Section C:

TEST OF NEW THEORY

"*Here and my trials for the present, the results are negative, they do not shake my strong feeling of the existence of a relation between gravity and electricity though they give no proof that such a relation exists*"

Michael Faraday (1791–1867)

Chapter 5

Applying Force Line Elements Theory to Earth's Magnet

5.1 Inconsistency Between Relativity Theory and Gauge Theory, Relation Between Gauge Symmetry and Introduction of the Gravitational Force Line

An electron's wave function ψ (*x.t*) is given by

$$\psi\,(x.t) = \cos\,[2\pi\,(\frac{x}{\lambda} - vt)] + i\,\sin\,[2\pi\,(\frac{x}{\lambda} - vt)] \qquad 5\text{-}1\text{-}1$$

as a matter–wave according to $\lambda = \hbar/mv$.

When attempting a phase transformation of $e^{i\Lambda(x)}$ ψ (*x.t*), the expectation value of the momentum changes and this could cause gauge symmetry to break.

$$\psi'(x) \longrightarrow e^{i\Lambda(x)}\,\psi(x)$$

$$\frac{d\psi'}{dx} \longrightarrow \frac{d}{dx}\{\,e^{i\Lambda(x)}\psi(x)\}$$

$$\frac{d\psi'}{dx} = \frac{d}{dx}\left(e^{i\Lambda(x)}\right)\psi(x) + e^{i\Lambda(x)}\frac{d\psi}{dx}$$

$$= ie^{i\Lambda(x)}\,\frac{d\Lambda(x)}{dx}\psi(x) + e^{i\Lambda(x)}\,\frac{d\psi}{dx} \qquad 5\text{-}1\text{-}2$$

$$< P > = \psi^*\,\frac{h}{2\pi}\frac{d\psi}{idx} \longrightarrow < P' > = (\psi')^*\,\frac{h}{2\pi i}\frac{d\psi'}{dx}$$

$$< P' > = (\psi')^*\,\frac{hd\psi'}{2\pi idx}$$

$$= [e^{i\Lambda(x)}\psi]^*\,\frac{h}{2\pi i}\,[i\,\frac{d\Lambda(x)}{dx}e^{i\Lambda(x)}\,\psi\,(x) + e^{i\Lambda(x)}\frac{d\psi}{dx}]$$

$$= \frac{h}{2\pi i}\,[i\psi^*\,\frac{d\Lambda}{dx}\,\psi + \psi^*\,\frac{d\psi}{dx}]$$

$$= \frac{h}{2\pi i}(i\psi^*\,\frac{d\Lambda(x)}{dx}\,\psi) + < P > \qquad 5\text{-}1\text{-}3$$

This momentum of an electron, referred to as mechanical momentum ($mv = \frac{\hbar}{\lambda}$), can interact with the Newtonian gravitational force. Nevertheless, in order to remove such change of the expectation value of the momentum $\frac{h}{2\pi i}(i\psi^* \frac{d\Lambda(x)}{dx}\psi)$ in Eq. 5-1-3 and to maintain gauge symmetry, we have to insert the electromagnetic field that is formed by the classical electro dynamical force line. If so the phase transformation at this point would be

$$\psi'(x) \longrightarrow e^{i\Lambda(x)}\,\psi(x) \qquad 5\text{-}1\text{-}4$$

$$A'(x) \longrightarrow A\,(x) - \frac{d\Lambda(x)}{dx}$$

$$< P' > = \psi'^* \frac{h}{2\pi i}[\frac{d}{dx} + i\,A'(x)]\psi'$$

$$= (e^{i\Lambda(x)}\psi)^* \frac{h}{2\pi i}[\frac{d}{dx} + i\left(A\,(x) - \frac{d\Lambda(x)}{dx}\right)]\,e^{i\Lambda(x)}\,\psi$$

$$= (e^{i\Lambda(x)}\,\psi)^* \frac{h}{2\pi i}\,\frac{d}{dx}\,(e^{i\Lambda(x)}\,\psi)$$

$$+ (e^{i\Lambda(x)}\,\psi)^* \frac{h}{2\pi}\left(A(x) - \frac{d\Lambda(x)}{dx}\right)e^{i\Lambda(x)}\psi$$

$$< P' > = \psi'^* \frac{h}{2\pi i}\left[\frac{d}{dx} + iA'(x)\right]\psi'$$

$$= \frac{h}{2\pi i}\,(\,i\psi^* \frac{d\Lambda}{dx}\psi + \psi^* \frac{d\psi}{dx} + i\psi^* A\,(x)\psi - i\psi^* \frac{d\Lambda}{dx}\,\psi)$$

$$= \psi^* \frac{h}{2\pi i}\,[\,\frac{d}{dx} + iA\,(x)\,]\psi = < P >$$

$$\therefore < P' > = < P > \qquad 5\text{-}1\text{-}5$$

Hence, the momentum is unchanged and gauge symmetry is maintained.

The important factor here is that the electromagnetic field momentum $\frac{h}{2\pi}A(x)$ (a momentum also formed by force lines and force line elements) is added to the mechanical momentum of an electron $\frac{h}{2\pi i}\frac{d}{dx}$ (of course this momentum can be interacting gravitationally). In other words, the real momentum is not $\psi^*\,(\frac{h}{2\pi i}\frac{d}{dx})$ but rather $\psi^*\,\frac{h}{2\pi i}\,[\frac{d}{dx} + iA(x)]\,\psi$.

Thus, in order to establish the sum of such momentum, the electron as a wave packet (formed by a matter wave) is required to have a gravitational force line and gravitation force line element as a physical reality. With this physical reality, the electron can interact with the electromagnetic force line (introduced by M. Faraday) for maintaining gauge symmetry. Consequently, gauge symmetry requires the "existence of the gravitational force line." Therefore, the classical general theory of relativity as curved empty space theory is rejected by the existence of the gravitational force line. Additional reasons follow.

First, gauge invariance from gauge symmetry is a prerequisite for the law of energy conservation. But, because the classical curved space theory of relativity lacks the force line and force line element as a physical substance and physical realities, it is a big problem for this theory to satisfy the law of energy conservation.

Second, the curved space theory of general relativity cannot distinguish geometry and physics, because the result of gravitational interaction by this theory is only a change of pure empty space, so automatically physics become mathematics. However, because physics is not mathematics (geometry), the curved space theory of relativity became unacceptable as a physical theory. An electron that follows classical electromagnetic theory as a force line theory, has a force line, and can satisfy gauge symmetry. Thus, the requirement of gauge symmetry for the "electromagnetic field $A(x)$ to be inserted" in turn requires "gravitational force line to have existed," and this requirement of gauge symmetry transforms as the "gravitational force line needs to be inserted into the electromagnetic force line" in order to satisfy relativity. We can visualize such physical requirement in Figures 5-1-1 and 5-1-2.

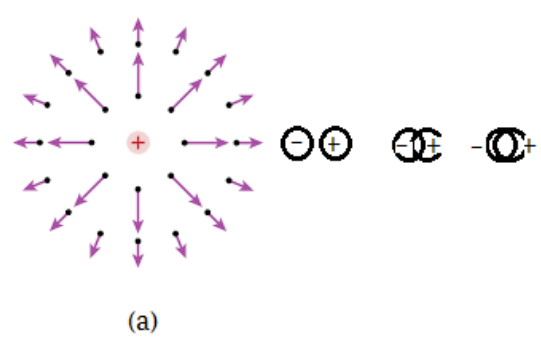


Figure 5-1-1 Electromagnetic force line alone

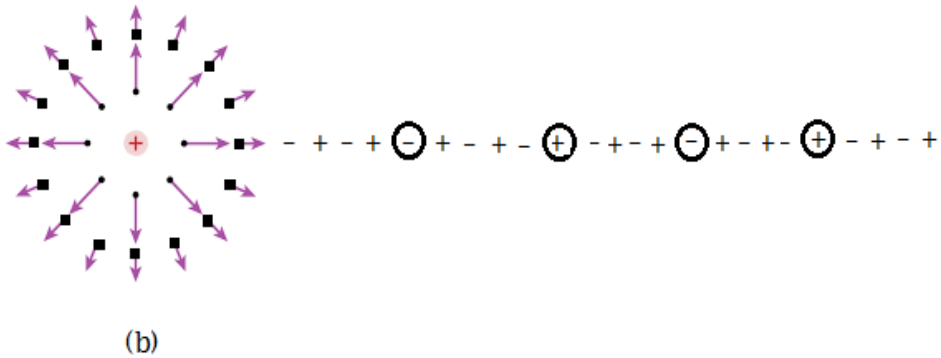


Figure 5-1-2 Gravitational force lines inserted into an electric force line and its elements

According to the requirement of gauge symmetry, as seen in Figure 5-1-2, the gravitational force line is inserted between the electric monopole of electromagnetic force line. At this point, one component of the gravitational force line is called the "force line elements of gravity," and one component of the force line element is called the "monopole of gravitational force line." One such force line element of gravity is illustrated in Figure 5-1-3.

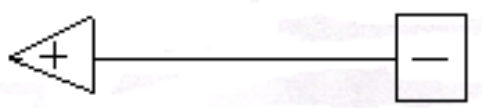


Figure 5-1-3

As discussed in §4.3, the electromagnetic monopole is called the source monopole of the gravitational force line. The rule for sketching an electromagnetic field with force lines as vectors are as follows:

(1) Because the field falls off as $\frac{1}{r^2}$, the vector gets shorter as they move farther away from the origin.

(2) They always point radially outward.

(3) They emanate from a point charge symmetrically in all directions.

(4) Field lines begin at the positive charge and end at the negative ones.

(5) They cannot simply terminate in midair, although they may extend to infinity.

(6) Field lines can never cross.

According to such sketch rule, an 8 times stronger effect from the curved motion of a force line element is required to satisfactorily visualize one electromagnetic force line element (see Figure 5-1-4.

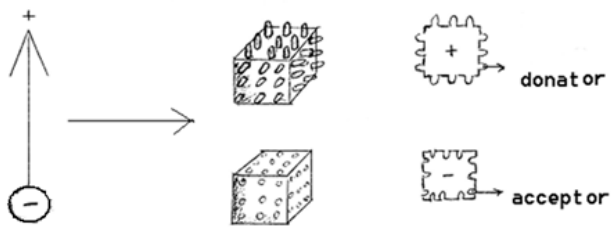


Figure 5-1-4

According to the same condition, we can visualize one gravitational force line element, as illustrated in Figure 5-1-5.

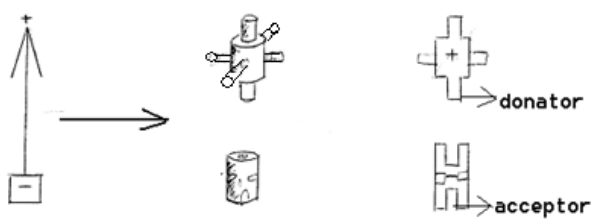


Figure 5-1-5

In reality, one of the electromagnetic force line element has 10^{21} acceptors of gravitational force line elements, but Figure 5-1-4 shows only a few acceptors and donators. The actual end of the gravitational force line and electromagnetic force line must be a soft curve, in order to have free movement under any condition possible.

Now, according to the requirement of gauge symmetry $[\psi^* \frac{h}{2\pi i}(\frac{d}{dx}+iA(x))\psi]$, we can visualize one electromagnetic force line element with a gravitational force line of $\pm g$; (see Figure 5-1-6).

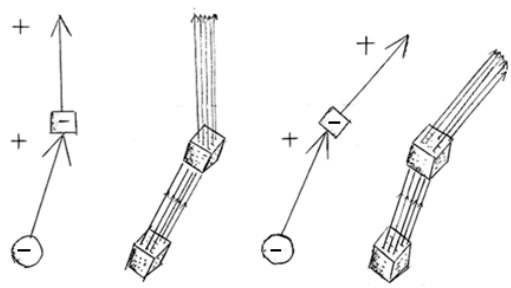


Figure 5-1-6

When particles interact gravitationally, the particles in fact are interacting with the gravitational force line from which the last electromagnetic monopole of the particles surface came. This physical situation is shown in Figure 5-1-7.

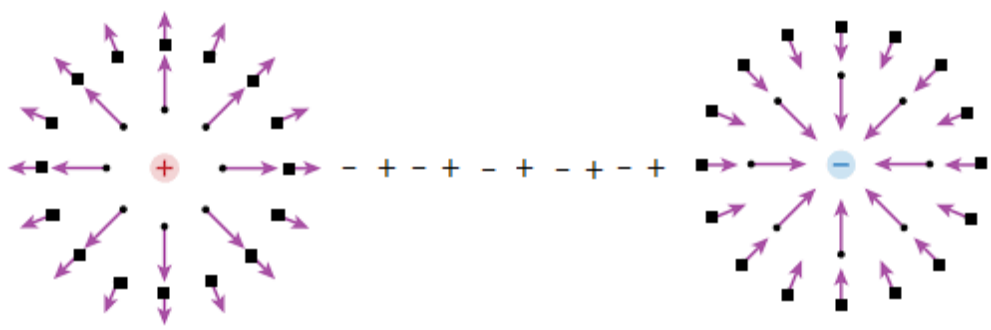


Figure 5-1-7

Because the gravitational force line can be thought of as being an extra- force line of the extended electromagnetic force line, as seen in Figure 5-1-7, we can also think of the gravitational field as being an extra extended field of the electromagnetic field. Therefore, we can express the gravitational field as $\mathbb{E}$, and because the magnetic field B is generated from the electric field E, the gravitomagnetic field from a gravitational field can be expressed as magnetic field $\mathbb{B}$, and likewise the electrospin field S, can be expressed as the gravitospin field $\mathbb{S}$. Here we can define the surface area of the electric monopole as $21U_oF_e$, and the surface area of the gravitational monopole as $1U_oF_e$, where U_oF_e is the related dimension. Nevertheless gravito magnetic field strength is very weak, we can observe this weak gravito magnetic field direct on the sun's atmosphere as Sun's Loop (cf.§15)

5.2 Newton's Law of Universal Gravitation Described by Force Line Elements Theory

Beyond gravitational force line elements, there must be opposite signs for the gravitational charge (mass) of an electron and a proton (i.e., there must be a positron and antiproton, according to gauge symmetry and charge symmetry as a universal requirement of nature called gravitational charge asymmetry that cause of CP violation in weak interaction) as well as opposite signs for the gravitational charge (mass) of a neutron and an antineutron. Moreover, in nature opposite signs of the gravitational charge (mass) of each particle ($m_{\mathrm{p}}^{+}m_{\mathrm{p}}^{-}$) must also exist. Therefore, with gravity, existence of a positive mass and a negative mass ($m^{+}m^{-}$) is possible, just like the positive charge and negative charge ($e^{+}e^{-}$) in classical electromagnetic theory (cf. §17, §18, §24).Therefore new definition of anti particle and anti matter is required. Each single particle can have its anti particle, but this anti particle is not anti matter. Because usual atoms have a structure with electron, proton and neutron, it can have anti matter with positron anti proton and anti neutron. However, electron, proton and neutron each particle don't make a system, they can have only it's anti particle as positron, anti proton and anti neutron. Example alone of positron is not anti matter. However, alone of anti hydrogen is anti matter.

