Chapter 8

# Applying CFLE Theory to the Sun and Stars

## 8.1. Quantization of Solar Mass and Star Mass by CFLE Theory

When the speed of an electron reaches the speed of light, the mass of the electron becomes its bar mass, which is $S_n = 2.006745 \times 10^{28}$ times bigger than the rest mass by the strength of a strong force, as discussed in §6.

Therefore, a strong force is $(2.006745 \times 10^{28})^2 = 4.207019 \times 10^{56}$ times stronger than the gravitational force, as calculated from the following formula:

$$F = \frac{GMm}{r^2} \quad \Longrightarrow \quad F = \frac{GMS_n mS_n}{r^2}$$

$$F = m\frac{GMS_nS_n}{r^2} \quad \Longrightarrow \quad F = m\frac{G}{r^2}(MS_nS_n) \qquad \text{8-1-1}$$

Thus, the maximum congregated mass by a strong force without change of the component particle (proton) system is

$$M = (1.672649 \times 10^{-27}\ \text{kg})\ (4.207019 \times 10^{56})$$

$$= 6.735789 \times 10^{29}\ \text{kg} \qquad \text{8-1-2}$$

where $1.672649 \times 10^{-27}$ kg is the proton mass as a component particle of the sun.

With a correspondence number of $c_c = 1.5$ and a mass number of the sun (like the mass number of every element) of $A = 2$,

$$M_\odot = (6.735789 \times 10^{29}\ \text{kg})\ (1.5 \times 2)$$

$$= 2.020737 \times 10^{30}\ \text{kg} \qquad \text{8-1-3}$$

Taking into account the gravitational permittivity of air (cf. §10.2) at $g = 1$, the electrical permittivity (cf. §10.2) of air at $g = 1$ and permittivity of air for weak force at $g = 1$ .

$x_g = 1.016774$

$x_e = 1.000589$

from Eq. 10-5-12-3

$x_W = 1.000020$ 8-1-4

the theoretical value of the sun's mass for Earth surfaces observer becomes

$$M_\odot = (2.020737 \times 10^{30}\ \text{kg})\ [\frac{(1.000589)}{(1.016774)(1.000020)}]$$

$$= 1.988531 \times 10^{30}\ \text{kg}$$

$$\approx 2 \times 10^{30} kg \qquad 8\text{-}1\text{-}5$$

This mass is called the quantized mass of the sun.

The observed value of the sun's mass is

$M_\odot = 1.98855 \pm 0.00025 \times 10^{30}$ kg 8-1-6

Therefore, the quantized star unit mass of $A = 1$ is

$$M_\odot = \frac{1.988611 \times 10^{30}\ \text{kg}}{2}$$

$$= 9.943053 \times 10^{29}\ \text{kg}$$

$$\approx 1 \times 10^{30} kg \qquad 8\text{-}1\text{-}7$$

The important point of these results is that the quantized star mass corresponds with the quantized particle (proton) mass, and justification of this important general corresponding property has already been confirmed quantitatively. Furthermore, this result implies that the quantization of an astronomically huge object is also possible by using quantum mechanics on an astronomical scale without destructive infinity. From this positive result, we can infer the property of the Newtonian gravitations force or the case of where a strong force is not $\sim 10^{56}$ times stronger than gravitational force, Because of the repulsive force between a neutron and a neutron, a proton and a proton, or a neutron and a proton, the sun and any star can have such huge mass system in a stable state. These surprising results give meaningful insight about the real physical reason for a supernova explosion. When the force line curve of a massive star of the early universe changes from $g_{\mathrm{i}} \rightarrow g_{\mathrm{f}}$, the attractive force of the strong force of the star system cannot overcome the repulsive force between a neutron and a proton, and finally the gravitational system of stars should be destroyed by Pauli's exclusions principle. This means that a supernova explosion phenomenon corresponds with the nuclear decay of an atom as collapse of Bose-Einstein condensation.

## 8.2 Obtaining the Possible Maximum Star Mass by CFLE Theory

In §7.8, I had explained that the possible maximum mass number of atomic elements in nature is

$A = 238.030$ (uranium) 8-2-1

Because a star is the corresponding object of an atom and its elements, we can assume the possible maximum star mass from such condition. However, as explain before, between gravity and electricity there is a difference of $c_{\mathrm{c}} = 1.5$ and related gravitational permittivity

$Q_{\mathrm{g}} = (0.016774)\ (1.5) = 0.025161$

$x_{\mathrm{g}} = 1.025161$

The related electrical permittivity of air at $g = \frac{6.545979}{1.5} = 4.363986$ is

$Q_{\mathrm{e}} = (0.000589)\ (4.363986) = 0.002570$

$x_{\mathrm{e}} = 1.002570$ 8-2-2

$x_{\mathrm{g}}x_{\mathrm{e}} = (1.025161)\ (1.002570) =1.027796$

So, the effective difference is

$d = \frac{1.5}{1.027796} = 1.459434$ 8-2-3

Therefore, the possible maximum quantized star mass number is

$A = (238.030)\ (1.459)$

$= 347.286$ 8-2-4

Because the mass number of the sun is $A = 2$, the mass limit of a star is

$$M = \left(\frac{347}{2}\right) M_{\odot} \approx 174 M_{\odot} \quad 8\text{-}2\text{-}5$$

This is the theoretical value by CFLE theory, and it agrees well with observed value.

Stellar mass by Eddington limit is

$$M_{eddington} = 150 M_{\odot} \quad 8\text{-}2\text{-}6$$

Study of the Arches cluster suggests that $150M_{\odot}$ is the upper limit for any star in the current era of the universe. As it turns out, a star named R136a in the RMC136a star cluster has been measured as $265M_{\odot}$, thus putting this mass limit into question. In CFLE theory, however, this phenomenon can explain by exotic atoms (muonic hydrogen atom and its radius,hadronic atom and its radius, kaonic hydrogen). When stars constitute by such material,is called exotic stars.

Possible maximum stellar mass is

$$M_{Max} = 174 M_{\odot} \times 1.459$$

$$\approx 254\ M_{\odot} \quad 8\text{-}2\text{-}7$$

Star R136 a1 is 265 $M_{\odot}$ that is kind of wolf-rayet star

Star WR102ka is 175 $M_{\odot}$that is kind of wolf-rayet star

This means that somewhere among the star clusters or in the galaxy clusters, there can exist temporarily and locally high-energy density conditions resulting in the inhomogeneous strong galaxy potential between the galaxy core and outside of the galaxy core in the galaxy remnant (cf. §11). Such places in the universe could be create stars with a mass over the $174M_{\odot}$ limit, much like a temporarily created artificial element that has a mass number over the natural permitted limit of 92 of uranium. Because force line curve ($g$ = 3.772 and $g$ = 5.658) of particles are a feature of the current universe, stars that generally exist in the current universe will have a mass number under the limit of $174M_{\odot}$.

