6. Gravitation, as a result of the nucleonic *ec*-structure

The force of gravitation is the most common of the four known forces, but until now it has hardly been possible to unveil some of its secrets. None of the hypotheses, developed thus far, *explains* this phenomenon adequately. In this respect, no progress has been made, anyway, since Newton.

In his general theory of relativity Einstein found a mathematical solution for the influences of gravity: the path of an object will not be curved by a heavy mass, but rather the continuum of space-time around that mass! As no physical property can be attributed to a non-entity, Einstein's space has to be a physical one. With that, one happens to be back at the start with respect to a physical explanation.

According to the energon hypothesis, gravitation must be due to the relative *ec*-motion in its plasma and in nucleons, the mass-centres of matter. In the preceding chapters, the following data have been derived with respect to the nucleons and the *ec*'s:

Neutrons consist of 931 electrons and 931 positrons (together 1862 *ec*'s) whirling around with a mutual, average velocity V_N = 0.7413.c, inside an idealised, homogeneous sphere with a radius r_n = 0.51184 fermi.

Protons consist of 929 electrons and 930 positrons (together 1859 *ec*'s) with a mutual, average velocity V_P = 0.7399.c, inside an idealised sphere with radius r_p = 0.51430 fermi.

Electrons and **positrons**, shaped spherical with an average radius r_e = 0.0066979 fermi, emit immense quantities of **energons**, the constituents of all forces.

In chapter 4 we saw, that even around neutral systems of electrons and positive ions, electrical forces remain if the velocity of one of the charges exceeds that of the other. It is an interesting question, whether it could be possible that inside the nucleons a similar mechanism is operative.

In this chapter a trial will be made to answer that question positively.

The phenomenon of ***ec*-spin** will appear essential for the explanation of gravitation, because it is the only one of the three concerning entities, namely the charge, the velocity and the spin of the *ec*'s inside the nucleons, which cannot be compensated fully with respect to the outside world. Two other entities that influence gravity are the *ec*-density of the nucleons and the *ec*-mass.

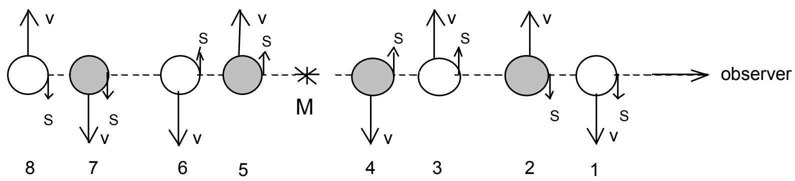
As has been demonstrated in § 3.5.1, approaching opposite *ec*'s are deflected in a way, ruled by spin. Equal spin-directions are stable, whereas an opposite spin is toppled over into the stable equal spin position. It has to be accepted that these events inside nucleons must be restricted by the need that positrons and electrons alternate, and by the energy that the often occurring meetings would need for the toppling-over of the *ec*'s. Therefore, the following thesis is proposed:

> *In nucleonic ec-structures, encountering opposite ec's will always pass in the same manner. The sign of the spin of the meeting partners is equal to the sign of the angular momentum with respect to the nucleon centre of one of the two kinds of charge. In matter this concerns always the same kind of charge.*

This means that only two kinds of neutrons were possible at the moment that these structures came into being in the primeval *ec*-plasma: a choice had to be made in favour of one of the possibilities, forever!

The above principle favours the alternation of positive and negative *ec*'s, exiles the need of toppling-over of *ec*'s with consumption of energy, but it also reduces the number of movement combinations that are thinkable.

Figure 39



In **figure 39** the possible combinations of movement along a line through the nucleon centre (*M*) are schematically pictured. The opposite charges are indicated by white and grey discs, the velocity within one plane by an arrow *v*, and the equatorial velocity of *ec*-spin, by a short, thin arrow *S*. From the point of view of an outside observer the *ec*'s along the line can successively be numbered. Charge *1* (white) has a right-turning angular momentum with respect to *M*, and a right-turning spin *S*. According to the principle of structuring (above) the meeting partner charge *2* (grey) has an opposite charge, an opposite angular momentum to *M*, but a spin, equal to charge *1*. The opposite meeting partners *3* and *4* show the resting combination of movement. White has now a left-turning angular momentum to *M* and a left-turning spin (thus equal again) and grey shows a right-turning angular momentum but a left-turning spin like white (*3*). The opposite half of the line shows an identical situation with respect to *M*, but oppositely to the outside observer.

Note that the choice: an equal sign for angular momentum and spin of an *ec*, has been made in favour of white. Note also that in that case white always takes the outside turn with respect to *M*, which is conform the mechanism, described with figure 21 (§ 3.5.1) and in favour of +/- variation. Still a choice can be made for the identity of the colours.

This condition demands an even number of ec's along both halves of the row. From the point of view of *M,* every movement of charge is compensated, even the temporary lack of charges, caused by hiding charges at conjunction. That is not the case, however, from the point of view of the outside observer: the equilibrium of loss of charge at conjunction is broken, because more distant charges have a bigger probability of conjunction than nearby charges and show different combinations of linear velocity and spin direction of the charges as well. The successive numbers give an indication of that probability of conjunction: the probability is proportional to each following number.

