The Electromagnetic Effects

QGD cosmology predicts that in its initial state the universe only existed free $preons^{(+)}$ uniformly distributed in quantum-geometrical space, itself dimensionalized by the interactions between $preons^{(-)}$.

$Preons^{(+)}$ eventually combined to form particles and particles combined to form progressively more massive structures. The first particles to be formed were neutrinos, constituting the cosmic neutrino background and later formed the photons that form the cosmic microwave background radiation[4]. The isotropy of $preons^{(+)}$ in the initial state of the universe explains the isotropy of the CMBR.

However, observations suggest that most $preons^{(+)}$ in the universe are still free or form particles which momentums are too small for instrumental observation (that is: $\left\|\vec{P}_a\right\| < m_{e^-}$). These constitute what we may call the preonic field. Magnetic fields are regions of the preonic field polarized through interactions with particles that have non-zero spin angular momentum. And what we call the magnetic spin momentum is an effect of their dynamic structure which reflect or absorb free $preons^{(+)}$ directionally, hence polarizing polarizes them.

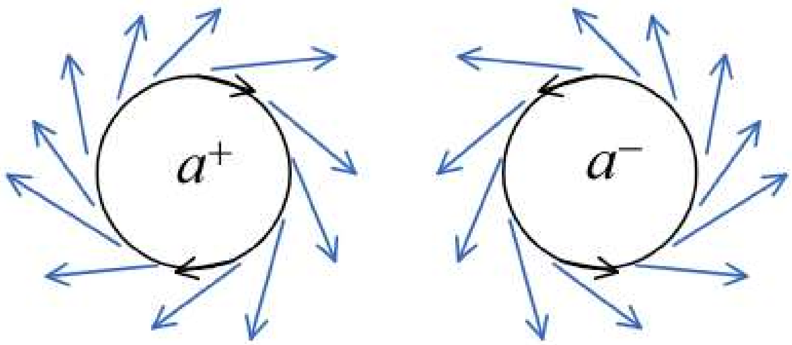
Another important consequence, described later in this section. is that so-called charged particles do not possess intrinsic electrical charges which is why we will use the expression *polarizing particles* to describe particles such as electrons, protons, muons and other so-called charged particles.

The Electromagnetic Effects of Attraction of Repulsion

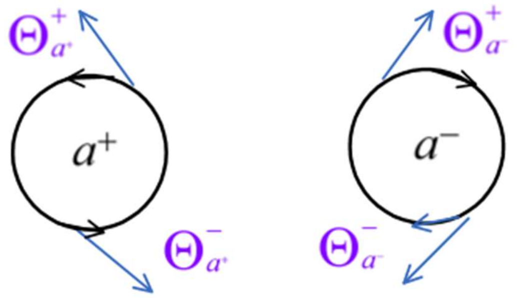
The preonic field is composed of free $preons^{(+)}$ that, in the absence of polarizing particles or structures, move in random directions. The momentum of unpolarized region of the preonic field is equal to zero. Free $preons^{(+)}$ interact with particles or structures matter in accordance with the laws of momentum which as we have seen govern preonics which is a generalization of optics. When the motion of components of a particle or structure are random, the absorbed and reflected $preons^{(+)}$ are also random so that its magnetic moment $\vec{\Theta}_a$ is equal to zero. That is:

[4] The mechanism of formation of particles and structures will be discussed in detail a section dedicated to the topic.

$\vec{P}_{\vec{\Theta}_a} = \sum_{i=1}^{m_\Theta} \vec{c}_i = \vec{0}$ where m_Θ is the number of $preons^{(+)}$ of the preonic field that interact with the particle and $\vec{c}_i$ the momentum vector of the i^{th} $preon^{(+)}$.