## 8.3 Quantization of Solar Size and Star Size by CFLE Theory

In §7.4, I had discussed the theoretical electric charge distribution radius of the proton at $= 5.793596$ . That is

$$r_p = 4.9745598 \times 10^{-15} \text{ m} \qquad 7\text{-}4\text{-}2\text{-}6$$

According to the correspondence principle, the sun's gravitational charge distribution radius by increase quantization constant is

$$R_{\odot} = (4.974560 \times 10^{-15} \text{ m})\ (1.686044 \times 10^{21})$$

$$= 8.387327 \times 10^{6} \text{ m} \qquad 8\text{-}3\text{-}1$$

From this charge distribution surface, however, comes the electromagnetic force and its related weak force line, which in turn create the gravitational force surface and all of its force line curve of $g$ = 6.545979. So, the effective radius is

$$R_{\odot} = (8.387327 \times 10^{6} \text{ m})\ (6.545979)^{2}$$

$$= 3.593956 \times 10^{8} \text{ m} \qquad 8\text{-}3\text{-}2$$

Given the sun' mass number $A$ = 2, the gravitational radius of the gravitational surface is

$$R_{\odot} = (3.593956\times 10^{8} \text{ m})\ (2)$$

$$= 7.187913 \times 10^{8} \text{ m} \qquad 8\text{-}3\text{-}3$$

The difference of the gravitational permittivity for observer of Earth surface at $g_{ES} = 2$ is

$$Q_1 = (0.016774)\ (2) = 0.033548, \quad x_1 = 1.033548 \qquad 8\text{-}3\text{-}4$$

The difference of the permittivity of weak force for observer of Earth surface at $g = 1$ is

$$x_2 = 1.000020 \qquad 8\text{-}3\text{-}5$$

So, the expected radius of the sun for Earth's observer, as calculated by CFLE theory, is

$$R_{\odot\text{theory}} = \frac{7.187913 \times 10^{8}\ \text{m}(1.000020)}{(1.033548)}$$

$$= \frac{7.187913 \times 10^{8}\ \text{m}}{1.033527}$$

$$= 6.954739 \times 10^{8}\ \text{m} \qquad 8\text{-}3\text{-}6$$

The observed value is

$$R_{\odot\text{observe}} = 6.95508 \times 10^{8}\ \text{m} \qquad 8\text{-}3\text{-}7$$

Because the theoretical value agrees well with the observed value, we can decide the quantized unit star radius to be

$$R_{\circledcirc} = \frac{6.954749\ \text{x}\ 10^{8}\ \text{m}}{2}$$

$$= 3.477370 \times 10^{8}\ \text{m} \qquad 8\text{-}3\text{-}8$$

Where $\circledcirc$ is a symbolized usual star

Because of the success in quantization of the star mass and star size, we can apply the formula $\Delta M_{\odot} V_{\odot} \Delta X_{\odot} \leq \hbar_{\odot}$ to the sun and a general star without doubt. Therefore, we need to find the energy quantum $\hbar_{\mathrm{j}}$ of the sun $\hbar_{\odot}$ and the star $\hbar_{\circledcirc}$. The solar force line structure can be expressed by Figure 8-3-1.

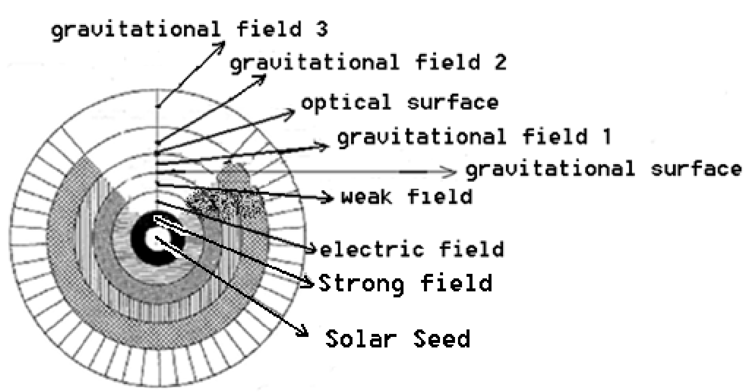



Figure 8-3-1

## 8.4 Confirmation of the Inertial Constant of the Sun and its *g* by CFLE Theory

$M_{\odot} R_{\odot}^{2} = (1.988 \times 10^{33}\ \text{g})\ (6.955 \times 10^{10}\ \text{cm})^{2}$

$= 9.616 \times 10^{54}$ g·cm$^2$ 8-4-1

where $M_\odot$ is the sun's mass, and $R_\odot$ is the sun's radius. The observed value of the moment of the sun's inertia is, however,

$I = 5.7 \times 10^{53}$ g·cm$^2$ 8-4-2

The difference is

$$d = \frac{96.16 \times 10^{53}\ \text{g·cm}^2}{5.7 \times 10^{53}\ \text{g·cm}^2}$$

$= 16.9$ 8-4-3

This difference in value occurs by proper mass distribution of the sun. However, because the inertial constant of a homogenous sphere is $k = \frac{2}{5}$, the proper mass distribution of the sun is

$K = \frac{2}{5x}$ 8-4-4

According to §7.14, the $x$ value is the force line curve $g$ (viz., $x = g$.)

Because the sun's force line curve is $g$ = 6.546, and the additional gravitational permittivity of component particles at $g$ = 57.74 (cf. Formula 8-8-3) is

$Q_g = (0.000579)\ (57.74) = 0.033431$

$x_g = 1.033431$

the effective solar force line curve is

$g = (6.546)\ (1.033431) = 6.765$ 8-4-5

Therefore, the solar inertial constant is

$$k = \frac{1}{(2.5)\ (6.765)}$$

$$= \frac{1}{16.913}$$

$\approx \frac{1}{16.9}$ 8-4-6

These results show that the sun's force line curve is $g$ = 6.546 and the solar inertial constant is $k = \frac{1}{16.9}$, as proven in §7.14.

## 8.5 Solving the High Corona Temperature Problem by CFLE Theory

A nuclear fusion reaction creates a temperature ($T$) of 15 million K in the sun's core. This temperature decreases gradually from the core to the outer layer of the sun, and is $T$ = 5780 K in the photosphere, but in the corona the temperature is $T \approx 10^6$ K, as seen in Figure 8-5-1.

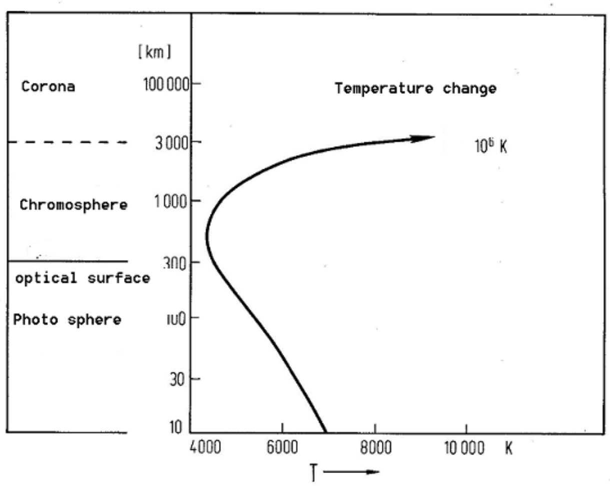



**Figure 8-5-1**

The explanations for this unusual reversal to a high temperature in the corona have led to the suggestion of a wave heating theory, as well as a magnetic reconnection theory, collectively called the coronal heating theory. However, this theory cannot explain away the coronal heating problem. The high temperatures of 1~3 million K (sometimes 1~10 million K) in the corona require energy to be carried from the solar interior to the thin corona by a non-thermal process, because the second law of thermodynamics prevents heat from flowing directly from the cooler solar photosphere to the much hotter corona. [Recall that the second law of thermodynamics requires heat to flow from a higher to a lower temperature.]

