9. Dimension of energons and cosmological consequences

Accepting the idea of the existence of *energons* or *power particles (pp's)*, being nature's absolute fundamental particles, produced by the *elementary charges (ec's)*, questions about the dimensions and quantities of those entities arise. Very interesting estimations, about these qualities of the hypothetical *pp's*, can be made. This may be done, by calling attention to some logical demands, with respect to the hydrogen atom in lowest state of energy. However, it is only possible to make rough approaches in answering these questions, because precise data fail.

9.1. The demand of *pp*-density at the position of the orbiting electron of *H*-atoms in lowest state of energy

Suppose, that the orbiting *ec* must be hit by 10^a attracting *pp's*, in the period of time in which it covers a fraction of its orbit, equal to its diameter.

The ratio $\dfrac{\text{area of the H - atom}}{\text{cross section area of ec}} = 4.\left(\dfrac{r_H}{r_e}\right)^2$,

demands that the positive *ec*-surplus inside the proton has to radiate:

$$10^a \times 4 \times \left(\frac{r_H}{r_e}\right)^2 \text{ pp's per period of } \frac{2.r_e.t_s}{2.\pi.r_H}(\text{sec})$$

t_s = orbiting period of the electron, r_e = radius of the electron

r_H = radius of the *H*-atom (in lowest state of energy)

If the reaction period of *pp*'s is put on $\mathbf{t_0 = r_{pp}/c}$, (r_{pp} = the radius of the *pp*), the quantity of *pp*'s, emitted by the nucleonic charge in the period t_0 will be:

$$N_{pp} = 10^a.4.\left(\frac{r_H}{r_e}\right)^2.t_0.\frac{2.\pi.r_H}{2.r_e.t_s},$$

thus:

$$N_{pp} = 4.\pi.10^a.\left(\frac{r_H}{r_e}\right)^3.\frac{r_{pp}}{c.t_s}\ pp's$$

9.2. Demand of the intensity of *pp*-creation, at the surface of the *pp*-source inside the proton.

If N_{es} equals the quantity of surface-*Spp*'s of an *ec*, and 10^{-b} of that quantity radiate a *pp* in the period t_0, the *ec*-surface will radiate in the period t_0 :

$$N_{pp} = N_{es}.10^{-b} = 4.\left(\frac{r_e}{r_{pp}}\right)^2.10^{-b}\ pp's$$

By combining this quantity with that, found in the preceding paragraph, an equation for r_{pp} can be set up:

$$4.\pi.\left(\frac{r_H}{r_e}\right)^3\cdot\frac{r_{pp}}{c.t_s}\cdot 10^a = 4.\left(\frac{r_e}{r_{pp}}\right)^2.10^{-b}\ ;\ r_{pp}^{\ 3} = \frac{r_e^{\ 5}.c.t_s.10^{-b}}{\pi.r_H^{\ 3}.10^a}$$

$$r_{pp} = \frac{r_e}{r_H}\cdot\sqrt[3]{\frac{r_e^{\ 2}.c.t_s.10^{-b}}{\pi.10^a}}$$

Note that in this equation b ≥ 0

9.3. Demand of acceleration of the orbital electron along the radius of the *H*-atom

The force, exerted by the nucleonic charge on the orbital electron, has to be strong enough to accelerate the mass of the electron along the radius to the right extent.
The average momentum of a *pp* may be presented as $P_{pp} = m_{pp} \times c$, where m_{pp} expresses the average mass, or preferably the average exertion of mass of a *pp*, and *c* the average velocity of *pp's* (equal to the velocity of light).
The number of 10^a *pp's* (according to the supposition of the preceding paragraph) transmit a momentum, equal to

$P' = 10^a \times m_{pp} \times c$, in the period of time:

$t' = 2r_e \times t_s / (2\pi \times r_H)$

In the period of *pp*-reaction t_o the transmitted momentum is equal to:

$P'' = 10^a \times m_{pp} \times c \times t_o \times \pi \times r_H / (r_e \times t_s)$,

This means that the exertion of force measures:

$$f_0 = \frac{\pi.r_H.m_{pp}.c.10^a}{r_e.t_s}$$

9.4. The inconsistency of the model with the existence of mass inside *ec*'s

From the logical relations in the paragraph's 9.1, 9.2 and 9.3, it can be deduced that the inner *ec* must be mass-less!

Suppose that the mass of an *ec* is formed by all *pp*-volumes, fitting in the *ec*-volume, thus:

$m_e = (r_e/r_{pp})^3.m_{pp}$

The force f_0 (see above) has to accelerate this mass to the extent of v_e^2/r_H,because: force = mass × acceleration, and $f_0 = m_e.v_e^2/r_H$, hence $m_e= f_0.r_H/v_e^2$, or:

$$\frac{\pi.r_H.m_{pp}.c.10^a.r_H}{r_e.t_s.v_e^2} = \frac{r_e^3}{r_{pp}^3}\cdot m_{pp} \;;\; r_{pp}^3 = \frac{r_e^4.t_s.v_e^2}{\pi.r_H^2.c.10^a}$$

$$r_{pp} = \frac{r_e}{r_H}\cdot\sqrt[3]{\frac{r_e.r_H.t_s.v_e^2}{\pi.c.10^a}}$$

By combining this value for r_{pp} with that of § 9.2, one will find:

$\mathbf{10^{-b} = (v_e^2.r_H)/(c^2.r_e)}$

Substitution of the known data:

$v_e = 2 \times 10^6$ m.s^{-1} ; $r_H = 0.5 \times 10^{-10}$ m ; $c = 3 \times 10^8$ m.s^{-1} ;

$r_e = 6.7 \times 10^{-18}$ m ; $t_s= 1.5 \times 10^{-16}$ s

shows that $10^{-b} = 10^{2.5}$, or **b = -2.5**,

which is in contradiction with the starting point b ≥ 0, see § 9.2

The only way to get out of this problem is to deny the above supposition, which states that the whole *ec*-volume attributes to the (exertion of) mass. This denial is in agreement with the philosophy of the energon hypothesis, in which mass and force exertion are seen as phenomena, belonging to the same event: the annihilating reactions between *pp's* and *Spp's* on the *ec*-surfaces.

Suppose thus that the mass of an *ec* is only formed by the *Spp's*, fitting in the outer layers of the *ec*. If *x* layers are concerned with the exertion of mass and force, the mass of an *ec* may be presented as:

$$m_e = \frac{4.\pi.r_e^2}{\pi.r_{pp}^2}\cdot x.m_{pp}$$, on the condition that $x.r_{pp} \ll r_e$.

