Low Entropy Start of the Universe with two Cricket Balls of oppositely charged Particles

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Abstract : *A cold low entropy start of the universe is proposed where two spherical cricket ball sized agglomerates, containing all the energy in the universe, collide. Each agglomerate contains the same amount of densely-packed, basic particles with a diameter of smaller than 10^{-50} m. One agglomerate contains "neg" particles with a charge ⅓ of that of an electron, and the other "pos" particles with a charge ⅓ of that of a positron. The first particles formed upon collision are very high-energy photons consisting of a neg and a pos. These dumbbell shaped spinning particles are essential for the formation of fields. A small part of the photons reacted with 1-3 neg's or 1-3 pos's, forming proto quarks and leptons resulting in the formation of equal amounts of neutral matter and antimatter. The symmetry of proto quark combinations proves a good indicator for the stability of hadrons. Both mass and energy are manifestations of the polarisation of photons around bodies which explains their relation. Implicitly this model shows that gravity is an electro-magnetic force.*

Keywords — *High-Energy astrophysics, Elementary Particles, Astrophysics, Miscellaneous (Matter and Antimatter).*

I. INTRODUCTION

A cold low entropy start of the universe is proposed where two spherical agglomerates collide. Each agglomerate contains the same amount of densely-packed, basic spherical particles with a diameter smaller than 10^{-50} m. These cricket ball sized agglomerates contain all the energy of the universe [1]. One agglomerate contains "*neg*" particles with a charge ⅓ of that of an electron, and the other "*pos*" particles with a charge ⅓ of that of a positron. This particle-based start does explain many of our observations in the universe and does away with the need for dark energy and dark matter. Further it ventures answers to what causes mass, fields, forces and energy [2, 3].

II. ENERGY

If the universe is constructed of the two building blocks, *neg* and *pos*, for symmetry reasons it is *a priory* plausible that it started with two equally sized spheres, one of each kind (Fig. 1). Each sphere is packed with spherical basic particles in a regular dense packing. The temperature has to be low, complying with a low entropy.

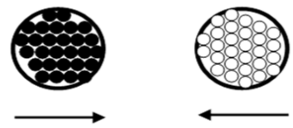

Fig 1: Approach of agglomerates of *pos* ● and *neg* ○ particles at the start of the universe

By packing very small charged particles in a sphere with a diameter of 0.1 m they can contain all the potential energy of the universe. Because there is not yet a field, there is no repulsion between the particles. Not knowing how the spheres are brought together, the initial distance between the spheres and the number of particles in each sphere, one must look elsewhere for information. Therefore, calculations were made for spherical particles with diameters varying from 10^{-90} to 10^{-30} m. Their charges of ⅓ that of an electron and a positron then enables the calculation of the potential energies within each sphere (Fig. 2).

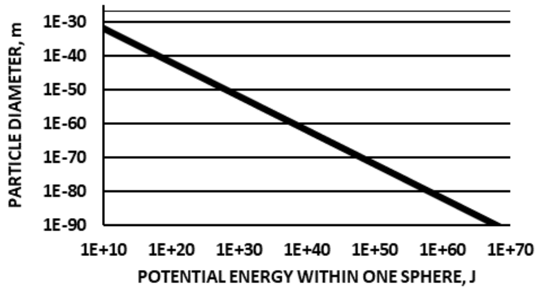

Fig. 2 : Potential energy in each 0.1 m sphere as a function of the particle size

Even assuming the spheres were initially at rest and almost touching each other the potential energy between the two spheres is dwindling the energy within each sphere (Fig.3).

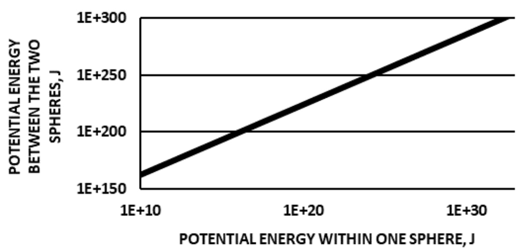

Fig. 3 : Relation between the potential energy within each sphere and that between the two spheres

III. FORMATION OF PROTO PARTICLES

Assuming a negative gravitational mass for antimatter results in the separation of matter and antimatter and in little annihilation, provided the gravitational force is much stronger that the Coulomb force. This is illustrated by an example for two charged elementary particles having Planck masses of 2.18×10^{-8} kg and a charge of one third to two times the charge of an electron where the gravitational force is two to three orders of magnitude larger than the Coulomb force. The very high potential energy of the original particles in and between the spheres as shown in Fig. 3 implies much higher masses and a much better separation between matter and antimatter. Once electrical neutral particles were formed, gravitational forces became more and more important resulting in larger and larger accretions of matter and antimatter, culminating in galaxies sand clusters.