Historically, the corona temperature was obtained by observing physical processes of the sun. In the late 30's, Grotrian (1939) and Elden (1941) discovered that the strange spectral lines observed in a spectrum of the solar corona were emitted by elements such as iron

(Fe), calcium (Ca), and nickel (Ni) in very high states of ionization, and hence they concluded that the coronal gas is extremely hot with a temperature of more than 1 million K. This high ionization is not by UV rays, but produced by electron collision. The strong emission lines of the sun's corona are presented in Table 8-5-1

**Table 8-5-1. Strong Emission Line of the Sun's Corona**

| λ (A°) | Identification | $X_i$ (eV) | $A_x$ (A°) |
|---|---|---|---|
| 3388 | [Fe XIII] | 325 | 10 |
| 5303 | [Fe XIV] | 355 | 20 |
| 6374 | [Fe X] | 233 | 4 |
| 7892 | [Fe XI] | 261 | 6 |
| 10747 | [Fe XIII] | 325 | 48 |
| 10798 | [Fe XIII] | 325 | 30 |

where $X_i$ in the table is the ionization energy

$$\frac{2}{3}kt \sim X_i \qquad 8\text{-}5\text{-}1$$

Because the ionization energy is on average 300 eV, the expected temperature is $T \sim 10^6$ K. At the sunspot, $T = 2 \times 10^6 \sim 10 \times 10^6$ K. In this process, we cannot find any physical inconsistencies, and therefore the corona temperature problem has remained unsolved by modern physics for about 70 years. CFLE theory, however, views this problem as a natural phenomenon, because according to §8.3, the solar force line curve $g$ = 6.545979 is under the gravitational surface, which is essentially the photosphere. The temperature of under the gravitational surface at $g$ = 6.545979 is

$$T = (5.780 \times 10^3 \text{ K})\,(6.545979)^4 = 10.61 \times 10^6 \text{ K} \qquad 8\text{-}5\text{-}2$$

However, the force line curve state of the gravitational surface which is essentially the photosphere, is $g$ = 5.793596. According to $E = \sigma T^4$ (cf. §18.7) and $g^4 = m$ the temperature of the gravitational surface is

$$T = (5.780 \times 10^3 \text{ K})\,(5.793596)^4 = 6.512 \times 10^6 \text{ K} \qquad 8\text{-}5\text{-}3$$

Despite such very high temperature, a neutral atom can stay in this surface in a stable state, because the gravitational force of the sun caused by its curved force line is stronger than the atomic electrical force of the component particles of the sun's surface. Therefore, the temperature of the photosphere, corresponding to the gravitational surface force line curve of $g$ = 5.793596, can be expressed as

$T = 6.512 \times 10^6$ K 8-5-4

Despite such an extremely high temperature of the photosphere, it is not a broken state of the second law of thermodynamics. When the observed corona is of $r_o = 2R_\odot$ is at $g$ =(5.793596-1) =4.793596, the force line curve state there is $g$ = 4.793596.

Therefore, the temperature of the corona where $r_o = 2R_\odot$ at $g = 4.793596$ is

$T_{2R_\odot} = (5.780 \times 10^3 \text{ K})\ (4.793596)^4$

$= 3.052 \times 10^6$ K 8-5-5

Because of effect of correspondences number $C_c = 1.5$ , real temperature is

$T_{2R_\odot} = (3.052 \times 10^6 \text{ K})/(1.5)$

$= 2.035 \times 10^6$ K 8-5-6

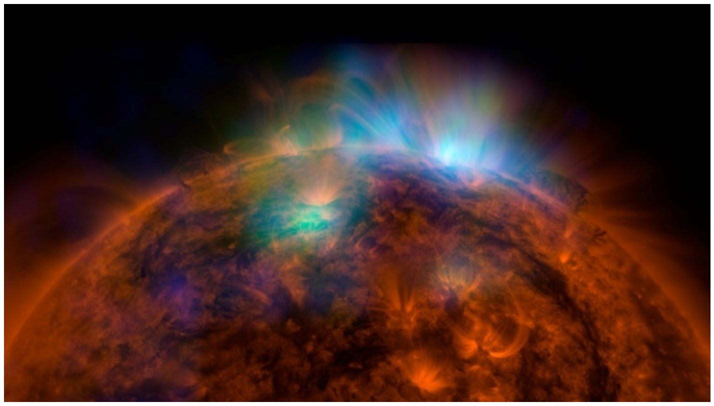
The observed value is

$T_{2R_\odot} \approx 2 \times 10^6$ K 8-5-7

Here, we can find that the theoretical value of CFLE theory agrees quite well with the observed value.

For such energy relation to realize what kind of heating mechanism should be used in the solar corona? This problem of corona heating mechanism is different problem of high corona temperature problem.

Recently Nano flares theory that was first suggested by T. Gold and E. Parker in 1964~ 1972, is strongly supported by observational results (2014.December.23 published) by NASA's Nuclear Spectroscopic Telescope Array (NuSTAR).



**X-rays stream off the sun in this image showing observations from by NASA's Nuclear Spectroscopic Telescope Array, or NuSTAR, overlaid on a picture taken by NASA's Solar Dynamics Observatory (SDO). (NASA/JPL-Caltech/GSFC)**

**Figure 8-5-2**

To summarize, the CFLE theory does not need an additional heating process for the corona. There is only natural heat current from a high temperature to a low temperature according to the second law of thermodynamics. This corona phenomenon can be analyzed only when an observer in the flat force line co-ordination system observes the phenomenon occurring in the curved force line co-ordination system, which is weaker than the real strength by as much as the curve of the force line. If an observer does not recognize the relative strength relation between flattened force line and curved force line phenomena, then such problematic phenomena (corona heating problem) will remain a mystery. The conclusion of this chapter is simply to say that the temperature of the photosphere is very much higher than what it is believed to be by observers of Earth. The photosphere of the sun comprises a very strong gravitational force from its curved force lines, and the component particles stay in a neutral state, despite the very high temperatures.

## 8.6. Solving the Problem of the Nebular Hypothesis of the Solar System by CFLE Theory

The nebular hypothesis was first proposed in 1734 by Emanuel Swedenborg, and the theory was developed further by Immanuel Kant in 1755. A similar model was proposed in 1796 by Pierre–Simon Laplace. It featured a contracting and cooling protostar cloud. As the nebular contracted, it flattened and shed a ring of material that later collapsed into a planet. Although the Laplacian nebular model dominated in the 19th century, it encountered some difficulties. The main problem was the angular momentum distribution between the sun and the planets. The planets have an angular momentum of 99% and this fact could not be explained by the nebular model. As a result, this theory of planet formation was largely abandoned at the beginning of the 20th century.

The fall of the Laplacian model stimulated scientists to find a replacement for it. During the 20th century, many theories were proposed, including the planetisimal theory of Thomas Chamberlain and Forest Ray Moulton, the tidal model of Jeans, the accretion model of Otto Schmitt, the protoplanet theory of William McCrea, and the capture theory of Michael Woolfson. In 1978, Andrew Prentice resurrected the initial Laplacian ideas about planet formation and developed the modern Laplacian theory. None of these attempts were completely successful and many of the proposed theories were descriptive.

The widely accepted modern variant of the nebular hypothesis is the solar nebular disk model (SNDM), but this model came across the angular moment problem too. That is, how the material, which is accredited to the protostar, loses its angular momentum. The momentum is probably transported to the outer part of the disk, but the precise mechanism of this transport is not well understood. In actual observations, young stars have been observed to exist inside of giant clouds of molecular hydrogen. This is evidence that the ideas of all the proposed theories are basically wrong. Even the recent theoretical calculations return absurd results, and there remain unexpected gaps between modern physics and the reality observed in nature. The following calculation process demonstrates such type of erroneous predictions.

Spherical interstellar material (SISM) has a density of $\rho = 10^{-24}$ g/cm$^3$. The total mass is given by the expression $M = M_\odot$, where $M_\odot$ is the solar mass having a value of

$$M_\odot = 1.989 \times 10^{30} \text{ kg}$$

The expected radius of SISM is

$$R = \left[\frac{\left(\frac{3}{4\pi}\right) M_\odot}{\rho}\right]^{\frac{1}{3}}$$

$= 2.6$ pc 8-6-1

where 1 pc = $3.086 \times 10^{18}$ cm.

The rotations impulse is given by

$J = I\omega$ 8-6-2

where $I$ is the inertial moment $I = \frac{2}{5} M_{\odot} R_{\odot}^2$, and ω is the gradient of the orbital speed of the galaxy center,

$\omega = \frac{10 \text{ km/s}}{1 \text{ Kpc}} = 3 \times 10^{-16} \text{ s}^{-1}$

So, the rotations impulse pro-mass unit is

$\frac{J}{M_{\odot}} \approx 10^{-18} \text{ m/s}^2$ 8-6-3

Contraction from $R$ to $R_1 = 1R_{\odot}$.

