How Æther S-Particles are responsible for Electric Fields

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1. Introduction.

In this the third paper of the series we show how S-particles which are responsible for inertia forces also provide the seat for electric phenomenon. We derive a view as to what constitutes electric charge and why in the electron and positron the charge quantum is related to the mass quantum. Also why there is perfect symmetry between positive and negative charge quanta. We derive Coulomb force from direct principles involving the æther S particle continuum, and this leads us to deriving values for this continuum involving known data.

2. Another S-particle Vector Property.

Summarising the æther continuum needed to explain inertia we have S-particles with the following characteristics

- Zero mass
- Velocity **c**
- Energy E_0
- Momentum $\mathbf{p}_0$
- Number Density N_D (very large)
- Small size ($<< \sqrt[3]{[1/N_D]}$)
- Uniform arrival directions

To explain electric force we need another S-particle characteristic that is a vector quantity not tied to its velocity, a vector quantity like spin (but we do not think they are actually spinning, spin is just a convenient way to visualize a vector arrow in the S-particle). These S-particles are the quanta responsible for electric fields, *the direction of their spin arrows signifies the direction of the E field carried by the Sp's*. At this stage we will allow this spin vector to have only two possible states, parallel or anti-parallel to the velocity direction, see Figure 1, thus our Sp's define a longitudinal field (in a later paper we will introduce spin vectors which do not align with velocity, thus incorporating a transverse feature which forms the basis for magnetic effects). To differentiate between these opposite forms of Sp we will designate those with parallel spin as S^+ and those with anti-parallel spin as S^-. We define an electrically neutral space as one where the incoming Sp's arrive in equal numbers S^+ and S^-, Figure 2.

3. Interaction with Matter to explain Electric Charge.

Our previous paper showed how S-particles absorbed then emitted after a time delay τ give rise to inertia. There we assumed that, in response to a collision on one side of the mass, it emitted another S-particle on the other side. We now give matter other properties

- 1. The mass/charge particle (e.g. electron) is made up from a large number of Sp's arranged in a symmetrical structure, with all the Sp's in the outer shell having their spin vectors pointing radially.
- 2. Spin vectors pointing radially outward represent positive charge, spin vectors pointing radially inwards represent negative charge. *Here we see the beautiful symmetrical duality of particles and anti-particles*.
- 3. A surface Sp's, when triggered by an incoming Sp, is emitted radially outwards, thus traveling in a direction parallel or anti-parallel to its spin vector.
- 4. The spin *vector* of an incoming absorbed Sp controls the direction in which the surface emits, after time delay τ, an outer shell Sp. It emits it in the direction of the incoming spin vector.

This sequence of events is illustrated in Figure 3. At this stage the reader might think this is just a fanciful fabrication of events contorted to fit the known data, mass is unlikely to perform this internal juggling act. However the rewards for proceeding down this road is a unification of inertia with electromagnetic and atomic quantum theory explaining why electrons behave statistically in the manner they do, but that is the subject of a later paper.

In a neutral æther, because Sp's arrive in equal numbers S^+ and S^- from all directions, the new electric rules for matter-Sp engagement do not result in a net force, except for the inertia as explained in the previous paper. However it will be evident that should the S^+ outnumber the S^- (or vice versa) for arrivals from a given direction, then the symmetry is lost and there *will* be a resultant force on the matter particle. For the anti-particle (opposite charge) the force would be reversed. This is what we have come to recognize as an *electric* force, where conventional wisdom has introduced the concept of electric quanta as special entities belonging to the electromagnetic world. *Here we see that the electric quanta are not separate from inertial ones, they are the same thing*. These particle dynamics will become more evident during the following description of the Coulomb force between charged particles.

