

11. The physical space.

In Chapter 9 we have seen that the physical space must exist of immense quantities of energons, moving into each direction with velocities between $\frac{1}{2}c$ and $1\frac{1}{2}c$.

An astonishing possibility urged itself while evaluating the ideas:

The potential density of space and the density of the ec's are equal.

Now the question is: which mechanisms rule those densities?

Before trying to find the answer, some data are repeated below:

The ec-weight	$m_e = 0.9109534 \times 10^{-30} \text{ kg}$
The ec-radius	$r_e = 6.6979 \times 10^{-18} \text{ m}$
The quantity of <i>Spp</i> 's of an ec:	$N_{es} = 3.277 \times 10^{30}$
The <i>pp</i> -radius	$r_{pp} = 7.4 \times 10^{-33} \text{ m}$
The <i>pp</i> -production-factor	$N_{cr} = 1.8618 \times 10^{-12} \text{ t}_0^{-1}$
The <i>pp</i> -content of space	$C_{pp} = 2.74 \times 10^{81} \text{ pp's.m}^{-3}$
The average potential density	$D_{pp} = 7.58 \times 10^{20} \text{ kg.m}^{-3}$
The absolute period of time	$t_0 = r_{pp} / c = 2.468 \times 10^{-41} \text{ s}$
Equatorial spin-velocity of ec's	$V_r = 1.1744 \times 10^{-7} \text{ m.s}^{-1}$

Stabilisation and de-stabilisation of ec's.

In the paragraphs 6.3.1, 9.6 and 9.8.1 some equations have been used for the calculation of the equatorial spin-velocity of ec's (V_r), the radius of *pp*'s (r_{pp}) and the *pp*-content inside the ec's (C_1).

$$V_r = p^2 \cdot h / (2\pi^2 \cdot m_e \cdot r_e \cdot K_r^{1/2}) = 1.1744 \times 10^{-7} \text{ m.s}^{-1}$$

$$r_{pp} = V_r \cdot 2r_e \cdot \sqrt{2}/c = 7.4 \times 10^{-33} \text{ m}$$

$$C_1 = 1368 \times C_{pp} ; C_{pp} \times \text{ec-vol.} \times 0.955 = 3.28 \times 10^{30} = N_{es}.$$

However, there are reasons for doubting the value of C_1 : it is much higher than C_{pp} , which has shown itself as being the ultimate value for a stable energon density.

From the next calculations the conclusion can be drawn that there is a connection between the *pp*-production-factor (N_{cr}) and the spin-velocity of the elementary charges, besides the connection between this velocity and *pp*-dimension.

The value $\tan(0.034^0) = 5.9341 \times 10^{-4}$ attracts the attention:

$$r_{pp} / \{\tan(0.034^0) \times r_e\} = 1.8618 \times 10^{-12} = N_{cr}.$$

The equation can be written as $N_{cr} = (\tan 0.034^0)^{-1} \times (r_{pp} / r_e) / t_0$, and because

$$\tan(0.034^0) \times 360^0 / 2\pi = 0.034 \text{ radian, we can say:}$$

$$(\tan 0.034^0)^{-1} = 360^0 \times 1 / (0.034 \times 2\pi) [\text{degr/rad}] = 1685.17 [\text{degr/rad}] \times$$

$$\times (r_{pp} / r_e) / t_0 [t_0] = 1.8618 \times 10^{-12} [\text{degr/rad}/t_0 = \text{angular velocity}].$$

From N_{cr} the **angular velocity** for $2.r_e$ can be derived, see **Fig. 67**:

$$\tilde{\omega}_{cr} = 1.8618 \times 10^{-12} \times 2.r_e / t_0 = 1.8618 \times 10^{-12} \times 2.r_e \times c / r_{pp} = \mathbf{1.0104 \times 10^{12} [degr/s]},$$

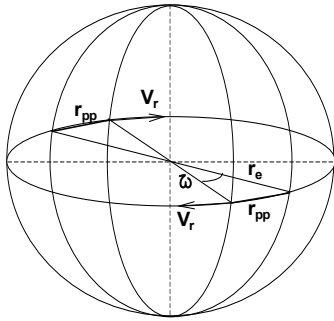
or $\tilde{\omega}_{cr} = (\tan 0.034^0)^{-1} \times 2 \times c = \mathbf{1.0104 \times 10^{12} [degr/s]}$. No ec-puls correction necessary.