Because the rotation impulse is

$J = I\omega = I_1\omega_1$ to $\omega_1 = \omega\, (\frac{I}{I_1})$

$= \omega\, (\frac{R^2}{R_1^2}) \approx 4 \text{ s}^{-1}$ 8-6-4

therefore, the rotations speed of the surface is

$V \approx 3 \times 10^{11}$ cm/s

$\approx 10\, c$

$\approx 3 \times 10^9$ m/s 8-6-5

where $c = 3 \times 10^8$ m/s

These results show that the rotations speed of a surface is 10 times faster than the speed of light, which is an unrealistic result. The real rotations speed of the sun's surface is

$V = 2 \times 10^3$ m/s 8-6-6

Thus, there is discrepancy between theory and reality. These results show where the current address of modern physics is. In CFLE theory, however, this problem is very simply solved. As discussed in §7.2, CFLE theory predicts that when atoms approach one another, the force line curve state is $g$ = 3.836, because nucleons can interact at least with muons ($g$ = 3.836 for muons). Therefore, when SISM contract, there is more interstellar material to participate in star formation according to $g$ = 3.836. Because of this strong neutrolateral force, material can contract gravitationally, but they cannot disperse to the outer side of the star by expansion of high temperature. That is, this neutrolateral force strength is

$$F' = F\,(3.836)^2, \quad F' = 14.72\,F \qquad \text{8-6-7}$$

This additional strong force factor $g$ = 3.836 can be applied to the problematic calculation process of the nebular hypothesis. That is, because of the curve of the force line, component particles can interact with muons of other component particle with more strong force. The additional total strength is

$$M_\pi = [3.836]^4 m_e = 217 m_e$$

However, the volume of a spherical cloud is

$$V = \frac{4}{3}\pi R^3 \qquad \text{8-6-8}$$

An additional factor influences this volume. The total effect is

$$E_{\text{effect}} = \frac{4}{3}\pi R^3 (217)^3$$

$$= \frac{4}{3}\pi R^3\,(10.22 \times 10^6)$$

The net additional effect is

$$E_{\text{effect}} = (217)^3 = 10.22 \times 10^6$$

Because of this additional factor, an interstellar cloud can have a much larger size.

Because the solar inertial constant is $k = \frac{1}{16.9}$ and a homogenous sphere is $k = \frac{2}{5}$, the solar force line curve is $g = \frac{16.9}{2.5}$ = 6.76. Thus, the interstellar cloud loses energy because of this inertial moment by as much as $g$ = 16.9 for mass distribution of the sun's interior.

The total effect is

$$E_{\text{effect}} = \frac{16.9}{2.5} = 6.76$$

Therefore, the real additional effect is

$$E_{\text{real}} = \frac{10.22 \times 10^6}{6.76}$$

$$= 1.51 \times 10^6 \qquad 8\text{-}6\text{-}9$$

That is, CFLE theory predicts that "because the force line curve is $g$ = 3.836, an interstellar cloud can have a 1.5 × $10^6$ times larger size and larger related material." So, according to this prediction, the rotations speed by the existing calculation ought to be slower by as much as

$E_{\text{real}}$ = 1.51 × $10^6$ times

That is,

$$V = \frac{3 \times 10^9 \text{m/s}}{1.51 \times 10^6}$$

$$= 1.99 \times 10^3 \text{ m/s}$$

$$= 1.99 \text{ km/s} \qquad 8\text{-}6\text{-}10$$

The real observed value is

$$V = 2 \times 10^3 \text{ m/s} = 2 \text{ km/s} \qquad 8\text{-}6\text{-}11$$

This observed value agrees well with the theoretical value from CFLE theory. So, here, we can have assurance again that CFLE theory can successfully solve the problem of the nebular hypothesis. This problem type is the same problem type of Lorentz's objection to the Uhlenbec–Goudsmit proposal of the spin magnet moment of the electron. Namely, the electron's equatorial rotations speed would exceed the speed of light by a factor ~10, in objection against Lorentz electrodynamics itself when the spin magnetic moments become established. Uhlenbec's historical verbatim about this problem is vividly reproduced here:

> "…Lorentz received us with well known great kindness, although, I feel, somewhat skeptical too. He promised to think it over. And in fact, already next week he gave us a manuscript, written in his beautiful handwriting, containing long calculation on the electromagnetic properties of rotating electron. We could not fully understand it, but it was quite clear that the picture of the rotating electron, if taken seriously, would give rise to serious difficulties. For one thing, the magnetic energy would be so large that by the equivalence of mass and energy the electron would have a larger mass than the proton, or, if one sticks to the known mass, the electron would be bigger than the whole atom! In any case it seemed to be nonsense. Goudsmit and myself both felt that it might be better for the present not to publish anything, but when we said this to Ehrenfest, he answered: 'I have already sent your letter in long ago; you are both young enough to allow yourselves some foolishness!"[1]

This problem is solved simply too when we use CFLE theory in the same way as for the nebular hypothesis problem. The speed of light factor of ~10 is the same factor of the nebular hypothesis. That is, from Eq. 8-6-10,

$V = 3 \times 10^9$ m/s

The ratio between this speed and light speed is

$$R = \frac{3 \times 10^9 \text{ m/s}}{2.998 \times 10^8 \text{ m/s}} \approx 10$$

and the Compton radius of an electron is

$$R_c = \frac{\hbar}{m_e c} \qquad 8\text{-}6\text{-}12$$

where $m_e$ is the mass of an electron. The classical radius of an electron is

$$R_{cl} = \alpha R_c \qquad 8\text{-}6\text{-}13$$

where α is the fine structure constant

$$\alpha = \frac{e^2}{\hbar c} = \frac{1}{137.036}$$

1. Excerpt from Kurt Grelling. 1988. A logical theory of dependence, p. 301. In: B. Smith, Editor, *Foundations of Gestalt Theory*. Philosophica Verlag, Munich.

Hence,

$$R_{\mathrm{cl}} = \frac{e^2}{m_e c^2}, \quad \alpha = \frac{e^2}{\hbar c}, \quad R_{\mathrm{cl}} = \alpha R_c \qquad \text{8-6-14}$$

The difference of the Lorentz radius of an electron is

$$d = \frac{3}{2\alpha} \approx 206 \qquad \text{8-6-15}$$

So, the radius of a Lorentz electron is actually $\frac{3}{2\alpha} \approx 200$ times larger than predicted by a purely electrostatic calculation. When this difference factor $d = \frac{3}{2\alpha} \approx 206$ is analyzed by CFLE theory, the force line curve should only be $g = (3.836)^4 = 217$. When the Lorentz difference factor $d = \frac{3}{2\alpha}$ decomposes, the force line curve obtained is

$$g = \sqrt[4]{206} = 3.788 \qquad \text{8-6-16}$$

The difference between 3.788 and 3.836 is only the difference of the gravitational permittivity of air and electrical permittivity of air. That is,

$$x_{\mathrm{g\ air}} = 1.016774$$

$$Q_{\mathrm{quark}} = \frac{0.000589}{3} = 0.000196, \quad x_{\mathrm{quark}} = 1.000196$$

$$Q_{\mathrm{highspeed\ particle}} = \frac{0.000589}{(8\times8)} = 0.000009, \quad x_{\mathrm{highspeed\ particle}} = 1.000009$$

$$\frac{(x_{\mathrm{g\ air}})(x_{\mathrm{quark}})}{x_{\mathrm{highspeed\ particle}}} = \frac{(1.016774)(1.000196)}{1.000009} = 1.016964$$

$$g = (3.772)\,(1.016964) = 3.836 \qquad \text{8-6-17}$$

$$Q_{\mathrm{neutral\ force}} = (0.000589)\,(8) = 0.004712, \quad x_{\mathrm{neutral\ force}} = 1.004712$$

$$g = \frac{(3.772)\,(x_{\mathrm{neutral\ force}})}{x_{\mathrm{air}}}$$

$$= \frac{(3.772)\,(1.004712)}{1.000589} = 3.788 \qquad \text{8-6-18}$$

This force line curve is just like the force line curvature used to solve the problem of the nebular hypothesis.