4. Coulomb Force Explained.

The next figure 5 depicts a positron, showing how the electrically neutral Sp continuum impinges on it, and indicates how this neutrality is destroyed around it. The arrival rate of Sp's onto the positron, which we previously called the collision frequency, is given by

$$f_{collision} = N_D A_c c \text{ per second} \qquad (1)$$

and they arrive in equal numbers S^+ and S^-. This is also the emitting rate, but the emissions are all S^+. Outer-shell S^+'s leave the positron travelling radially outward, with their spin vectors pointing radially along their velocity direction. This pattern obeys simple geometric rules, in that the density of those S^+ reduces as the square of the radius from the positron center, hence we will refer to these particles as Coulomb S^+'s. For an isolated positron, because of the isotropic nature of the arriving Sp's, on average the S^+ are emitted uniformly in all directions, dispersed into 4π steradians. Thus there is no net force. The transmission density or rate per solid angle is

$$f_{transmission} = \frac{N_D A_c c}{4\pi} \tag{2}$$

Now consider an electron at a distance r which subtends a solid angle

$$\Omega = \frac{A_c}{4\pi r^2} \tag{3}$$

so the capture rate for these Coulomb S^+'s is given by

$$f_{capture} = f_{transmission} \cdot \Omega = \frac{N_D A_c^{\ 2} c}{16\pi^2 r^2} \tag{4}$$

Each of these absorbed S^+ quanta impart their momentum p_0 to the electron. Each absorbed quanta also triggers an emission (after delay time t) of an outer shell S^- particle on the opposite side of the electron, as shown in Figure 6. Thus the momentum gained is exactly cancelled by the momentum lost, which at first sight is not a recipe for supplying force. However, the Coulomb S^+ quanta cannot be considered in isolation from the otherwise neutral Sp continuum which impinges on the electron. When the total effect is considered it is found that the non-neutral Coulomb S^+ quanta destroy the neutral isotropy which would otherwise be equal numbers of S^- and S^+. There is a net gain of momentum at half the rate given by (4), yielding a Coulomb force given by

$$F_{Coulomb} = \frac{N_D A_c^{\ 2} c p_0}{8\pi^2 r^2} \tag{5}$$

When equated to the classical Coulomb formula

$$F_{Coulomb} = \frac{e^2}{4\pi\varepsilon_0 r^2} \tag{6}$$

we find a formula for electron charge *e* as

$$e^2 = \frac{N_D A_c^{\ 2} c p_0 \varepsilon_0}{2\pi} \tag{7}$$

In a later paper we explore Sp's with their spin vector at an angle to their velocity vector, thus not entirely *longitudinal*, having a degree of *transversivity* which is responsible for magnetic effects. In electromagnetic radiation the ratio of electric to magnetic field is a known quantity Z_0, the intrinsic impedance of space, which we will relate not to space, but as a characteristic of the Sp quanta which fill all space. Thus it is of interest to eliminate ε_0 from (7) using

$$\varepsilon_0 = \frac{1}{Z_0 c} \tag{8}$$

yielding an equation for electron charge entirely in terms of the space quanta characteristics

$$e^2 = \frac{N_D A_c^{\ 2} p_0}{2\pi Z_0} \tag{9}$$

We know from a previous paper that electron mass *m* is given by

$$m = N_D A_c p_0 \tau \tag{10}$$

hence from (9) and (10) we obtain

$$\frac{Z_0 e^2}{m} = \frac{A_c}{2\pi\tau} \tag{11}$$

It is of interest to make use of the classical electron radius

$$r_e = \frac{Z_0 e^2}{4\pi mc} = 2.818 \cdot 10^{-15}\,\mathrm{m} \qquad (12)$$

then assuming $A_c = \pi r_e^2$ we can establish the value for τ from

$$\tau = \frac{r_e}{8\pi c} = 3.74 \cdot 10^{-25}\,\mathrm{s} \qquad (13)$$

Now from (10) we can express the momentum density of Sp's in terms of known values

$$p_{density} = N_D p_0 = \frac{m}{A_c \tau} = 9.762 \cdot 10^{22} \qquad (14)$$

where we recognize that the random directions of these momenta yield a vector sum of zero. However knowing that each Sp has an energy $p_0 c$ we find that the energy density of space is

$$W_{density} = N_D p_0 c = \frac{mc}{A_c \tau} = 2.927 \cdot 10^{31}\,\mathrm{J/m} \qquad (15)$$

This is an enormous energy density which Nature freely provides. Surely mankind can find ways to tap into this available resource.