We can also derive the angular velocity from the spin-velocity: $V_r = 1.1744 \times 10^{-7} m.s^{-1}$ (§ 6.3.1); $\tilde{\omega}'_{cr} = 1.1744 \times 10^{-7} / (2.\pi.r_e) = 2.7906 \times 10^9 [rotations / s]$. In this case an ec-puls correction must be executed, because r_e and r_{pp} do not exclude each other.

The value of $\tilde{\omega}'_{cr}$ must be divided by the square (interaction!) of $(7.38 / 7.4)$, see § 9.6:

$$\tilde{\omega}_{cr} = 2.7906 \times 10^9 \times 360^0 \times (7.4 / 7.38)^2 = \mathbf{1.0101 \times 10^{12} [degr/s]}.$$

Figure 67



The relationship between spin-rotation (V_r) and the pp -creation in ec's (N_{cr}) is also conceivable directly from the supposed cause of ec-spin (see § 2.3): from the ejected pp 's into one direction only a very small part has a track perpendicular to the ec-surface. All the other tracks have oblique angles with that surface. As this is valid for each direction, *ec-spin has an important influence on the character of pp 's, working on one object.*

From D_{pp} , $l_{ec} = 4\pi.r_e^3/3 = 1.2586 \times 10^{-51} m^3$ and the pp -loss of 4.5 % we find: $0.955 \times D_{pp} \times l_{ec} / m_e \approx 1.0$, or *the potential density of space is equal to that of ec's*. The inside pp -creation of an ec amounts to: $N_{cr} = 1.8618 \times 10^{-12} \times N_{es} / t_0$, or N_{es} pp 's per $(t_0 / N_{cr}) = 1.3256 \times 10^{-29} s$. This amount will be annihilated in the same period, so that *N_{es} pp 's exists permanently inside an ec.*

De-stabilisation occurs with collision between ec's within a period of $10^{-25} s$, which must cause a dramatic disturbance of the equilibrium of the ec's: a kind of *super-ec* is formed and is inflating itself with velocity c until its density has become normal again (D_{ec}). Then it decays into multiple normal ec's with an identical total weight (see § 9.8.2).

Stabilisation of the density of the physical space.

The stabilisation of the pp -density of space seems to be unconceivable, but this problem may perhaps be approached by the thought that the pp 's in space will frequently collide. These collisions must differ very much from the annihilating collapse with the ec-mantle. In the energon hypothesis it is thought that pp 's with unusual velocities (too high or too low) will pass the ec unchanged. Therefore it seems that it has to be accepted that colliding pp 's in space can neither be changed because a partly loss of angular

momentum is unthinkable. However, the necessity of a mutual *pp*-influence looks inevitable. That will be discussed after an analysis of the frequency of *pp*-collision.

The situation in *ec*'s as well as in space is thought to be stabilised on an equal density. This leads to the presumption that there must be an equal chance on collision between *pp*'s and *pp*'s versus *Spp*'s. With equal densities is meant the density of *pp*'s, emitted to the *ec*-inside, the density of the *Spp*'s of the active *ec*-mantle with respect to the *ec*-capacity, and the average *pp*-density of space (*except the neighbourhood of large masses, see below*).

According to the energon-hypothesis free space contents:

$$C'_{pp} = 3 / (\pi \cdot r_e \cdot r_{pp}^2) = 2.604 \times 10^{81} \text{ } pp's \cdot m^{-3}; \quad (C_{pp} = 2.73 \times 10^{81}; \text{ § 9.8.1})^*$$

If 1 m^3 is seen as a sphere, then its diameter measures: $d_s = 2 \cdot \{3/(4 \cdot \pi)\}^{1/3} = 1.2407 \text{ m}$.