As f_0/acceleration = m_e, one may say:

$$\frac{\pi.r_H.m_{pp}.c.10^a.r_H}{r_e.t_s.v_e^2} = \frac{4.x.r_e^2.m_{pp}}{r_{pp}^2} \;;\; r_{pp} = \frac{r_e}{r_H}\cdot\sqrt{\frac{4.r_e.t_s.v_e^2.x}{\pi.c.10^a}}$$

Combination with the value from § 9.2 leads to the equations:

$$\left(\frac{4.r_e.t_s.v_e^{\ 2}.x}{\pi.c.10^a}\right)^{6/2} = \left(\frac{r_e^{\ 2}.c.t_s.10^{-b}}{\pi.10^a}\right)^{6/3} ; \quad x^3 = \frac{\pi.c^5.10^a.10^{-2b}.r_e}{4^3.t_s.v_e^{\ 6}}$$

$$x = \sqrt[3]{\frac{\pi.c^5.r_e.10^a.10^{-2b}}{4^3.t_s.v_e^{\ 6}}}$$

Substitution of the known data (see above) gives:

$$10^{\log x} = 10^{0.55977} \times 10^{(a-2b)/3}$$

thus a = -1.679 + 2b + 3.log(x), or

b = 0.83965 + a/2 - (3/2).log(x), which is positive indeed.

9.5. The upper limit of the *pp*-radius

Supposition 1 : The orbiting *ec* receives one reacting *pp* (10^d, d = 0), within the reaction period t_0, in order to allow a constant exertion of force.

As $t_0 = r_{pp}/c$, the amount of reacting *pp's* in the period of time $2.r_e/v_e$ will be

$(2.r_e/v_e).(c/r_{pp}).1$, thus:

$$a = \log\left(\frac{2.r_e.c}{r_{pp}.v_e}\right) + 0 \text{ ; or}$$

a = -14.736 - log(r_{pp}) + 0

Supposition 2 : An *ec* has only one active (outer) *Spp*-layer, thus x = 1.

Now the equation for the approximate radius of a *pp* is shaped conform:

$$r_{pp} = \frac{r_e}{r_H} \cdot \sqrt{\frac{4.r_e.t_s.v_e^{\ 2}.10^0}{\pi.c.10^a}} \text{ , see § 9.4}$$

thus $r_{pp} = 5.7575 \times 10^{-22} \times 10^{-a/2} = 10^{-21.24} \times 10^{-a/2}$

log(r_{pp}) = -21.24 -a/2

a = -42.48 - 2.log(r_{pp}) = 13.008

Combination with the result of *supposition 1* leads to:

-27.744 - 0 - log(r_{pp}) = 0, or log(r_{pp}) = -27.744 - 0,

thus r_{pp} **≤ 1.803 × 10^{-28} m**

9.6. The lowest limit of the *pp*-radius.

In the view of the energon hypothesis it may be possible to approach the lowest (and probably real) value of the energon radius rather accurately. That may be done by using the following considerations :

1. At the creation of ec's from a dense pp-cloud, the pp's (Spp's) form a homogeneous, spherical mantle.

2. The spinning movement of this mantle (fastest along the equator) must possess the smallest displacement that can be felt in the period of communication between two opposite points on this equator

The smallest unit of length, allowed to work with, is the radius of the *Spp's*: $\boldsymbol{r_{pp}}$, while the period of communication inside the *ec* measures:

$\Delta \mathbf{t_{re}} = \mathbf{2.r_e.\sqrt{2}/c}$ (see also chapter 7).

In § 6.3.1 we have found that the equatorial spin velocity of ec's equals:

$V_r = 1.17 \times 10^{-7}$ $m.s^{-1}$, so that we can say: $\mathbf{r_{pp}} = V_r.\ (2r_e.\sqrt{2}/c) = \mathbf{7.4 \times 10^{-33}}\ \boldsymbol{m}$,

This result can be refined by applying the influences of *ec*-pulsation to distance and force-exertion (see § 7.1; page *151* and page *130*-ω'_{cr}):

$\mathbf{r_{pp}}' = V_r.(1.06\times0.94\times1.03\times0.97)^{½}.(2.r_e.\sqrt{2}/c) = \mathbf{7.38 \times 10^{-33}\ m}$

With respect to the *pp*-radius, it is curious to read the words of G.'t Hooft: gauge forces unite with 10^{16} GeV at distance 10^{-32} *m*. See also page *147*. *)

The suppositions leading to this dimension of energons must have important consequences for the interpretation of the surrounding physical world. Some of these consequences will be examined in the next paragraphs.

9.7. Some data, related to the *pp*-radius

To simplify the calculations it makes sense to estimate the relation between the powers of some numbers, if the intensity of acting *pp's* on the orbiting electron in an *H*-atom is varied (10^{a} , see § 9.1).

Say $\boldsymbol{10^d}$ ***pp's*** act in $\boldsymbol{t_0}$ *s* at the orbiting electron, and *d* will be varied from 0 to 5.

From § 9.5 we can see, with **d = 4.386**:

$\mathbf{log\ (r_{pp}) = -\ 27.744 - d = -32.130}$, and $a = -\ 14.736 - \log(r_{pp}) + d$, thus

$\mathbf{a = 13.008 + 2d = 21.783}$, and from § 9.4 : $b = -\ 6.528 - ½\log(r_{pp}) + ½d$, or

$\mathbf{-b = -7.344 - d}$

The table shows the influence of different choices for *d*, on the values of r_{pp} , *a* , and *b*:

Table 6

	d = 0	d = 1	d = 2	d = 3	d = 4	d = 4.386
$\log(r_{pp})$		-28.744	-29.744	-30.744	-31.744	-32.130
a	+13.008	+15.008	+17.008	+19.008	+21.008	+21.780
-b	-7.344	-8.344	-9.344	-10.344	-11.344	-11.730

If the radius of an energon is put on **7.4 × 10^{-33}** ***m***, the following values of the related conceptions can be calculated:

- 10^{a} The quantity of attracting surplus *pp's*, acting on the surface of the orbiting electron during the period $2r_e / v_e$, measures:
$10^a = 10^{21.780} = 6.026 \times 10^{21}$

- 10^{d} The quantity of attracting surplus *pp's*, acting on the surface of the orbiting electron during the period t_0, measures:
$10^d = 10^{4.386} = 24322$

- N_{es} The quantity of surface-*Spp's* of an electron amounts to:
$N_{es} = 4.r_e^2 / r_{pp}^2 = 3.277 \times 10^{30}$

- 10^{-b} The fraction of N_{es}, reproducing itself by expelling *pp's* during the period t_0 :
$10^{-b} = 10^{-11.730}$ or preferably $10^{-11.73006}$, thus **$N_{cr} = 1.8618 \times 10^{-12} / t_0$** (§ 9.9)

- m_{pp} The potential mass (exertion) of a *pp* :
$m_{pp} = m_e / N_{es} = 2.780 \times 10^{-61}$ *kg*

- f_{pp} The force exertion of a *pp* on an *ec* :
$f_{pp} = m_e.v_e^2.r_H^{-1}.10^{-d} = 3.387 \times 10^{-12}$ N, or
$f_{pp} = m_{pp}.c^2 / (r_{pp}) = 3.376 \times 10^{-12}$ N

- V_{po} The rotating velocity of the *pp*-poles may be estimated from the attracting force between the poles, being :
$f_{po} = m_{pp}.V_{po}^2 / r_{pp}$, in which $f_{po} = f_{pp}$, thus:
$V_{po} = (f_{pp}.r_{pp} / m_{pp})^{1/2} = c = 3.00 \times 10^8$ $m.s^{-1}$.

