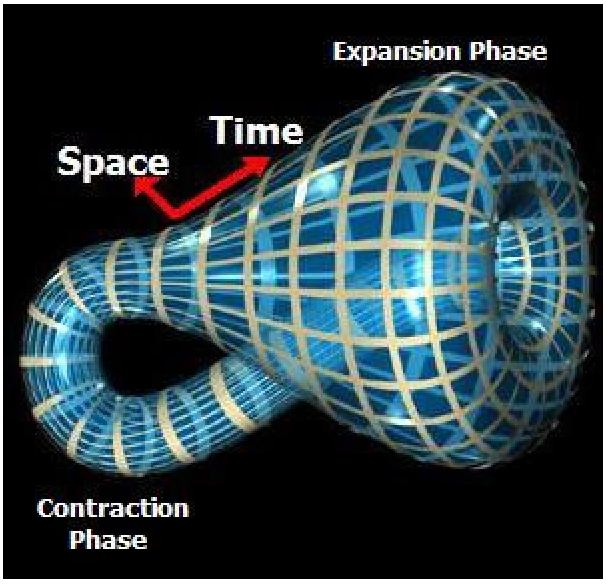
Subject: Science

Article: 6

Baryons and Leptons

Doç. Dr. Haluk Berkmen

In the model which I am proposing, there is no difference between Tachyons and Antiparticles; Tachyons are antiparticles and antiparticles are Tachyons. Antiparticles are produced naturally from Beta Decay (see **4-Particles and Antiparticles**) and from Cosmic rays entering our atmosphere. In both cases the required initial energy is much higher than the vacuum energy. Particle-antiparticle pairs were created copiously during the contraction phase of our universe. This phase is not the "early phase" as the Big bang model claims, but is a necessary and temporary contraction phase as shown in the drawing below.

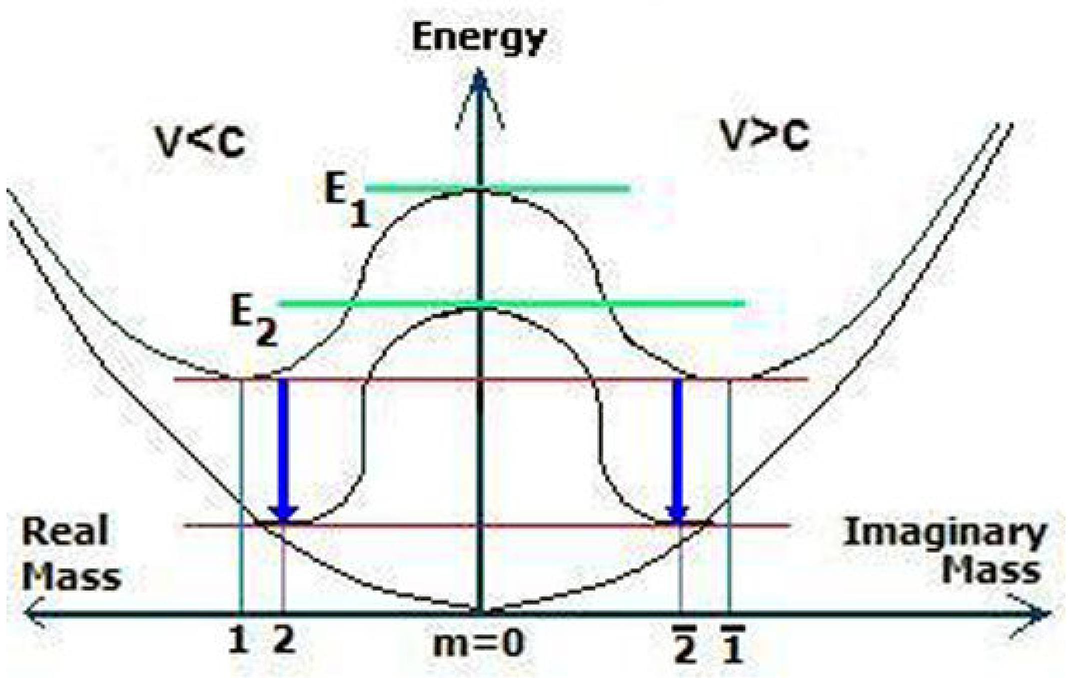


During contraction many particles with high energy and heavy mass were created. These particles form the baryon family. There are hundreds of unstable baryons but only one stable baryon; the proton. The neutron is stable within the nucleus and within a neutron star, but decays (Beta Decay) when it starts to move feely. Two big, open questions in cosmology are, a) How were baryons formed? and b) Why are there no anti-baryons in our universe?

