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Electrons and Protons Are Produced Together

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Since electrons and protons exist we know that they either can be produced or have existed for infinity. The universe, to the best of our knowledge, is electrically neutral indicating that the number of electrons and protons is equal. So, if electrons and protons can be produced, their production rate must be equal to many decimal places. Given the differences between electrons and protons we would not expect this to be the case unless they are produced together in an interaction. The existence of the quantum field of mainstream quantum field theory shows us that energy is available to account for electron and proton production. And, under the particle pair model for the quantum field, a version of the particles already exists allowing for particle production to be a simple conversion process that conserves energy. It is incumbent on physicists to take the question of electron and proton production seriously as humans should be able to understand and replicate electron and proton production.

1. Production or Infinite Existence

One of the most important unanswered questions is; how did the universe came to contain the electrons, protons and neutrons that make up its stable mass? Given that a neutron can be produced by combining an electron and proton this question can be simplified to; how did the universe get electrons and protons? And, more specifically; how did the universe come to have electrons and protons without their antimatter opposite positrons and antiprotons respectively?

Given that electrons and protons do exist and are known to be permanently stable we can consider two possibilities. Either electrons and protons can be produced, without their antimatter opposites, or they have existed for infinity. Throughout the rest of the paper when proton and electron production is discussed it is in consideration of the case when antimatter is not produced at the same time. Pair production does not ultimately change the net number of electrons or protons.

Since electrons and protons look like they will exist for an infinite time into the future, the question of whether they have existed for an infinite time in the past cannot be dismissed lightly. In physics we generally first consider the case where interactions are symmetric with respect to time, such that if an electron or proton could be produced, they could also be destroyed by the same interaction run in reverse. The desire for a time symmetrical interaction favors the hypothesis that electrons and protons have existed for infinity since it does not appear possible for them to be destroyed.

On the other hand, asymmetrical interactions are also common. For example, we cannot make a fire or explosion run in reverse. Historically most physicists have favored the hypothesis that electrons and protons can be produced, so this paper focuses on that possibility. At the very least, scientists must explore the possibility that electrons and protons can be produced and not reject the idea without more evidence.

2. Reproducible or One-Time Production

The next important question is whether a particle production event is a one-time occurrence or whether it is reproducible. In normal applications of the scientific method we expect that an observation or experiment can be reproduced, so a scientist would first assume that we can reproduce an electron or proton production event if such an event can occur.

The alternative hypothesis is that electron and proton production was a one-time event. Inherent in this assumption is that it is impossible for humans to reproduce electron or proton production. This is not commonly considered a scientific approach and it is much like the hypothesis that some people support that life only evolved on Earth.

One argument against particle production is the perception of some scientists that it would violate the principle of conservation of energy. But, since electrons and protons exist, and we are pretty certain the principle of conservation of energy cannot be violated, electron and proton production must not be a conservation of energy violation.

This is much easier to understand when we factor in quantum field theory. In mainstream quantum field theory space has a mass-energy equivalent to 10^{94} grams per cubic centimeter if we stop calculating at wavelengths equal to the Planck length and smaller. This was first computed by Wheeler and Misner.[1] It is important to note that within quantum field theory there is no such thing as empty space.

This means that one cubic centimeter of space contains vastly more energy than all the mass-energy in the entire universe, so we have plenty of energy available to make certain that energy is conserved in a particle production process. And given the particle pair model for the quantum field, the basic particles are already present in an unstable form, and available for some sort of stabilizing and energy conserving conversion process to occur.

3. Electric Neutrality of Space

Within our solar system we find the Sun, planets and other bodies are electrically neutral to a large extent. They may carry a small electric charge, but overall, they have the same number of protons and electrons to within many orders of magnitude.

With astronomical observations we also find that large bodies interact in ways that indicate that they are, for the most part, electrically neutral. The number of electrons and protons appears to be equal throughout the visible universe to many orders of magnitude, if not precisely equal.

This introduces the question; how can electrons and protons be produced in the same amount? Electrical neutrality tells us that either electrons and protons are produced in separate events that just happen to occur with the same probability, or electrons and protons are produced together in the same interaction.

Given the current state of particle theory, which highlights vast differences between an electron and proton, it appears highly unlikely that electrons and protons could be produced separately at identical rates. If anything, under quark theory, they should be produced at vastly different rates. Therefore, we must conclude that electrons and protons are produced together in order to achieve the electrical neutrality that we observe.

