to: All scientific writers who have contributed to the wiki writing, and all (online free) video (QM) course writers/programmers. Your contribution truly democratized the scientific knowledge to anyone who interested to know.

Note: I hope to get all my SunQM series papers posted at arXiv.org. If you are a qualified arXiv-endorser and willing to endorse anyone of my 20 papers, please let me know. Thank you very much for your help.