339(6): Collision and Transmutation of Vacuum Particles.

In general, consider the process:

$$A + B \rightarrow C + D + E \quad -(1)$$

in which two particles A and B collide inelastically to produce C and D. In so doing they transmute into C and D and energy E. In so doing they transmute into C and D the energy E. In so doing they transmute into C and D.

the energy E. In so doing, by cross over symmetry, (UFT 246 to UFT 248),

$$A + \bar{C} \rightarrow \bar{B} + D + E \quad -(2)$$

where the bar denotes antiparticle. In an elastic collision:

$$E = 0. \quad -(3)$$

The usual Compton theory is an elastic collision between a massless photon γ and an electron e^-. The process is:

$$\gamma + e^- \rightarrow \gamma + e^-. \quad -(4)$$

By cross over symmetry:

$$\gamma \rightarrow e^+ \quad (\text{i.e. } B \rightarrow \bar{C}) \quad -(5)$$

and

$$e^- \rightarrow \gamma \quad (\text{i.e. } C \rightarrow B^-). \quad -(6)$$

Therefore eq. (4) becomes electron positron annihilation:

$$e^+ + e^- \rightarrow \gamma + \gamma \quad -(7)$$

However, in UFT 171 it was shown that the elastic collision described in eq. (7) is untenable. The theory collapses into nonsense.

In order to produce a correct theory, eq. (7) has to be replaced by:

2) $$e^+ + e^- \rightarrow \gamma + \gamma + E \quad -(8)$$

where E is the energy produced by the endoergic or energy producing collision of an electron and positron.

It is well known from particle colliders that electron positron annihilation produces many different types of particles in addition to photons.

Similarly the collision of a photon with mass with an electron only makes sense in relativity theory if energy is released:

$$\gamma + e^- \rightarrow \gamma + e^- + E \quad -(9)$$

otherwise the theory again collapses into nonsense as shown in UFT 158 ff up to UFT 248.

Therefore the inelastic collision of two vacuum particles is considered; the vacuum particle is denoted by <u>vac</u>. The process is therefore:

$$\boxed{vac + vac \longrightarrow A + B + E} \quad -(10)$$

where A and B are elementary particles, and E is energy released by the collision. This is loosely described as "<u>energy from the vacuum</u>". It is assumed that the vacuum particle is uncharged, so A and B must be oppositely charged. Charge conjugation symmetry C must be conserved, and parity inversion symmetry must be conserved. So one example of eq. (10) is:

$$\boxed{vac + vac \rightarrow e^- + e^+ + E} \quad - (11)$$

where e^- is the electron and e^+ is the positron. We have:

$$C(e^-) = e^+ \quad - (12)$$

$$P(e^-) = e^+ \quad - (13)$$

So eq. (11) conserves C and P. It also conserves motion reversal symmetry T.

In general, collisions of vacuum particles can produce pairs of any elementary particles provided that the process conserves C, P, T, CP, CT, PT and CPT. So in general:

$$\boxed{vac + vac \rightarrow A + \bar{A} + E} \quad - (14)$$

where $\bar{A}$ is the antiparticle of A.

Therefore eq. (62) of UFT247 is used for eq. (14). Consider the collision of a vacuum particle of mass m(vac) with a static vacuum particle. The collision produces a pair of antiparticles of mass m. The law of conservation of energy means that:

$$\gamma m(vac) c^2 + m(vac) c^2 = \gamma' mc^2 + \gamma'' mc^2 + E$$

$$- (15)$$

) and the law of conservation of momentum means that:

$$\underline{p} = \underline{p}' + \underline{p}'' \quad -(16)$$

In the notation of UFT247, the energy from the vacuum is:

$$E = x + \hbar(\omega - \omega') \mp \left((\omega - \omega')^2 - c'\right)^{1/2} \quad -(17)$$

where:

$$c' = 2(\omega^2 - x^2)^{1/2}(\omega' - x_1^2)^{1/2}\cos\theta - 2\omega\omega' + x^2 \quad -(18)$$

where

$$x = m(\text{vac})c^2/\hbar \quad -(19)$$

and

$$x_1 = mc^2/\hbar \quad -(20)$$

Here ω is the angular frequency of the incoming vacuum wave/particle and ω' is the angular frequency of the wave/particle A.

The end result of this process is that electron/positron pairs, or A and $\bar{A}$ pairs, appear from the vacuum, together with energy E.