- p_{rt} The number of *pp*-rotations per second:
$p_{rt} = V_{po} / 2.\pi.r_{pp} = 6.452 \times 10^{39}$ rotations / s

- f_0 The force exertion between two *ec*'s at distance of 1 *m*:
$f_0 = 10^d \times (r_H / 1_m)^2 \times f_{pp}$, or: $f_0 = m_e \times v_e^2 \times r_H = 2.3 \times 10^{-28}$ N

- t_0 $r_{pp}/c = 2.468 \times 10^{-41} s$

9.8. Cosmological consequences of the diameters of fundamental particles

9.8.1 *The pp-density in the universe*

According to the energon hypothesis the proportionality between the amount of *pp*'s and time is $N_{pp} \propto t$ and so does the volume of this *energetic universe*: $I_{en} \propto t$. The radius of the horizon of observation must be proportional to time as well: $R_H \propto t$, but the radius of the expanding material universe, is proportional to $t^{2/3}$: $R \propto t^{2/3}$ (S.Weinberg in "The first three minutes"). This different approach should be valid in the first period of the universe, but the results do not agree if applied to a later universe (see next page). With the horizon of observation can be remarkt that particles that were invisible before, became gradually observable together with the created energons, while crossing the horizon of observation. *This defines our present view on the universe.*

It may be imagined that the next scenario is applicable to the filling of the known universe with energons. Probably, it started 1.5×10^{10} years ago with one- or two times the *ec*-equivalence of 10^{80} nucleons, say $1.5 \times 10^{80} \times 1862$ *ec*'s. A considerable part of the *ec*'s turned into poëls, the rest of it became nucleons (12% nuclear bound, see page *147*).

The number of the ever produced *pp*'s, in that case, amounts to:

$$\mathbf{NT_{pp}' \approx F_1 \times (c / r_{pp}) \times F_2 \times t} \quad (\textit{t in years})$$

$$F_1 = 1.5 \times 10^{80} \times 1862 \times N_{es} \times N_{cr} = 1.70422 \times 10^{102}$$

$$F_2 = 3.15576 \times 10^7 \ \textit{seconds / year,}$$

or $NT_{pp} \approx 3.27 \times 10^{160}$, if $t = 1.5 \times 10^{10}$ *years.*

The total volume of these *pp*'s amounts to:

$$\mathbf{IH_{pp}' \approx (4\pi/3) \times (r_{pp})^3 \times NT_{pp}' \approx (4\pi/3) \times c \times (r_{pp})^2 \times F_1 \times F_2 \times t} \ \ m^3$$

or $$\mathbf{IH_{pp}' \times (F_2)^{-3} \times c^{-3} = (4\pi/3) \times (r_{pp})^2 \times F_1 \times (F_2)^{-2} \times c^{-2} \times t} \ \ ly^3$$

$$\mathbf{\approx 6.55 \times 10^{16}\ \textit{ly}^3}$$ (*ly* means light year), if $t = 1.5 \times 10^{10}$ *years.*

The maximal volume of the 'observable' universe may be put on:

$$\mathbf{IH' \approx (4\pi/3)} \times \mathbf{t^3} \approx \mathbf{1.41 \times 10^{31}} \ ly^3$$, if $t = 1.5 \times 10^{10}$ *years* ($\sim 1.42 \times 10^{26}$ *m* = R_u).

Thus the ratio between both volumina may be presented as:

$$\mathbf{IH_{pp}'/ IH' = (r_{pp})^2 \times F_1 \times (F_2)^{-2} \times c^{-2} \times t^{-2} = 1.043 \times 10^6 \times t^{-2}}$$

or $$\mathbf{IH_{pp}'/ IH' \approx 4.63 \times 10^{-15}.}$$

This ratio means that averagely 4.63×10^{-15} -th part of the volume of the universe must be occupied by the *pp*'s, if it is assumed that it concerns the same universe and that no *pp's* have been annihilated ever since. That is certainly not true, but it makes no difference for the picture, as is given below.

The above ratio is leading to the **average *pp*-content of space:**

$$\mathbf{C_{pp}} \approx (4.63 \times 10^{-15}) / 4/3.\pi.(r_{pp})^3 \approx \mathbf{2.73 \times 10^{81}}\ \ \boldsymbol{pp}\textbf{'s}\ \ \boldsymbol{m^{-3}},$$

with the **average potential density**:

$$\mathbf{D_{pp}} \approx C_{pp} \times m_{pp} \approx \mathbf{7.58 \times 10^{20}}\ \ \boldsymbol{kg\,.m^{-3}}, \text{ (constant for each } r_{pp}\text{)}.$$

The density of an *ec* can be calculated according to:

$$\mathbf{D_{ec} = m_e\ /}\boldsymbol{ec}\textbf{-volume} = \mathbf{7.2376 \times 10^{20}}\ \ \boldsymbol{kg.m^{-3}}$$

It is very remarkable that there exists such a close resemblance between this density and the potential density of space, using the factor 4.63 × 10^{-15}, understood as a need of space of the *pp*'s. Diminishing the factor with about 4.5% (loss by force-exertion!?) leads to the factor **4.42 × 10^{-15}**, which gives, according to the hypothesis, the ratio between the capacities of the outer *Spp*-mantle and that of the *ec* itself:

Table 7

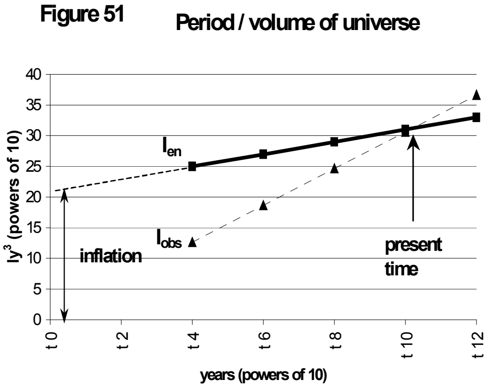
years	I_{en}	I_{obs}
10^4	24.97	12.62
10^6	26.97	18.62
10^8	28.97	24.62
10^{10}	30.97	30.62
1.5×10^{10}	31.15	31.15
10^{12}	32.97	36.62

$$\mathbf{N_{es} \times r_{pp}^3\ /r_e^3 = 4.r_{pp}\ /r_e = 4.42 \times 10^{-15}} \textbf{ (Space-factor).}$$

This result makes the use of this great coincidence almost inevitable.

The equality of D_{pp} and D_{ec} can hardly be a coincidence !

Figure 51



We can calculate the volume of the **energetic universe *I_{en}*** at diverse points of time, using the volume of the created *pp*'s *IH'* (see previous page), but corrected for the need of space and 4.5% annihilation.

