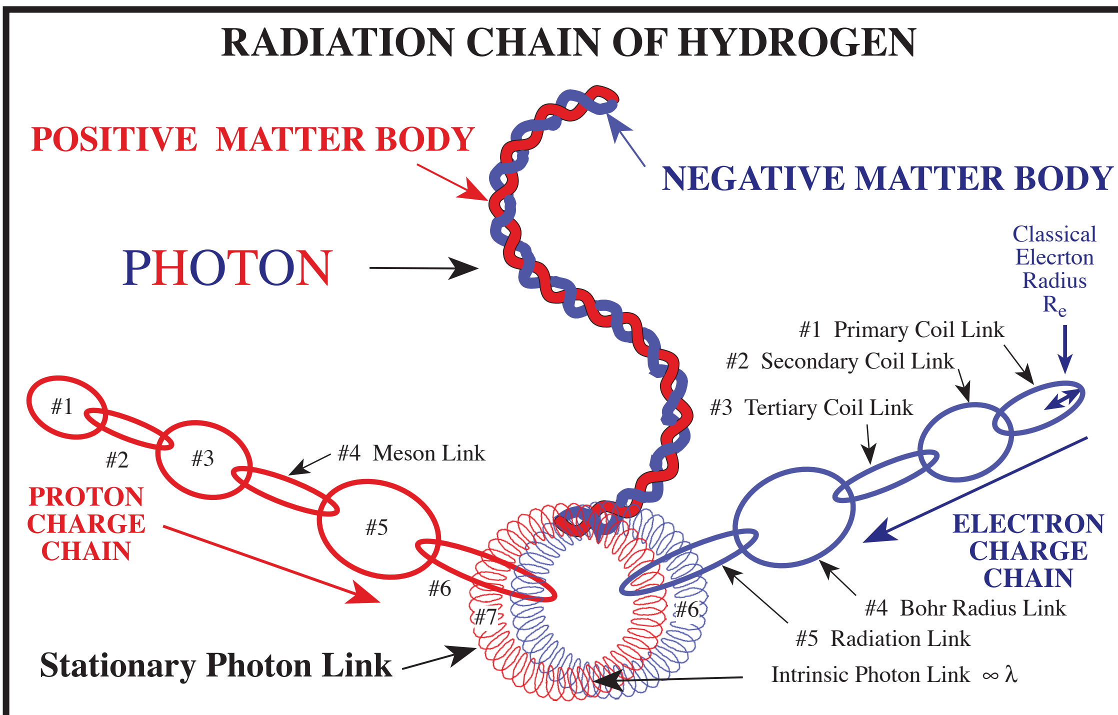
The Discovery of Antimatter and Cosmic Rays

by James Carter

The answer to the problem of the Big Bang theory's missing antimatter is that today's protons and electrons were particle-antiparticle pairs at the time when they were created. Around 1930, Paul Dirac made the great and unexpected discovery of antimatter with just a pencil and paper and a few logical thoughts running through his great mind.

Dirac predicted the existence of antimatter many years before these particles were finally discovered and then eventually created in the laboratory. He discovered that an electron and a proton each have stable antiparticles that are identical in mass but with opposite charges. Dirac calculated that when electrons or protons are created from high momentum photons, they must be created with their antiparticles of positive positrons or negative antiprotons. Since then, all experiments have shown that electrons and protons can only be created or destroyed together as particle-antiparticle pairs.

The positron is the opposite of an electron with a positive electric charge chain and the antiproton is the opposite of a proton with a negative magnetic charge chain. These antimatter particles can form atoms that are completely stable among themselves but immediately transform into photons with any contact with their antiparticles. Antimatter is easily created by applying



enough energy to matter. When a positron is created from energy, an electron is always created with it. This newly created electron is probably here to stay but as soon as the positron comes into contact with another electron they briefly combine into an atom of positronium and then immediately annihilate into X-ray photons.

Dirac's discovery of antimatter demands that the number of protons and electrons in the universe be basically fixed. We can create as many electrons as we like from the energy of photons but the positrons created with them will soon annihilate with other electrons and release that energy back into photons and bring the total number of electrons back down to their intrinsic number. We cannot increase the number of electrons in the universe except by somehow isolating the newly produced positrons from other electrons.

The Discovery of the Cosmic Rays

The discovery of cosmic rays was a long process that continued throughout the 20th century. The most amazing aspects about these "rays" are the enormous energies of some of the individual particles and the enormous amount of total energy that they contribute to the temperature of the universe. The most energetic of cosmic ray particles have energies that can barely be dreamed of by the particle physicists at CERN. The most energetic of the cosmic rays have energies of about 100 Joules. This is 100,000,000 times more particle energy than can be produced by the Cern collider. The total energy of these rare intruders from outer space is about the same as the total energy of the much more plentiful photons of the 2.7°K CBR.

The most unexpected finding about the measurement of cosmic rays was their complete lack of antimatter. Dirac's law of matter-antimatter conservation is absolute here on Earth but when we look out deep into the cosmos, it seems to be violated completely. Cosmic rays are a good general measure of the distribution of matter in the universe. Nuclei from all the elements are present in cosmic rays but there are no anti-atoms in cosmic rays. Matter-antimatter pairs are created profusely in high energy events when cosmic rays strike Earth's atmosphere but there appears to be no positrons or antiprotons among the primary cosmic rays themselves.

From their completely random direction, we can assume that cosmic rays come to us from long ago in the Living-Universe at large and not just from the Milky Way. It is thus probable that they are from a time near the universe's beginnings. They consist of high energy photons, electrons, protons, and other atoms with an overall temperature of 3°K. Since their temperature is practically identical to the temperature of the CBR, it can further be assumed that they both immerged from near the same period in the evolution of the universe when its overall temperature was about 6°K just as it is today.

The combined equal energies of cosmic rays and the CBR are hundreds of times greater than the photon energy produced by all of the galaxies combined. A minor fraction of cosmic rays comes from the galaxies, but the temperature of their overall energy is much too high for them all to have originated there. Thus, although cosmic rays give us a window into the distribution of matter in the early universe, it remains unclear to the Big Bang theorists why we cannot detect any antimatter. Dirac's law requires that each electron and proton present in the universe today must have been created with equal numbers of positrons and antiprotons.

Dirac's discovery of antimatter leads immediately to the cosmological question of how all the electrons formed in the first place. If each of these electrons was created with a stable positron then where are all those positrons today? The same much bigger question must also be asked about all the antiprotons that must have been created with each of today's protons. Big Bang enthusiasts have never been able to come up with a credible solution for the creation of matter that can account for Dirac's basic principle of matter-antimatter conservation as well as the related law for the conservation of charge.

In his book, *The First Three Minutes,* Steven Weinberg declared that these laws are invalid because of his invented violation of parity that allowed a very few protons and electrons to be created without antiparticles. He then claimed that after their creation, almost all the just formed matter-antimatter pairs annihilated in a great flash of photons which left the few remaining parity violated electrons and protons that make up the universe today. The problem with this proposal is that none of the photons from this great burst of gamma rays has ever been detected. No one has ever explained how we can still have a near perfect record of CBR photons and have never detected a trace of Weinberg's much larger burst of annihilation photons that occurred just a short time earlier.

The only answer to the problem of the universe's missing antimatter is that today's protons and electrons were particle-antiparticle pairs when they were created and that today the universe still contains the same number of these primordial protons as electrons.