The number of *pp*'s that can maximally be present along this diameter amounts to:

$$n_d = 2 \times (3 \times 2.60 \times 10^{81} / 4 \cdot \pi)^{1/3} = 1.7068 \times 10^{27} \text{ } pp's.$$

Therefore the average distance between *pp*'s in space is:

$$a_{pp} = d_s / n_d = 7.2690 \times 10^{-28} \text{ m}.$$

The period needed to cover a_{pp} measures $a_{pp}/c = 2.4247 \times 10^{-36} \text{ s}$.

The central section of a *pp* amounts to: $\sigma = \pi \cdot (r_{pp})^2 = 1.7203 \times 10^{-64} \text{ m}^2$, and the area of a sphere with radius a_{pp} : $O_A = 4\pi \times (7.2690 \times 10^{-28})^2 = 6.640 \times 10^{-54} \text{ m}^2$, thus

$$(\sigma/O_A)' = 2.59081 \times 10^{-11}, \text{ that gives the chance on collision between two } pp's.$$

As one *pp* is surrounded by 10.39 other *pp*'s, $(\sigma/O_A)'$ must be multiplied, see page 154:

$$(\sigma/O_A) = (\sigma/O_A)' \times 10.39 = 2.69185 \times 10^{-10} \text{ in } a_{pp}/c \text{ seconds.}$$

The frequency of *pp*-collisions per N_{es} *pp*'s per second can now be described by:

$$v_{coll/Nes} = (\sigma/O_A) \times (c/a_{pp}) \times N_{es} = \mathbf{3.6381 \times 10^{56} \text{ s}^{-1}}.$$

As the pp-concentration inside ec's (C_1') is equal to that of free space (N_{es}/ec -volume), the amount of pp-collisions must also be equal.

The amount of *pp*-collisions, in the mean period for a *pp* to cross the *ec*-volume, can be calculated according to: $v_{coll/Nes} \times 2 \cdot (2/\pi)^2 \cdot r_e/c = 6.5884 \times 10^{30}$. Dividing this by N_{es} gives the number of collisions for each *pp* within that crossing period, rounded off :

$$v_{coll/ec} \approx \mathbf{2.0} \text{ per } 1.81095 \times 10^{-26} \text{ s}.$$

An other approach to the frequency of *pp*-collision in space is the calculation of the amount of collisions per *pp* per t_0 , using a cubic measurement:

$$v_{coll/t_0} = v_{coll/Nes} \times t_0 \times 1.612 / N_{es} \approx \mathbf{4.42 \times 10^{-15}} \text{ (space-factor),}$$

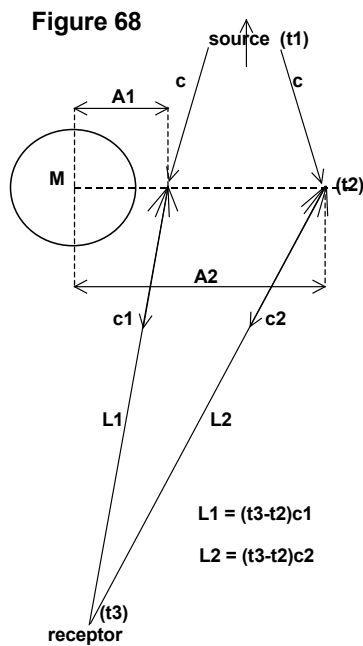
in which 1.612 gives the ratio between the edge of a cube and the radius of an equal spherical volume (§ 5.3). The result approaches the ratio between the total *pp*-volume

and the volume of space, as aspected.

The value $v_{coll/ec}$ is an unique number, suitable to express the condition for the equilibrium between the diverse pp -phantoms: one collision at the entrance (or emergence) and one collision (or annihilating) at leaving the system.

The problem of equilibrium can be comprised by the following statement:

The creative emission by ec's into the in- and outside space is just enough to maintain the necessary pp -density on N_{es} pp 's per ec-volume.



The bending of light by heavy masses, described by Einstein and regarded as a result of gravitation, may probably be understood as a local influence of energon-density in the neighbourhood of a heavy mass M on the velocity of pp -waves, forming a potential signal, see **figure 68**.