6.1. Spin Compensation Defect by Conjunction

In the energon hypothesis it is assumed that the primeval *ec*-plasma only could have given rise to the neutrons at the moment that all electromagnetic forces had been compensated by counter forces, caused by opposite motions of *ec*'s. To demonstrate that again in combination with the just proposed thesis, now the arbitrary line through the centre of a neutron has been visualised by means of the symbols in the formulas below:

$\Theta v^{+}s^{+}\oplus v^{-}s^{+}\Theta v^{-}s^{-}\oplus v^{+}s^{-}\Theta v^{+}s^{+}\oplus v^{-}s^{+}\Theta v^{-}s^{-}\oplus v^{+}s^{-}$ **ж**

ж $\oplus v^{+}s^{-}\Theta v^{-}s^{-}\oplus v^{-}s^{+}\Theta v^{+}s^{+}\oplus v^{+}s^{-}\Theta v^{-}s^{-}\oplus v^{-}s^{+}\Theta v^{+}s^{+}$

In contrary to figure 39 the possibilities of motion are given twice per radius: 4 negative *ec*'s (Θ) and 4 positive *ec*'s (⊕). In reality, the neutron radius contains 7.63 charges (+ and -, see § 5.4). In the figure the velocities of charge v and spin *S* are indicated as seen by the outside observer and both are positive, if turning to the right, and negative, if turning to the left. The charges can be numbered from 1 to 16, beginning at the right side, with equal and even numbers in both halves of the row.

At this stage we have to remind of the effect of charge velocity on the capacity to exert a force on other charges: this force has to be multiplied by a factor $\{1 - (v/c)^2\}^{-1/2}$ or, if *v* is small with respect to *c*, by $(1 + v^2/2c^2)$, see the chapters 2 and 3. The conceptions of charge and capacity of force exertion are identical. Thus one can say that the charge is increased a little if brought to motion. This idea can be applied to the appreciation of charges and velocities, as experienced by the outside observer. In **table 5** all effects of charge and velocity of charge (inclusive spin), as experienced by the observer, are registered and added. A choice has now been made for white as an electron (⊖).

Table 5

number	without conjunction			Conjunctional effect		
	charge	velocity	spin	charge	v ± s	
1	⊖	+	+	...	....	
2	⊕	-	+	2	1 times: - s	
3	⊖	-	-	3	2 times: + s	
4	⊕	+	-	4	3 times: - s	
5	⊖	+	+	5	4 times: + s	
6	⊕	-	+	6	5 times: - s	
7	⊖	-	-	7	6 times: + s	
8	⊕	+	-	8	7 times: - s	
9	⊕	+	-	9	8 times: - s	
10	⊖	-	-	10	9 times: + s	
11	⊕	-	+	11	10 times: - s	
12	⊖	+	+	12	11 times: + s	
13	⊕	+	-	13	12 times: - s	
14	⊖	-	-	14	13 times: + s	
15	⊕	-	+	15	14 times: -s	
16	⊖	+	+	16	15 times: + s	
	8 ⊕	0	0		60 - s	60 + s
	8 ⊖	0	0		total effects 120,	
sum	0	0	0	60 v+s additions at ⊖-hidings, none with ⊕		
	full compensation					

As can be seen, without conjunction the effects of charge, velocity of charge, and spin are zero (column 2, 3 and 4), providing the ideal situation that all spinning planes unite, and that ½.n is an even number.

However, if one looks to the temporary *hidings of charges* by the phenomenon of conjunction, the situation becomes different. The number of the charges can be considered as an indication for the relative probability of conjunction: c_1 cannot hide at all, c_2 can only hide behind c_1, whereas c_3 can hide behind c_2 as well as behind c_1, thus its chance is 2 times larger than that of c_2, etc.

Evaluating this example, the following results emerge.

The charge- and spin-hidings both have an equal occurrence of 120 times and both contain 60 positive- and 60 negative hidings, thus compensating each other.

However, if the addition of equal charge- and spin velocities is considered, a complete other situation exists:

Addition of v+s occurs **60 times** with the hidings of negative charges and none of those of positive ones. Though these 60 hidings are divided in 30 hidings of positive- and 30 hidings of negative velocity, *it does mean that negative charge velocity is well balanced decreased by the phenomenon of conjunction, with the cooperation of ec-spin.*

> **If negative charges in a neutron combine equal signs of spin and angular momentum to the centre, a lack of negative charge velocity will be observed from the outside. That combination in the positive charges will cause a lack of positive charge velocity.**

This phenomenon will be indicated by **SCDC** (Spin Compensation Defect by Conjunction)

6.2. Implication of SCDC

From the example in the preceding paragraph can be seen that taking *n* as the number of *ec*'s in one row, the number of addition-hidings form two groups of 30 hidings:

$\mathbf{N = \frac{1}{8}.n.(n-1) = 30}$, but these two groups are not in equilibrium.

(v+s+) has 4 hidings in the first half of the section and 26 hidings in the second half.

(v-s-) has 8 hidings in the first half and 22 hidings in the second half.