This new definition is very important for problems of CP violation (cf.§6.5), origin of excess positron(cf.§21) and future of universe to solve(cf.§13,§24).

Finally there must be an attractive force and repulsive force ($F_{\mathrm{g}}^{+}F_{\mathrm{g}}^{-}$) in gravity similar to the electromagnetic attractive force and repulsive force ($F_{\mathrm{e}}^{+}F_{\mathrm{e}}^{-}$). (The proof for the mass dipole is in §17 and §18.)

A shell particle (photon) that is formed only by shell material (bundle of force line elements) likely has a positive mass and a negative mass just before emission. Because the photon is formed by a pair of bundled force line elements from a pair of massive particles and any pair of charged particles has opposite signs of charge and mass, the force line bundles screen each mass by each force line of each charge; therefore, these bundles each have a different sign of mass. Globally, however, they are gravitationally electrically neutral, and so they still satisfy gauge symmetry and gauge invariance. Usual material (i.e., formed by seed material and shell material) is a system formed by protons and electrons, and because a neutron decays a proton and an electron out of

the nucleus, in a broad sense a neutron is a system formed by electrons and protons. However, because usual material has an electromagnetic force that is 10^{21} times stronger than gravitational force (and at the same time it has an original strong force that is 10^{28} times stronger than gravitational force), any repulsive interaction between like mass signs of proton mass (m_{p}^{+}) and neutron mass (m_{n}^{+}) is blocked in the long range, along with attractive interaction between the different electric charge signs of protons and electrons (as well as different strong charge signs of protons and neutrons), so usual material is neutralized electrically by reactions of the short range.

After this electrical neutralization of usual material, only attractive forces as gravitational dipoles remain for long-range reactions. Now, because in usual material, the number of gravitational dipoles is proportional to the mass of the gravitation system of the object, we can satisfy the established condition of Newton's law. Thus, the statement "the attractive force between objects is proportional to the mass of the object" consequently becomes "despite that globally like-sign masses (e.g.,$m^{+}m^{+}$ between protons and protons in atoms of elements of objects) must act repulsively gravitationally, they in fact act attractively, because locally, there must exist a dipolar electromagnetic force and a dipolar strong force." The physical meaning of such statement is the same as that from gauge symmetry for relativity to be satisfied. Namely, "for maintaining gauge symmetry, an electromagnetic field $A(x)$ must be inserted," because the expectation value of the Newtonian mechanical momentum of an electron is changed by phase transformation. For such changed Newtonian gravitational momentum to be absorbed the electromagnetic field as a compensation field of the dipole moment must be inserted. For this is needed insertion of the electromagnetic force. The logical justification of such postulate that a gravitational force line and gravitational dipole moment must exist and be introduced, is guaranteed by gauge symmetry. In other words the positive sign mass (m^{+}) reacts to the negative sign mass (m^{-}) of another particle, and the negative sign mass (m^{-}) reacts to the positive sign mass (m^{+}) of the particle. This means that because the total wave function is

$$\Psi_{\mathrm{total}} = \psi_{\mathrm{orbital}} \cdot \psi_{\mathrm{spin}} \qquad 5\text{-}2\text{-}1$$

when the spin wave function is asymmetrical, the orbital function can be symmetrical. This is what makes the covalent bond of a H_2 molecule

possible, despite it being composed of only a pair of 1 proton plus 1 electron. Without such spin asymmetry and orbital symmetry between H atoms, there would only be repulsive action according to the Pauli principle, as demonstrated in Figure 5-2-1.

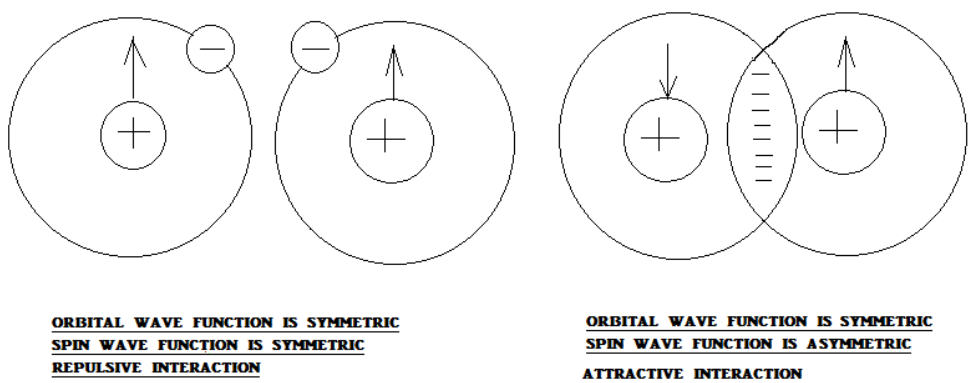


Figure 5-2-1

According to electromagnetic attractive interaction and strong attractive interaction, there are gravitational attractive interactions.

Therefore, Newton's 2nd law of motion can be expressed by such polarizable gravitational field:

$$F = ma = m\left(\frac{G_0 M}{r^2}\right) = m\mathbb{E}, \qquad \mathbb{E} = \frac{G_0 M}{r^2} \qquad 5\text{-}2\text{-}2$$

where G_0 is the gravitational constant in a vacuum. Such gravitational field $\mathbb{E}$ follows the theory of relativity in the same way as the electric field E discussed in §4.4. Thus, when a particle moves with constant velocity v, it produce a magnet field $\mathbb{B}$ same as the magnetic field B in §4.4. Such magnetic field is called the mass-magnetic field or gravitomagnetic field. Namely,

$$\mathbb{E}' = \frac{\mathbb{E}}{k}$$

$$= \frac{G_0 M\left(1-\frac{v^2}{c^2}\alpha\right)}{r^2\left(1-\frac{v^2}{c^2}\alpha\ \sin^2\theta'\right)^{\frac{3}{2}}}$$

$$= \mathbb{E}\left(1-\frac{v^2}{c^2}\alpha\sin^2\theta'\right)^{-½}$$

$$= \mathbb{E} + (\frac{1}{2}\frac{v^2}{c^2}\alpha \sin^2\theta')\ \mathbb{E} \qquad 5\text{-}2\text{-}3$$

Because $A \times B = AB \sin\theta$

$$\mathbb{E}' = \mathbb{E} + (v \times \frac{1}{c^2}(v \times \mathbb{E}) \qquad 5\text{-}2\text{-}4$$

When $\frac{1}{c^2}(v \times \mathbb{E}) = \mathbb{B}$, we obtain

$$\mathbb{E}' = \mathbb{E} + v \times \mathbb{B}$$

$$= \mathbb{E} + v\,\mathbb{B} \qquad 5\text{-}2\text{-}5$$

5.3 Theoretical Value of Magnetic Field $\mathbb{B}$ Generated from Mass and the Real Observed Value

This gravitomagnetic field $\mathbb{B}$ of curved force line elements theory applies to massive astronomical objects (e.g., Earth, the sun, stars, galaxies, cosmos discussed in §15), and can explain and predict quantitatively and qualitatively phenomena that modern physic has not been able to explain so far, despite the low energy state of broken symmetry(cf §15). Such phenomena include about Earth's magnet, its dipole form, its movement to a western direction and its slow weakening, its periodic polarity reversal, and about the sun's magnet and sunspots, its periodic generation, its energy and energy scale, its periodic magnetic polarity reversal, the big energy scale of flare, etc.

Because Dynamo theory uses rotating, converting, and electrically conducting fluid, this theory cannot explain source of electricity of fluid. Namely, source of magnetism of astronomical objects is explained by electricity. That is only extended classical electrodynamics. Therefore, this theory is meaningless for true relation between gravity and electricity to explain.

The discussion so far that gravitational mass is a weak electric charge has already been presented in §4.3. To prove the logical and physical justifications of such discussion, I will only touch on here about the four factors of Earth's magnet.

Because mass is a weak electric charge, when an electric current flows through a wire loop (Figure 5-3-1(a)), creating a wire loop-shaped

mass loop rotation (Figure 5-3-1(b)), a magnetic dipole moment is generated.

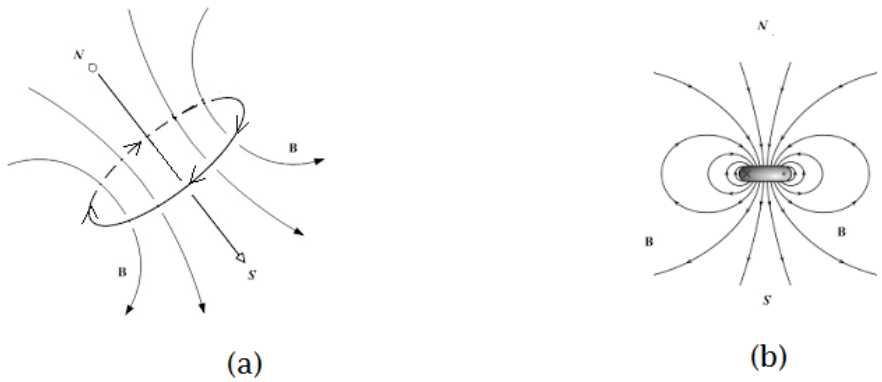


Figure 5-3-1

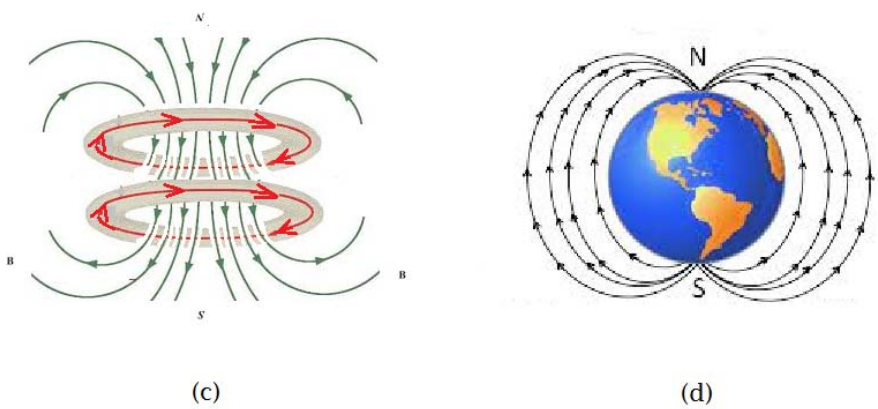


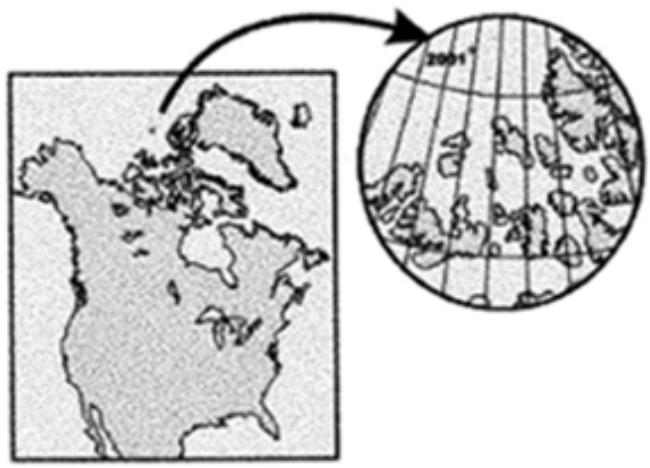
Figure 5-3-2

Now, because Earth can be thought of being formed by copious mass loops (Figure 5-3-2(c)), Earth rotation could generate a dipole form of the magnetic field $\mathbb{B}$ (Figure 5-3-2(d)). The following pages give an explanation from National Resources Canada on the position of both magnetic poles.

> "The Earth's magnetic field is shaped approximately like that of a bar magnet and, like a magnet, it has two magnet poles, one in the Canadian arctic, referred to as the North Magnetic Pole, and one off the coast of Antarctica, south of Australia, referred to as the south Magnetic Pole. At the North Magnetic Pole the Earth's magnetic field is directed vertically

downward relative to the Earth's surface. Consequently, magnetic dip, or inclination, is 90°. In addition, the North Magnetic Pole is the eventual destination for a traveler who follows his or her compass needle from anywhere on Earth. The north Magnetic Pole is slowly drifting across the Canadian Arctic. The Geological Survey of Canada keeps track of this motion by periodically carrying out magnetic surveys to redetermine the Pole's location. The most recent survey, completed in May 2001, determined an update position for the Pole and established that it is moving approximately northwest at 40 km per year. The observed position for 2001 and estimated positions for 2002 to 2005 are given in the table.