If we compare it with the **observable volume *I_{obs}***, calculated conform:

$\log\{(t.c)^3.\ 4\pi/3\} = \log(ly^3 \times 4\pi/3)$,

in which length *t.c* is replaced by the light-year *ly*, we see *I_{obs}* logically crossing *I_{en}* in our time, see **Table 7** and **Figure 51**.

Remarkably, the finding of equal D_{pp} and D_{ec} depends on the present proportion between the volumes of *pp*'s and the observable space. It also leads to the conclusion that there must have been a very high primeval volume. This is in keeping with the idea of a period of inflation in the universe, which must embrace an increase of volume in the first second to 2.97 × 10^{13} ly^3 (see Δ_u in § 9.8.6), or to a diameter of 38 × 10^3 *ly*.

Concluding one can say that the present time allows the observation of the beginning of the universe and that the physical space apparently is created by the elementary charges by emitting *pp*'s to a density equal to that of the *ec*'s itself, which forms a *threshold-value between matter and energy* (see also pages *161/162*).

9.8.2 *The instability of black holes at lowest dimensions.*

The energon hypothesis leads to the conclusion that the hypothetical black hole has a lowest limit of dimension, which is reached with a density approaching that of the *ec's*. The ratio between the volumes of *ec's* and that of the space, needed for just touching *ec's*, can be obtained from:

$(4/3).\pi.r_e^3 / (2.r_e)^3 = 0.524.$

If the maximum density is corrected with that factor, the critical density for a black hole equals: $\mathbf{D_{cb} = 3.7925 \times 10^{20}}$ ***kg.m***$^{\mathbf{-3}}$

The escaping velocity for a black hole must be calculated as being an internal phenomenon. That makes the following consideration of the mean energetic influence between the total gravity in the centre and a small mass in the surface necessary:

$\mathbf{m.c^2 = G.M_b.m/ R_b}$, *that is a constant thus* M_b *and* R_b *must be proportionally*.

G = constant of gravity, M_b = mass and R_b = radius of a black hole.

$\mathbf{R_b = (G/c^2).M_b = 7.4239\times10^{-28} \times M_b}$ ***m***,

The density may be described by the formula:

$$D_b = \frac{M_b}{(4/3).\pi.R_b^{\,3}} = \frac{c^6}{(4/3).\pi.G^3.M_b^{\,2}} = \frac{5.83536\,\mathrm{x}\,10^{80}}{M_b^{\,2}}\,kg.m^{-3}$$

with c = 2.998×10^8 *m.s*$^{-1}$ and G = 6.672×10^{-11} *N.m*^{2}*.kg*$^{-2}$.

Hence $D_{cb} = \dfrac{5.83536\,\mathrm{x}\,10^{80}}{M_{cb}^{\,2}}\ kg.m^{-3}$, causing the **critical mass of a black hole**:

$$\mathbf{M_{cb}} = \sqrt{\frac{\mathbf{5.83536\,x\,10^{80}}}{\mathbf{3.7925\,x\,10^{20}}}} = \mathbf{1.24042\,x\,10^{30}}\ \boldsymbol{kg} = \mathbf{0.629}\ \boldsymbol{sm}$$

with a **radius of 921 *m*** (one sunmass = 1 *sm* = 1.97074×10^{30} *kg*)

If a black hole would finally reach its critical mass (whatever the reason might be), it almost has the density of an *ec*. This means that the individual *ec*'s cannot move as usual, which stops the gravitational force. A second result is that the radiated *pp*'s can hardly escape from the total structure (see also pages *159/160*).

Possibly an instable black hole, with a mass of 1.24×10^{30} *kg and a radius of 921 m,* ***can lead to a real 'Big Bang'.***

Table 8

t *s*	**t /t_0**	**a** *kg*	**b** m^3	**a/b** kg/m^3
10^{-10}	4×10^{30}	9.92×10^{41}	3.27×10^{9}	3.03×10^{32}
10^{-9}	4×10^{31}	9.92×10^{42}	3.27×10^{9}	3.03×10^{33}
10^{-8}	4×10^{32}	9.92×10^{43}	3.30×10^{9}	3.01×10^{34}
10^{-7}	4×10^{33}	9.92×10^{44}	3.60×10^{9}	2.76×10^{35}
10^{-6}	4×10^{34}	9.92×10^{45}	7.62×10^{9}	1.30×10^{36}
10^{-5}	4×10^{35}	9.92×10^{46}	2.52×10^{11}	3.94×10^{35}
10^{-4}	4×10^{36}	9.92×10^{47}	1.24×10^{14}	8.00×10^{33}
10^{-3}	4×10^{37}	9.92×10^{48}	1.14×10^{17}	8.70×10^{31}
10^{-2}	4×10^{38}	9.92×10^{49}	1.13×10^{20}	8.78×10^{29}
10^{-1}	4×10^{39}	9.92×10^{50}	1.13×10^{23}	8.78×10^{27}
10^{0}	4×10^{40}	9.92×10^{51}	1.13×10^{26}	8.78×10^{25}
10^{1}	4×10^{41}	9.92×10^{52}	1.13×10^{29}	8.78×10^{23}
10^{2}	4×10^{42}	9.92×10^{53}	1.13×10^{32}	8.78×10^{21}
3.5×10^{2}	1.42×10^{43}	3.52×10^{54}	4.84×10^{33}	7.30×10^{20}

To describe that evolution it will be necessary to use an other factor of creation than is given before:

($N_{cr} = 1.862 \times 10^{-12} / t_0$).

The factor must be inversely proportional to the *pp*-density of the black hole, because the reactions of annihilation must increase proportionally to the density. As the unsurpassible *pp*-density, that will be reached is 10^{14} × the *ec*-density, it seems reasonable to ascribe an average factor of creation to the mass of a critical black hole that is $(10^0 \times 10^{14})^{-½} = 10^{-7}$ times N_{cr} (see page *159*).

In the next reasoning the factor $\mathbf{N_x = 2 \times 10^{-19} / t_0}$ will be handled.

The increase of the exploding mass can be calculated by:

$$\mathbf{a = M_{cb}.(1+N_x)^{t / t0}}$$

$$\approx \mathbf{M_{cb}.(1+N_x.t/t_0)}\ kg, \text{ if } N_x \text{ is small.}$$

The available space grows with the speed of light, given by:

$$\mathbf{b = 4/3.\pi.(R_{cb} + c.t)^3}\ m^3,$$

so that the density is **a/b** $kg.m^3$.

The absolute perod of time:

$$t_o = r_{pp}/c = 2.468 \times 10^{-41}\ s.$$

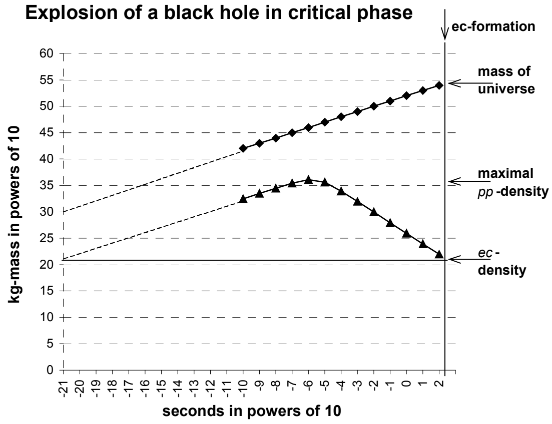
The *ec*-density measures:

$$D_{ec} = 7.2 \times 10^{20}\ kg.m^{-3},$$

the unsurpassable *pp*-density amounts to $2.26 \times 10^{14} \times 7.2 \times 10^{20} = 1.6 \times 10^{35}\ kg.m^{-3}$.