The first composite particles formed when the two agglomerates move into each other were very high energy photons consisting of one *pos* and one *neg*. The number of particles within each sphere and the energy per photon can then be calculated (Fig. 4) as well as the energy per photon (Fig. 5).

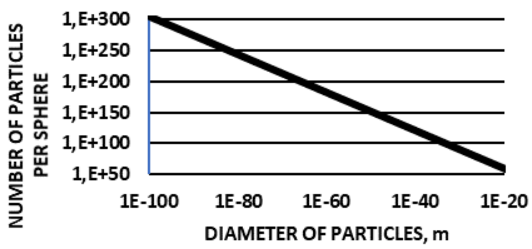

Fig. 4 : Number of particles per sphere as a function of the particle diameter

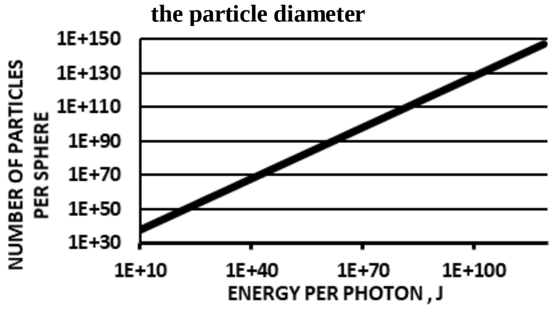

Fig. 5 : Energy per photon as a function of the number of particles per sphere

Some of the photons will then be hit by *pos*'s from the *pos* agglomerate and others by *neg*'s from the *neg* agglomerate (Fig. 6). Basic particles of opposite charge are bound together by the strong (colour) force [4].

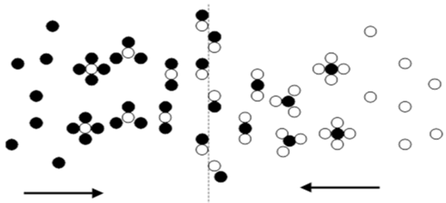

Fig. 6 : Initial formation of photons, proto-quarks and proto-charged leptons from basic *pos* ● and *neg* ○ particles.

Where a *pos* in a photon is hit by a *neg* a proto-quark is formed with a charge of $\frac{1}{3}$ of an electron (*e)* (Fig.7). Subsequently proto-quarks with charges of $\frac{2}{3}e$ are formed when the central *pos* in a proto-quark with a charge of $\frac{1}{3}e$ is hit by an additional n*eg*. Finally, a proto-lepton with a charge of *e* will form when the central *pos* in a proto-quark with a charge of $\frac{2}{3}e$ is hit by yet another *neg*.

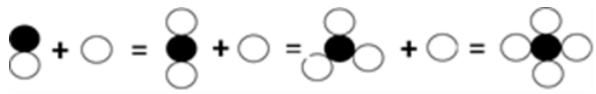

Fig. 7: Formation of quarks and leptons by collision of a photon with one, two and three *neg* particles consecutively.

The central *pos* in a lepton cannot accommodate more than 4 *neg*'s. Similarly, by reversing the charges of *pos* and *neg* particles, proto-quarks and charged leptons with positive charges will form. After all basic particles have been consumed, the predominant particle will be the photon; proto quarks and leptons will be formed in much smaller quantities.

Photons are present everywhere in the universe. In the absence of bodies, these dipoles will have a random polarisation of their spin. However, with bodies present, these will polarise the photons in their environment and give them overall a certain degree of polarisation. Photons are essential for the formation of fields. It is only with the formation of quarks and leptons that one can start to discriminate between matter and antimatter.

When the blending between the two sides of the dividing line in Fig. 6 began, at first hadrons and charged leptons were formed with the highest mass. These proto-particles will have had masses that are much higher than the present quarks and leptons as well as much smaller dimensions. Substitution of *up* and *down* quarks by *top* and *bottom* quarks and of electrons by tao-leptons will already result in particles that have a 10^4-10^5 higher mass. If more flavours than the three that are presently known are found, these values will become much larger**.** *This is a critical point; otherwise the gravitational force would not have been stronger than the Coulomb force at the start of the universe, which is a prerequisite for the agglomeration of separate bodies of neutral matter and antimatter without the danger of much annihilation.*

These starting conditions are only possible when there is no repulsive force between the particles in the spheres. A force requires a field to make itself manifest. As shown below, a field requires photons, which only become available after the collision of the spheres. The potential energy between particles in the spheres can only be unlocked when a field has been established after oppositely charged particles have come into contact with each other. Upon bringing the spheres agglomerates together, three sources of energy can be identified. These are:

- The total potential energy of each of the charged particles in each sphere
- The potential energy between the two oppositely charged spheres
- The kinetic energy with which they bounce together

Because the exact size of the spheres and the translational and rotational velocity at which they are brought together (*2c relative to each other?*) is not known, it is only possible to give estimates for these energies. There can be little doubt that the collision will result in extremely high (Big Bang) temperatures.