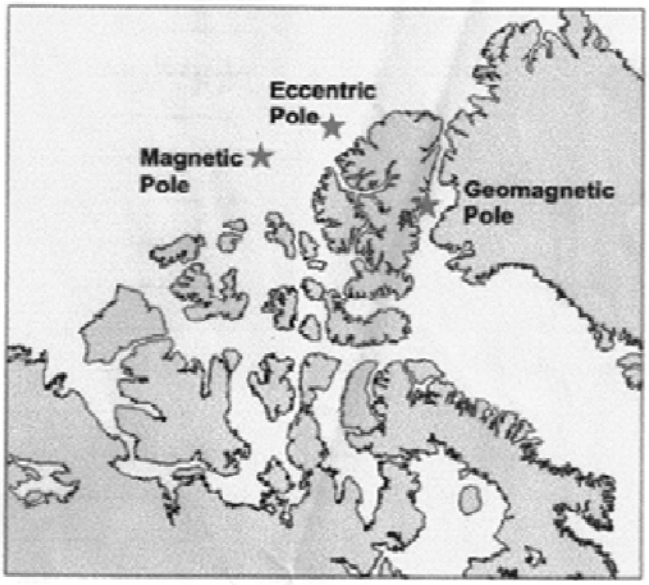
Year	Latitude (°N)	Longitude (°W)
2001	81.3	110.8
2002	81.6	111.6
2003	82.0	112.4
2004	82.3	113.4
2005	82.7	114.4



The magnetic field in the region of North Magnetic Pole experiences secular variation just like the magnetic field at any other location on the Earth's surface. To illustrate how this leads to the movement of the Magnetic Pole, consider Observer A, standing at the North Magnetic Pole on January 1. On that day he observes that the inclination is exactly 90°, as expected. Repeat observations made at exactly the same spot during the year show that the inclination is slowly decreasing. On January 1 of the following year he observes an inclination of $89^{o}57'$. During the same time interval, Observer B, who is standing 40 km northwest of observer A, notices that the inclination has increased to 90°. He is now at the North Magnetic Pole. So the slow motion of the Magnetic Pole across the Arctic is due to the secular

variation of the magnetic field, a process that originates in the outer core of the Earth, approximately 3000 km below the surface, the Magnetic Poles from which its location can be determined. This is periodically done for both poles, more regularly and frequently for the North Magnetic Pole.

Positions of Different Magnetic Poles for 2001		
Type of Pole	Position (North)	Position (South)
Geomagnetic	79.6° N, 71.6 W	79.6° S, 108.4° E
Eccentric	83.0° N, 93.3 W	75.0° S, 118.4° E
Magnetic (IGRF)	81.0° N, 110.0 W	64.6° S, 138.3° E
Magnetic (Observed)	81.3° N, 110.8 W	64.7° S, 138.0° E



It is also possible to estimate the position of the Magnetic Poles from a magnetic reference field model such as the IGRF. The positions calculated from the IGRF will differ from the observed positions but the differences are relatively small." [1]

The slope of the rotational axis of the Earth changes from 21.5° to 24.5° within a 41,000 year period. At the same time, the rotational axis of the Earth precesses in a 19,000 year to 26,000 year period (average 22,500 years), as shown in Figure 5-3-3.

1. Source: Canada National Resources, Geological Survey of Canada. 2008. *GSC Geo Magnetism – North Magnetic Pole*. Available at http://cgc.rncan.gc.ca/geomag/nmp/northpole_e.php (accessed June 2011). Reproduced with permission.

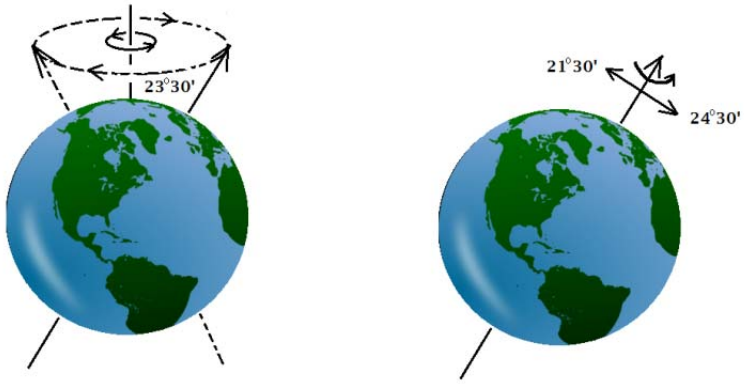


Figure 5-3-3

Meanwhile, Earth's orbit changes from an almost perfect circle to an ellipse in a 100,000 year period, while at the same time, the distance between Earth and the sun has changed more than 18,000,000 km, as shown in Figure 5-3-4.

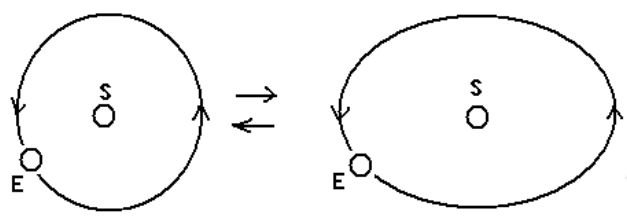


Figure 5-3-4

When the orbital radius of Earth changes, the gravitational potential energy changes accordingly, because the gravitational force line elements theory is essentially quantum theoretical, and can explain that such energy changes had happened discontinuously through energy changes of component particles of Earth's interior. Because component particles of Earth are bound by gravitational energy, the gravitational potential energy of Earth changes, and this gravitational energy shifts to the electromagnetic energy of the component particles, otherwise Earth would not be able to maintain stability of its gravitational system. Therefore m_L and its nuclear spin quantum number (NSQN) are changed. According to this NSQN change, there is a change in the

direction of Earth's magnetic force line, so even though the direction of Earth's rotation and its orbital motion is unchanged, the North Pole and South Pole of Earth's magnetic field changes with periodicity. Moreover, because the orbital radius of Earth is elongated, the gravitational potential energy of Earth wanes. Hence, this energy change shifts (absorption) to the electromagnetic energy of the component particles, and the associated Earth magnet is changed by this energy shift. When magnetic reversal occurs, the component of the opposite direction of the magnetic field is stronger and stronger. Therefore, offset between the existing magnetic field and reversal magnet field occurs. Thus, overall, Earth's magnet weakens at the period of reversal. When the orbital radius of Earth elongates, the orbital speed of Earth is greatly reduced according to the law of conservation of angular momentum:

$$L = MVR = K \qquad \text{5-3-1}$$

When the orbital speed is reduced, one region observed on Earth's surface will not be the same region to a distant guide star having the same rotation speed of Earth. Instead, a sagging of Earth's rotation occurs to the distant guide star, which is observed as preceding Earth's magnetic distribution (see Figure 5-7-2). But, because the preceding direction is opposite to the direction of Earth rotation and the angle between gravity and mass magnet, to an observer of Earth's surface, Earth's magnetic distribution would appear to be moving North-West. Such preceding of Earth's magnetic distribution appears too, because of Earth's precession.

So far, I have discussed the four factors of Earth's magnetic phenomena qualitatively only by considering that "mass is a weak electric charge," as discussed in §4.3. Because such consideration is qualitatively well applied to Earth's magnetic phenomena, we can expect that the quantitative predictions value and observations value agree well. Now, using the conversion factor of §4.3 in curved force line elements theory, $Tr = 1.043 \times 10^{-10}$ C/kg, we can quantitatively obtain the electric charge corresponding to Earth's mass of $m_E = 5.976 \times 10^{24}$ kg:

$$q_{\text{Earth}} = (5.976 \times 10^{24}\ \text{kg})\ (1.043 \times 10^{-10}\ \text{C/kg})$$

$$= 6.233 \times 10^{14}\ \text{C} \qquad \text{5-3-2}$$

Now, the electric field from this charge, given Earth's radius of $r_E = 6.378 \times 10^6$ m, is

$$E = \frac{q}{4\pi\varepsilon_o r^2}$$

$$E = \frac{6.233 \times 10^{14}\ \mathrm{C}}{4\pi\ (8.8541 \times 10^{-12}\ \mathrm{A.S}V^{-1}\mathrm{m}^{-1})\ (6.378 \times 10^6\ \mathrm{m})^2}$$

$$= 1.377 \times 10^{11}\ \mathrm{v/m} \qquad 5\text{-}3\text{-}3$$

But, because $F = ma$, $F = \frac{q}{E}$, $a = \frac{q}{m}E$, therefore

$$a = \frac{(6.233 \times 10^{14}\ \mathrm{c})(1.377 \times 10^{11}\ \frac{v}{m})}{(5.976 \times 10^{24}\ \mathrm{kg})}$$

$$= 14.362\ \mathrm{m/s^2} \qquad 5\text{-}3\text{-}4$$

The four component elements of Earth are oxygen, silicon, magnesium, and iron. The ratio of the proton and neutron in these four elements is P:N = 1:1, and the ratio of the magnetic moments of the proton and neutron is

$$\frac{\mu_n}{\mu_p} = -\frac{2}{3} \qquad 5\text{-}3\text{-}5$$

In force line elements theory, this magnetic ratio is given by the curve of the force line element; that is,

$$\frac{g_n}{g_p} = -\frac{3.772}{5.658}$$

So, the real difference is

$$\frac{\mu_n}{\mu_p} = -\frac{2}{3} \rightarrow \frac{g_n}{g_p} = -\frac{3.772}{5.658} \qquad 5\text{-}3\text{-}6$$

Therefore, the difference of force line curve is

$$\Delta g = 1.5 \qquad 5\text{-}3\text{-}7$$

This factor is called sometimes Earth's gravitomagnetic factor (EGM factor), and is expressed as

$$m_{EGM} = 1.5 \qquad 5\text{-}3\text{-}8$$

This value is the predicted value of the curved force line elements theory. The observational value of μ_n/μ_pin the standard model is

$$\frac{\mu_n}{\mu_p} = 0.68497945, \frac{1}{x} = 1.45989781$$

After big bang nucleosynthesis, number of big bang proton is changed neutron as stellar helium during stellar nucleosynthesis by stellar gravity.

Total difference by curve of electric force line and weak force line in stellar neutron as curve of force lines of helium is

$$\mathrm{d} = \Delta g^2 = (1.5)^2 = 2.25, d_{helium} = (2)(\Delta g)^2$$

$$= 4.5 \qquad 5\text{-}3\text{-}9$$

Ratio between changed curve of force line and original proton is

$$\mathrm{R} = \frac{4.5}{6.545979} = 0.687449 \qquad 5\text{-}3\text{-}10$$

Because difference by electrical permittivity of air at $\mathrm{g} = 8$ with keplerian missing factor $f_K = 1.202$ as $x_e = 1.005664$ (cf.§11,§13), real value is

$$R_{real} = \frac{0.687449}{1.005664} = 0.683577 \qquad 5\text{-}3\text{-}11$$

Because in the accelerating universe electric charge of mass center of universe is unchanged (cf.§24,§TB25), the real value of gravitational force and charge(rest mass) of all universe is observed to be $C_c = \frac{1}{0.683577} = 1.462893$ (correspondence number)time smaller (cf.§24,§TB25). Therefore, observational acceleration of gravity is

$$a_{Earth} = \frac{14.362 m/s^2}{1.463} = 9.817 \text{ m}/s^2 \qquad 5\text{-}3\text{-}12$$

We know that the ratio (at equator)/ (centrifugal acceleration) = 288.38

The gravitational permittivity of Earth (cf. §10. 6) is

$$x_1 = 1.073176 \qquad 5\text{-}3\text{-}13$$

the gravitational permittivity of air (cf. §10.2) is

$x_2 = 1.016774$ 5-3-14

and the electrical permittivity of air of quarks $\frac{1}{3}$e is

$$Q = \frac{0.000589}{3} = 0.000196$$

$x_3 = 1.000196$ 5-3-15

The additional effect of all the permittivity values is

$$d = \frac{x_1\, x_2}{x_3}$$

$$= \frac{(1.073176)(1.016774)}{1.000196}$$

$= 1.090964$ 5-3-16

Therefore, $\frac{\text{at equator}}{\text{centrifugal acceleration}} = 288.38$ becomes

$$\frac{288.38}{1.090964} = 264.34, \quad \frac{1}{264.34} = 0.003783$$ 5-3-17

The total effect is

$E = 1 + 0.003783 = 1.003783$ 5-3-18

Hence, the effective surface gravity at the equator is

$$a = \frac{9.817\ \mathrm{m/s^2}}{1.003783} = 9.780\ \mathrm{m/s^2}$$ 5-3-19

This value is the theoretical value of charge screening theory.

The observed value is

$a = 9.780327\ \mathrm{m/s^2}$ 5-3-20

Because the theoretical value agrees quite well with the observational value, we can calculate the magnetic field that is generated by Earth's mass with the formula of classical electromagnetic theory. Because all of Earth's mass can be treated as a mass point at Earth's center, we can use the magnetic formula

$$B = \frac{\mu_0 \frac{2}{5} QVR}{4\pi r^3} \qquad 5\text{-}3\text{-}21$$

However, the inertial constant of Earth (about the rotation axis of $C = 0.3306\ M_{\oplus}a^2$, and about the equatorial axis of $A = 0.3295 M_{\oplus}a^2$) is

$K = 0.3306 \approx 1/3$

$K = 0.3295 \approx 1/3$ 5-3-22

The formula would be

$$B_{\mathbb{B}} = \frac{\mu_0 \frac{1}{3} QVR}{4\pi r^3} \qquad 5\text{-}3\text{-}23$$

The revolution speed of Earth at the equator is

$V = 4.651 \times 10^2$ m/s 5-3-24

The radius of Earth is

$R = 6.378 \times 10^6$ m 5-3-25

The electric charge from Earth's mass is

$q = 6.233 \times 10^{14}$ C 5-3-26

The theoretical expected Earth magnetic field is

$$B_{\mathbb{B}} = \frac{(4\pi \times 10^{-7})\left(\frac{1}{3}\right)(6.233 \times 10^{14}\text{C})(4.651 \times 10^2\text{m/s})(6.378 \times 10^6\text{m})}{4\pi(6.378 \times 10^6\text{m})^3}$$

$= 2.38 \times 10^{-4}$ T

$= 2.38$ G 5-3-27

But, the Δg of mass is by $\frac{1}{C_c} = 0.683$, and that of the mass magnet is

$\Delta g = 1.463$, $\frac{1.463}{8} = 0.183$ 5-3-28

The theoretical expected equatorial magnetic field is therefore

$B_{\mathbb{B}} = (2.38\text{ G})\ (0.683)\ (0.183) = 0.297$ G

$$\approx 0.3 \text{ G} \qquad 5\text{-}3\text{-}29$$

The real observations value is

$$B = 0.29 \sim 0.40 \text{ G} \qquad 5\text{-}3\text{-}30$$

Because the theoretical and observed values match well, this confirms the discussion by curved force line elements theory that "mass is a weak electric charge" and "gravity is a weak of weak electrical force," a minimum guarantee of physical justification.

5.4 Mechanism of Earth Magnetic Reversal, and its Period

Previously discussed were three periodic movements of Earth's rotation and revolution, namely the periodic change of axial tilt of Earth (41,000 years), the periodic change of the Earth precession (19,000 years to 26,000 years average 22,500 years),and the periodic change of the orbital radius of Earth (100,000 years). Accordingly, accompanying such changes are changes in the gravitational potential energy and related angular momentum energy. During such global gravitational energy changes, there is a shift to the electromagnetic energy of the local component particle of Earth (electrical energy absorbed by the component particles), because component particles that are electromagnetic particles at the same time follow quantum theory, meaning each proton and neutron of Earth experiences quantum theoretical change.