For balancing-sake the two groups each have to be taken on an average: 30 / 2,

$\mathbf{N_2 = \frac{1}{2} \times \frac{1}{8}.n.(n-1) = 15}$

It must also be accentuated that **one *ec* does not participate with hiding**, namely the first one of the row, expressed by (n-1). Eliminating that charge leads to

$\mathbf{S_d = \frac{1}{2}.\frac{1}{8}.n^2.S = 16.S}$

The ratio between 16.S and 30 amounts to $\mathbf{S_d = (\frac{1}{2}.n).S / (n-1) = 0.5333.S}$

or $\mathbf{S_d / S = (\frac{1}{2}.n) / (n-1) = 0.5333..}$

That means that in reality the total effects of conjunction must be multiplied by (½.n) / (n-1), in order to get the right answer.

As has been shown before, two possible *ec*-structures of neutrons can be distinguished, which will be called:

S^+-systems, referring with the positrons to the combination of equal signs of spin and total angular momentum, leading to a lack of velocity of positive charges.

S^--systems, referring with the electrons to the combination of equal signs of spin and total angular momentum, leading to a lack of velocty of negative charges.

The remarkable conclusion can be made that, because of *SCDC*, even the neutral *ec*-systems like neutrons are exerting electrical forces, though to a very small extent:

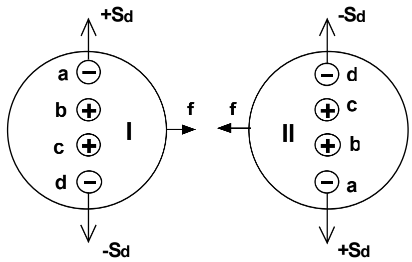
Equal S-systems, either S^- or S^+, exchange attracting forces, opposite S-systems, S^+ against S^-, exchange repulsing forces.

It is tempting to consider the two different structures as the fundaments of **matter** and **anti-matter**. Matter most likely forms S^-- systems, because free neutrons transmute to protons by ejecting a negative charge.

The attracting forces are thought to be identical to the force of **gravitation,** whereas the repulsing forces must be called the force of **anti-gravitation.**

These statements will be reasoned below. To that purpose **figure 40** is used.

Figure 40



The surplus of *ec*-movement, caused by *SCDC*, may be indicated by two opposite velocity vectors (compensation of movement) with equal magnitude and being attached to one kind of *ec* (^+S_d , ^-S_d).

If the normal electrical force is called f_n , the S_d-influenced force may be described by

$$f_s = f_n.(1+a),$$

in which *a* represents an increment, resting after the respective motion of charges.

Using this equation in the case of two S^--systems (see figure), the following interactions among four charges (a-d) can be formulated:

Ia/IIa = + f_n.(1+2a)	Ib/IIa = - f_n.(1+ a)
Ia/IIb = - f_n.(1+ a)	Ib/IIb = + f_n
Ia/IIc = - f_n.(1+ a)	Ib/IIc = + f_n
Ia/IId = + f_n	Ib/IId = - f_n.(1+ a)
Ic/IIa = - f_n.(1+ a)	Id/IIa = + f_n
Ic/IIb = + f_n	Id/IIb = - f_n.(1+a)
Ic/IIc = + f_n	Id/IIc = - f_n.(1+a)
Ic/IId = - f_n.(1+ a)	Id/IId = + f_n.(1+2a)

Only the effects of movement rest after the addition of all forces:

$-2.a.\ f_n - 2.a.\ f_n = -4.a.\ f_n$. This force is negative, thus attracting.

A similar reasoning can be applied to S^+-systems. In that case, only the signs of moving and non-moving charges have to be mutually exchanged in the figure. The result remains the same.

With opposite *S*-systems, the signs of all forces become reversed, which results in:

$+2.a.f_n + 2.a.f_n = +4.a.f_n$. This force is positive, thus recoiling.

The *SCDC*-approach has been applied to one row of *ec*'s along a line through the centre of the structure, as a connection with the observer. Of course, if the plane through the centre will be rotated around that line, equal results will be found.

Two imagined systems, representing four *ec*'s each (fig. 40), give rise to four effects $a.f_n$ (√4 effective *ec*'s per S-system). In general, *nn* effects are the results of the interaction between *nn* charges in both structures. This means that the overall force between two nucleons is proportional to the square of the number of effective *ec*'s per nucleon:

$f_g = \{(nn)^{1/2}\}^2.a.f_n = x^2.a.f_n$,

if *x* expresses the number of gravity active *ec*'s per neutron (§ 5.3).

Using the simplified model of nucleons with data as described before, in the next paragraphs an attempt will be made to describe gravitation, as a result of SCDC, with application of differences between charge-velocities in two structures (see Chapter 4).

6.3. The gravitational number

If a quantitative approach to the force of gravitation is attempted, it is necessary to know the value of the effective *SCDC* of nucleons.

In this study, the *effective SCDC* will be expressed in the *gravitational number*, meaning the effect of the ratio between the deficiency of charge velocity and the equatorial spin velocity in nucleons on their interaction.

As already has been stated in this work, the conception of *ec*-spin is different to that in quantum mechanics. In the energon hypothesis spin is thought to be connected to the double creation of *pp*'s in the *ec*-mantle, at which the internal reaction between *pp*'s and *Spp*'s causes a limited rotation of the *ec*-mantle around one axis (see § 2.3; 3.5.1; 9.6). Because this overall result still must be seen as a reaction between individual energons, each reaction is accompanied by an equal displacement of the *Spp* along the *ec*-mantle perpendicularly to the axis of rotation. This makes that the total displacement along circles parallel to the equator is proportional to their radius, so that:

the rotation of the charge of an ec is like the rotation of a solid body.