These waves belong to one point in time on their source (t_1) and form a diverging front with respect to that source. If this front passes (at time t_2) the heavy mass M (a star for example), it meets different pp -densities. These densities, caused by pp 's that are sent transversally to the direction of the wave by mass M , must be inversely proportional to the square of distance A to the mass.

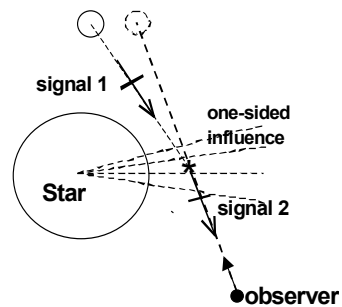
In analogy with waves in gases, parts of the signal-waves, scattered by pp -collisions, will move at lower velocities in regions with higher pp -densities.

The two parts can only transfer a signal to a receptor by converging into that receptor (at time t_3). That can happen if the initial direction of the wave will be bent a little towards the mass M . In that case the different tracks can be covered in an equal period of time:

$$L_1/c_1 = L_2/c_2 = t_3 - t_2$$

That gives an effect as gravitation should do!

Figure 69. Bending of signals



Thus the influence of the pp -emission of a heavy mass (star) on passing pp 's, forming an EM -signal, will cause a bending of the working direction of the signal, which is in accordance of Einstein's General Theory of Relativity (**Figure 69**).

The volumetric condition for free energons.

The problem of the volumetric behaviour of free pp -masses may be approached by using the space factor 4.42×10^{-15} .

On page 103 (§ 9.8.1) was found that $4.42 \times 10^{-15} = 4.r_{pp} / r_e$, thus being dependent of a ratio between the unchangeable radii of energons and elementary charges. As indicated, that ratio is equal to the ratio of the capacity of the outer S_{pp} -mantle of an ec and that of the ec itself. The reason why pp 's in ec 's need the same volume as free pp 's do must be identical. Probably this problem must be brought back to the movement of the pp 's.

On page 131 the amount of pp -collisions during the mean crossing-period for an ec , is found to be 2 (4 pp 's!). That means a meeting of 2 pp 's for half of that period ($\sim r_e$) giving the ratio 4 pp -radii against 1 r_e . That is just the ratio for the space factor ($4.r_{pp}/r_e$). Other periods do not change this ratio!

Possibly, the condition for the need of space by free pp 's is just one pp -collision (4 r_{pp} 's) in the period to cover a mean hemisphere with radius r_e .

The inevitable birth of ec 's from high-density pp -clouds.

High-energy events can damage the fundamental structure of matter, as has been mentioned in § 9.8.2. The pp -clouds, that arise from those events, have a density higher than that of ec 's ($D_{ec} = 7.2 \times 10^{20} \text{ kg.m}^{-3}$). Immediately after the disturbance, the pp -cloud starts to expand with velocity c under the influence of pp -creation (N_{cr}), until the density has reached its normal value D_{ec} .

It can be reasoned that, at that moment, the pp -cloud must break up into a proportional number of normal ec 's, gluing together a surplus of actually meeting pp 's in the region of the settling mantles.

For an explanation the following approach has been chosen.

An ec takes a distinct place and volume in space, so that an ec -in being must be seen as build up from a distinct point in space.

An amount of N_{es} pp 's will be created in a period $t_0/N_{cr} = 1.236 \times 10^{-29} \text{ s}$.

The period of convergence for distance r_e must be $\Delta t_{re} = r_e \cdot \sqrt{2}/c = 3.16 \times 10^{-26} \text{ s}$,

which means that $\Delta t_{re} \times N_{cr}/t_0 \times N_{es} \approx 2560 \times N_{es}$ pp 's will be created in Δt_{re} s, thus

reaching simultaneously the *ec*-mantle in-being. Correction for the *pp*-rotation will cause a factor $\frac{1}{2}$, which is leading to a thickness of 1280 S_{pp} 's, but the efficiency of building is not likely to be 100%, so that it seems to be reasonable to make the estimation that

1.2×10^3 S_{pp} -layers are forming the *ec*-mantle.

The weight of the *ec*, however, is determined by the N_{es} active S_{pp} 's.