In other words, because all the component particles of Earth are changed globally, collectively, and quantum theoretically, so too are the component particles' protons and neutrons changed (transition), from the ground state to an excited state, according to the nuclear shell model. Accordingly, the nuclear magnetic quantum number and the nuclear spin quantum number are changed too.

Finally, also changed is the direction of the magnetic dipole moment that follows. So, even though the direction of Earth's rotation is always the same, the North Pole and South Pole of Earth are changed.

The common period of these three periodic changes of Earth is

$$T_c = (4.1 \times 2.25 \times 10) \times 10^4 \text{ years} = 9.23 \times 10^5 \text{ years} \qquad 5\text{-}4\text{-}1$$

However, the gravitational force line curve of Earth by proper mass distribution of Earth's interior (cf. §10.6) is

$$g = \frac{1}{0.3306} = 3.030, \quad \frac{3.030}{5/2} = 1.212$$

Next value is called keplerian missing factor (cf.§11)

$$f_k = \frac{1.212}{1.008566} = 1.202 \qquad 5\text{-}4\text{-}2$$

Moreover, given g = 8 as the maximum neutrolateral force, c_c = 1.5, and 1.212, the electrical permittivity of air is

$$Q_e = (0.000589)\ (8)\ (1.5)\ (1.212) = 0.008566$$

$$x_e = 1.008566 \qquad 5\text{-}4\text{-}3$$

Consequently, because of all these differences, the real common period is

$$T_{eb} = \frac{9.23 \times 10^5 \text{ years}}{1.212} = 7.616 \times 10^5 \text{ years}$$

$$T_{ep} = (7.616 \times 10^5 \text{ years})\ (1.008566) = 7.681 \times 10^5 \text{ years} \qquad 5\text{-}4\text{-}4$$

where "b" represents the bar value, and "p" is the permittivity value.

This common period is called the great common period.

Hence, throughout 3.3×10^8 years of geological time, great magnetic reversals have occurred

$$Z = \frac{3.3 \times 10^8 \text{ years}}{7.681 \times 10^5 \text{ years}} = 430 \text{ times} \qquad 5\text{-}4\text{-}5$$

The observational value by paleomagnetology is roughly $Z \approx 400$ years.

The next possible shorter period is

$$T_{sb} = \frac{4.1 \times 10^5 \text{ years}}{1.212} = 3.383 \times 10^5 \text{ years}$$

$$T_{sp} = (3.383 \times 10^5 \text{ years})\ (1.008566) = 3.412 \times 10^5 \text{ years} \qquad 5\text{-}4\text{-}6$$

Other possible periods are

$T_{sb} = \frac{2.25 \times 10^5 \text{ years}}{1.212} = 1.856 \times 10^5$ years

$T_{sp} = (1.856 \times 10^5 \text{ years})\ (1.008566) = 1.872 \times 10^5$ years 5-4-7

Still other possible periods are

$T_{sb} = \frac{1.0 \times 10^5 \text{ years}}{1.212} = 8.251 \times 10^4$ years

$T_{sp} = (8.251 \times 10^4 \text{ years})\ (1.008566) = 8.322 \times 10^4$ years 5-4-8

Some final possible shorter periods are

$T_{sb} = \frac{9.23 \times 10^4 \text{ years}}{1.212} = 7.62 \times 10^4$ years

$T_{sp} = (7.62 \times 10^4 \text{ years})\ (1.008566) = 7.68 \times 10^4$ years 5-4-9

$T_{sb} = \frac{4.1 \times 10^4 \text{ years}}{1.212} = 3.38 \times 10^4$ years

$T_{sp} = (3.38 \times 10^4 \text{ years})\ (1.008566) = 3.41 \times 10^4$ years 5-4-10

$T_{sb} = \frac{2.25 \times 10^4 \text{ years}}{1.212} = 1.86 \times 10^4$ years

$T_{sp} = (1.86 \times 10^4 \text{ years})\ (1.008566) = 1.87 \times 10^4$ years 5-4-11

However, such regular periods occurred only via the gravitational relation between the sun and Earth. If another factor were involved, there would be no regular magnetic reversal. The first cause is a change in global internal energy caused by impacts from huge meteorites or asteroids. At such times, there are huge global heat energy shifts to the electromagnetic component particle, leading to a change of electromagnetic energy level of the component particles. Thus, owing to this energy level transition, changes occur to the nuclear magnetic quantum number and the nuclear spin quantum number, which can offset energy for regular magnetic reversal.

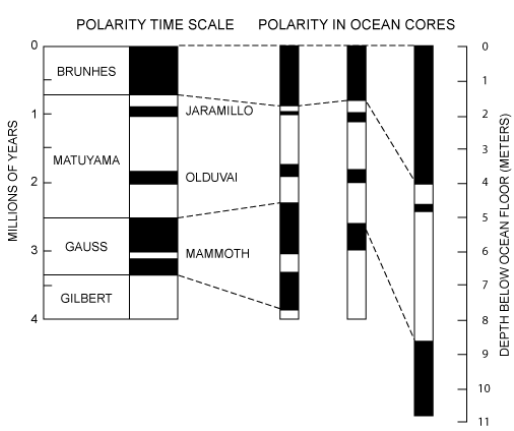
A second cause is the change of orbital radius of the sun. The sun revolves in a galactic orbit with a period of a 2.5×10^8 years. When the sun revolves, its speed is not changed, and during a geologic age of 3.3×10^8 years, the total revolution is

$$R = \frac{3.3 \times 10^8 \text{ years}}{2.5 \times 10^8 \text{ years}} = 1.3 \qquad 5\text{-}4\text{-}12$$

During this time, the change of orbital radius of the sun causes a gravitational energy change of the solar system and the sun. This solar potential energy change by the galaxy's center offsets the energy for regular magnetic reversal by energy change of Earth only, so regular magnetic reversal on Earth cannot happen.

Consequently, to chase such Earth history, we require finer paleomagnetological research. The next pages present information on the magnetic reversal of Earth from paleomagnetological research of old rock, conducted by National Resources Canada.

> "The Earth's magnetic field is aligned roughly along the spin axis and has an approximately dipole shape, similar to that of a bar magnet, with north and south magnetic poles. This is the normal state of affairs, but occasionally the magnetic field switches polarity, the north and south magnetic poles reverse, and the field settles down in the opposite state. The process goes by several names — 'magnetic field reversal' and 'polarity transition' are the most common.
>
> Reversals have been documented as far back as 330 million years. During that time more than 400 reversals have taken place, one roughly every 700,000 years on average. However, the time between reversals is not constant, varying from less than 100,000 years to tens of millions of years. In recent geological times reversals have been occurring on average once every 200,000 years, but the last reversal occurred 780,000 years ago. At that time the magnetic field underwent a transition from a 'reversed' state to its present 'normal state'.



> We get our information about reversal from certain types of rock in which information about the direction of the magnetic field is imprinted. When igneous rocks, which may form inside the Earth or on its surface, cool and solidify they acquire a magnetization parallel to the ambient magnetic field.

> If the rock cools quickly, as would a lava flow, it acquires an almost computer simulations, that fluid motions try to reverse the field every few thousand years, but that the inner core acts to prevent reversals because the field cannot diffuse as rapidly in the inner core as it can in the fluid outer core.
>
> Only on rare occasions can the thermodynamics, the fluid motion and the magnetic field all evolve in a compatible manner that allows for the original field to diffuse completely out of the inner core so that the new dipole polarity can diffuse in and establish a reversal field. Many authors have pointed out that the dipole part of the magnetic field has been weakening during historic times, and that if the present trend continues, the dipole field will go to zero in roughly 1500 years. Some people take this to mean that we are entering a reversal. Although this possibility cannot be discounted, many investigators believe that the trend will not continue and that the field will regain its strength, as it has many times in the past." [2]

During a magnetic reversal, the lines of the field leave the North Pole and go to the South Pole. Periods of magnetic reversal are broken into epochs and events. Epochs are longer period where one field direction dominates. Events are shorter periods within epochs of opposite magnetic polarity. The last geomagnetic reversal epoch for Earth was about 780,000 years ago.

5.5 Relations Between Magnetic Reversal Period and Ice Ages

The four component elements of Earth are oxygen, magnesium, silicon, and iron:

Oxygen's energy level ends at $2p^2$

Magnesium's energy level ends at 3s

Silicon's energy level ends at $3p^1$

Iron's energy level ends at $3d^3$

When the energy levels of the four elements are pictured as one element energy level, we find that each transition of electrical energy level corresponds to an ice age period of about 10,000 years.

2. Source: Canada National Resources, Geological Survey of Canada. 2008. *Geomagnetism – Magnetic Field Reversals*. Available at http://gsc.nrcan.gc.ca/geomag/nmp/reversals_e.php (accessed June 2011). Reproduced with permission.

Recall from the preceding discussion the concept of gravitational force lines between electrical force lines. So, despite that the spin of an electromagnetic force line is up (↗), the spin of gravitational force line

can be up (↗) and down (↘) (see Figure 5-7-9). Consequently, when Earth's gravitational potential shifts to its electromagnetic component elements,two different energy level transitions can appear in the energy levels of the component particles. Namely, offset transition (magnetic weakening, heat emission) or reinforcement transition (magnetic strengthening, heat absorption). Iron has 26 electrons and 30 neutrons.

When an iron atom is excited, 5 of 6 electrons in the 3d energy level can have the same spin. Therefore, iron can have a very strong magnetic field, because the nuclear shell model predicts that the nuclear energy level of a neutron is almost the same as the atomic energy level of an electron. Since the iron nucleus has 4 more neutrons than electrons, it can have many more varied energy levels than the electron. This reason could be the reason for the many various magnetic reversal periods and ice age periods, so that Earth could adapt to more various gravitational changes.

Thus, one gravitational energy level transition takes 4,500 years. In other words, the time it takes for 6 electrons of the 3d state to excite to the final energy level of $3d^5$ is 1.17×10^6 years. This result can be applied to the nuclear shell model. The only difference is that there are additional transitions because of the extra 4 neutrons. Because each change of electrical energy level takes 10^4 years,in principal there can exist a 1.8×10^5 year longer ice age period and magnetic reversal period.

When a change of gravitational potential offsets Earth's magnet, Earth's magnetic field and component particles will emit heat, because the direction of magnetic force lines between Earth and its component particles, by transition, is opposite. This emitted heat causes Earth's global climate to become increasingly warmer (a prototype of global warming). This period is called the interglacial (IG) period. During this period, glaciers will melt according to the quantity of energy created from the changed gravitational potential.

Conversely, when a change of gravitational potential reinforces Earth's magnet, Earth's magnetic field and component particles will absorb the

heat of Earth, because the magnetic force line lying in the same direction causes superimposition of the magnetic field. This heat absorption causes Earth's global climate to become increasingly cooler (a prototype of an ice age), creating the period called an ice age (IA). A glacier in this period will grow increasingly bigger according to the quantity of energy created by the changed gravitational potential. Table 5-5-1 refers to the ice age and interglacial ages of the last 10^6 years: column 7 of the table is the real direction of Earth's magnet, whereas column 8 is the expected direction of Earth's magnet from the electric field of the electron.

From Table 5-5-2, we can estimate the common periods of magnetic reversal. By the electron of 3d:

$$T_{3\mathrm{d}} = (4{,}500)(26)$$

$$= 1.17 \times 10^5 \text{ years}$$

$$T_{3\mathrm{d}} = \frac{1.17 \times 10^5}{1.463}$$

$$= 7.997 \times 10^4 \text{ years} \qquad 5\text{-}5\text{-}1$$

where 1.463 is the number of Earth Gravito-Magnetic factor or factor of correspondence number by CFLE theory from formula 5-3-8.

By the 4 additional neutrons of the nucleus, we get

$$T_{1\mathrm{n}} = \frac{(4{,}500)(27)}{1.463}$$

$$= 8.305 \times 10^5 \text{ years} \qquad 5\text{-}5\text{-}2$$

$$T_{2\mathrm{n}} = \frac{(4{,}500)(28)}{1.463}$$

$$= 8.612 \times 10^5 \text{ years} \qquad 5\text{-}5\text{-}3$$

$$T_{3\mathrm{n}} = \frac{(4{,}500)(29)}{1.463}$$

$$= 8.920 \times 10^5 \text{ years} \qquad 5\text{-}5\text{-}4$$

$$T_{4\mathrm{n}} = \frac{(4{,}500)(30)}{1.463}$$

$$= 9.23 \times 10^5 \text{ years} \qquad 5\text{-}5\text{-}5$$

Table 5-5-1. Ice Ages and Interglacial Ages of the Last 10^6 Years

Years	Energy Level	Direction of Two Spins	Elements	Ice Age or Inter-glacial	Spin and Energy	Direction	Of Earth Magnet
	4p2		Fe nucleus				
	4p2		Fe nucleus				
8	4p1	Disagree	Fe nucleus	IA	absorb different	But Normal	Reverse
0	4p1	Disagree	Fe nucleus	IA	absorb Different	But Normal	Reverse
0	3d5	Disagree	Fe3d	IA	absorb Different	But Normal	Reverse
000years	3d5	Disagree	Fe3d	IA	absorb Different	But Normal	Reverse
7	3d4	Disagree	Fe3d	IG	Radiation Same	But Normal	Reverse
0	3d4	Disagree	Fe3d	IG	Radiation Same	But Normal	Reverse
0	3d3	Disagree	Fe3d	IG	Radiation Same	But Normal	Reverse
000years	3d3	Disagree	Fe3d	IG	Radiation Same	But Normal	Reverse
6	3d2	Agree	Fe3d	IA	absorb Different	Normal	
0	3d2	Agree	Fe3d	IA	absorb Different	Normal	
0	3d1	Agree	Fe3d	IA	absorb Different	Normal	
000years	3d1	Agree	Fe3d	IA	absorb Different	Normal	
5	4s	Agree	Fe	IG	Radiation Same	Normal	
0	4s	Agree	Fe	IG	Radiation Same	Normal	
0	3p3	Agree	Fe	IG	radiation Different	Normal	
000years	3p3	Agree	Fe	IG	radiation same	Normal	
4	3p2	Disagree	Fe	IG	radiation same	But Normal	Reverse
0	3p2	Disagree	Fe	IG	radiation Different	But Normal	Reverse
0	3p1	Disagree	Si	IG	Radiation Same	But Normal	Reverse
000years	3p1	Disagree	Si	IG	Radiation Same	But Normal	Reverse
3	3s	Disagree	Mg	IG	Radiation Same	But Normal	Reverse
0	3s	Disagree	Mg	IG	Radiation same	But Normal	Reverse
0	2p3	Disagree	Mg	IG	Radiation same	But Normal	Reverse
000years	2p3	Disagree	Mg	IG	Radiation same	But Normal	Reverse