The gravitational number can be derived in two ways: conform a global method and with a step-by-step method via the probability of specific *ec*-conjunction in nucleons.

6.3.1 *Global approach*

The spin value of *ec*'s can be derived from Planck's constant.
In this reasoning the spin of the ec's will be regarded as a combination of own- and orbital rotation:

$$\mathbf{S_e = 1/(2\pi) \times \tfrac{1}{2}h/(2\pi) = h/(8\pi^2) = 0.83921 \times 10^{-35}\ J.Hz^{-1}\ (kg.m^2.s^{-1}).}$$

This *EM*-value arises from a phenomenon that may be considered as a rotation of (electrical) mass, thus, as a mechanical angular momentum as well. With the spin of nucleonic *ec*'s one meets a relation between mass- and electrical action, to which the constant K_r must be applicable (see § 5.3: K_r = 'dynamic' ratio between electrical- and gravitational force in an electron-proton system). With the conversion of S_e into the mechanical angular momentum S_m the influence of K_r on either of the interacting partners is incorporated:

$$S_m = \frac{S_e}{\sqrt{K_r}} = \frac{h}{8\pi^2.\sqrt{K_r}}$$

This mechanical spin value represents the angular momentum of a small sphere, having its total mass m_e/p^2 (!) located in the periphery (§ 2.3 and § 5.3). With the factor $1/p^2$ attention has been paid to the relation with the *ec*-mass in other nucleons.

Submitting V_r for the equatorial speed of this rotation, the mechanical angular momentum equals:

$$\mathbf{S_m = (1/4).m_e.V_r.r_e.p^{-2}\ .}$$

After elimination of S_m out of both equations we find:

$$V_r = \frac{p^2.h}{2\pi^2.m_e.r_e.\sqrt{K_r}} = 1.1744 \times 10^{-7}\, m.s^{-1} \approx 2.79 \times 10^{9}\, rotations.s^{-1}$$

Note that these values may be neglected with respect to those of the orbital ec of the H-atom at lowest energy (see page 51).

From moving electrical charges the effect of velocity at the force can be calculated:

$$f_v \approx f_0 + f_0.\left(\frac{v^2}{2c^2}\right),\ \text{if } v \ll c \qquad \text{(see § 2.3)}$$

Likewise, the gravitational force, as a consequence of *SCDC*, involves the factor:

$$\frac{1}{K_r} = \frac{V_z^2}{2c^2} \qquad \text{(see § 5.3)}$$

In this equation V_z stands for the effective speed defect of one of the kinds of charges, as experienced by one nucleon with respect to the other, thus originating from an interaction. The value of this equation must be equal to the increment *a*, described in the preceding paragraph. The calculation of V_z reveals:

$$V_z = \sqrt{\frac{2c^2}{K_r}} = 8.85002 \times 10^{-12}\ m.s^{-1}$$

After comparison of the deficiency of charge velocity V_z with the equatorial spin velocity V_r the following relation appears:

$$\frac{V_z}{V_r} = \sqrt{\frac{2c^2}{K_r}} \times \frac{2\pi^2.m_e.r_e.\sqrt{K_r}}{p^2.h} = \frac{2.\sqrt{2}.\pi^2.m_e.r_e.c}{p^2.h} = 7.536 \times 10^{-5}$$

in which $p^2 = 1.022566$ (see § 5.3)

This ratio is called the **gravitational number**: $\mathbf{N_g = 7.536 \times 10^{-5}}$.

6.3.2. *Step-by-step approach, using the probability of ec-conjunction in nucleons*

It is possible to determine N_g by calculating four factors:

* V_m/V_r = the ratio between the average transversal spin velocity and the equatorial spin velocity of *ec*'s.
* V_d/V_m = the ratio between the average spin defect per conjunction and the average transversal spin velocity.
* K_c = the probability of specific *ec*-conjunction inside nucleons into all directions.
* $\cos^2\gamma$, in which γ expresses the average angle of the planes of *ec*-spin at conjunction.

As N_g expresses the effect at an interaction between nucleons, it can be calculated from the square of the product of the four factors:

$$\mathbf{N_g = (V_m/V_r \times V_d/V_m \times K_c \times \cos^2\gamma)^2}$$

ad V_m/V_r. The spin of *ec*'s is like the rotation of a solid body (§ 6.3). Therefore, the ratio measures:

$$\mathbf{V_m/V_r = (2/\pi)^2 = 0.40528}$$

ad V_d/V_m. This ratio is equal to S_d/S (see § 6.2), thus:

$S_d/S = V_d/V_m = ½.n/(n-1)$.

In § 6.2, however, we found also that the number of gravity active *ec*'s per nucleon equals $(nn)^{1/2}$, which should consequently replace the number *n*. As neutrons and protons within the nuclei are both involved, the number *n* can better be replaced by the square root of a number between 1862 and 1859, say np' = 1860.5.