Figure 52

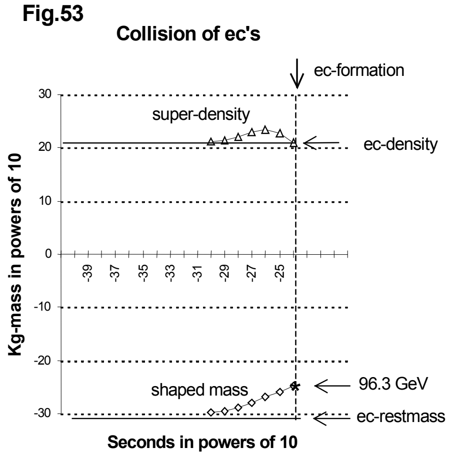
Explosion of a black hole in critical phase



As we can see from **table 8** and **figure 52**, the *pp*-density varies from 10^{14} × the *ec*-density after 10^{-6} *s* to that density itself in 350 *s*. The *pp*-mass grows in that period proportionally to time to 10^{54} *kg*. From that point of time 10^{84} *ec*'s may come into existence, enough to create a **new proto-universe**, probably including the anti-matter of a second universe, causing an energetic separation by inflation (pages 155-158).

With the collision of *ec*'s we may meet a creation of mass from a super dense *pp*-field as well. If a positron and an electron will be brought to **collision by a collider**, the deflecting forces of the *ec*-spin must be overcome, which will take an appropriate amount of energy. If this energy is just enough to bring to touch, then the relative *ec*-velocity is almost zero. The touching *ec*'s will combine and the spherical double volume with density D_{ec}, thus with radius 1.26.r_e, starts to expand with the velocity of light, creating new *pp*'s conform the factor of creation. The changing density of the generated *pp*-field will temporarely exceed that of the *ec* itself. This can be understood as follows.

Fig.53



The total mass of the energy (**a**) and its volume (**b**), developed by two touching elementary charges (*ec*'s), can be calculated using the formulas describing the explosion of an instable black hole. But now an (almost) normal creation factor is working. These formulas are:

$\mathbf{a} \approx \mathbf{2.\ m_e\ .(\ 1 + N_{cr} \times t\ /\ t_0\ )}$ ***kg*:** for the shaped mass, and

$\mathbf{b\ = (4/3).\ \pi\ .\ (\ 1.26.r_e + c.t\ )^3}$ m^3**:** for the volume of it.

The area of collision grows with the velocity of light and its density happens to increase until 10^{-26} seconds after the collision, see **table 9** and **figure 53**. Then this density decreases to that of an *ec* (D_{ec}) after 1.25×10^{-24} seconds, so that 'condensation' into *ec*'s or clusters of *ec*'s (instable particles) becomes possible. At that moment the total mass is 1.72×10^{-25} *kg* or **96.3 *GeV***.

It is remarkable that this value differs little from the lower limit of the mass of the hypothetical Higgs boson, namely **95.3 *GeV***, given by D.F.Teyssier at the Cern, Geneva (*'La masse du boson de Higgs', see Chapter 14, page XViii*).

The reliability (degre de confiance) is calculated on 95%, thus the spread of the lower limit of mass amounts to 92.9 - 97.7 *GeV*.

Table 9

t (sec)	a (kg)	b (m^3)	a/b
10^{-30}	1.96×10^{-30}	2.52×10^{-51}	7.78×10^{20}
10^{-29}	3.20×10^{-30}	2.52×10^{-51}	1.27×10^{21}
10^{-28}	1.56×10^{-29}	2.55×10^{-51}	6.13×10^{21}
10^{-27}	1.39×10^{-28}	2.73×10^{-51}	5.09×10^{22}
10^{-26}	1.38×10^{-27}	6.27×10^{-51}	2.20×10^{23}
10^{-25}	1.38×10^{-26}	2.38×10^{-49}	5.81×10^{22}
10^{-24}	1.38×10^{-25}	1.23×10^{-46}	1.13×10^{21}
1.25×10^{-24}	$\mathbf{1.72\times10^{-25}}$	2.36×10^{-46}	$\mathbf{7.30\times10^{20}}$

A second possibility appears with an excess of colliding energy. Now the center-pointed velocity *-v* between the meeting *ec*'s may interfere with the eccentric velocity *+c* of the expansion. If the resulting speed is seen as the sum of both velocities, c-v, then one can imagine that an extra period of time is needed to start the normal expansion.

Say $\mathbf{t_{col} = 1.26.r_e \ / \ (c\text{-}v_{col})}$, then the mass, generated during this period, can be considered as an extra mass (m_{col}) resulting from the excess of colliding energy, increasing with v_{col} :

$$\mathbf{a = 2.m_e.\{1 + (N_{cr}/ t_0).(t + t_{col})\}}$$

$$\mathbf{b = 4\pi/3.(1.26.r_e + c.t)^3}$$

Suppose **c-v = 0.02 . c**, thus **v = 0.98.c** .Then $t_{col} = 1.4075 \times 10^{-24}$ s (= $1.26.r_e$ / 0.02.c) and $m_{col} = 1.9347 \times 10^{-25}$ *kg*.

After 1.7×10^{-24} *s*, the *pp*-density is 7.3×10^{20} $kg.m^{-3}$ and the generated mass is:

$$2.m_e.\{1 + (N_{cr}/ t_0).(t + t_{col})\} = \mathbf{239\ \mathit{GeV}.}$$

After 2.1×10^{-24}*s,* a collision speed of 0.96.c causes a mass generation of

216 *GeV*, at a density of 7.1×10^{20} $kg.m^{-3}$.

The upper value of the Higgs-boson amounts averagely to **220 *GeV***, according to Teyssier, which means that the found energy of particles came from collisions with velocities around 0.96.c.

9.8.3 *The mass of the universe*

The values of the average potential density of space (D_{pp}) and the *ec*-density (D_{ec}) have seemingly the same magnitude. If that is assumed, this equality confirms the supposed quantity of *ec*'s in the universe.

With a supposed total of *ec*'s between 2.8×10^{83} and 2.8×10^{84} *ec*'s in the observable universe, with the age of 1.5×10^{10} years, the overall potential density of the ever produced *pp*'s in those cases, would amount from 7.61×10^{20} to 7.61×10^{21} *kg* per m^3. This means that from 4.9 % to 90.5 % of those *pp*'s must be used in the annihilating reactions of force exertion.

However, the very small volume of the *ec*'s, with respect to the volume of space that matter takes, makes a high degree of *pp*-annihilation impossible.