Photons with low translational velocity have an energy that is at least 10 orders of magnitude higher than that of the highest energy cosmic gamma rays that are currently known [5].

IV. SYMMETRY AND STABILITY

As described above, there are reasons to describe the charged proto-lepton as a *pos* surrounded by four *neg*'s or vice versa for the anti-particle. Assuming the *pos* to be at the centre of a tetrahedron with the four *neg*'s located at the vertices, the simplest particle with a symmetrical spatial charge distribution is obtained. Such a symmetrical distribution of charge in three dimensions is apparently a requirement to ensure stability.

For quarks having a fractional charge, a symmetrical spatial distribution of charge is not possible. The only way to form a more stable particle is to team up with one or two quarks in such a way that the charge becomes either zero, or one or two times that of the electron or positron. For mesons that consist of two quarks, this always results in a particle that lacks symmetry in the charge distribution along the axis connecting the two quarks, which may well be the reason mesons are short lived. An interesting aspect of mesons consisting of a quark and its anti-quark is that such mesons can neither be considered matter nor antimatter. The same problem holds for positronium. If the absence of gravitational mass for these components can be proven this would be an indirect proof for a negative gravitational mass for antimatter.

For baryons consisting of three quarks, more symmetrical configurations are possible than for mesons. This is particularly pronounced for the proton as shown in Fig. 8 An isolated neutron is less symmetric than the proton and this may explain the fact that it is less stable. For simplicity, the quarks in the baryons are given in two dimensions .

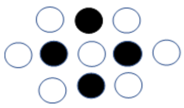

Fig. 8: Arrangement of *pos* ● and *neg* ○ particles in a proton.

The heaviest proto-quarks and proto-leptons are the smallest particles where a central particle is surrounded by two, three or four particles of opposite charge. Given the discrepancy between the basic particles and the classical radii of the currently known leptons, the existence of more flavours becomes likely. The different flavours of quarks and leptons may be considered as various energy stages of the proto particles discussed above.

V. PHOTONS

The rule that nowhere the *velocity* of *c* can be exceeded must also apply to photons. The question that immediately arises is why the visible light and gamma ray photons we are familiar with move with a translation velocity *c*. The explanation is that these photons have a relatively low energy compared with photons forming a field. Because the vector sum of the translational and the rotational velocity of a photon cannot be higher than *c*, this implies that such a field photon has hardly any translational velocity. Because these photons determine the field, the field strength would change with the concentration of these photons. This could imply that the gravitational *constant* is not everywhere the same in the universe and could well eliminate the need for dark matter.

VI. MASS AND ENERGY

In the absence of other bodies, photons have a random polarisation. The presence of bodies will polarise photons around them that will diminish as the distance from the body increases. For a body at rest the amount of polarization is measure for its mass. For bodies moving with a constant translational and/or rotational velocity, an equilibrium situation for the polarisation of the surrounding photons will be established. Acceleration will upset this equilibrium temporarily until the velocities again become constant. The energy required for the acceleration results in an increase to the polarisation of the surrounding photons. *What is called a field is in fact a polarisation of photons. The amount of polarisation of the photons surrounding a particle is a measure of both its mass and its energy and hence for their relation.* What Erik Verlinde named information finds its embodiment in the polarisation of photons in a field [6].

Even the Equivalence Principle can be explained with this model. Both inertial mass and the corresponding gravitational mass cause the same amount of orientation of the photons in the field. The polarisation can be considered as information embedded in the randomness. Polarisation is caused by the presence of bodies. The fact that matter and antimatter repulse each other is not only the cause for the expansion of the universe, but also that it prevents total annihilation between matter and antimatter [2, 3, 4].

VII. GRAVITY

Feynman in his Lectures on Physics is fascinated by the fact that both the gravitational force and the Coulomb force between bodies are inversely proportional to the square of their distance [7]. He then ventures the possibility that also the gravitational force has an electromagnetic origin. Now it has been shown that gravitational waves move with the velocity of light. Further a negative gravitational mass of antimatter would also support an electromagnetic origin.[8]. Mutatis mutandis gravity as an electro-magnetic force would prove the negative gravitational mass of antimatter and the untenability of the Weak Equivalence principle [9]. The reverse polarisation of antimatter in our model also implies its negative gravitational mass.

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