The value of the above ratio then becomes:

$\mathbf{V_d/V_m = ½.\sqrt{np'}/(\sqrt{np'}-1) = 0.51187.}$

ad K_c. Admitting that the nucleons in nuclei possess a proton-like structure, thus using the parameters, which already has been found before, i.e.

the radius of *ec*'s $r_e = 6.6979 \times 10^{-18}$ m,

the average minimum *ec* distance in protons $a_{mp} = 6.7425 \times 10^{-17}$ m

the radius of protons $r_p = 5.1430 \times 10^{-16}$ m (idealised),

the number of *ec*'s per proton np = 1859,

it is possible to calculate the probability of specific *ec*-conjuction K_c.

To that purpose it is necessary to distinguish all spatial possibilities of conjunction, i.e. the position inside the proton and the direction of transversal motion of the hiding *ec*. This may be done by imaging the *ec*'s, situated on a sphere with a radius $a_{mp}/2$. In such a sphere the number of *ec*-positions, with different vectors of velocity with respect to one observer (another nucleon), measures:

$$n_a = \frac{1}{2} \cdot \frac{4\pi.(a_{mp}/2)^2}{\pi.r_e^2} = \frac{1}{2} \cdot \left(\frac{a_{mp}}{r_e}\right)^2 = 50$$

The factor ½ indicates the fact that in the second half of the small spheres the transversal velocities are equal to those in the first half.

The following considerations are also important for the calculation of K_c:

a/ The total of possibilities of conjunction must be found by shoving the centre of the small sphere successively, over one *ec*-volume at the time, throughout the whole proton volume.

b/ It is necessary to distinguish the part of the proton volume (periphery), in which the small sphere with radius $a_{mp}/2$, does not fit completely.

c/ The outermost *ec*-layer of the proton does only count partly for the activity of conjunction, because that activity decreases at larger distances from the axis of observation.

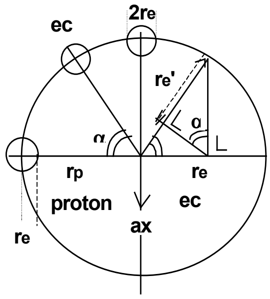
The consideration c/ will be explained by using **figure 41 a and 41 b.**

The contribution to conjunction of *ec*'s lying on the axis of observation *ax* (through the centre of the proton) is complete, whereas the contribution of *ec*'s lying on maximal distance from that axis, is only partly. The contribution to the conjunction can be expressed as a function of r_e, namely $\mathbf{r_e' = r_e.sin^2\alpha}$ (see figure), if α indicates the position of an arbitrary *ec*. The average value of r_e' can be found by integration of that function over 90^0:

$$r_{eg} = \frac{2}{\pi} \cdot r_e \cdot \int_0^{\pi/2} sin^2\,\alpha.\,d\alpha \qquad \text{thus} \quad r_{eg} = \frac{2}{\pi} \cdot r_e . \left[\frac{\alpha}{2} - \frac{\sin 2\alpha}{4} \right]_0^{\pi/2}$$

Hence, the value measures: $\mathbf{r_{eg} = ½.r_e}$

Figure 41-a 41-b



This value has to be used for the correction of the proton diameter, before calculation of K_c :

$$\mathbf{r_p' = r_p - ½.r_e = (76.786 - 0.5).r_e = 76.286\ r_e\ .}$$

The number of conjunction types, in that part of the proton volume with a radius $R = r_p' - a_{mp}/2$, can be found from **figure 42 a and 42 b**. It equals:

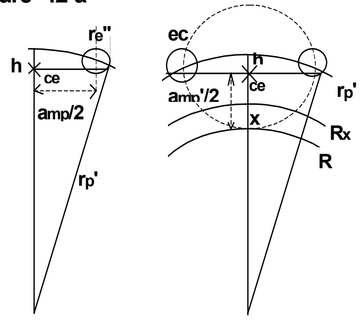
$$\mathbf{n_R = ½(a_{mp}/r_e)^2.(R/r_e)^3 = ½(10.0666)^2.(71.2527)^3}$$
$$\mathbf{= 1.8329 \times 10^7.}$$

To calculate the number of conjunction types in the rest of the proton volume, the radius has to be varied from R to ($R+a_{mp}'/2$), in which $a_{mp}'/2 = a_{mp}/2 - h$.

The value of $a_{mp}'/2$ may be derived according to:

$r_e'' = r_e.\cos\{\sin^{-1}(½.a_{mp}/r_p' + r_e/r_p')\} = 0.9969.r_e$

Figure 42-a 42-b



$$h = r_p' - \sqrt{\left(r_p'\right)^2 - \left(\frac{a_{mp}}{2} + r_e''\right)^2} = 0.2387.r_e\ ;$$

$$\frac{a_{mp}'}{2} = \frac{a_{mp}}{2} - h = 4.7946 \text{ x } r_e$$

The area of a sphere with a radius $R_x = R + x.r_e$, expressed in units of *ec* cross-section , measures:

$$O_x = \frac{4.\left(R + x.r_e\right)^2}{r_e^2}$$

The area of the incomplete spheres (in units of *ec* cross-section), with radius $a_{mp}/2$ and with the centres on the surface of sphere R_x, is described by :

$$O_{Rx} = \frac{4.\left(a_{mp}/2\right).\left\{\left(a_{mp}/2\right) - x.r_e\right\}}{r_e^2}$$