The conclusion from the equality of D_{pp} and D_{ec} must be that 2.8×10^{83} is the most probable number of *ec*'s in an universe with the age of 1.5×10^{10} years, but that the number of nucleons is considerably lower than 1.5×10^{80}, because most of the *ec*'s exists as poëls.

9.8.4 *Gravitational effects suggesting the existence of dark matter*

Many of the cosmologists believe that large quantities of dark matter exist in the universe. Some important reasons for this believe are the too fast movement of peripheral stars in galaxies and the too low mass of the universe to be closed.

It happens to be, that these questions can be answered, to a large extent, by the energon hypothesis in terms of gravitational effects.

Two considerations play a role in the answers:

1. Like photons, the gravity signals of nucleons need a time tolerance (see chapter 10). However, this tolerance must be very low because of the large ratio between the dimensions of the participating particles, namely *pp*'s and nucleons, and because of the need to raise this tolerance to the second power, expressing in this way the existence of a permanent to and fro interaction.
2. The expansion of the universe causes a decrease of the energy of electro-magnetic waves (increasing wavelengths). There is no reason to exclude the energy of the gravity signals from this phenomenon.

Both considerations are leading to special gravitational effects, which makes that the known formula for gravitation:

$f_G = G.m_1.m_2/A^2$, has to be brought into the form:

$f_G = G \cdot \frac{m_1.m_2}{A^2} \cdot \varepsilon_{tol}.\varepsilon_{exp}$, where ε_{tol} expresses the factor of tolerance and ε_{exp} the factor of expansion.

The factor of tolerance.

It makes sense to suppose that the tolerance for the velocity of gravity signals inside the nucleons (v_q) is determined by the ratio between the *pp*-radius (r_{pp}) and the mean nucleon-diameter $r_p + r_n = 2.r_m = 1.02614 \times 10^{-15}$ *m*, multiplied by *c*:

$v_q = (r_{pp}/2r_m).c$, or $v_q/c = r_{pp}/2r_m$. As the signals have already been coded for this tolerance by the nucleonic sources, the real tolerance becomes:

$(v_q/c)^2 = (r_{pp}/2r_m)^2 = 5.2 \times 10^{-35}$

This means that the gravity signals, which are absorbed at one moment, have been emitted over a period of time (t_c), depending also on the distance between the emitter and the receiver (chapter 10). That period of tolerance amounts to:

$$t_c = \frac{A/c}{1-(v_q/c)^2} - \frac{A/c}{1+(v_q/c)^2} = \frac{A}{c} \times \left\{ \frac{2\times(v_q/c)^2}{1-(v_q/c)^4} \right\} \approx \frac{A}{c} \times \frac{2.v_q^{\,2}}{c^2} \times \left(1+\frac{v_q^{\,4}}{c^4}\right)$$

$$t_c \approx \frac{A}{c} \times \left(\frac{r_{pp}}{2.r_m}\right)^2 \times 2 = \frac{A}{c} \times 1.040 \times 10^{-34}\, s$$

The influence of time tolerance t_c on the force can now be described by the factor:

$(1+ t_c \times c/2r'_m) = \{1+ (A/c) \times 1.04011\times10^{-34} \times (c/2r'_m)\}$, in which $t_c \times c/2r'_m$ descibes the ratio between the tolerance t_c and the mean traverse-period of the nucleons:

$2.r'_m = (2/\pi)\times 2r_m = 6.5326\times10^{-16}$ *m.* Thus:

$\varepsilon_{tol} = (1 + 1.592 \times 10^{-19} \times A)$, with dimension (1 + L / L).

The factor of expansion.

As the energy of the signals of gravity will be inversely proportionate to the expansion of the universe, the *constant of Hubble* can be used to calculate that influence.

The value of Hubble's constant has now been put on

H = 20 $km.s^{-1}.ly^{-6}$, or H' = $T_u^{-1} = 2.112\times10^{-18}$ $m.s^{-1}.m^{-1}$ (see next paragraph).

If multiplied by a distance in meters, one finds a velocity:

H'×A = $2.112\times10^{-18}\times$A $m.s^{-1}$ [1],

and division by a velocity gives the expansion at distance A:

H'×A / V_u = 1 + $2.112\times10^{-18}\times$A / V [2].

The combination with ε_{tol} is only possible if the influence of the exceptional period of inflation will be counted in ε_{exp}. It's obvious that the total of angular momentum in that period (the basic form of gravitation) differs much from the next period, as can be seen from the ratio between the totals of mass, velocity and distance in both systems:

$$f_{eq} = \frac{M_U \times V_{infl} \times R_{infl}}{M_U \times c \times R_U} \approx 1.33 \times 10^3 \cdot$$

$V_{infl} = 2.075\times10^{15}$ $m.s^{-1}$; $R_{infl} = 2.72\times10^{22}$ *m* ; $R_U = 1.42\times10^{26}$ *m* (page *155/158*).

Suppose: **V_{rel}** = f_{eq} × 1 $m.s^{-1}$, so that

$V_{infl} \times R_{infl} /(V_{rel} \times c \times R_U) \approx 1$ ($s.m^{-1}$).

The difference in gravitational momentum can now be brought into equilibrium by using a new relative velocity $V_{rel} = 1.33 \times 10^3$ $m.s^{-1}$ in formula [2]:

$\varepsilon_{exp} = \{1 + 2.112 \times 10^{-18} \times A / (1.33 \times 10^3)\}^{-1}$, thus:

$\varepsilon_{exp} = (1 + 1.588 \times 10^{-21} \times A)^{-1}$, with dimension $[1 + L.T^{-1} / L.\,T^{-1}]^{-1}$.

The combined formula for the gravitational force at large distances is then given by:

$$f_G = G \times \frac{m_1.m_2}{A^2} \times \frac{1 + 1.592 \times 10^{-19} \times A}{1 + 1.588 \times 10^{-21} \times A} N$$

where A = distance between the objects in meters.

Table 10

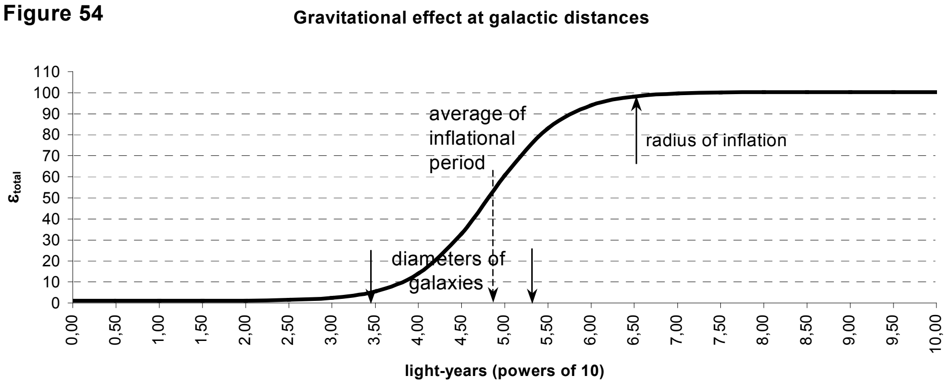
10^xly	ε_{total}	10^xly	ε_{total}
0	1.0015	5.2	70.897
1	1.0149	5.4	79.461
2	1.1489	5.6	86.035
3	2.4690	5.8	90.781
3.2	3.3083	6	94.058
3.4	4.6094	6.2	96.252
3.6	6.6013	6.4	97.690
3.8	9.5938	6.6	98.620
4	13.964	6.8	99.158
4.2	20.088	7	99.596
4.4	28.193	8	100.19
4.6	38.146	9	100.25
4.8	49.299	10	100.25
5	60.589	10.17	100.25

It implicates that the receiving nucleons must be able to collect the combining gravitational information from a long distance into normal quanta (dominancy of the receptor: compare the relativity of light, page 126).