This clear agreement in results means that an electron rotates like the sun, is called particle rotation, and a spin magnet moment is produced by rotation of the force line element(cf.§20.3) is called rotation of force line elements as figure 8-6-1


**Figure 8-6-1**

## 8.7. Resolution of the Solar Oblateness Controversy by CFLE Theory

In Newtonian physics, under standard assumptions for astrophysics, a two-body system consisting of a lone object orbiting a spherical mass would trace out an ellipse with the spherical mass as a focus. The point of closest approach is fixed. There are a number of effects present in the solar system that cause the perihelion of the planet to precess around the sun. Another effect is solar oblateness, which produces only a minor contribution.

The calculations of Newtonian physics were brought into question with the observations of the rate of precession of the perihelion of Mercury's orbit. This inconsistency was first recognized in 1859 by U. Le Verrier. His re-analysis of available fine observations of Mercury over the sun's disk from 1679 to 1848 showed that the actual rate of the precession disagreed with what he had calculated from Newton's theory. One account initially estimated the discrepancy as 38″ per tropical century. This was later re-estimated by Simon Newcomb to be 43″, which was quite close to the currently established value of 42.98″ ± 0.04″ per century. In the years that followed, and well into the $20^{th}$ century, many physicists would pick up this challenge of solving Mercury's perihelion precession.

Albert Einstein was among those who attempted to solve this issue. In 1915, using his then still newly developed general theory of relativity; he calculated a precession discrepancy of 42.98″ per century for Mercury, which was very close to the accepted correct value.

Einstein's theory, however, was challenged by Robert Dicke and H. Mark Goldenberg in 1966. Dicke and Goldenberg observed the sun's brightness and oblateness by varying the telescope's magnification, and they concluded that the sun was oblate. Now, based upon the assumption that the sun's interior rotation period and its surface rotation period are the same, the diameter difference from the sun's oblateness would be predicted to be only ~200 m (or $1 \times 10^{-7}$). This value would have no significant effect on the calculation of Mercury's perihelion precession by Einstein. However, Dicke and Goldenberg observed the diameter difference of the sun's oblateness to be ~250 times larger, at 52 km (or $4 \times 10^{-5}$), within a ±10% error. This value would reset Mercury's predicted perihelion precession as 3″ per century. This large discrepancy with Einstein's general relativity prediction would serve to create huge debates within the scientific community, since it was widely held that Einstein's 43″ value was fixed in stone!

**Table 8-7-1**

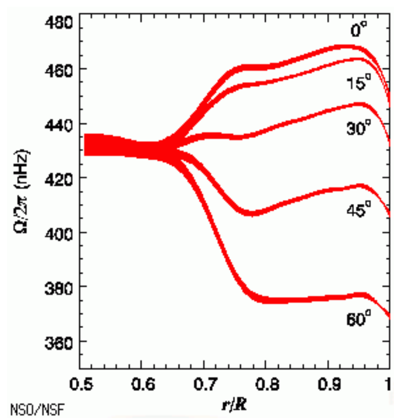
**Sources of the precession of perihelion for Mercury**

| Amount (arcsec/Julian century) | Cause |
|---|---|
| 531.63 ±0.69 | Gravitational tugs of the other planets |
| 0.0254 | Oblateness of the Sun |
| 42.98 ±0.04 | General relativity |
| 574.64±0.69 | Total |
| 574.10±0.65 | Observed |

In 1973, researchers at Astronomy Catalina in the Santa Catalina Laboratory for Experimental Relativity by Astronomy (SCLERA), Arizona, under the leadership of Henry Hill, set out to re-establish the exact measurements of the sun's oblateness. They concluded that the sun's core was rotating 6 times faster than its surface, rendering an oblateness diameter of $7 \times 10^{-6}$, within a ±20% error.

This was 50 times larger than the generally accepted prediction. This value was slightly lower than that of Dicke and Goldenberg, but importantly, it also spelt trouble for the general relativity calculation of Mercury's perihelion precession, since it would render a value of 0.5″ per century.

The debate over the exact measurement of the sun's oblateness was finally settled in 2008, thanks to unprecedented precision measurements made by NASA's RHESSI spacecraft. Dr. Tony Phillips, working out of the Goddard Space Flight Center, made the important announcement on October 22nd of that year.




**Tacho cline of the Sun**

**Figure 8-7-1**

The non-magnetic sun's corrected oblateness is 8.01 ± 0.14 mas near the value expected from simple rotation, and in a 3 month period, the sun's radius difference is 6 km or a radius difference of 60 times large.

In this regard, it is most important to firstly determine why the sun's oblateness is larger than predicted values. Secondly, we have to solve how the sun can have a larger oblateness in previous observations. CFLE theory can resolve these serious problems. According to CFLE theory, the sun has a minimum force line curve of $g$ = 3.836, as discussed in §8.6. So, the total additional effect of all kinds of force lines is

$$g^4 = (3.836)^4 = 216.53 \quad \text{8-7-1}$$

However, the sun's inertial constant is $k = \frac{1}{16.9} = \frac{1}{(2.5)(6.76)}$). The total additional effect is expensed to the inertial moment. Because the additional sun effect, calculated in §8.6, is

$$\frac{16.9}{6.76} = 2.5$$

the total effect is

$$d = \frac{216.53}{2.5} = 86.61 \qquad \text{8-7-2}$$

Therefore, the sun can have a larger bulge than usual, by as much as this additional effect by its curved force lines. Because $c_c = 1.5$, the total real effect is

$$d = \frac{86.61}{1.5} = 57.74 \qquad \text{8-7-3}$$

The related additional gravitational permittivity of the component particles is

$x = 1+ \{(0.000579)\ (57.74)\} = 1+ 0.033431= 1.033431$

Therefore, the theoretical expected value is

$$d = (57.74)\ (1.033431) = 59.67 \approx 60 \qquad \text{8-7-4}$$

The value measured by NASA's RHESSI in 2008 is

$$d = 6 \text{ km} \ \Rightarrow \ \frac{6000 \text{ m}}{100 \text{ m}} = 60 \qquad \text{8-7-5}$$

This value agrees well with the value predicted by CFLE theory.

This agreement means that the sun can have a 60 times larger bulge than the theoretically predicted diameter of 0.2 km. However, because there is at the same times a 60 times stronger neutrolateral force from the curved force line of the sun, this unusually large bulge cannot influence Mercury's motion. Furthermore, the neutrolateral force of Mercury is a changed additional force caused by change of the force line curve of Mercury resulting from the sun's unusual bulge. The 60 times larger oblateness of the sun by curved force lines cannot influence Mercury's precession of perihelion. This result means that the observations of solar physicists (Hill and his co-workers, Dicke and

Goldenberg) and of NASA about the sun's shape were right. At the same time, the prediction of classical general relativity was right too. So, finally, CFLE theory can give an answer about the relation between surface rotations speed and inner rotations speed.

As mentioned above, according to NASA's observation in 2008, the sun's oblateness is 60 times larger than its usual bulge. This value is very close to that determined by Hill and his co-workers in 1982. If the sun has so large a bulge, its interior would rotate 6 times more rapidly. However, because according to CFLE theory the sun's force line has a maximum curve of $g$ = 6.76, the sun's interior cannot rotate 6 times faster. This additional neutrolateral force from the curved force lines of the sun's interior offsets the rapid rotation by 60 times the large oblateness of the sun.

### 8.8. Solar Macro Energy Quantum $\hbar_\odot$ and its Physical Meaning According to CFLE Theory

The quantum number of a strong force is $N = 4.027012 \times 10^{56}$, and as discussed in §8.1, this is the solar energy quantum. That is, this number has the same role as Planck's energy quantum in quantum mechanics. That means exactly that "the uncertainty principle $\Delta MV\Delta X \leq \hbar_\odot$ can be applied to the sun."