Hence, the number of possibilities for the surface of sphere R_x may be calculated according to:

$$N_x = \frac{4.(R + x.r_e)^2}{r_e^2} \text{ x } \frac{4.(a_{mp}/2) \text{ x} \{(a_{mp}/2) - x.r_e\}}{r_e^2} \text{ x } \frac{1}{2}$$

The variation of R_x has to be stopped with the value (r_p'-h), thus the number of possibilities inside the periphery of sphere (r_p'-R) can be calculated from:

$$N_s = \frac{1}{2} \cdot \int_0^{a_{mp}'/2} N_x.dx = \frac{1}{2} \cdot \int_0^{a_{mp}'/2} \{4.(71.2527 + x)^2.4.(5.033).(5.033 - x).dx\}$$

$$N_s = 202.673. \int_0^{a_{mp}'/2} (71.2527 + x)^2.dx - 40.266. \int_0^{a_{mp}'/2} (71.2527 + x)^2.x.dx$$

$$N_s = 202.673.\left[\frac{(71.2527 + x)^3}{3}\right]_0^{4.7946} + (40.266).(71.2527).\left[\frac{(71.2527 + x)^3}{3}\right]_0^{4.7946} - 40.266.\left[\frac{(71.2527 + x)^4}{4}\right]_0^{4.7946}$$

N_s = $7.99162 \times 10^7 - 7.72092 \times 10^7 =$ **2.70700×10^6**.

The total number of conjunction types for the whole proton is expressed by:

n_r = $n_R + N_s = 1.8329 \times 10^7 + 2.70700 \times 10^6 =$ **2.1036×10^7.**

Note, that this number does not express the sign of the hiding charges.

In proton-like structures, the probability of effective ec-conjunction into any direction (K_c) will be defined by the ratio between the number of permanently realisable conjunctions and the number of conjunction types :

$$\mathbf{K_c} = \frac{(1/2).n_p.(n_p - 1)}{n_r} = \frac{(1/2) \text{ x } 1859 \text{ x } 1858}{2.1036 \text{ x } 10^7} = \mathbf{0.0821}$$

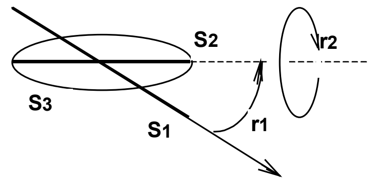
This number will not only be important for the calculation of the gravitational number and of the gravitational constant, but also for getting a better insight in the mechanism, which causes whole-numbered waves of the orbiting electrons around nuclei. This will be shown later on.

ad $\cos^2\gamma$. During conjunction the spin effect will be proportional to the cosine of the angle γ', formed between the planes of spinning (through the equators).

Figure 43 shows that the planes can cant along two axes: seen from aside the disk S_1 can turn over as indicated by r_1 to position S_2 , or to position S_3, as indicated by r_2 .

Therefore, among the occurring angles between the planes of spinning during conjunction, two categories can be distinguished, both consisting of angles between 0^0 and 90^0 (positive) and between 90^0 and 180^0 (negative). As we propose complete equilibrium of EM forces within nucleons, all spin directions must be present equally, so that the total effect of the average angles between the spinning planes on SCDC should be:

Figure 43

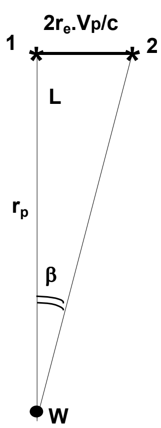


$$\cos^2(45^0) = \cos^2(135^0) = 0.5000.$$

However, the average value $\gamma = 45^0$ (or 135^0) cannot completely be true, because there must be a slight distortion of the angles, caused by the ratio of conjunction distance and the transversal displacement of the *ec* in the period, needed to transmit a coherent signal. This problem is pictured in **figure 44.** A signal, with speed *c* from end *1* of bar $2.r_e$ (diameter of the spinning plane) into the direction of *W*, at distance r_p (proton radius = mean distance of conjunction), can only be coherent with a signal from end *2*, if signal *1* has covered the distance $2.r_e$ at that moment with velocity Vp/c (= relative velocity of proton *ec*'s). Then the bar has covered a distance $(2.r_e/c)V_P$ at moment *2*, causing an angle of distortion β.

To estimate the average angles of distortion, it is necessary to know:

Figure 44



a/ the average distance to the hiding *ec*'s ($D = r_p$).

b/ the transversal displacement of the hiding *ec*, in terms of its radius, thus $L_g = 2.r_e.V_p/c = 0.7399.2r_e$

The angle of distortion can now be estimated:

$$\boldsymbol{\beta = \tan^{-1}(0.7399.2r_e / 38.8520.2r_e) = 1.091^0}$$

Hence, the average angle γ between the spinning planes at conjunction is expressed by: $\boldsymbol{\gamma = (90^0 - 1.091^0)/2 = 44.45^0}$

The fourth factor for the calculation of the gravitational number N_g can be determined, and with that, N_g itself:

$\boldsymbol{\cos^2\gamma = \cos^2(44.45^0) = 0.5096}$, thus

$$\boldsymbol{N_g = (0.40528 \times 0.51187 \times 0.0821 \times 0.5096)^2 = 7.533 \times 10^{-5}}$$

If this result is compared with the already found result $N_g = 7.536 \times 10^{-5}$, it is amazing to find that two, total different estimations of the gravitational number, lead to values that differs so little.