In the table the resulting factor ε_{total} has been given for differing values of distance *A*. It shows a steep increase of the gravitational effect for distances between 10^3 and 10^6 light-years (enclosing the diameters of the galaxies!), and a slowing down of this increase after 10^6 light-years to about a constant effect of 100 times the 'normal' value. See also **figure 54**.

Besides the following, this formula can explain a few extra phenomena, see p.165 (anomalous acceleration) and p.169 (total power of the universe).

Figure 54



The conclusion is that most of the supposed extra mass in the universe may be an illusion, caused by gravitational effects at galactic distances !

In the course of time of the expanding universe decreasing masses were surrounded by the gravitational barrier. This may be the reason of the successive formation of stars in super-clusters, clusters and single galaxies.

9.8.5 Relation between the expansion of the universe, the creation of energons in matter and the Constant of Hubble

In paragraph 9.8.1 some conditions with respect to the *pp*-density in the universe were considered to be probable.

To explain Hubble's Constant, some additional conditions will be necessary:

- the creation of energons must have an almost immediate influence throughout space;
- the creation of energons happens by matter (*ec*'s), constantly per unit of time;
- the red-shift of photons is related to the constant creation of energons since the beginning of the universe.

The underlying vision on the growth of the universe is the constant production of energy-particles (*pp*'s) by a constant amount of elementary charges (*ec*'s). It is believed that this spherical cloud of *pp*'s maintains a constant density.

The increase of space is given by:

$\Delta_U = 2.51 \times 10^{61}\ m^3.s^{-1}$ or $2.970 \times 10^{13}\ ly^3.s^{-1}$, see § 9.8.6.

The increase can also be expressed as a linear increase with respect to time zero:

$\Delta_{RU} = (3.\ \Delta_U / 4.\pi)^{1/3} = 1.818 \times 10^{20}\ m.s^{-1}$ (initial velocity).

To understand the following, one has to realize that R_U increases with a length in meters *that depends on the expired time.* Division by the age of the universe gives the acceleration to the centre of time:

$$\frac{\Delta_{RU}(m.s^{-1})}{T_U(s)} = \frac{1.818\times10^{20}(m.s^{-1})}{4.734\times10^{17}(s)} = 3.84\times10^{2}\ m.s^{-2} ,$$

If expressed in units of velocity (initial velocity), the growth of velocity per meter will be:

$$\frac{3.84\times10^{2}(m.s^{-2})}{1.818\times10^{20}(m.s^{-1})} = 2.112\times10^{-18}\ m.s^{-1}.m^{-1} .$$

It must be remarked that the period of inflation has been spread along the total age of the universe with this reasoning, saying that $2.112 \times 10^{-18} \times R_U = c\ (m.s^{-1})$.

It's logical that Δ_{RU} (Δ_U) disappears numerically, because it was already integrated in our picture of the existing universe as part of the age of it (§ 9.8.6).

But so do not the new dimensions $m.s^{-1}.m^{-1}$(velocity per meter).

This equation can also be presented as: **$1 / T_U = 2.112 \times 10^{-18}$ *$m.s^{-1}.m^{-1}$***

= 20.0 *$km.s^{-1}.ly^{-6}$* = 65.2 *$km.s^{-1}$/ Mpc = Hubble's Constant* **)

The general form of the formula for diverse radii of the universe is given by:

$1 / T_U'$ $m.s^{-1}.m^{-1}$ (or $km.s^{-1}.Mpc^{-1}$).

Each period adds a length to an existing length and is stretching that way an enclosed photon in the course of time.

Imaginary measurements in a former stage of the universe would give higher values, because *1/T'* would be higher. In our days those values reach us as an increase of velocity by distance, giving a red-shift of photons of known frequences.

Despite the uncertainty of age and mass of the universe, the preceding considerations make it reasonable to suppose that **the creation of energons by the elementary charges causes the expansion of space.**

9.8.6 *The cosmological constant*

Albert Einstein introduced in 1917, in addition to his general theory of relativity, the *cosmological constant* as a counterbalance for the force of gravitation in the universe. Later on he regretted this, because the necessity of the constant could not be proved.

It may be reasoned, however, that his insight still might be correct in some way!

The growing physical space of the universe inflates also its content of matter, but *seen as a black hole, the total energy of the universe ($M_U.c^2$) and its potential energy of gravitation ($-G.M_U^2/R_U$) stay unchanged and oppositely (see pages 195, 160).*

The increase of the volume of the observable universe per second (Δ_U) equals the volume of the total production of *pp*'s per second, corrected for the factor of density and the reactions of annihilation; as has been shown before, the factor of density- correction = (volume of *Spp*'s)/(volume of the *ec*) = $4.r_{pp}/r_e = 4.42 \times 10^{-15}$, see § 9.8.1.

This means a prevalence of the velocity of the expansion of space against the velocity of light in the first period of the universal development!

Thus: $\mathbf{\Delta_U} = 0.95 \times 1.5 \times 10^{80} \times 1862 \times N_{cr} \times N_{es} \times (c/r_{pp}) \times (4/3).\pi.(r_{pp})^3 / 4.42 \times 10^{-15}$

$= 2.516 \times 10^{61}\ m^3.s^{-1} = \mathbf{2.970 \times 10^{13}\ ly^3.s^{-1}}$,

which is equal to the 2.112×10^{-18} -th part of the total space (~ age).

(Note that $(4.42 \times 10^{-15})^{-1} = 2.26 \times 10^{14}$).

An increment of volume per unit of time, independent of the number of *ec*'s and of the age of the universe, is given by:

$$C_C = \frac{(N_{es}.N_{cr}) \times (4.\pi.r_{pp}^{\ 3}/3) \times (c/r_{pp})}{N_{es}.(4.\pi.r_{pp}^{\ 3}/3)/(4.\pi.r_e^3/3)} = \frac{4.\pi.N_{cr}.r_e^3.c}{3.r_{pp}} = 9.49 \times 10^{-23}\ m^3.ec^{-1}.s^{-1}$$

This increment of space per second, caused by each elementary charge, could be called the **cosmological constant ($1.042 \times 10^8\ m^3.kg^{-1}.s^{-1}$).**

The conception of C_C, giving the quantum of space, created in one second by one *ec*, makes the following deductions possible.