Table 5-5-1 (*continued*)

Years	Energy Level	Direction of Two Spins	Elements	Ice Age or Inter-glacial	Spin and Energy	Direction	Of Earth Magnet
2	2p2	Agree	O	IA	Absorb Different	Normal	
0	2p2	Agree	O	IA	Absorb Different	Normal	
0	2p1	Agree	O	IA	Absorb Different	Normal	
000years	2p1	Agree	O	IA	Absorb same	Normal	
1	2s	Agree	O	IG	Radiation same	Normal	
0	2s	Agree	O	IG	Radiation same	Normal	
0	1s	Agree	O	IG	Radiation same	Normal	
000years	2s	Agree	O	IG	Radiation same	normal	

Table 5-5-2. Periods of Ice Ages

Alps	North Europe	North America	Duration	From Today
Würm Ice Age	Weichel Ice Age	WisconsinIce Age	100,000years	100,000 years ago
Würm Interglacier	Elmsan Inter gracier	Sangamon Interglacier	120,000years	
Riss Ice Age	Salle Ice Age	Tilinoian Ice Age	100,000 years	320,000 years ago
Riss-Mindel Inter glacier	Hoxonian interglacier	Yarmouth Inter glacier	300,000 years	
Mindel Ice Age	Elster Ice Age	Kansan Ice Age	75–100,000 years	700,000 years ago
Mindel-Güntz Inter glacier	Cronerian Interglacier	Aftonian Inter Glacier	200,000 years	900,000 years ago

If we consider an ice age of 300,000 to 400,000 years ago from now, we can guess that it had an abnormal direction of magnetic force lines. Likewise, if we consider an ice age period of 780,000 years ago from now, we can guess that it also had an abnormal direction of magnetic force lines. This is because it is well known by paleomagnetology that the last ice age of Würm, Weichsel, Wisconsin ended 11,000 years ago, and that during the last 780,000 years, the direction of magnetic force lines has not been changed. Thus, we can predict that the great period of 769,000 years had ended 11,000 years ago. After all, because the direction of the magnetic force lines has not changed, we can speculate

that the current type of period is an offset type of transition. In other words, the saved energy in Earth's magnetic field is emitted as heat and all glaciers are melted by the heat emitted from offsite magnetic fields.

In another consideration, the present tilt of the Earth axis is 23.5° and its precession period is 26,000 years. But, because 11,000 years have already passed, only 1,000 years remain until the turning point of the shortest period of 13,000 years. If, during this term, there is a reversal of Earth's magnet, then that will be the end of global warming by Earth's magnetic field. However, because in the past 10,000 years there was no reversal of Earth magnet's, there should be a greater acceleration of global warming, so all the glaciers of Earth should eventually be melted by the heat emitted from Earth's magnetic field and component particles. Accordingly, a lot of low-lying countries and areas inhabited by humans should be flooded and under water (in 1994, Tuvalu in the South Pacific started flooding).

Furthermore, because it is well known that Earth's magnet has weakened by 5% for each 100 years during the last 500 years, Earth's magnet should be zero after 2,000 years. For this reason, the magnetic shield of the upper sky would vanish and the mirror height would become much lower. Particles from cosmic rays that are usually just a few hundred kilometers from the upper sky would not be properly deflected, and instead will hit directly to Earth's surface, creating very bad affects on living things and environments, much like the radioactive material from an atom bomb. Already, damage of the magnetic shield in the upper sky of Brazil has begun (cf. §15.8).

In addition, because global warming will become increasingly stronger until such time that the regular magnetic field reaches its zero state with green gas increasing, Earth's tropical and desert areas will grow ever larger. Because that would cause a global state of chaos with fast increasing of human population, defensive research is needed immediately.

For such dangerous natural change to end and conditions to revert to present-day temperatures and new glaciers to grow will require at least 2000 years, as seen in Figure 5-5-1. To overcome such a great global crisis and preserve our present civilization or achieve a more advanced one, we will need to accurately predict and properly prepare for such an eventuality.

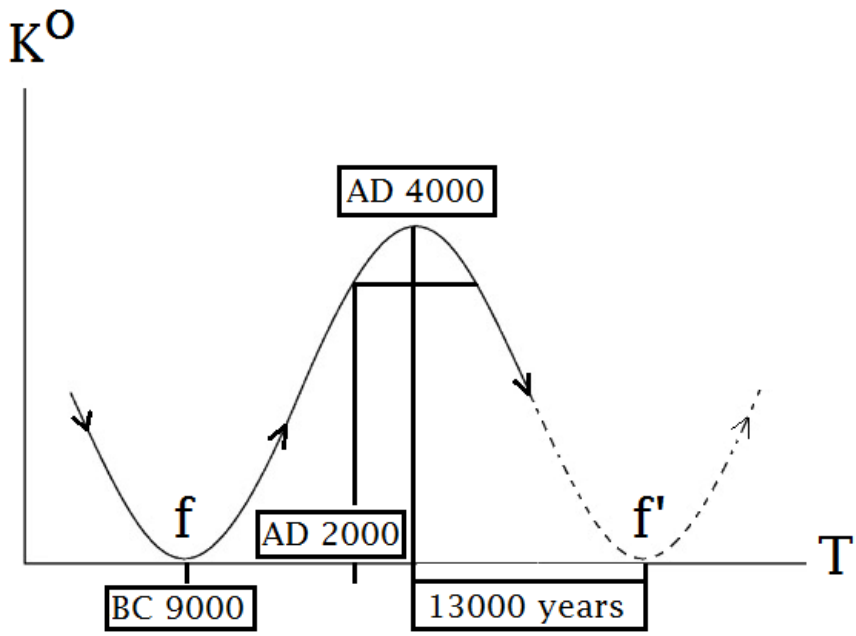


Figure 5-5-1. Point f is not only the end point of the 769,000 years of great common magnetic reversal period, but also the starting point of a new period of 26,000 years of Earth's precession.

To conclude this discussion, I shall discuss two more causes of the ice ages according to the discussion so far

In modern physics, there are only eight causes of ice ages:

1st is the change in Earth's atmosphere

2nd is the position of continents

3rd is the fluctuation in ocean currents

4th is uplift of the Tibetan plateau and its surrounding

5th is Milankovitch's cycle (a variation of Earth's orbit)

6th is meteorite activity

7th is volcanic activity

8th is the biological effect

However, with the discovery by CFLE theory of the interaction between Earth's gravitational force and electromagnetic force of

component particles, we can now add a 9th and a 10th cause of ice ages: the gravitomagnetic effect, and the sun. The change of the sun's gravitational potential occurs as a cycle that happen through change of its revolution speed, its rotation speed, its rotation axis, and its orbital radius by interaction with the galaxy center. Thus, an additional period of ice age is the Sun's revolution cycle, $P_{\text{Sun}} = 2.5 \times 10^8$ years.

With all these given causes of ice ages, we can now investigate the past history of Earth and predict its future natural events satisfactorily.

5.6 Theoretical Reasons for Earth's Pole Movement: A Comparison of the Theoretical and Observed Values of Pole Movement

When Earth's orbital radius elongates, Earth's revolution will become slower according to the law of conservation of angular momentum, so to a distant guide star, every revolution appears to be sagging. When Earth's orbital radius is shorter, to the distant guide star, it will appear to be preceding. The maximum change of the orbital radius is ~1.8×10^7 km in a 100,000 year period. Because such change of gravitational potential shifts to the electromagnetic component particles, we can calculate the change of the electromagnetic potential (d_{re}) by the force quantized constant discussed in §4.1. That is,

$$d_{\text{re}} = \frac{1.8 \times 10^{10}\text{m}}{1.69 \times 10^{21}} = 1.06 \times 10^{-11}\ \text{m} \qquad 5\text{-}6\text{-}1$$

In fact, because such a change occurs through a 100,000 year period, the average change per year is

$$d_{\text{re}} = \frac{1.06 \text{ x } 10^{-11}\text{m}}{10^5 \text{ years}} = 1.06 \times 10^{-16}\text{m/year} \qquad 5\text{-}6\text{-}2$$

On the other hand, because there is a difference between the magnetic moments of a neutron and a proton, a different Δg value results when the gravitational energy shifts to the electromagnetic energy. That is,

$$\Delta g = \frac{6.545979}{1.5} = 4.363986 \qquad 5\text{-}6\text{-}3$$

where 1.5 is the electromagnetic factor m_{EGM} (from Formula 5-3-7-2):

$$\Delta g = -\left(\frac{-3.772}{5.658}\right) = 1.5 \qquad 5\text{-}6\text{-}4$$

g = 6.545979 is the force line curve of a proton (cf. §7.5). Because the gravitational permittivity of Earth (x_g = 1.073176; cf. §10.6) at g = 1.5 from the m_{EGM} of 1.5 is

$$x_g = 1.073176 \qquad 5\text{-}6\text{-}5$$

and the electrical permittivity of the component particles for the maximum neutrolateral force at g = (6.545979× 2)=13 is

$$x_e = 1 + (0.000589 \times 13) = 1.007657 \qquad 5\text{-}6\text{-}6$$

where the other 1.5 is the correspondence number c_c (cf. §7.13,§24,§TB25), of cosmic helium factor $g_H = (\ 2)(1.5\ )^2 =$ 4.5(cf.§24), thus the real Δg is

$$\Delta g = \left(\frac{1.073176}{1.007657}\right)(4.5) = 4.792595 \qquad 5\text{-}6\text{-}7$$

The total energetic difference is

$$\Delta g^2 = (4.793)^2 = 22.975 \qquad 5\text{-}6\text{-}8$$

Thus, the net electromagnetic change (d_{rey}) becomes

$$d_{\text{rey}} = \frac{1.06 \times 10^{-16}}{22.975} = 4.61 \times 10^{-18} \text{ m/year} \qquad 5\text{-}6\text{-}9$$

To determine the ratio of this average change, we use the nuclear charge distribution radius, because the gravitational mass and electric charges within it are concentrated.

By experiment (cf. §7.4.2.12),

$$r' = 4.97 \times 10^{-15} \text{ m} \qquad 5\text{-}6\text{-}10$$

Hence, the ratio of the electric change is

$$d_q = \frac{4.61 \times 10^{-18}\text{m}}{4.97 \times 10^{-15}\text{m}} = 9.28 \times 10^{-4} \text{ per year} \qquad 5\text{-}6\text{-}11$$

Consequently, because of the gravito-electric charge on Earth's surface, there should be a related gravitomagnetic movement of any form occurring by as much as this ratio per year. Therefore, the change of the magnetic pole on Earth's surface is

d_{rb} = (4 × 10^4 km)(9.28 × 10^{-4}/year)

= 37.12 × 10^1 km/year = 37 km/year 5-6-12

The gravitational permittivity of Earth (cf. §10.6) at g = 1.466 is

Q_g = (0.073176) (1.466) = 0.107276

x_g = 1.107276 5-6-13

Therefore, the real speed is

d_{rb} = (37kmm/year)(1.107276)

= 40.969 km/year

≈ 41 km/year 5-6-14

This value is called the average maximum value of magnetic pole movement. The observed average maximum value is 41 km/year, but this same result can be obtained by another means, as follows:

The maximum change of the orbital radius in a 100,000 year period is

R_c = 1.8 × 10^{10} m

So, the average change per year is

$$R_a = \frac{1.8 \times 10^8 \mathrm{m}}{1 \times 10^5 \text{ years}} = 1.8 \times 10^5 \text{ m/year} \qquad 5\text{-}6\text{-}15$$

However, such gravitational change is smaller than the electrical change because $\frac{\mu_n}{\mu_p}$ = 1.464.

Hence, the effective change is

$$R_a = \frac{1.8 \times 10^5 \text{ m}}{1.464}$$

$$= 1.23 \times 10^2 \text{ km/year} \qquad 5\text{-}6\text{-}16$$

This change is only the gravitational change. Because the force line curve of the gravitomagnet is $\theta = \frac{1.464}{8} = 0.183$, the gravitomagnetic change is

$R_a = (1.23 \times 10^2 \text{ km/year})\ (0.183)$

$= 22.51 \text{ km/year}$ 5-6-17

Because the gravitational permittivity of Earth is $x = 1.073176$ (cf. §10.6), the gravitational permittivity of air at $g = \frac{1}{1.464}$ is

$Q = \frac{0.016774}{1.464} = 0.011458, \quad x = 1.011458$

$\frac{x_e}{x_a} = \frac{1.073176}{1.011458} = 1.061019$ 5-6-18

The net gravitomagnetic change is

$R_a = \frac{22.51 \text{ km}}{(1.061019)^2} = 19.99 \text{ km/year}$ 5-6-19

$\approx 20 \text{ km/year}$

The observed value is

$R_{ao} \approx 20 \text{ km/year}$ 5-6-20

However, Earth revolves around the sun, and sun has its own magnetic field B.

This situation corresponds to setting the magnetic moment of an electron orbiting around its nucleus. Thus, the magnetic moment P is

$P = \frac{q}{2m} L$ 5-6-21

and the relation between the magnetic moment and spin angular moment is given as

$P_{spin} = -\frac{e}{m} L = \gamma L$ 5-6-22

where γ is the gyro-magnetic ratio g. Experimentally,

$g = 2$

so the maximum change of the magnetic pole movement is

$l \approx$ (20 km) (2) = 40 km/year 5-6-23

Because the strength difference between gravity (Earth) and electricity (atom) is c_c = 1.5 (cf. §7.13), the related gravitational permittivity difference of air (cf. §10.2) is

Q = (0.016774) (1.5) = 0.025161

x = 1.025161 5-6-24

Therefore, the net value is

$l \approx$ (40 km) (1.025161) =41.01 $\approx$ 41 km/year 5-6-25

This value is the same value of Formula 5-6-14.