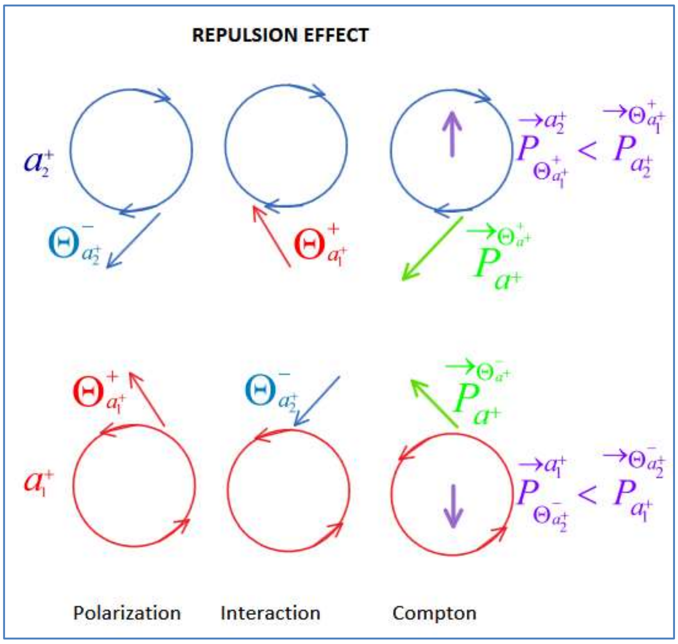
However, when a components of the particle or structure (an electron for example) are aligned, that is when it has a non-zero magnetic momentum, then absorbed and reflected $preons^{(+)}$ will consequently be aligned. The interactions between the preonic field and a polarizing particle or structure causes the polarization the preonic field and what we commonly refer to as a magnetic field. From the discussion about optical reflection, we know that the direction of the reflection will depend on the direction of the particles the $preons^{(+)}$ will interact with. The figure above is a diagram that illustrates the dependency of the reflection of $preons^{(+)}$ on the orientation of a particle or structure. The black vectors represent the direction of the components of the particles or structures a^+ and a^-, and the blue vectors represent the polarization of the preonic field in the regions neighbouring them.



When two polarizing particles or structures come into proximity, they each interact with each other's polarized preonic field. The figure on the left shows how we will represent, and label polarizing particles or structures and the interacting regions of the polarized preonic field.

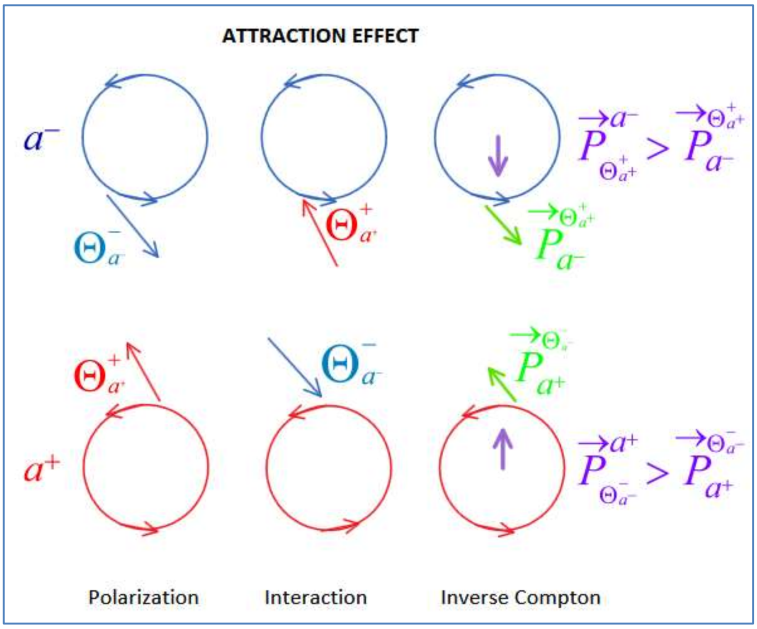
Compton Scattering and the Repulsion and Attraction of Charged Particles.

We have shown in the section on reflection of light that when applying the laws of momentum to the interaction between photons and atomic electron that the Compton scattering occurs when $\overset{\rightarrow e^-}{P_\gamma} > \overset{\rightarrow \gamma}{P_{e^-}}$ and the inverse Compton scattering when $\overset{\rightarrow e^-}{P_\gamma} < \overset{\rightarrow \gamma}{P_{e^-}}$ where γ is the incident photon and $\overset{\rightarrow e^-}{P_\gamma}$ and $\overset{\rightarrow \gamma}{P_{e^-}}$ are respectively the momentum of the $preons^{(+)}$ emitted by the electron and the momentum imparted by the photon with which it interacts. Conservation of momentum requires that the momentum of the electron must change by a vector of equal magnitude but inverse direction of the sum of $\overset{\rightarrow e^-}{P_\gamma}$ and $\overset{\rightarrow \gamma}{P_{e^-}}$. That is, $\Delta \vec{P}_{e^-} = -\left(\overset{\rightarrow e^-}{P_\gamma} + \overset{\rightarrow \gamma}{P_{e^-}} \right)$. This implies that if $\overset{\rightarrow e^-}{P_\gamma} > \overset{\rightarrow \gamma}{P_{e^-}}$ then the momentum vector of the electron will increase in the direction opposite of the point of interaction by $\Delta \vec{P}_{e^-}$. Inversely, if $\overset{\rightarrow e^-}{P_\gamma} < \overset{\rightarrow \gamma}{P_{e^-}}$ then the electron's momentum vector will increase towards the point of interaction by $\Delta \vec{P}_{e^-}$. Whether we have a Compton or reverse Compton scattering depends on the relative direction of the photon and electron (or particle or structure). That is, based on the laws of momentum, if the photon and electron at the point of interaction move directly towards each other, then $\overset{\rightarrow e^-}{P_\gamma} > \overset{\rightarrow \gamma}{P_{e^-}}$ and if their trajectories intersect tangentially, then $\overset{\rightarrow e^-}{P_\gamma} < \overset{\rightarrow \gamma}{P_{e^-}}$. The Compton scattering and its inverse are special cases of preonic interactions which can explain the effects of repulsion and attraction between polarizing particles.