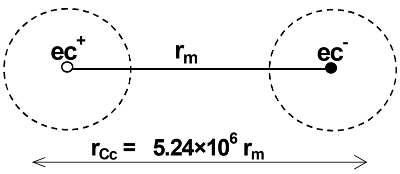
The increase of the volume of the universe can be seen as a continuous addition of *quanta of physical space* created by the *ec*'s throughout the universe. Those quanta are collections of *pp*'s with a constant density 7.2×10^{20} kg/m^3 (equal to D_{ec}, see § 9.8),

The *ec*'s exist in the form of two, very different forms of dynamic structures:

1. Nucleons, which contain about 12% of the total amount of *ec*'s and being the far most energetic structures.
2. Atoms and neutrino's (poëls) with weakly bound *ec's*.

The production of space-quanta by weakly bound ec's.

Figure 55

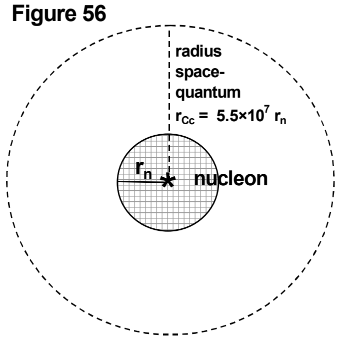


The created volume 9.49×10^{-23} m^3 has a radius of $(3 \times 9.49 \times 10^{-23} / 4\pi)^{1/3}$ = $\mathbf{2.83 \times 10^{-8}}$ ***m*** **=** $\mathbf{r_{Cc}}$, which is $2.83\times10^{-8}/5.4\times10^{-15} = 5.24\times10^{6}$ times r_m (distance between the *ec*'s of a poël).

The velocity of increase is also given by the figures 2.83×10^{-8} $m.s^{-1}$. The amount of *pp*'s from a poël in the volume is $2.C_C$ × space-factor / *pp*-volume = 4.912×10^{59}, the weight of which is $4.912 \times 10^{59} \times m_{pp}$ = 0.1366 *kg*, leading to the density $\mathbf{1.4 \times 10^{21}}$ $\boldsymbol{kg.m^{-3}}$.

The production of space-quanta in nucleons.

Figure 56



The partition of *pp*-loss between both kinds of *ec*'s amounts to 0.12 × 4.8% + 0.88 × 4.46% = 4.50%.

If *1 second* is chosen for the period of production then the amount of produced *pp*'s by 1862 *ec*'s is:

$$1862 \times 2.456 \times 10^{59} / 4.8 = 9.527 \times 10^{61} \; pp\text{'s},$$

with a weight of **26.485 *kg*** and density of $\mathbf{2.8\times10^{23}}$ $\boldsymbol{kg.m^{-3}}$ because the volume must be $\mathbf{9.49 \times 10^{-23}}$ $\boldsymbol{m^3}$. Thus that leads to a highly increased density. The normal C_c-density (= D_{ec}) allows a normal velocity of *pp*-waves (c). It will be accepted now that, because of increasing collisions between *pp*'s, this wave-velocity is maximally proportional to the ratio between the normal- and the active density, in this case:

$$(7.2\times10^{20} / 2.8\times10^{23}).c \approx \mathbf{2.57\times 10^{-3}.c}$$

The 'cosmological constant C_c is crucial for these calculations.

9.9 Planck's Constant

It shows to be possible to derive the value of Planck's constant, using data from the energon hypothesis. It is surprising to find that *this constant is closely related to the discrepancy between the mass- and electric points of ec's at their interaction:*

e_{ex} = 0.1406.re, (see § 3.5.3).

Minor corrections must be made for the *fine structure constant*: **(1 - $\alpha.\pi/2$) = 0.98854**, **(**see page *150*), the *effect of ec-pulsation*: **ρ = 0.9995**, (see § 7.1) and the *factor of communication* between *ec*'s and nucleons: **p = K_r/K = 1.01122**, (see § 5.3).

Normally Planck's constant can be found according to:

h = $2\pi \times m_e \times V_e \times r_H$ = **6.6262 × 10^{-34} *kg.m^2.s^{-1}***.

According to the energon hypothesis the angular momentum of an attracting *pp* is:

$M_{pp} = ¼ \times m_{pp} \times c \times r_{pp} \approx 1.5418 \times 10^{-85}$ *kg.m^2.s^{-1}* (§ 9.7; pages *142/143*).

The *pp*-energy radiated by such an *ec,* if **N_{cr}** is put on **1.8618 × 10^{-12} / t_0**, is given by

$E_{ec} = M_{pp} \times N_{es} \times N_{cr} \times (c / r_{pp}) \approx 3.8110 \times 10^{-26}$ *kg.m^2.s^{-2}* (§ 9.7).

The rough restoring energy between electron and a proton at distance r_H would be:

$$E_{exch} = \frac{e_{ex}}{r_H} \times E_{ec} \times \frac{1}{p} \approx 6.7068 \times 10^{-34}\ kg.m^2.s^{-2}$$,(**see pages 148 – 151**).

If corrected by ρ and (1- $\alpha.\pi/2$ *)*, the restoring *pp*-energy amounts to:

6.7068 ×10^{-34} × 0.9995 × 0.98854 = 6.6266 × 10^{-34} *kg.m^2.s^{-2}*,

which means an addition per second of:

h ≈ 6.6266 × 10^{-34} *kg.m^2.s^{-1}*

This consonance may be regarded as an indication of the real existence of energons.

It can be demonstrated that the amount of reacting *pp*'s on an orbiting *ec* at a distance r_H *m* from a proton, is equal to the above mentioned amount of *pp*'s, transporting the 'restoring' energy: $e_{xe}/r_H \times 3.811 \times 10^{-26} \approx$ **6.7×10^{-34} *kg.m^2.s^{-2}***. The *pp*-production of the 'positive *ec*' in the proton amounts to $N_{cr} \times N_{es}/ t_0 = 2.472 \times 10^{59}$ *s^{-1}*, that passes in an equal period the sphere $4.\pi.r_H^2$ of the orbiting electron. This *ec* can catch the next amount of *pp's* : $(\pi.r_e^2/ 4.\pi.r_H^2) \times 2.472 \times 10^{59} = 3.1288 \times 10^{52}$ *pp*'s *s^{-1}*, or $\times 1.5418 \times 10^{-85} = 4.824 \times 10^{-33}$ *kg.m^2.s^{-2}. That can only reach the really absorbed energy by multiplication with e_{ex}/r_e (page 31)*: **4.824×10^{-33}× 0.14 ≈ 6.7×10^{-34} *kg.m^2.s^{-2}***.

*) Van Quantum tot Quark, Stichting Teleac 1989, page 250.

**) According to V.Icke (Oct.2005): HC ≈ 21.47 *km.s^{-1}.ly^{-6}*, thus $T_U \approx 1.4 \times 10^{10}$ *y*.