It is possible now, by using the value N_g, to make a quantitative approach to the constant of gravitation, as will be shown in the next paragraph. The narrow agreement with the measured value, which will be found, supports our conception of gravity.

6.4. Derivation of the constant of gravity from the energon hypothesis

The constant of gravity has been measured and its value is found to be:

$G = 6.6720 \times 10^{-11}$ N.m^2.kg^{-2}

It appears to be possible to derive this value, using the energon hypothesis with its conception of gravity and the data on this subject, obtained thus far.

The parameters, which will be used, are:

Planck's constant (*h*), the gravitational number (N_g), the average radius of *ec*'s (r_e), the relative velocity of *ec*'s in proton-like structures (V_P), and the rest-values of the masses of neutrons (m_n) and protons (m_p).

The calculation of the exerted gravitational force follows the next outline:

ec-spin per unit of area × factor of reduction × speed = force

or in dimensions:

$(M.L^2.T^{-1}) \times (L^{-2}) \times (...) \times (L.T^{-1}) = M.L.T^{-2}$

Something remarkable can be seen from this outline: the constant of Planck, and with that, the spin value of *ec*'s, have to be conceived as the results of *pp-radiation per unit of area*, which is in line with the energon hypothesis. A new parameter has to be introduced, using the numerical value of Planck's constant, but with the dimensions of mass per unit of time ($M.T^{-1}$):

h_r = h per unit of area (kg.s^{-1}), see also Explanations (pages 149-150).

Relativity, however, asks for an increase of the unity of length, using the γ-factor in combination with the *ec*-velocity V_P in protons.

Increase of length: $1\ m \rightarrow (1-0.74^2)^{-1/2} = 1/0.67 = 1.4925\ m$,

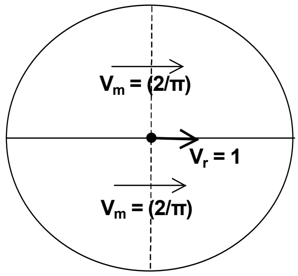
Increase of area: $\rightarrow (1.4925)^2\ m^2 = 2.2277\ m^2$

Increase of spin: $2.2277 \times h/4\pi = 0.17727.h$, thus

$Spin.m^{-2} = 0.17727.h_r$ ($kg.s^{-1}$), to be used in the formula of *G*.

The *factor of reduction* is formed by some ratios. One of it is the square of the ratio between the *ec*-radius and the distance between the two interacting masses $(r_e/R)^2$. That number is equal to the factor of conversion for the probability of *ec*-conjunction of protons into the actual probability.

Figure 46



The second is the *recalculation of the gravitational number* to the value of the average transversal spin velocity $(N_g.V_r/V_m)$, see fig.46).

The *speed that is involved*, can only be a combination of the velocity of the signals of interaction (*c*) and the average transversal velocity of the nucleonic *ec*'s (V_P). However, that combination has already been used in the gravitational number N_g (see fig.44). The only factor that rests is the value of *c*.

The overall influence of the factors, mentioned above, transform the spin of the *ec*'s into the force of gravitation.
Substitution of the known values gives:

$$G = \frac{(0.17727).h_r.(\pi/2).N_g.r_e^2.c}{m_n.m_p} = 6.673 \times 10^{-11}\ kg^{-1}.m^3.s^{-2}$$

$\mathbf{G = 6.673 \times 10^{-11}}$ $N.m^2.kg^{-2}$,

which is equal to the measured value.

Used data.
h_r = h/m^2 = 6.6261764×10^{-34} $kg.s^{-1}$ (p.80); N_g = 7.533×10^{-5} (p.79): r_e = 6.6979×10^{-18} *m* (p.59)
V_P = 0.7399.*c* (p.66); V_m/V_P = 0.40528 (p.75); c = 2.997925×10^8 $m.s^{-1}$; $m_n.m_p$ = 2.8016×10^{-54} kg^2

Note, that in the equation for *G*, the square value m_n^2 has been replaced by the product $m_n \times m_p$, which gives a better connection with the effective situation in matter, consisting of mixtures of protons and neutrons.

It will be clear, that the force of gravitation between two large proton-neutron systems, M_1 and M_2, is described by the equation:

$$F_G = G \times \frac{M_1.M_2}{R^2}\ kg.m.s^{-2}$$

In § 9.8.4 it will be demonstrated that possibly the gravitational force at galactical distances has to be corrected by two factors, respectively connected with the expansion of space and with the tolerance of material systems for gravitational signals.