This does open up the possibility that neutrons are produced as a step in the process since neutrons decay into electrons and protons, and that would give us the three basic particles that make up the stable mass of the universe. But, we will need experimental evidence in order to decide whether neutrons are a step in the electron and proton production process, or not.

4. Primal and Secondary Production

When we consider electron and proton production there are two types of conditions we must consider. The first is primal production, which we can define as electrons and protons being produced from the quantum field without other particles with mass being present locally. In secondary production we may find a somewhat different production interaction when other particles are already present and we can vary parameters such as pressure, voltage, and current.

5. Experiments

In order to prove that we can produce electrons and protons we must perform experiments. While some researchers can proceed on a purely theoretical track, only experimental confirmation of electron and proton production will be convincing and experimental evidence is required to confirm any theories.

Given that there are two forms of electron and proton production to consider, primary and secondary, we must perform two different types of experiments. In order to demonstrate primary electron and proton production we must perform experiments at high vacuum and see if we detect spontaneous electron, proton, or hydrogen production.

Sustaining high levels of vacuum is problematic as there always appears to be some leakage or outgassing into a vacuum chamber. This continues after all leaks are sealed and sources of outgassing eliminated often frustrating vacuum experimenters. It could be that we have seen electron, proton, or hydrogen production but dismissed it.

In order to be acceptable as proof, any such experiment must be devised to minimize the possibility of hydrogen contamination or leakage. Such an experiment can also be used to test the neutron production hypothesis, since there should be a higher percentage of deuterium present if neutron production is a step in the electron and proton production process.

An experiment devised to look for secondary electron and proton production will be more complicated. It is important to note that if electrons are being produced in large numbers, there will be measurable electrical charge or current. This will appear as anomalous energy production.

Historically when an experimenter sees anomalous energy production, the first thought is to think that it is a violation of the principle of conservation of energy. Consequently, when anomalous energy production is seen it is assumed that experimental error of some kind occurred. Instead we must consider that quantum field energy can be converted to particle mass-energy without changing the total energy in space, while at the same time producing electrons that can be released and detected.

If we are taking the position that electron and proton production occurs and we are capable of reproducing it experimentally, then we must expect that electron production will produce measurable effects related to it. We will also see proton production, so hydrogen build-up should occur in such an experiment. And if neutrons are a step in their production we should see deuterium in larger percentages.

It is time that scientists stop ignoring anomalous energy production and anomalous hydrogen production when they occur in experiments and take steps to determine if we may actually be seeing electron and proton production.

6. Historical Experiments

In the early 1900s Clarence Skinner measured anomalous hydrogen production in a vacuum arc discharge apparatus that was similar to a Crook's tube.[2][3] In his experiment hydrogen evolved from a silver anode that had been carefully prepared to ensure it was free of hydrogen. Today it is widely thought that his result was due to experimental error.

Another, better known, experiment was performed by Sir Joseph John Thomson when he invented the first mass spectrometer.[4][5] Thomson started out with hydrogen gas in an early vacuum arc discharge apparatus, and he was able to see gas in his spectrometer with atomic masses of 1, 2, 3 and 4 indicating production of neutrons, deuterium, tritium, helium, and perhaps helium-3. He then added oxygen to his apparatus with the hydrogen gas mix and after running it a while he detected oxygen and neon as well.

The high-voltage in Thomson's experiment is generally not considered high enough to produce neutrons, helium, or neon in such an apparatus. So, even though his experiment is famous, physicists choose to ignore the evidence of neutron production, which could be indicative of a form of electron and proton production or the combining of protons and electrons into neutrons at lower than expected voltages. It was also early evidence of nuclear fusion at lower than expected energies. These two experiments hint at one experimental approach that may yield proof of secondary electron and proton production.

7. Conclusion

We know that electrons and protons exist and many physicists support the hypothesis that they were produced, so it is incumbent on physicists to seek to understand how they are produced and to reproduce that production experimentally.

Since the universe appears electrically neutral, we expect there are an equal number of electrons and protons. And given the differences between electrons and protons, it is almost a certainty that they are produced together in an interaction.

Since the quantum field is considered to be composed of short-lived particle pairs it is likely that there is a straightforward conversion process that leads to electron and proton production without violating the principle of conservation of energy.

References

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