The figure on the left illustrates the interaction between two oppositely polarizing particles (a^+ and a^-). The circular vectors represent the angular momentum of the particles and the blue and red vectors correspond to the direction of the polarization preonic field respectively. Since the polarization of $\vec{\Theta}^+_{a_1^+}$ is opposite to orientation of a_2^+ then $P^{\to a_2^+}_{\vec{\Theta}^+_{a_1^+}} < P^{\to\vec{\Theta}^+_{a_1^+}}_{a_2^+}$ and $\Delta\vec{P}_{a_2^+}$ will point away from $\vec{\Theta}^+_{a_1^+}$, thus a_2^+ will move away from a_1^+.

Similarly, the polarization of $\vec{\Theta}^-_{a_2^+}$ is opposite the orientation of a_1^+ so that $P^{\to a_1^+}_{\vec{\Theta}^-_{a_2^+}} < P^{\to\vec{\Theta}^-_{a_2^+}}_{a_1^+}$, consequently a_1^+ will move away from a_2^+. This explains the effect of repulsion between two similarly charged particles (and structures).



In the figure on the right, we have two particles of opposing polarization. Here since the polarization of the region $\vec{\Theta}^+_{a^+}$ is opposite to the orientation of a^- and the region $\vec{\Theta}^-_{a^-}$ is polarized in opposite the orientation of a^+ then $P^{\to a^-}_{\vec{\Theta}^+_{a^+}} > P^{\to\vec{\Theta}^+_{a^+}}_{a^-}$ and $P^{\to a^+}_{\vec{\Theta}^-_{a^-}} > P^{\to\vec{\Theta}^-_{a^-}}_{a^+}$ and as a result $\Delta\vec{P}_{a^+}$ will point to a^- and $\Delta\vec{P}_{a^-}$ will point to a^+. Therefore a^+ and a^- will move towards each other and appear to be attracted.

As we have shown, the observed repulsion between like polarizing and attraction between particles does not result from repulsion and attraction between the particles themselves but from their interactions with the preonic regions polarized between them.

Also, since the polarized $preons^{(+)}$ are emitted radially from a polarizing particle or structure, the intensity or momentum of the polarized region follows the inverse square law. In fact, the inverse square law of the momentum of a magnetic field is a consequence of QGD's preonics.

Interaction between Large Polarizing Structures and the Preonic Field

Large structures that have aligned polarizing particles behave has one single polarizing particle. The main difference is that the effect of a large number of bounded and aligned polarizing particles creates more intense polarization over a much larger region of the preonic field.

Based on QGD's description electromagnetic effect, we can infer that the momentum of the preonic field polarized by a particle (its magnetic moment) is proportional to the product of the magnitude of angular spin momentum of the particle by the density of the preonic field. That is:

$\vec{\Theta}_a^{+/-} \propto \left\|\vec{S}_a\right\| dens_{p^{(+)}} \vec{c}$, where a is a polarizing particle, $\vec{S}_a$ and $dens_{p^{(+)}} = \frac{m_R}{Vol_R}$, that is, the number of $preons^{(+)}$ in the region R and $\vec{c}$ is the fundamental momentum .

The momentum imparted to a particle b by a preonic field polarized by a particle a at a distance r is $\left\|\Delta\vec{P}_b\right\| \propto \frac{\left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\|}{r^2}$ where $\vec{\Theta}_a^{+/-}$ is the momentum of the polarized preonic field generated by a and $\vec{S}_b$ is the spin angular momentum of the interacting particle or structure.