We have to conclude that the given picture of the *ec*-rise from high-density *pp*-clouds is only possible *on the condition* that a layer of about 1.2×10^3 S_{pp} 's is needed for a proper functionality of the *ec*. An other *ec*-radius, say $x.r_e$, is impossible then because it leads to another amount. Thus the creation can seemingly only happen at the moment that

$N_{\text{mantle}}/N_{es} \approx 1.2 \times 10^3$, not sooner and not later. (See page 159).

If an identical reasoning is applied to the universe as a whole, an interesting and astonishing result is got:

the universe may be bordered by a regulating energetic film.

The necessary formula must have the following shape, giving the at-once offer of *pp*'s to the extreme regions of the universe in our time (see N_{mantle} above) :

$$N_U = 0.955 \cdot \sqrt{2} \cdot R_U \cdot 10^{83} \cdot N_{es} \cdot N_{cr} \cdot t_0^{-1} \cdot c^{-1} \approx 1.6 \times 10^{160}$$

(with 4.5 % annihilation and no difference of *pp*-rotation; $R_U = 1.42 \times 10^{26} m$).

A loss by efficiency, as above, may lead to:

$$N_U \approx 1.3 \times 10^{160}.$$

One single layer of touching S_{pp} 's in this region would contain

$$4 \cdot R_U^2 / r_{pp}^2 = 1.61 \times 10^{117} S_{pp}'s,$$

so that the energetic film around the universe must consist of

$$8 \times 10^{42} S_{pp}\text{-layers, with an overall thickness of } 6 \times 10^7 \text{ km.}$$

*This relative thin S_{pp} -film should be seen as the regulator of the constant *pp*-density of the universe ($C_{pp}' = 2.61 \times 10^{81} m^{-3}$) and as a complete isolator.*

There exists a difference between the mantle of *ec*'s and that of the universe. In the mantle of the universe both kinds of *pp*'s are active and no new *pp*'s are formed and emitted. In the contrary, it can be seen as the reverse of the *ec*-mantle: the *pp*'s (space) will be destroyed in the outer regions of the universe. An argument in favour of this vision can be found in the derivation of the fourth equation of the constant G (see the pages 154/155). In this reasoning the velocity of light must be coupled to the amount of

pp 's along a distance, $c' = c \cdot n_{pp} \text{ s}^{-1}$, causing the loss of the length-dimension. It can be imagined that the amount of pp 's per meter, into the direction of the borders of the universe, increases (increase of pp -density). Because we can say $c = c'/n_{pp}$, an increase of n_{pp} diminishes the "constant c ", if c' is the real constant.

This vision is in agreement with the black-hole state of the universe (see pages 159/160). The formula $R_U = (G/c^2) \cdot M_U$, valid for this state, tells that R_U must be a constant. That seems impossible with an increasing amount of pp 's, but R_U and c stay numerically unchanged, while in reality the used meters has been shrunken, because only the amount of pp 's counts. Thus $R_U \cdot c^2 = G \cdot M_U$ stays valid in a changed cosmos.

From normal black holes only the neutral emission of gravity can escape, whereas information bearing signals, must stay inside (if they exist). From the universe no emission at all can escape. An immense pp -annihilation must happen, but it is dubiously whether the complex information, which is undoubtedly existing, can be erased completely.

There are resting some other intriguing questions.

Until now, cosmological problems have been handled in this work as taking place in a spherical space in which time has its own place. The often used metaphor of a spherical bent space, embracing a four-dimensional entity, as a parallel of a two-dimensional spherical bent plane embracing a three-dimensional spherical space, does not reach our imaginative faculty. We can conclude that there are real borders. But how can an observer near the border of a spherical universe have the same impression of that universe into all directions? Even the bending of light by gravity cannot give an acceptable image of equal information, coming from all directions.

However, the presumable existence of an energetic film, mentioned above, as an isolating and regulating border of the universe, may give a possible solution. This border must constantly interact with arriving energons, containing information. *As this information probably cannot get lost, it will be reflected and so offer a sight at the universe into the opposite direction.*

Another problem concerns the question how the universe can react as a whole on disturbances of density at distant places? That problem remind us of the period of fast inflation that must have existed in the beginning of time. Something in space must happen much faster than the velocity of light allows.