On the other hand, because the component particles can have different energy states according to the local situation, they can have different gravitational and electromagnetic spin quantum numbers. Therefore, this energy change can be offset, and it is possible that there will be no remaining energy for magnetic pole movement according to this factor. So, it appears there can be variable speeds for magnetic pole movement, a fact made possible according to Kepler's square law. That is, the possible minimum speed of the pole movement is

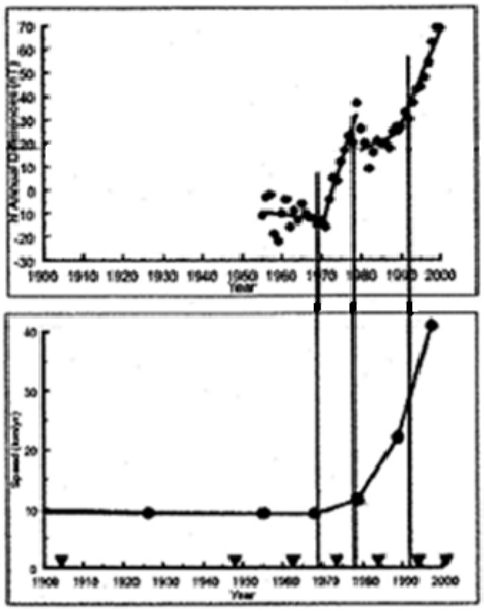
$l \approx \frac{41 \text{ km/year}}{4.465}$ = 9.183 km/year $\approx$ 9 km/year 5-6-26

where 4.465 is the possible maximum change of the force line curve (g = 4.465; cf. §5-6-1-2) according to Kepler's square law.

The next few pages present information about magnetic pole movement and observations for the value of this movement by National Resources Canada.

> "The change in velocity of the North Magnetic Pole since the early 1970s has been remarkable 9 km/yr to 41 km/yr. This is clearly seen in the accompanying plot [*on the next page*] which shows the average rate between observations as a function of time.
>
> The acceleration has also increased from 0.22 km/yr^2 to 32.21 km/yr^2. A change in the velocity of the North Magnetic Pole must be reflected in a corresponding change in both the inclination and the horizontal component of the magnetic field. Data from 'Resolute Bay Observatory', the nearest to

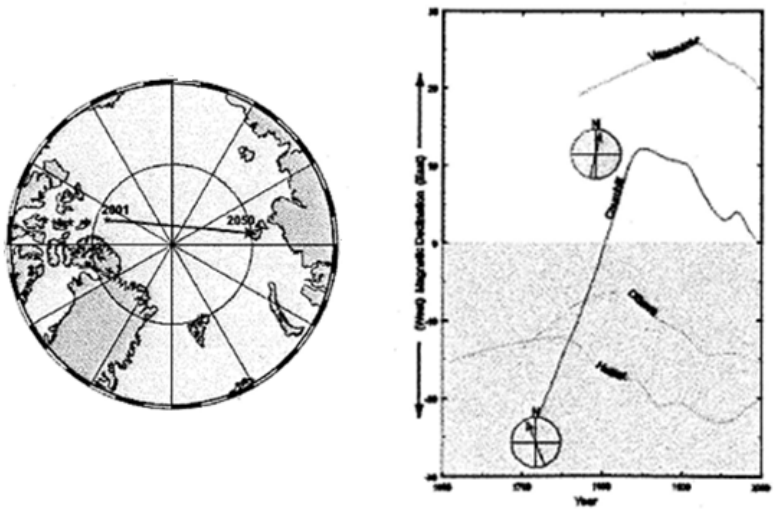
the North Magnetic Pole, show that the annual change in H has increased from roughly –10 nT/yr to almost 70 nT/yr during a half century. The increase has not been uniform, but as a series of steps that have occurred in approximately 1970, 1979 and 1990. Changes in the magnetic field characterized by an abrupt change in the secular variation have been named 'magnetic jerk' or 'geomagnetic impulse'. Six jerks of global extent have occurred during the past century: in 1901, 1913, 1925, 1969, 1978 and 1992.



The last three jerks can be seen clearly as abrupt changes in the slope of the annual change in H at Resolute Bay. The 1969 jerk corresponds to the start of increase in the speed of NMP and two subsequent jerks, especially that near 1992, appear to correlate with additional increase in the speed. In contrast to its present-day acceleration, the Magnetic Pole showed little apparent motion between 1831 and 1904. It seems highly unlikely that the pole actually remained stationary for 73 years, but there are no direct observations from which we can determine its motion during that time period. However, we can use spherical harmonic models produced for this time period to infer the track of the North Magnetic Pole. The accompanying plot shows North Magnetic Pole positions at 20 year intervals between 1820 and 1920 calculated from the spherical harmonic models produced by Jackson and colleagues. The model positions are slightly displaced to the north-west of the observed positions. If we adjust the track to best match the observed positions we find that the Magnetic Pole reached its southernmost latitude, 68.60°, in 1860. The year is significant since 1860 is the year of a possible magnetic jerk.

Spherical harmonic models can also be used to estimate the position of the North Magnetic Pole back to approximately 1600. Prior to that time there were too few observations from which reliable models can be produced. It appears that the North Magnetic Pole moved southeast a distance of approximately 860 km between 1760 to 1860. Prior to that it was located in a relatively confined area near 75°N,110°W.

The accompanying figure shows the path of the North Magnetic Pole since its discovery in 1831 to the last observed position in 2001. During the last century the Pole has moved a remarkable 1100 km. What is more, since about 1970 the NMP has accelerated and is now moving at more than 40 km per year. If the NMP maintains its present speed and direction it will reach Siberia in about 50 years. Such an extrapolation is, however, tenuous. It is quite possible that the pole will veer from its present course, and it is also possible that the pole will slow down some time in the next half century.



The strength and direction of the Earth's magnetic field slowly change with time, a phenomenon referred to as secular change or secular variation. The cause of secular variation is related to the process by which the magnetic field is generated. Secular change occurs everywhere on Earth, but the magnitude of the change varies from place to place and also with time." [3]

5.7 Realizations of the Possibility of Gravitational Force Screening and Anti Gravitation Phenomena Observed on Earth's Surface

Because gravitational monopoles exist, they can in principal screen and weaken as a classical electrodynamics gravitational force. In the same way that an electric charge screens in the classical electrodynamics way as an electric monopole from dielectric polarization, the gravito-dynamics gravitational monopole from a digravitic polarization is what causes a gravitational charge to screen or to weaken. Because Newton's law of universal gravitation is a polarization dipole moment field theory, we first have to consider about polarization. That is, the gravitational polarizations generated by component particles of every object are collectively and at the same time electromagnetic. However, because research of such phenomenon has not presently been done, we need to study the gravitational force and develop associated technology for screening.

3. Source: Canada National Resources, Geological Survey of Canada. 2008. *Geomagnetism* – Long-Term Movement of the North Magnetic Pole (In-depth). Available at http://gsc.nrcan.gc.ca/geomag/nmp/long_mvt_nmp2_e.php (accessed June 2011). Reproduced with permission.

An example of a first step toward such a study is to find phenomenon that has gravitational polarization and anti-gravity, and then the next step would be to try to explain this phenomenon both qualitatively and quantitatively by the curved force line elements theory, and lastly to compare the agreement between theoretical and observed values.

As mentioned above, when Earth's radius of revolutions is elongated, Earth has a slower speed according to the law of conservation of angular momentum, and every revolution appears to be sagging relative to a distant guide star in the constellation. Additionally, the gravitational force of the sun causes Earth's gravitation to polarize and at the same time become electromagnetically polarized, as seen in Figure 5-7-1, and the component particles (electrons, protons, and neutrons) will be polarized too.

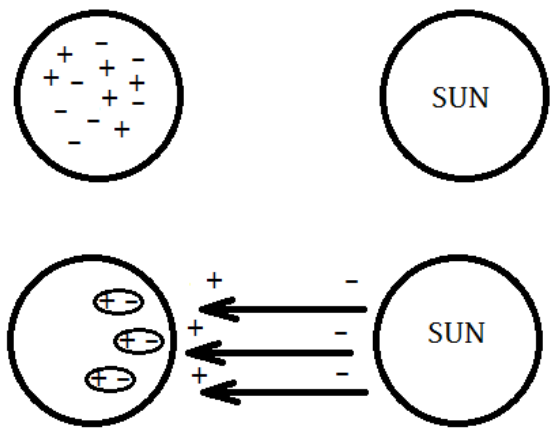


Figure 5-7-1

After gravitational and electromagnetic polarizations, the negatively charged electron and the neutron stay more in the direction of the sun because they are attracted by it, as depicted in Figure 5-7-2.

Because of the attraction by the sun, the magnetic distribution is preceded by as much as angle θ as observed by an observer on Earth's surface. Because the maximum change of the orbital radius is 1.8×10^7 km during a 100,000 year period, the average changing amount per year (C_{amount}) is

$$C_{\text{amount}} = \frac{1.8 \times 10^7 \text{ km}}{10^5 \text{ years}}$$

$= 1.8 \times 10^2$ km/year 5-7-1

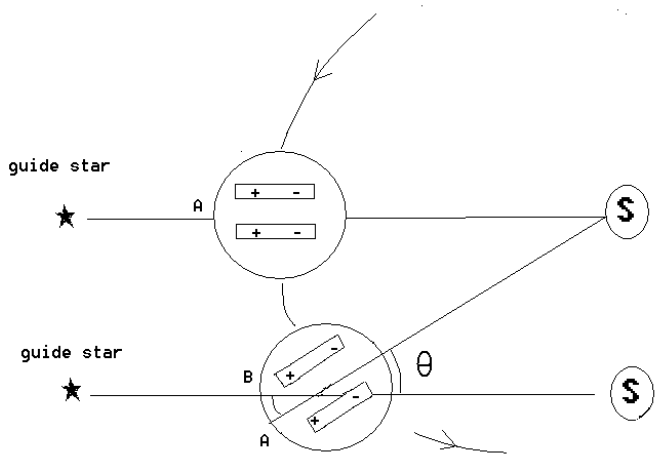


Figure 5-7-2a. Sagging of point A on Earth's surface from point B, the baseline of a distant guide star

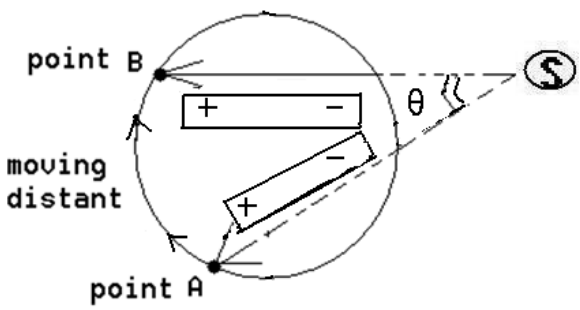


Figure 5-7-2b. Preceding Movement of Magnetic Distribution from Point A to Point B

However, because the component particles (protons and neutrons) change in the nucleus from protons to neutrons and from neutrons to protons, at the same time, the magnetic moment changes by 1.463 times too. Hence, the gravitational change according to such change is

$$C_{\text{amount}} = \frac{1.8 \times 10^2 \text{ km}}{1.463}$$

$$= 1.23 \text{ x } 10^2 \text{ km} \qquad 5\text{-}7\text{-}2$$

Because the magnetic force line curve according to such change is

$$\theta = \frac{1.463}{8} = 0.183 \qquad 5\text{-}7\text{-}3$$

so the effective preceding of the magnetic distribution is

$$C_{\text{amount}} = (123 \text{ km})\ (0.183) = 22.509 \text{ km/year} \qquad 5\text{-}7\text{-}4$$

Because the gravitational permittivity of Earth is x = 1.073176 (cf. §10.6) and the gravitational permittivity of air at g = 1.463 (cf. §10.2) is

$$Q_{\text{a}} = \frac{0.016774}{1.463} = 0.011465$$

$$x_{\text{a}} = 1.011465$$

$$\frac{x_{\text{e}}}{x_{\text{a}}} = \frac{1.073176}{1.011465} = 1.061012 \qquad 5\text{-}7\text{-}5$$

$$\left(\frac{x_{\text{e}}}{x_{\text{a}}}\right)^2 = (1.061012)^2 = 1.125746$$

$$S = \frac{22.509 \text{ km/year}}{1.126}$$

$$= 19.99 \text{ km/year}$$

$$\cong 20 \text{ km/year} \qquad 5\text{-}7\text{-}6$$

This is the predicted value by curved force line elements theory.

Since the real observed average value is C_{amount} = 20 km/year, we can conclude that the curved force line elements theory gives a satisfactory result.

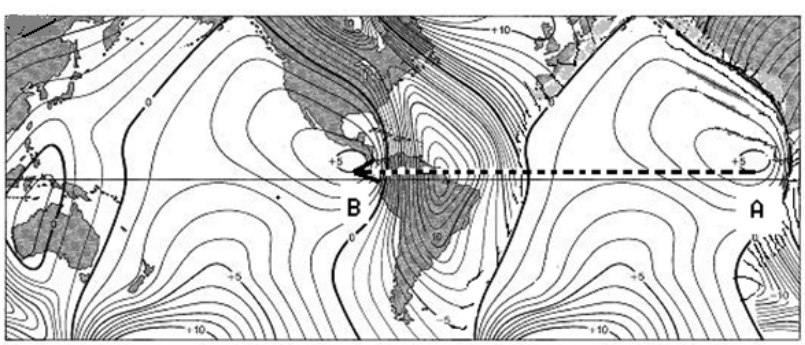


Figure 5-7-3. Preceding Movement of Earth's Magnetic Distribution. In order to emphasize same magnetic distributions, Europe has been omitted in the map around A.

Because Earth rotates, its component particles are partly in a nighttime region and partly in a daytime region, giving a gravitational potential difference of as much as Earth's diameter as viewed by an observer in the sun's coordination system. Such difference of gravitational potential shifts to the component particles in Earth's interior and leads to a change of its electromagnetic relation. This is as if Earth's gravitational potential imposes upon its component particles for global stability. In other words, because gravitational potential differences can be rerouted internally, any sudden local changes that could affect the stable distribution of gravitational acceleration and sudden stable mass distribution can be blocked. Therefore, Earth has the ability to maintain its system's stability by possibly controlling any energy shift. The reason for such adaptability of Earth is only because Newton's gravitational theory is a polarizable dipole moment field theory. When the gravitational force of the sun acts upon Earth, Earth is polarized by the gravitational force line of the sun, as shown in Figure 5-7-4.