Hence,

$$\hbar_\odot = \frac{h_\odot}{2\pi} = 6.409201 \times 10^{55} \text{ Js} \qquad \text{8-8-1}$$

Therefore, the uncertainty degree $\Delta X$ of the sun in the galaxy system is

$$X_{\Delta co} \leq \frac{\hbar_\odot}{\Delta \text{MV}}$$

$$\leq \frac{6.409201 \times 10^{55}\ \text{Js}}{(1.989\ \times 10^{30}\text{kg})(2.5 \times 10^{5}\ \text{m/s})}$$

$$\leq 1.289 \times 10^{20} \text{ m}$$

$$\leq 4.177 \times 10^{3} \text{ pc} \qquad \text{8-8-2}$$

where 1 pc = $3.086 \times 10^{16}$ m.

Because the mass number of the sun is $A$ = 2, the effective uncertainty degree of $x$ is

$X_{\Delta co}$ = (4.177 × $10^3$) (2)

= 8.354 Kpc 8-8-3

The observed value is

$X_{\Delta co}$= 8.34 ± 0.34 Kpc

This observed value agrees well with the theoretical value calculated by CFLE theory. Therefore, we can confirm that the discussion so far is correct.

As discussed in §8.3, although the boundary of the sun can be fixed according to optical observation (e.g., photosphere), this size is not a meaningful physical size of the sun. When the sun revolves with its mass $M_\odot$ around the galaxy with $V$ = 250 km/s, it ought to have the physical existence range

$X_{\Delta co}$= 2.6 × $10^{20}$ m

= 2.75 kly(8.43kpc) 8-8-4

A greater accuracy of the sun's position under the 2.8 × $10^{20}$ m is not allowed by nature. The real optical boundary of the photosphere as the optical surface of the sun is only the electromagnetic surface for the optical observer on Earth. However, this surface of the sun is not the physical surface that follows the uncertainty principle. The actual reason that the sun's position and size can clearly be recognized is only because of the tremendous $10^{56}$ times difference between the sun and the proton. That is, because a spatial temporal huge small observer observed a spatial temporal huge big object, the observer cannot imagine the uncertainty degree of such an object. Despite that this macro world is a quantized world; a huge small observer cannot recognize a classical object or a classical astrophysical object that has quantum property too. This point is a highly significant important fact. On reading, it seems confusing, but at the same time it is reassuring, because this fact gives hope that without a big change of Schrödinger's wave equation, quantum dynamics can be applied to the macro world with only a simple change of scale of the energy quantum. The conditions of such hope are as follows: first, the sun and any astronomical object must be recognized to be huge wave packets. Second, their gravitational field (and its force line) must be recognized to being part of their body too.

Conclusion: The Sun is result of second quantization of galactro magnetic field of quantum galactro dynamics of CFLE theory by tremendously huge energy quantum of galactromagnetic field $\hbar_{galaxy}$.

### 8.9. Determining the Origins of 5~160 Minutes Solar Oscillation and Its Physical Meaning by CFLE Theory

In the early 1960's, Caltech physicist R.B. Leighton discovered the 5 min oscillation on the surface of the sun. This phenomenon is not a local phenomenon, but is a phenomenon of the entire surface of the sun, with a wavelength of $\lambda \approx 10^4$ km. Such wavelength was measured through the Doppler effect by A. Claverie, G.R Isaak, H.B Van der Ruay, and Troca Cortes in 1979. Thereafter, even longer oscillation periods (up to 160 min) have been found.

With current developments in helioseismology, there is hope for more knowledge about the solar interior. However, when considering this phenomenon with CFLE theory, the exact origin and meaning of the oscillation of the sun is made more obvious. That is, a typical classical object like the sun should have both particle nature and wave property, just like electrons and protons do (see Figure 8-10-1). Otherwise, we cannot explain and calculate the 5~160 min oscillation of the sun. In §7.4, I discussed the charge distribution radius of the proton at $g = 5.793596$.

That is,

$$r_p = 4.9745598 \times 10^{-15} \text{ m} \qquad 8\text{-}9\text{-}1$$

If some physical change of this surface occurs, the maximum possible speed of propagation of this change to the entire particle surface is

$$v = c = 2.998 \times 10^8 \text{ m/s} \qquad 8\text{-}9\text{-}2$$

and the minimum possible distant from the first change to the next change is

$d = 2\pi r = 31.256 \times 10^{-15}$ m 8-9-3

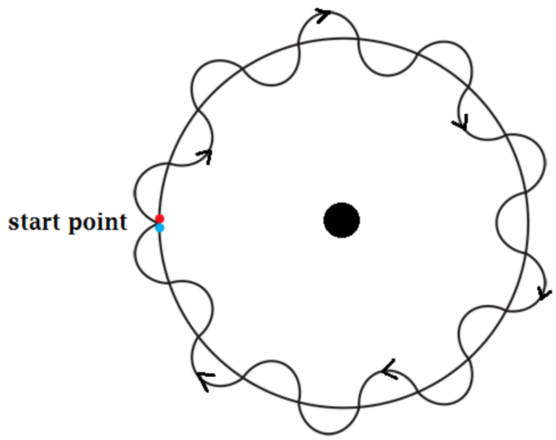



**Figure 8-9-1**

The required time for 1 period is

$$T_e = \frac{31.256 \times 10^{-15} \text{m}}{2.998 \times 10^8 \text{m/s}} = 10.42 \times 10^{-23} \text{ s} \quad 8\text{-}9\text{-}4$$

This surface is not a flat world, however. It is a world of curved force lines. Therefore, this 1 period time goes as slowly as the force lines curve factor, which is

$$g = (6.546)^4 \quad 8\text{-}9\text{-}5$$

Thus, the expected observational time is

$$T_{eg} = (10.42 \times 10^{-23} \text{ s})\ (6.546)^4$$

$$= 19.13 \times 10^{-20} \text{ s} \quad 8\text{-}9\text{-}6$$

and, according to CFLE theory, this electromagnetic time can translate to gravitational time. That is,

$$T_{gg} = (1.913 \times 10^{-19} \text{ s})\ (1.686 \times 10^{21})$$

$$= 3.225 \times 10^2 \text{ s}$$

$$= 322.5 \text{ s}$$

$$= 5.376 \text{ min}$$

$$\approx 5 \text{ min} \quad 8\text{-}9\text{-}7$$

This is the identity of the 5 min oscillation of the sun by CFLE theory.

Because nuclear fusion is occurring in the interior of the sun, the force line curve of a kaon needed is $g$ = 5.575. This curve means that a proton is surrounded by kaon

$$K^+ \rightarrow g = 5.575 \qquad 8\text{-}9\text{-}8$$

Because contact between the $K^+$ and $K^+$ of each proton occurs deeper than the charge distribution surface

$$R = 4.975 \times 10^{-15}\ \text{m} \qquad 8\text{-}9\text{-}9$$

According to the effect of the curved force line theory of relativity, time would be currently slower at the charge distribution surface. That is,

$$T_{\text{gK}} = (5.376\text{min})\ (5.575)^2$$

$$= 167.1\ \text{min}$$

$$\approx 170\ \text{min} \qquad 8\text{-}9\text{-}10$$

This result means the following: (1) The 5~160 min solar oscillation occurs by nuclear fusion in the sun; (2) the sun oscillates as one micro particle, meaning that all of the sun can resonate as a classical point-like particle; (3) through such resonance, the reaction of the sun occurs as one object. Any quantum state of the sun originally to be had by its component particles works as a wave packet. Because of the agreements between observed and theoretical values, the matter-wave theory of De Broglie can be applied to the sun like for classical astronomical objects. So here, we can confirm that the universe is not partly quantum theoretical and partly classic theoretical, but is globally and locally always quantum theoretical.

This valuable fact will be confirmed and checked continually to the end of this book.