The present Standard Model cannot answer either of these questions. In the model which I am proposing the questions are naturally answered.

How were baryons formed? At the contraction phase of the universe many baryons were formed together with their antibaryon counterparts. The heavy baryons were formed first and as the universe expanded and cooled the heavy baryons decayed into lighter ones. In the drawing below the origin corresponds to m = 0. So, all baryons started as an excited state with mass equal to zero. The heavier is the baryon, the larger is its initial energy.

In the graph below the baryon-antibaryon-pair having energy E_1 degenerates into the particle **1** and its antiparticle **1-bar**. Since this state is unstable, particle **1** decays into particle **2** (blue arrow). Here a single decay has been shown for simplicity, but in effect there can be consecutive decays into several different particles (energy levels) as well as several simultaneous shower decays. The antiparticle of 1, the **1-bar** has to decay into **2-bar**, because the particle antiparticle pair is coupled from the very beginning. We see that particle 2 has less mass then particle 1, since it is nearer to the origin.



Thus, baryons are not “formed” or built out of quarks but are “condensed energy packets”, which may or may not be stable. They came into being from zero-mass excited energy levels during the contraction phase of the universe. As the universe expanded they decayed into baryon-antibaryon pairs. This decay process continued until protons were formed. Once protons were formed the creation of new baryons stopped. The proton is known to be the only stable baryon in the universe. The neutron is a **quasi-stable** particle because it cannot exist for long as a free particle. This is because the mass of the neutron is slightly higher than the proton. The neutron mass is: 1.6749 x 10^{-27} kg, while the proton mass is 1.6726 x 10^{-27} kg; a small difference but enough for the neutron to decay.

In this model there is no need for quarks and gluons, because the proton does not decay. Instead there is a need for an undefined particle which can be tentatively called the ***tachyophoton***. The ***tachyophoton*** (**T**) is not the antiparticle of the photon, because it is not coupled to the photon, although it is massless and its speed is larger than the speed of light. It is responsible for the weak coupling between any particle and its antiparticle. But it is also the mediator of all kind of forces and interactions between the elementary particles. More detail about the *tachyophoto*n will be given in the next chapter.

Why are there no anti-baryons in our universe? Actually there are as many antibaryons as there are baryons. The reason why we do not observe them is because they are Tachyons. They have an imaginary mass and their speed is higher than the speed of light.

How many leptons are there? Leptons are force carrier particles, as discussed in article 4, **Particles and Antiparticles**. The stable lepton is the electron that revolves around the nucleus of an atom. The electron and the neutrino, as well as their antiparticles are decay products of the neutron. From Beta decay we know that the neutron decays into a proton, an electron and an antineutrino ($n^0 \Rightarrow p^+ + e^- + \tilde{n}_e$). So, there are only two leptons in our universe: The electron and the neutrino. As the universe cooled further, the electron formed a stable state with the proton. This stable configuration is known as the Hydrogen atom. All other heavier atoms are similar but not identical stable or unstable states of this first Hydrogen atom.

The present Standard Model of elementary particles claims that there are heavy leptons called the W^+ the W^- and the Z^0 mediating the weak force. In the model which I propose there is no need for these force carrier particles. Only the *tachyophoton* is enough to take care of all forces, be it strong, weak or electromagnetic. In order to take care of charged particle interactions, the tachyophoton has to come in three different charged forms, these are: T^+, T^- and T^0. The next chapter will deal with the ***tachyophoton.***