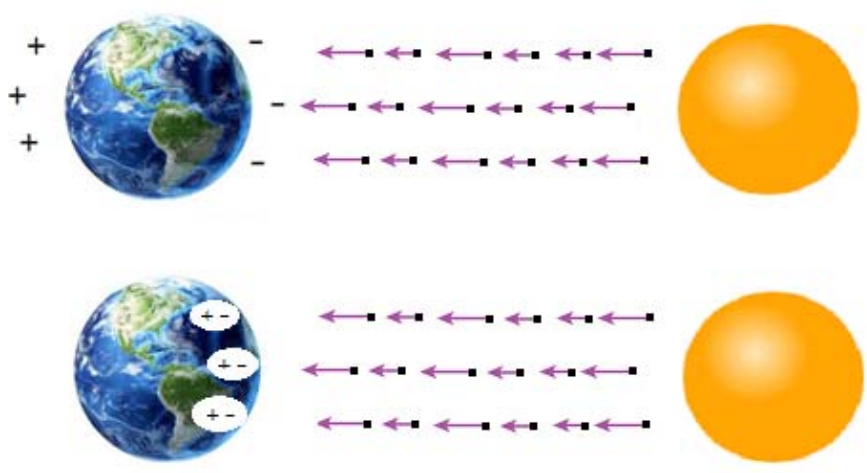


Figure 5-7-4

That is, the component particles in the daytime region of Earth are attracted by the gravitational force line of the sun and polarized to the sun's direction. However, these component particles cannot escape Earth, because Earth's gravitational force and the electromagnetic force of its component particles are stronger than the sun's gravitational force, so only the electron that moves around the nucleus can stay longer in the sun's direction. Such physical process can be visualized as in Figure 5-7-5.

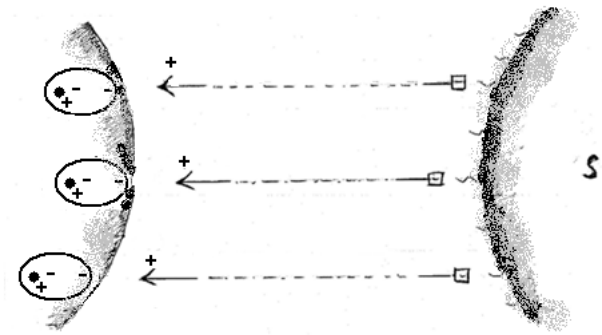


Figure 5-7-5

To summarize, the electron of component particles that are in the daytime area of Earth are attracted more to the sun's direction by as much as the difference of the sun's gravitational potential, and these electrons stay longer in the sun's direction and experience orbital change, causing the magnetic field of the component particles associated with the orbiting electrons to change collectively. Because Earth's magnetic field is a collective of the magnetic fields of its component particles, any change of the component particles' magnetic fields will present as a change of Earth's regular magnetic field. In simple terms, "Earth's magnetic field is attracted by the sun." Now, because the sun's gravitational potential difference, by as much as Earth's diameter, translates to a change of the electromagnetic potential of Earth's component particles, the maximum change of gravitational potential (d_{ve}) is

$$d_{ve} = (6.378 \times 10^3 \text{ km})\,(2) = 1.276 \times 10^4 \text{ km} \qquad 5\text{-}7\text{-}7$$

This potential change can be transformed to the electromagnetic potential by using a force quantization constant (cf. §4.1) from the special theory of relativity of force line elements:

$$d_{ve} = \frac{1.27 \times 10^7 \text{ m}}{1.69 \times 10^{21}} = 7.51 \times 10^{-15} \text{ m} \qquad 5\text{-}7\text{-}8$$

However, because the difference factor between gravity and electricity is $(\Delta g)^2 = (4.793)^2$ (cf. Eq. 5-6-4), the net electromagnetic change is

$$d_{ve} = \frac{7.51 \times 10^{-15} \text{ m}}{22.975} = 3.27 \times 10^{-16} \text{ m} \qquad 5\text{-}7\text{-}9$$

In other words, the orbital of positive charges in the nucleus is changed by as much as 3.27×10^{-16} m from the center of nucleus as a mass point or charge point. To determine the ratio of such change 3.27×10^{-16} m,

we have to use the charge distribution radius of the nucleus (cf.§7.4), $r = 4.97 \times 10^{-15}$ m. The required ratio is

$$d = \frac{3.27 \times 10^{-16}\ \text{m}}{4.97 \times 10^{-15}\ \text{m}} = 0.066 \qquad 5\text{-}7\text{-}10$$

because of gravitational permittivity of Earth effective value is

$$x_g = 1.107276 \qquad 5\text{-}6\text{-}13$$

$$d = (0.066)(1.107276) = 0.073080$$

Consequently, the axis of Earth's magnetic pole changes by as much as this ratio. Because Earth's magnetic pole axis tilts at the angle $\theta = 10°\ 24'$ from Earth's rotational pole axis, the possible change of this angle ($\theta = 10^{o}\ 24' = 624'$) by this ratio is

$$d\theta = (624')\ (0.073) = 45.55' = 45'.33'' \qquad 5\text{-}7\text{-}11$$

This angle is called the daily oscillations angle of the north magnetic pole. This angle can change the surface distance, because

$$\theta = \frac{45.55'}{60} = 0.76° \qquad 5\text{-}7\text{-}12$$

Because 1° is 111.66 km above 80° latitude, the corresponding distance of this angle on Earth's surface is

$$d = (111.66\ \text{km})\ (0.76^{o}) = 84.86 \cong 85\ \text{km} \qquad 5\text{-}7\text{-}13$$

This value is called the daily oscillations value of the north magnetic pole. The observed value is $d = 85$ km.

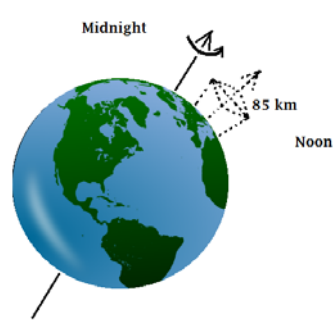
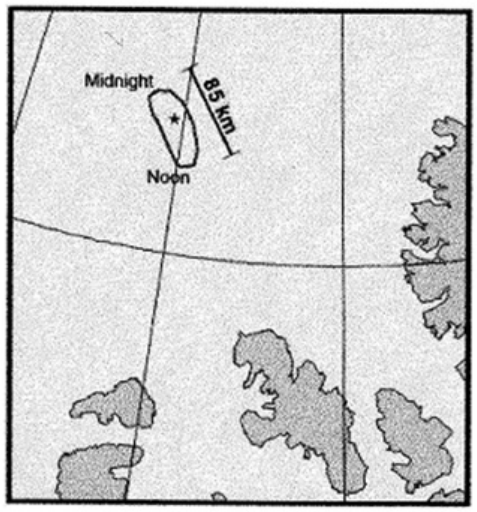


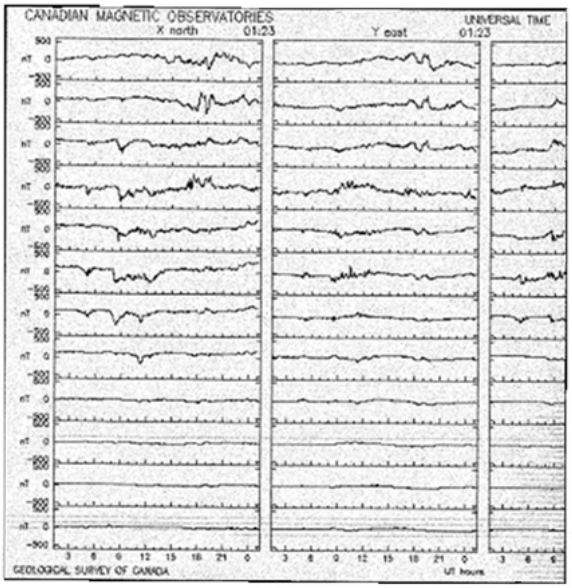
Figure 5-7-6

Here, I present information about the daily oscillation of the north magnetic pole by Natural Resources Canada:

> "Daily Movement of the North Magnetic Pole: It is important to realize that the position of the North Magnetic Pole given for a particular year is an average position. The Magnetic Pole wanders daily around this average position and, on days when the magnetic field is distributed, may be displaced by 80 km or more. Although the North Magnetic Pole's motion on any given day is irregular, the average path forms a well defined oval. The diagram shows the average path on distributed days. The cause of the North Magnetic Pole's diurnal motion is quite different than that of its secular motion. If we measure the Earth's magnetic field continually, such as is done at a magnetic observatory, we will see that it changes during the course of a day — sometimes slowly, sometimes rapidly. The ultimate cause of these fluctuations is the Sun. The Sun constantly emits charged particles that, on encountering the Earth's magnetic field, cause electric currents to flow in the ionosphere and magnetosphere. These electric currents disturb the magnetic field, resulting in a temporary shift in the North Magnetic Poles position.
>
> The size and direction of this shift varies with time, in step with the magnetic field fluctuation.
>
> Since such fluctuations occur constantly, the Magnetic Pole is seldom to be found as its 'official' position, which is the position in the absence of magnetic field fluctuation.



> This diagram below shows the data for the last 24 hours from the Canadian CANMOS observatories.



These data are received by telemetry from each station and must be considered as 'raw' or preliminary. For each station, the X, Y and Z components of the magnetic field are shown. Stations are displayed starting with the most northerly at the top progressing down the page in decreasing latitude. Universal time is used, with current time being at the right side of each plot frame. All frames use the same scale, so that the relative strengths of the field at different stations can be really compared." [4]

The discussion so far has been limited to only a few natural phenomena. To research about the anti-gravitational phenomenon and gravitational charge screening and for development of associated technologies, we need to conduct finer studies immediately. To achieve this, we need to reproduce such phenomena artificially by conducting experiments in huge accelerators (as light source), such as Spring 8 in Japan. In such accelerators, electrons or antiprotons accelerated to the same energy will give rise to particles orbiting at daytime to the sun's direction, as well as particle orbiting at nighttime to the direction of Earth's center, and thus give us a change to observe the change of the orbital radius and its associated amplitude changes. In this way, we can observe orbital dragging, with the associated direction of revolution of electrons during 24 hours, as shown in Figure 5-7-7.

4. Source: Canada National Resources, Geological Survey of Canada. 2008. *Geomagnetism* – Daily Movement of the North Magnetic Pole. Available at http://cgc.rncan.gc.ca/geomag/nmp/daily_mvt_nmp_e.php (accessed June 2011). Reproduced with permission.

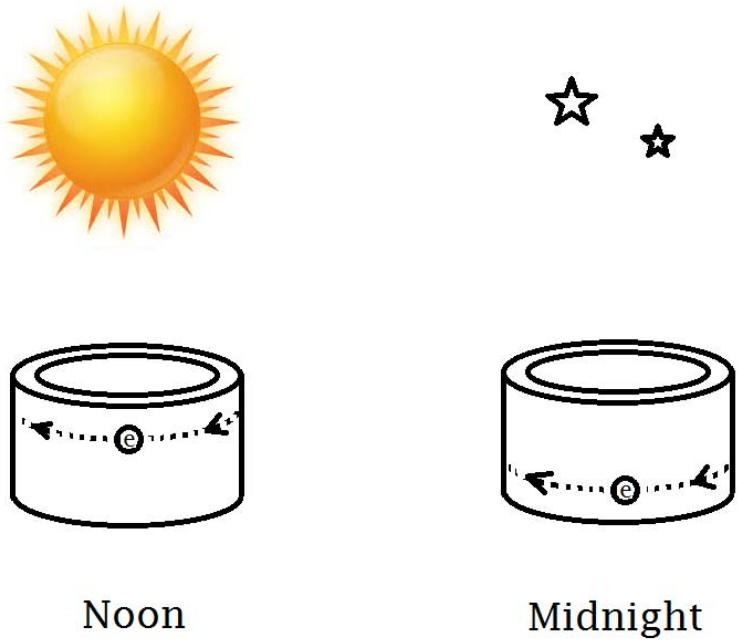


Figure 5-7-7

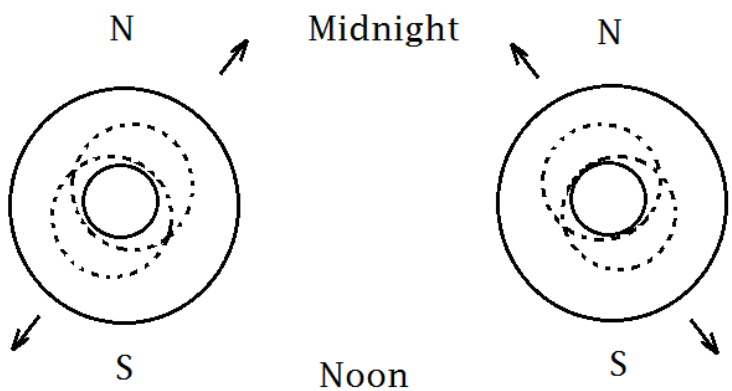


Figure 5-7-8

Additionally, with the orbital axis oscillating for 24 hours, we will be able to observe the degrees of change during summer and winter (e.g., such phenomenon is already being observed and opened to the public at the Spring 8 accelerator in Japan) as well as corresponding changes of the sun's activities (e.g., with sunspots and without sunspots).The curved force line elements theory predicts gravitational polarization and formation of ± gravitational monopoles. It also

predicts that despite that a same neutron can have different electromagnetic spins; such same neutron with a same electromagnetic spin can have different gravito-magnetic spins. Therefore, we know here that the curved force line elements theory can give a minimum theoretical base for realizing anti gravitation and screening the gravitational force for experimentation. All that is lacking is the research.