## 8.10. Relation Between Nuclear Decay (Fission) and Stellar Decay (Fission) in CFLE Theory, and Solving the Neutrino Shock Wave Energy Problem of Supernova Explosions by CFLE Theory

Nuclear decay occurs sooner or later whenever a nucleus containing a certain number of nucleons is put in an energy state that is not the lowest possible one for a system with that number of nucleons. A process that is particularly important in radioactive decay is α-decay, occurring commonly in nuclei with an atomic number greater than $Z = 82$, where the decay energy range is from 8.9 MeV to 4.1 MeV. In β-decay, electrons are emitted with a spectrum of energy. The total decay energy is 1.3 MeV. For nuclei whose $Z$ values are not the most stable in consideration of their A value, the $Z$ can be changed to attain stability by the three different β-decay processes—electron emission, electron capture, and positron emission. In all these processes, the decay energy $E$ varies from case to case, from a small fraction of 1 MeV to more than 10 MeV, and typically is somewhat less than 1 MeV. γ-Rays, which are emitted from many of the nuclei of the radioactive series, carry away the excess energy when nuclei make a decay transition from an excited state to a lower energy state. As the energy difference in a nuclear excited state ranges upward from $\sim 10^{-3}$ MeV, γ-rays have energy greater than $\sim 10^{-3}$ MeV. Most typically, γ-decay will arise when the proceeding β-decay has produced some daughter nuclei in a state of several MeV excitations.

Fission was discovered by Hahn and Strassman in 1939, using a chemical technique. They found that the bombardment of uranium by neutrons produced elements in the middle of the periodic table. It was immediately realized that a very large amount of binding energy would be released in the fission of a nucleus of large $Z$ into two nuclei of intermediate $Z$, because of the consequent reduction in the positive coulomb energy. Measurements soon showed that energy of around 200 MeV per fission was released and carried away largely by the kinetic energy of the two fission fragments. Measurements also showed that two or three neutrinos were emitted in each fission. However, such nuclei that disunite are the same as decay fusion in the stars.

Fusion involves two nuclei of very low amalgamation to form a more stable nucleus. The increased stability arises because $A \cong 60$, where the binding energy per nucleon maximizes. Efficient thermal fusion has, however, been taking place for a long time in the stars. It is responsible for the energy produced in all stars as well as for the production in the star of all the elements through iron. However, such stellar thermal fusion can be stopped by any one of the following reasons: (1) The star has too large a mass; (2) the energy state is changed by the star outside; or (3) the energy state changes by itself. Any of these can start the corresponding decay process like the fission process and the decay process of nuclei.

According to the correspondence property of CFLE theory, the fission process including particle decay ($\pi^{\pm}, \mu^{\pm}$ ) corresponds to a supernova explosion, $\alpha -$ decay corresponds to a nova, β-decay corresponds to a variable star, and $\gamma -$ decay corresponds to a planetary nebular. When a star stops its fusions process, it starts to decay by gravitational contraction and repulsion. Assuming that a star has homogeneous density with a spherical shape, and then the potential energy of the spherical shell between radius *r* + *dr* is

$$\Delta V_G = -G\frac{M(r)4\pi r^2 dr\rho}{r}$$

$$= -G\frac{\frac{4\pi}{3}r^3\rho 4\pi r^2\rho}{r}dr$$

$$= -G\frac{16\pi^2}{3}\rho^2 r^4 dr \qquad 8\text{-}10\text{-}1$$

The stellar potential energy with radius *r* is

$$V_G = -G\frac{16\pi^2\rho^2}{3}\int_0^R r^4 dr$$

$$= -G\frac{(4\pi)^2}{15}\rho^2 R^5 \qquad 8\text{-}10\text{-}2$$

A star formed with the nucleus *N*, with a nucleus mass of $m = 1.6 \times 10^{-24}$ gcm, has a mass of *M* and potential $V_G$ as follows:

$$M = Nm = \frac{4\pi}{3}\rho R^3 \qquad 8\text{-}10\text{-}3$$

$$V_G = -G\frac{(4\pi)^2}{15}\frac{1}{R}(\frac{3}{4\pi}Nm)^2$$

$$= -\frac{3}{5}\, G\, \frac{(Nm)^2}{R} \quad \text{8-10-4}$$

The volume of the star is

$$V = \frac{4\pi}{3} R^3, \quad R = \left(\frac{3}{4\pi} V\right)^{\frac{1}{3}} \quad \text{8-10-5}$$

The potential is

$$V_G = -\frac{3}{5}\left(\frac{4\pi}{3}\right)^{\frac{1}{3}} G(Nm)^2 V^{-\frac{1}{3}} \quad \text{8-10-6}$$

The pressure is

$$P_G = -\frac{dV_G/dR}{4\pi R^2} = -\frac{dV_G}{dV}$$

$$= -\frac{1}{5}\left(\frac{4\pi}{3}\right)^{\frac{1}{3}} G(Nm)^2 V^{-\frac{4}{3}} \quad \text{8-10-7}$$

The pressure of an electron is

$$P_e = \frac{3}{5}\left(\frac{\pi^4}{3}\right)^{\frac{1}{3}} \frac{\hbar^2}{m_e} N^{\frac{5}{3}} V^{-\frac{5}{3}} \quad \text{8-10-8}$$

Now, the pressure of the electron is stronger than that of the proton and the neutron. When the pressure of the electron and gravitation is balanced, the star is called a white dwarf. The interior energy of such a star is

$$E_{\text{int}} = C_1 \frac{m^{\frac{5}{3}}}{R^2} \quad \Longrightarrow \quad \text{Unrelativistic} \quad \text{8-10-9}$$

$$E_{\text{int}} = C_2 \frac{m^{\frac{4}{3}}}{R^2} \quad \Longrightarrow \quad \text{Relativistic} \quad \text{8-10-10}$$

Energy by gravitation is

$$E_G \approx -G\frac{m^2}{R} \quad \text{8-10-11}$$

Total energy is

$$E = E_{\text{in}} + E_G \quad \text{8-10-12}$$

The relation between mass and luminosity is

$$E_{(R)} = \frac{(C^2 m^{\frac{4}{3}} - Gm^2)}{R} \qquad 8\text{-}10\text{-}13$$

Here, $m \rightarrow m_{kr}, \quad R \rightarrow 0$

It should be

$$C_2 m_{kr}^{\frac{4}{3}} - G\, m_k^2 = 0 \qquad 8\text{-}10\text{-}14$$

Hence,

$$m_{kr} = (\frac{C_2}{G})^{\frac{3}{2}} = \frac{3\sqrt{\pi}}{2}\ (\frac{hc}{2\pi G})^{\frac{3}{2}}\ \frac{1}{m_p^2 \mu_e^2} \qquad 8\text{-}10\text{-}15$$

$$\mu_e = \frac{A}{Z} = \frac{56}{26} = 2.15 \qquad 8\text{-}10\text{-}16$$

Therefore, $m_{kr} = 1.2\ \mathrm{m}_{\odot}$.