Note: In a following section, we will discuss how the dynamics of atomic electrons follow from QGD's laws of momentum.

Electromagnetic Acceleration Particles and Theoretical Limits

As we have seen here, the momentum $\vec{c}$ of a $preon^{(+)}$ is intrinsic and fundamental. All properties are invariable except for their trajectories.

When a magnetic field imparts momentum to a polarizing particle, QGD predicts:

1. The mass of the particle increases by the sum of $preons^{(+)}$ it absorbs (which mechanism we describe here),

2. Its momentum increases by the sum momentum of the absorbed $preons^{(+)}$,
3. As consequence of the constancy of the momentum of $preons^{(+)}$, the spin angular momentum of a particle must decrease as its linear momentum increases. The follows from the relation $\sqrt{\left\|\vec{P}_b\right\|^2+\left\|\vec{S}_b\right\|^2}=m_b c=E_b$ and consequently
4. the polarization potential of a particle being a function of its spin angular momentum, a particle becomes increasingly less polarizing as it gains linear momentum, thus its capacity to interact with the preonic field decreases. In other words, the particle becomes increasingly neutral.

The momentum imparted by a uniform magnetic field to a polarizing particle is proportional to the product of the momentum of the momentum of the magnetic field, by the distance it travels, by the angular spin momentum of the particle.

The total momentum imparted by a magnetic field is then given by $\sum_{i=1}^{n}\left\|\underset{i}{\Delta}\vec{P}_b\right\| \propto \left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\| l$

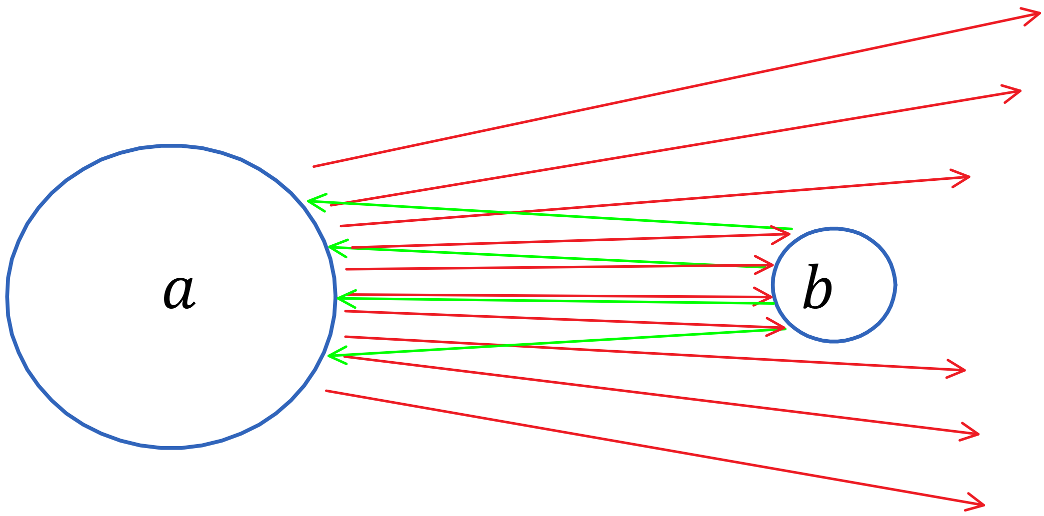
where n is the number of momenta imparting events along the particle's trajectory of length l. And the momentum imparted by the magnetic field for each individual event must equal or greater than the minimum permitted change in momentum that is: $\left\|\underset{i}{\Delta}\vec{P}_b\right\| = xm_b$ or $\left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\| = xm_b$.

Also, $\sqrt{\left\|\vec{P}_b\right\|^2+\left\|\vec{S}_b\right\|^2}=m_b c$,and $\underset{i}{\Delta}\vec{P}_b \propto \left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\|$ implies that the momentum imparted by a uniform magnetic field decreases as its linear momentum increases and as a consequence we can predict that the particle will cease to be accelerated by the magnetic field when its spin angular momentum falls below a certain value such that $\left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\| < m_b$. Below this minimum value, a magnetic field, not matter how powerful, will have no effect. It follows that the particles can not be accelerated or redirected by a magnetic field, which would lead to greater loses of accelerated particles in a circular electromagnetic accelerator than with a linear accelerator.

Asymmetric Polarization of the Preonic Field and Atomic Neutrality

It is currently believed that the electromagnetic interaction between any two polarizing particles at a given distance will have the same absolute value. The repulsion effects of any two like-polarizing particles is predicted to be same regardless of the type of particle as should the attraction between any two oppositely charged particles.