A third question is whether the energons must be seen as energy or not. If they are the cause of the expansion of the universe, they must have the power to move the immense masses, but they themselves must possess mass, according to the famous equation of Einstein. On the other hand, the dual character of energons, emerging from the two opposite poles, leads to the supposition of the existence of positive- and negative energy with a sum of zero. Therefore, it seems better to see the energons according to their second name: *power-particles*, having the power to do something. An energon has the power to *exert* a mass in combination with another energon (see § 2.2).

It seems obviously that the power of creation has been restricted to the material structure of the elementary charges. An exception occurs with the energetic destruction of those charges. In that case the induced, highly concentrated, energon clouds continue with the creation until the density of normal *ec*'s has been reached and the condensation of the *ec*'s can take place. A unique *ec*-destruction forms the enormous explosion of the instable black hole.

A smooth development to the present end-state is not likely: a state of continual *pp*-density, higher than that of *ec*'s seems to be impossible.

The combination of findings in § 5.3 (density of *ec*'s in nucleons), chapter 6 (emergence of gravity in nucleonic structures) and in § 9.8.1 (the need to accept inflation of the primeval universe) leads to the insight that the period, immediately following on the creation of *ec*'s, must have been a very dramatic one: an *inflation* of the universe must have happened *with* the forming of nucleons, at the moment that the *ec*-density was big enough, *thus with the choice between matter and antimatter*.

What was the role of this choice on the next development of the universe?

The choice between matter and antimatter probably could not have been made. Possibly both structures must have been realised at once. It is thinkable that the emergence of nucleons and anti-nucleons from the same compressed *ec*-plasma must have lead to a compression of time-space, because the reversed passing of the energy-threshold into free *ec*'s was not possible anymore("annihilation").

The compression of time-space would have its advantages, seen from the energons: while the angular momentum of *pp*'s decreases: $M_x = m.(x_l).(x_r)/(xt)$, energy and momentum do not change: $e_x = m.(x_l)^2/(xt)^2$, $m_v = m.(x_l)/(xt)$, the forces and power would increase with *x*-values between 1 and 0: $f_x = m.(x_l)/(xt)^2$, $e_x/t = m.(x_l)^2/(xt)^3$

From § 3.3.2 (page 24) can be seen that transversally moving *ec*'s with velocities higher

than $0.866c$ cause forces that increase very fast till infinity at velocity c . The above mentioned equation for f_x shows that an increasing f_x is accompanied by a value x , that is shrinking below 1, thus by a fast reduction of time and also by a reduction of distance. The concentrations of matter and antimatter could have expelled each other then into separated proto-universes, after which normalisation of time-space could have taken place.

An new approach to the problem, using the exchange of potential- and normal energy, is given in *pages 155/158 (proto universe)*, in which diverse quantitative links with other considerations in this work could be found. After reaching its equilibrium, the volume of the universe probably expanded with the constant, newly-formed volume of energons. Some consequences with respect to the black-hole state of the universe have been mentioned above.

What will be the the further development ? If there is a drift of energons into the direction of the border, accompanied by an increasing density and annihilation, will matter be dragged with it ?

A new insight in universal development came during the preceding decennium with measurements on the Ia-supernova as a standard-candle at very large distances. Combination with measurements of the red-shift of these 'candle-lights' seem to suggest that the expansion of the universe accelerates. That conclusion seems to be unrealistic and the energon-hypothesis confirms that vision.

In the hypothesis the (very early) inflation is seen as a too large offer of pp 's in the time of creation. That must have caused a temporary increase of pp -density with a *reduction of light-velocity* because the coupling between time and length was violated at that event ($C_c \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-1}$, § 9.8.6). As the red-shift $1+z = \{(c+v)/(c-v)\}^{1/2}$ will increase with this c -reduction, the measurements of luminosity and real red-shift (with c' , if known) could be brought into equilibrium.

The end of our universe is unknown, but if there is an end, the start of a new universe must wait till the evaporation of a lonely and small black-hole will cause its critical density.