Now, $\mu_e = 2\,,\ m_{kr} = 1.44\ \mathrm{M}_{\odot}$ 8-10-17

By accurate calculation,

$$m_{kr} = \frac{5.75}{\mu_e} M_{\odot} \qquad 8\text{-}10\text{-}18$$

This mass is called the Chandra Sekhar mass. When the pressure by gravitational force is bigger than $P_e$, the electrons and protons interact, $e^- + P \longrightarrow n + \nu$, and neutrinos are emitted outside of the star, rendering it a stellar neutron star. But a neutron is a fermion too. The repulsive pressure would be

$$P_n = \frac{3}{5}(\frac{\pi^4}{3})^{\frac{1}{3}} \frac{\hbar^2}{m_n} N^{\frac{5}{3}} V^{-\frac{5}{3}} \qquad 8\text{-}10\text{-}19$$

When this value is in an equilibrium state with $P_G$

$$\frac{1}{5}(\frac{4\pi}{3})^{\frac{1}{3}} G(N\, m_n)^2 V^{-\frac{4}{3}} = \frac{3}{5}(\frac{\pi^4}{3})^{\frac{1}{3}} \frac{\hbar^2}{m_n} N^{\frac{5}{3}} V^{-\frac{5}{3}}$$

$$V^{\frac{1}{3}} = 3(\frac{\pi^4}{4\pi})^{\frac{1}{3}} \frac{\hbar^2 N^{-\frac{1}{3}}}{G m_n^3}$$

$$= (\frac{4\pi}{3} R^3)^{\frac{1}{3}} \quad 8\text{-}10\text{-}20$$

From this formula, the radius of a neutron star is

$$\therefore R = \frac{3\pi}{2^{\frac{2}{3}}} (\frac{3}{4\pi})^{\frac{1}{3}} \frac{\hbar^2}{N^{\frac{1}{3}} m_n^3 G} \quad 8\text{-}10\text{-}21$$

For example, a star with $2M_\odot$ becomes a neutron star with radius

$M = 4 \times 10^{33}$ gm $= Nm_n$

$N = \frac{4 \times 10^{33}}{1.6 \times 10^{-24}} = 7.5 \times 10^{57}$

Therefore, the radius is

$$R \simeq 10 \text{ km} \quad 8\text{-}10\text{-}22$$

After becoming a neutron star with $8M_\odot \sim 12M_\odot$, the volume of star in the star Centrum now has the gravitational binding energy

$$\Delta E_G = G\frac{m^2}{R} \approx 3 \times 10^{46} \text{ J} \quad 8\text{-}10\text{-}23$$

The remaining energy is $10^{44}$ J per shock wave, and when a 5000 km/s shock wave occurs, the shell of the star flies away in an explosion, a phenomenon called supernova. These are the calculated results of modern physics. The important points related to this calculating process are that (1) the process of star formation is shown reversely by this calculation; (2) the properties of a huge star are clearly related with the properties of the component small particles, the electron, proton, and neutron; (3) the neutron star was discovered in 1965 by Antony Hewish and Samuel Okoye in the Crab nebular; (4) this calculation cannot account for strong interactions; and (5) the neutrinos generated by a supernova were actually observed in the case of supernova 1987 A. However, the major unsolved problem with type II supernovas is the uncertainty of how the burst of neutrinos transfers its energy to the rest of the star to produce the shock wave that causes the star to explode, since from the above discussion, only 1% of the energy is needed to be transferred to produce an explosion. The real non-understandable problem in this regard is in proving the 1% of energy transfer. The CFLE theory can explain the supernova phenomenon very simply. Because CFLE theory essentially asserts that the strong force is a curved electromagnetic force, and electromagnetic force can translate to the gravitational force, we can use the electromagnetic formula as discussed in §6.

$$\alpha = \frac{e^2}{4\pi\mathcal{E}_0\hbar c} \Longrightarrow \alpha_s = \frac{g^2e^2}{4\pi\mathcal{E}_0\hbar c} \qquad 8\text{-}10\text{-}24$$

Therefore, 1e must correspond to the unit stellar mass $1M_{\odot}$. Now, because it is a particle that can interact strongly, the pion's force line curves of $g$ = 4.066 can be changed using the relation of force according to

$$\alpha_s = \frac{g^2e^2}{4\pi\varepsilon_0\hbar c} \qquad 8\text{-}10\text{-}25$$

Therefore,

$g^2 = (4.066)^2 = 16.53$ --- $n = 0$ energy state 8-10-26

$g^2 = (4.919)^2 = 24.20$ --- $n = 1$ energy state 8-10-27

Now, since the electromagnetic unit charge 1e corresponds to the gravitational quantized unit star mass of $1M_{\odot}$, the star has 16 times ($8M_{\odot}$) to 24 times ($16M_{\odot}$) of mass. This star cannot maintain its global gravitational system stably through $\pi^{\pm}$ exchange, because the gravitational repulsive force from $K^{\pm}$ ($g^2 = (5.575)^2 = 31.08$) is stronger than the attractive force of the component $\pi^{\pm}$ particles. Despite that such star has this mass; it can explode through $\pi^{\pm}$ exchange. Another important reason is for that Pauli's exclusions principle to satisfy as Bose Nova explosion in Collapse of Bose-Einstein Condensation.

Therefore, this process is called the reversal of the Yukawa process. Because each component particle can have anti neutro-lateral force, like the repulsive magnetic field between the S pole and S pole, N pole and N pole, this star explodes by gravitational repulsive force between proton and proton, neutron and neutron, or neutron and proton.

This gravitational repulsive force is part of stellar explosive force. Major explosive force occurs by Pauli's exclusion's principle from collapse of Bose-Einstein condensate mentioned as bose-nova explosion in §19. As discussed in §8.3, we can quantize the stellar size and solar size, given a charge distribution radius of the proton of

$r_p = 4.974 \times 10^{-15}$ m $\Longrightarrow$ translation by quantization constant

$\Longrightarrow R_{Gcore} = 8.387 \times 10^6$ m

Therefore, from the corresponding gravitational core radius of the sun, $R_{Gcore}$= 8.387 × $10^6$ m at $g = 5.793596$, we can obtain theoretically the size of the remaining core of a supernova.

Because $\alpha_E = \frac{e^2}{4\pi\varepsilon_0\hbar c} = \frac{1}{137.04}$, we can use this as

$$\alpha_s = \frac{g^2e^2}{4\pi\varepsilon_0\hbar c} \qquad \text{8-10-28}$$

According to CFLE theory, the maximum strong state is $\alpha_s = 1$.

Therefore, the size of the original core is

$$R = \frac{8.387 \times 10^6}{137.036}$$

$$= 6.120 \times 10^4 \text{ m}$$

$$= 61.20 \text{ km} \qquad \text{8-10-29}$$

Because force line curve is $g = 5.793596$, the theoretical expected value is

$$R = \frac{61.20 \text{ km}}{5.794}$$

$$= 10.56 \text{ km}$$
$$\approx 11 \text{ km}$$

This value agrees quite well with value of Eq. 8-10-22.

$R \simeq 10$ km

Because the electromagnetic event horizon of the Sun and neutron star $R_{E\odot} = 2.95 \times 10^3 m$ , $R_{ENeutron\odot} = 4.2 \times 10^3 m$ is, the minimum size of core obtain

$R_{seed\odot\blacksquare} = 0.16$ m

$R_{seedN\circledcirc\blacksquare} = 0.22m$ 8-10-30

This radius is called seedomagnetic event horizon or gluomagnetic event horizon.

This core star is called the seed star, because it is no longer an electromagnetic object. For origin of gamma-ray buster and positron excess to understand the seed star is needed absolutely(cf.§7,§11,§13, §15,§22,§24)

When a star that has a 16 times ($8M_{\odot}$) ~24 times ($12M_{\odot}$) larger mass than the quantized unit star mass ($1M_{\circledcirc}$), it explodes as a supernova because of repulsive gravitational force, and neutrinos are emitted with energy of ~$10^{46}$ J, and only 1% of energy of $10^{44}$ J is re-absorbed by the star to generate the shock wave. This fact is impossible to calculate by modern physics comprehension, but CFLE theory can find the so-called dark energy for generating the shock wave in this situation. Because each proton and neutrino has a force line curve of $g$ = 6.546 and correspondence number of $c_c$ = 1.5, the maximal energy obtainable is

$d = g^2 c_c^2$

$= (6.546)^2 (1.5)^2$

$= 96.41$ times 8-10-31

This hidden energy is observed as

$E = \frac{1}{96.41} = 0.0104$

$0.0104 \times 100 = 1.04\% \approx 1\%$ 8-10-32

Therefore, 1% of neutrino energy of $10^{44}$ J is hidden energy of $10^{46}$ J by the curved force line of the component particle. Here, we find assurance that CFLE theory is right, and its extended application as a macro quantum theory to astronomical phenomena is validated too.