6.5 Frequency, wavelength and quantum of gravitational signals.

Following a somewhat different approach (V_d instead of V_a), the frequency of gravity signals may be expressed according to (spin/area)×(2/π)^2.V_p×t_r×c (= E), divided by h:

$$\nu_G = \frac{\sqrt{N_g}.V_r}{V_m} \text{ x } \frac{h}{4\pi^2.\left(r_n.r_p\right)} \text{ x } \left(\frac{2}{\pi}\right) \text{ x } V_p \text{ x } \left(t_r\right) \text{ x } c \text{ x } \frac{1}{h} \text{ x } \frac{1}{\gamma} \quad s^{-1}$$

in which V_r/V_m = (π/2), t_r is period of repetition (Chptr 8) and γ = relativistic factor, thus:

$$\nu_G = \frac{\sqrt{N_g}.V_p.t_r.c}{4\pi^2.r_n.r_p.\gamma} = 6.86 \text{ x } 10^{25}.\frac{1}{\gamma}\ s^{-1}\text{; wavelength } \lambda_G = \frac{c.\gamma}{\nu_G} = (0.4389.r_e)\ m$$

Both are constants; the factor $\gamma = (1-v_p^2)^{1/2}$ = 0.6726 reduces time, but increases the frequence ν_G with γ^{-1} because it is the reversed time.

To demonstrate the connection of λ_G with r_e, some additional factors may be used: 0.4389 × 2.(nn)$^{1/2}$ × (R_{re}/ r_n)^2 × r_e = 0.4389 × 86.3018 × 0.0258 × r_e = 0.977.r_e. Because r_e^+ = 1.03.r_e (see page 85), the connection may be λ_G **= 1.006.r_e^+.** The radius R_{re} has been derived from an imagined cluster of 1862 *ec*'s around the nucleon-centre with a capacity equal to that of 1862 *ec*'s: I_{re} = 4/3.π.(r_e)^3×1862 = 2.3436×10^{-48} m^3, and a radius R_{re} = (3×2.3436×10^{-48}/4π)$^{1/3}$. The ratio between R_{re}^2 and 1862 re^2 is 1/12.3.

The energy of the gravitational quantum has to be calculated reusing $h_r \rightarrow h$:

$$\mathbf{q_G} = \nu_G.h_r.\pi.r_n.r_p.\gamma^{-1} = \frac{\sqrt{N_g}.h_r.V_p.t_r.c}{4\pi.\sqrt{1-(V_p/c)^2}} = \mathbf{5.591 \text{ x } 10^{-38}}\ \boldsymbol{J},$$

This quantum is a *constant.*

It is supposed now that with arising matter, in a situation of very high neutronic density, each neutron participates with one *ec* in reactions with other neutrons (page 146).

This has two results: the estimation of mass using gravity differs from that done by *EM*-methods (mass-spectrometry) and secondly the **number of nucleons per *kg*** of matter ***N$_E$*** (**nucleonic number**) differs from Avogadro's number (N_A = 6.0225×10^{26} kmol^{-1})

$$\mathbf{N_E} = \frac{1861}{1862} \text{ x } \frac{1}{m_n} = \mathbf{5.967 \text{ x } 10^{26}\ kg^{-1}} \quad \text{(see page 146))}$$

It is interesting to see that the ratio N_E / N_A = 0.9908 approaches the ratio between the static- and dynamic force-constant K/K_r = 0.9889 up to +0.2 % (§ 5.3).

Two groups of n_1 and n_2 nucleons, respectively, have $n_1 \times n_2$ possibilities for connection, thus two masses of m_1 and m_2 *kg* should have $m_1 \times m_2 \times N_E^2$ connections. However, the energon hypothesis says that the phenomenon of gravitation is due to the action of √*(nn) ec*'s where *nn* is the total number of nucleonic *ec*'s. Therefore, the number of gravitational points of connection per *kg* is proportional to the square root of the *nucleonic number* (void of dimensions):

$$N_{EG} = \sqrt{N_E}\ kg^{-1} \text{ or } \mathbf{(N_{EG})^2 = N_E\ kg^{-2}}.$$

So, the real number of gravitational connections between m_1 and m_2 is:

$$N_{gc} = m_1 \times m_2 \times (N_{EG})^2.$$

If ***w*** is the constant of proportionality, the exchange of energy between two masses, weighing m_1 and m_2 *kg*, being in equilibrium and rotating at a distance of *A* meter, is given by the equation:

$$E_p' = \frac{-w.m_1.m_2.(N_{EG})^2.q_G}{A}\ J$$

This energy must be equal to the known potential energy :

$$E_p = \frac{-G.m_1.m_2}{A}\ J,$$ where G = 6.672 × 10^{-11} $kg^{-1}.m^3.s^{-2}$, which means:

$$w = \frac{G}{q_G.(N_{EG})^2} = \frac{6.672 \text{ x } 10^{-11}}{5.591 \text{ x } 10^{-38} \text{ x } 5.967 \text{ x } 10^{26}} = 2.000\ m$$

Thus a second equation of ***G*** may be presented:

$$\mathbf{G = w \times q_G \times (N_{EG})^2}\ \ kg^{-1}.m^3.s^{-2}\ (N.m^2.kg^{-2}),$$

where w = 2.000 *m*, q_G = 5.591 × 10^{-38} $kg.m^2.s^{-2}$, $(N_{EG})^2$ = 5.967 × 10^{26} kg^{-2}.

6.6 Relation between Einstein's view on space and gravitation

According to the energon-hypothesis, Einstein's supposition about the connection between the bending of light and mass may be confirmed. However, it looks also like the bending of light by the differentiation of *pp*-densities in the neighbourhood of heavy masses, thus not by gravitation.

In Chapter 11 (The physical Space) that problem will be discussed in more detail.