But if, as we have suggested, particles have no intrinsic charge, hence have no electrical charge, which leaves only the electromagnetic repulsion and attraction between particles which, as we have seen, is due to their interactions with the preonic field polarized as explained earlier. The repulsion or attraction between particles will be different depending on their type. That is, the momentum imparted by attraction or repulsion between two different types of particles is not symmetric.



In the figure above, the circles labeled a and b respectively represent two different types of particles electromagnetically interacting. The red and green arrows indicate the direction of polarizations of the preonic field from a and b. The momentum that can be imparted to one particle interacting by the other's polarized field is $\Delta\vec{P}_a \propto \frac{\left\|\vec{\Theta}_b^{+/-}\right\|\left\|\vec{S}_a\right\|}{r^2}$ (green arrows) and $\Delta\vec{P}_b \propto \frac{\left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\|}{r^2}$ (red arrows touching b). It follows that $\left\|\vec{\Theta}_b^{+/-}\right\|\left\|\vec{S}_a\right\| \neq \left\|\vec{\Theta}_a^{+/-}\right\|\left\|\vec{S}_b\right\| \rightarrow \Delta\vec{P}_a \neq \Delta\vec{P}_b$.

QGD Prediction

From this, we can predict that the momentum imparted through the electromagnetic interactions between a proton and an electron will differ from that between a proton and a muon, or between a positron and an electron. This allows QGD to make unique predictions that distinguishes from classical electrodynamics.

This prediction may be tested experimentally by comparing measurements of electromagnetically imparted momentums of particles to measurements of gravitationally imparted momentums.

If classical electrodynamics is correct and particles have intrinsic charges, then $\frac{\Delta\vec{P}_a}{\Delta\vec{P}_b} = \frac{\Delta\vec{G}_a}{\Delta\vec{G}_b}$ where $\Delta\vec{P}_x$ is an electromagnetic imparted momentum and $\Delta\vec{G}_x$ is gravitationally imparted momentum.

If QGD is correct and particles have no intrinsic charges, then $\frac{\Delta\vec{P}_a}{\Delta\vec{P}_b} \neq \frac{\Delta\vec{G}_a}{\Delta\vec{G}_b}$.

Atomic Neutrality and Valence

If electrons and protons do not have intrinsic electric charge, then to achieve atomic electrical neutrality is only achieved when $\vec{\Theta}^{+}_{p^+} = \vec{\Theta}^{-}_{e^-}$ where $\vec{\Theta}^{+}_{p^+}$ is the momentum of the polarization by the protons and $\vec{\Theta}^{-}_{e^-}$, that by the electrons, both taken outside the atomic radius.

The chemical valence of an elements can then be predicted from the relation between the protons and electrons polarization. We have two possibilities:

1. $\left\|\vec{\Theta}^{+}_{p^+} + \vec{\Theta}^{-}_{e^-}\right\| > 0$; two more atoms can form molecules. The number of chemical bonds depends on the valences of bounding atoms. Here $valence = \frac{\left\|\vec{\Theta}^{+}_{p^+} + \vec{\Theta}^{-}_{e^-}\right\|}{\left\|\vec{P}_{e^-}\right\|}$ where $\vec{P}_{e^-}$ is the orbital momentum of outer electrons of atoms.
2. $\left\|\vec{\Theta}^{+}_{p^+} + \vec{\Theta}^{-}_{e^-}\right\| \leq 0$; atoms that are chemically inert, thus cannot form chemical bonds with other atoms.

Final Notes and Testable Predictions of QGD's Electromagnetic Effects Description

In the absence of any intrinsic electrical charge, the interaction between polarizing particles must be completely accounted for by the electromagnetic and gravitational effects.

This, if correct, would greatly simplify calculations of, for example, the behaviour of polarizing particles in a magnetic field, so how can QGD's description of the electromagnetic effects be tested?

QGD Prediction

QGD predicts also predicts that dark matter is composed of free $preons^{(+)}$, the same $preons^{(+)}$ which when polarized form magnetic fields. Since the density of dark matter (or preonic density) is greater in center of galaxies than at its periphery, then the magnetic moment of polarizing particles and magnetic fields of structures in the center of galaxies should be greater than those of similar particles or structures in the outer regions of galaxies.

Therefore, observation of the Zeeman effect lines should show that the magnetic fields of stars near the center of our galaxy are greater than those of comparable stars at the outskirt of our galaxy.

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