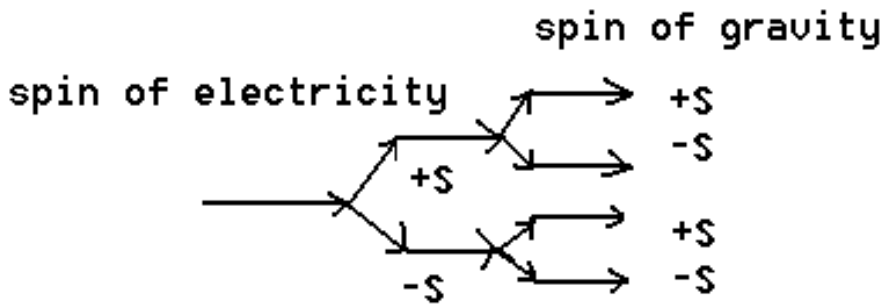


Figure 5-7-9

5.8 Gravitational Wave as a Bundle of Force Lines

The preceding discussions explained gravitational phenomena with the gravitation field$\mathbb{E}$, gravitomagnetic field$\mathbb{B}$, and gravito-spin field $\mathbb{S}$ that are formed by gravitational force lines and their force line elements. As discussed, when the orbital radius of Earth changes, so too will Earth's gravitational potential and its internal energy, and this change is subsequently transformed into the electromagnetic wave of Earth's component particles. Because the component particles have gravitational force lines, the very small emitted (absorbed) energy changes create gravitomagnetic waves. When the energy change is smaller than the electromagnetic energy (e.g., energy change of a huge molecule or a huge solid object),such huge object can emit (or absorb) the gravitational wave as a bundle of force lines and their elements. This gravitational wave is different only quantitatively (scale of energy, wave length, frequency) from the electromagnetic wave. Qualitatively, this gravitomagnetic wave should be the same as the electromagnetic wave, because for gauge symmetry to be maintained, this gravito-magnetic wave should correspond with the electromagnetic wave. Therefore, the gravitational field $\mathbb{E}$ can be

$$\mathbb{E}(\mathbf{r}.t) = \frac{G_0 M}{4\pi} \frac{\boldsymbol{\mathcal{R}}}{(\boldsymbol{\mathcal{R}}.u)^3} [u\,(c^2 - v^2) + \boldsymbol{\mathcal{R}} \times (u \times a)] \qquad 5\text{-}8\text{-}1$$

The magnetic field $\mathbb{B}$ from such field $\mathbb{E}$ is

$$\mathbb{B} = \nabla \times \mathbb{A} = -\frac{1}{c}\,\frac{G_0 M}{4\pi}\,\frac{1}{(\boldsymbol{\mathcal{R}}.u)^3}\,\boldsymbol{\mathcal{R}} \times [v\,(c^2 - v^2) + v\,(\boldsymbol{\mathcal{R}}.\mathrm{a}) + \mathrm{a}\,(\boldsymbol{\mathcal{R}}.u)] \quad \text{5-8-2}$$

and it follows that this field is

$$\nabla \cdot \mathbb{E} = 0, \quad \nabla \cdot \mathbb{B} = 0, \quad \nabla \times \mathbb{E} = -\frac{d\mathbb{B}}{dt}, \quad \nabla \times \mathbb{B} = \frac{1}{G_0 I_0}\frac{d\mathbb{E}}{dt} \quad \text{5-8-3}$$

When mass accelerates, this field becomes

$$\nabla^2 \mathbb{E} = \frac{1}{G_0 I_0}\frac{d^2\mathbb{E}}{dt^2}, \qquad \nabla^2 \mathbb{B} = \frac{1}{G_0 I_0}\frac{d^2\mathbb{B}}{dt^2} \quad \text{5-8-4}$$

This is the gravitomagnetic wave as a bundle of force lines, where G_0 and I_0 are the gravitational permittivity and gravitomagnetic permittivity, respectively, in a vacuum.

$\mathbb{A}$ is the gravitational vector potential corresponding to the electrodynamics vector potential. Because the conversion constant is $Tr = 1.043 \times 10^{-10}$ c/kg (cf. §4.3) and the quantization constant (cf. §4.1) is $N = 1.686 \times 10^{21}$, it is easy to derive G_0 from ε_0 theoretically (cf. §10.5).

Now, we can consider another interpretation of the matter-wave theory of De Broglie. De Broglie's matter-wave theory says that "particle is a wave packet that has plenteous component waves," but because the plenteous component wave λ_n follows $\lambda = \frac{\hbar}{mv}$ the emitted (or absorbed) mass and associated energy should change according to the change of the physical situation (i.e., change of λ, change of mv). For that to be realized, particles as a wave packet must form force lines and force line elements as physical materials should contain wave particles like electrons and protons that interact with each other via their electric charges. Therefore, De Broglie's matter–wave theory should say "particles should form gravitational force lines and force line elements for Newtonian interaction to be possible." However, because the classical theory of relativity has only geometrical empty space instead of physical substance, it conflicts with this theory and its notion of gravitational force lines and gravitational waves that are formed by force lines as a physical substance. Thus, the justification of De Broglie's matter–wave theory and Schrödinger's wave mechanics is assured here by the curved force line elements theory. Because a

gravito-magnetic wave is qualitatively the same as an electromagnet wave, the gravitomagnetic wave should take the form of the gravitational energy quantum h_g as Planck's energy quantum h. However, because the gravitational charge (mass) is only quantitatively different from the electric charge, the gravitational energy quantum becomes (cf §18.5)

$$h_g = (6.626176 \times 10^{-34}\ \text{Js})\ (1.190208 \times 10^{7})^4$$

$$= 1.329702 \times 10^{-5}\ \text{Js} \qquad 5\text{-}8\text{-}5$$

Consequently, the energy of a gravitomagnetic wave is quantized. That is

$$E_g = h_g \nu_g \qquad 5\text{-}8\text{-}6$$

So far, I have explained about four factors of Earth's magnet. The predicted values obtained here agreed well with observed values each time. Consequently, the proclamations that "mass is a weak electric charge, or gravity is a weak electromagnetic force" and that the "basic logic of the curved force line elements theory is right," is assured both quantitatively and qualitatively.

5.9 Solving the Origin of Magnetar's Magnetic Field

A magnetar is a type of neutron star with an extremely powerful magnetic field. The magnetic field decay powers the emission of high-energy electromagnetic radiation, particularly X-ray and soft gamma rays. The theory regarding these astronomical objects was suggested by Robert Duncan and Christopher Thomson in 1992, but the first recorded burst of gamma rays through to have been from a magnetar had been detected on March 5, 1979.To today known magnetars are SGR 1806-20, SGR 1900+14, SGR 0501+4516, 1E1048.1-5937, SWIFT J195509+261406, CXO J16410.2-455216, SWIFT J1822.3 Star-1606, 3XMM J185246.6 + 003317…. As of November 2013, 21 magnetars are known, with five more candidates awaiting confirmation. A full listing is given in the McGill SGR/AXP Online Catalog. Like other neutron stars, magnetars are around 20 km in diameter and have a greater mass than the Sun. The density of neutron star and pulsar is

$$\rho = 8\times 10^{13} g/cm^3 \sim 2 \times 10^{15} g/cm^3 \qquad 5\text{-}9\text{-}1$$

Magnetars are characterized by their extremely powerful magnet field

$$\frac{B_{dipole}(magnetar)}{B_{dipole}(pulsar)} = \frac{B_{sat}(neutronstar\ convection\ zone)R_{ms}^2}{B_{sat}(main-sequence\ core\ convection)R_{ms}^2} \sim 10^2 \quad 5\text{-}9\text{-}2$$

B_{dipole} of usual pulsar is

$$B_{dipole} \sim 10^{13} G \quad 5\text{-}9\text{-}3$$

Therefore B_{dipole} of magnetar is

$$B_{dipole} \sim 10^{15} G \quad 5\text{-}9\text{-}4$$

Magnetars are differentiated from other neutron stars by having stronger magnetic field, and rotating comparatively slowly.

This strong magnetic field gives rise to very strong and characteristic burst of X-ray and gamma rays.

The mean density of the Earth is

$$\rho = 5.514 g/cm^3 \quad 5\text{-}9\text{-}5$$

Related B_{dipole} of the Earth by EQ 5-3-9 is

$$B_{dipole} \sim 3 \times 10^{-1} G \quad 5\text{-}9\text{-}6$$

Such strong fields of magnetars are understood as resulting from a magneto hydrodynamic (MHD) dynamo. MHD is the study of the dynamics of electrically conducting fluids includes plasmas, liquid metals, salt water and electrolytes. The fundamental concept behind MHD is that magnetic fields can induce currents in moving conductive fluid, which in turn creates force on the fluid and also changes the magnetic field itself. The set of equations which describe MHD are a combination of the Navier-Stockes equation of fluid dynamics and Maxwell's equation of electromagnetism. These differential equations have to be solved simultaneously, either analytically and quantitatively. However, because MHD has to be used only given magnetic field from neutron stars and magnetar, this theory sooner or after should be met limit of explanation about relation between electromagnetic phenomenon and gravitational phenomenon like Dynamo theory in geophysics and solar physics as What remain unknown is just how highly magnetized and rapidly rotating these magnetatrs may be at birth.

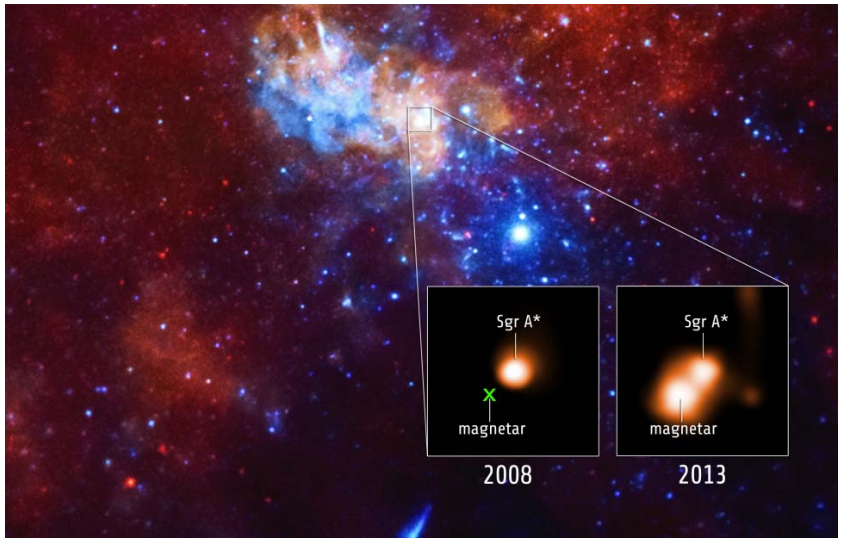


Figure 5-9-1

But CFLE theory can show and explain origin of such strong magnetic field simply from mass as very weak electric charge.

$$d = \frac{\rho_M}{\rho_E} = \frac{8\times10^{13}g/cm^3 \sim 2\times10^{15}g/cm^3}{5.5g/cm^3}$$

$$=1.5\times 10^{13} \sim 3.6\times 10^{14} \qquad 5\text{-}9\text{-}7$$

$$B_{dipole} = (3\times 10^{-1}G)\,(1.5\times 10^{13} \sim 3.6\times 10^{14})$$

$$= 4.5\times 10^{12}G \sim 1.1\times 10^{14}G \qquad 5\text{-}9\text{-}8$$

According to EQ 5-9-2, B_{dipole} of magnetar is

$$B_{dipole} = (\sim 10^2)\,(4.5\times 10^{12}G \sim 1.1\times 10^{14}G)$$

$$\approx 4.5\times 10^{14}G \sim 1.1\times 10^{16}G \qquad 5\text{-}9\text{-}9$$

According to this result now we can explain why magnetar's magnet field is stronger than usual pulsar although magnetar is same kind of usual pulsar.

$$\frac{B_{dipole}(magnetar)}{B_{dipole}(pulsar)} = \frac{B_{sat}(neutronstar\ convection\ zone)R_{ms}^2}{B_{sat}(main\text{-}sequence\ core\ convection)R_{ms}^2} \sim 10^2 \qquad 5\text{-}9\text{-}2$$

Because constituent neutron (kaonic neutron$n^{o}_{kaionic}$) of magnetar is different from usual constituent neutron (muonic neutron$n\,^{o}_{muonic}$) of usual pulsar, such relation of Eq5-9-2 is established.

Most outer particle of usual neutron is muon and muon's curve of force line is$g = 3.836$.

However, most outer particle of kaonic neutron or exotic neutron is kaonic lepton like exotic atom or hadronic atom and kaon's curve of force line is$g = 5.754$ as figure 15-9-2

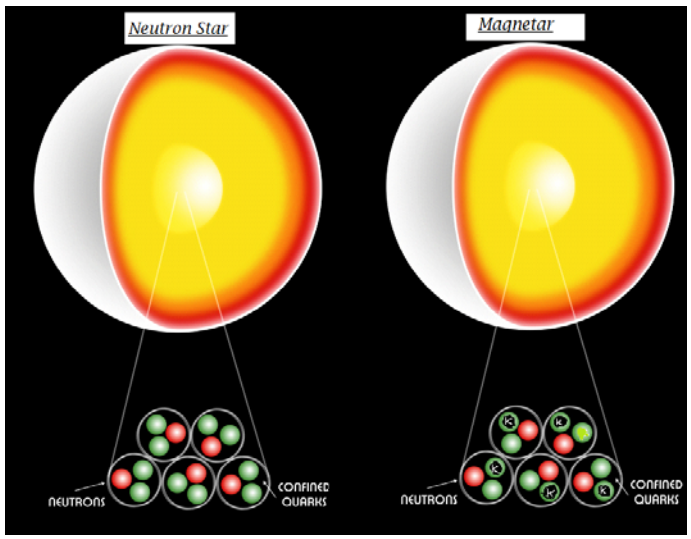


Figure 5-9-2

Because difference of curve of two force line from accelerating universe is $C_c = \frac{g_k}{g_\mu} = \frac{5.754}{3.836} = 1.5$, difference of total curve of gravitational force line is $g = 8$,

Total change for gravito magnetic field by change of degree of curve of weak force line and electric force line is

$$E_{tot} = (8 \times 1.5)^2 = 144 \qquad 5\text{-}9\text{-}10$$

This means that electromagnetic change by kaonic lepton is expressed gravito magnetic change.

Conclusion: magnetar is exotic neutron star: they gravitationally condensate more than usual neutron star. Therefore,magnetar is same

kind of ULXs. Some of them (e.g. M82X-2) are pulsar that is extremely brighter than usual pulsar.

Neutron star made by usual neutron that most outer particle is muon with $g = 3.836$. Magnetrar made by exotic neutron that most outer particle is kaonic lepton with $g = 5.754$ by flavor mixing or leptonic oscillation like neutrino oscillation.

> "If it is assumed that gravitation is an electromagnetic effect too, then there has to be proportionality between electromagnetic energy, inertial mass, and gravitational mass."
>
> Wilhelm Wien (1864 - 1928)