Experimental Evidence for Electron to Positron Transformation

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Since the discovery of the positive electron (positron) in 1932, physics has ignored the more plausible possibility that charge is not a fixed property of the electron. Instead of looking for the conditions under which this property might be altered, it has become dogma that the same particle with different charge states are distinct entities solely based on the negative energy solutions of the Dirac equation (formulated in 1928) [1] with its strange negative energy sea of electrons construct (with "holes") in 1930) [2]. It is about time to consider the alternate more logical interpretation – that under certain conditions, an electron can be transformed into a positron. Recent experimental evidence of heat transport along a quantum Hall edge seems to support the formation of a positively charged entity (positron) that can conduct heat in the opposite direction to negative electron flow[3]. A relatively simple experimental test for further verifying this new electron behavior is presented in the hope of advancing this line of research.

INTRODUCTION

The electron was discovered in 1897 by J. J. Thompson.[4][53] He determined that it was a negatively charged particle and calculated its mass to charge ratio. The charge was measured by R. A. Millikan in 1909 using oil drops in the electric field between two parallel plates.[6]. In 1932, a positively charged electron (positron) was discovered by C. Anderson in the high energy collisions of cosmic rays recorded in cloud chamber photographs.[7]. There are two possible ways of interpreting this positive electron. Either it is a separate distinct entity or it is an alternate charge state of the electron implying that the charge (sign) of the electron can be changed. It seems the latter was never really considered because of the previous theoretical work of P.A.M. Dirac (1928) [1]. He developed an equation describing the electron's behavior incorporating relativistic effects. Instead of discounting the negative energy solutions for this equation, an interpretation that eventually morphed into a positive electron was proposed. The subsequent discovery of the positive electron supposedly corroborated the theory and the interpretation was set – the positive electron has been a distinct, separate entity ever since (the birth of the "antiparticle"). Interestingly, Dirac wrote in his 1928 paper [1][p. 612]:

"One cannot do this on the quantum theory, since in general a perturbation will cause transitions from states with W positive to states with W negative. Such a transition would appear experimentally as the electron suddenly changing its charge from –e to e, a phenomenon which has not been observed." [W = energy][1]

Halpern and Thirring in their quantum mechanics book (1931) also noted:

"Dirac's system of equations refers to particles of charge +e as well as to those of charge –e; … this signifies that according to Dirac's theory the electrons can change their sign. …" (they felt the negative solutions should be ignored until the problems with them can be resolved) [8] [p. 150]-- the only statement found that is close to what is claimed in this paper.[2]

It seems more logical to treat the discovery of a positive electron as indicating that the sign of electric charge is not a fixed property. It was unfortunate that this discovery appeared to justify the Dirac equation's negative energy solutions with their strange interpretation (infinite negative energy sea of electrons) – this has misled physics ever since.

EVIDENCE FOR TRANSFORMING AN ELECTRON INTO A POSITRON

Since its discovery in 1982, the Fractional Quantum Hall Effect (FQHE) has given birth to the concept of "fractionally" charged "quasiparticles" or "composite fermions". [9][10][11] This phenomenon involving a two-dimensional electron system (2DES) occurs at extremely low temperatures in the presence of a strong perpendicular magnetic field. Recent experimental work at Harvard

[1] Just because it had "not been observed" does not mean it could not happen under certain circumstances. The discovery of the positive electron in 1932 was not initially universally accepted [8].

[2] Conservation of Charge is a fundamental guiding principle in physics. Physicists have been looking at the theoretical consequences if it were not conserved as well as searching for charge violating decay schemes [15] [16] If the transformation of an electron into a positron requires an external applied electric or magnetic field, then the process does not violate this concept.

measuring the heat flow under conditions necessary for the FQHE may be the first real evidence supporting the idea that positive electrons (positrons) are being formed.[3]

What was discovered at Harvard was that under conditions necessary for the FQHE, heat is not only transported downstream with the electron flow but upstream as well. Based on the fact that no charge is seen to be transported upstream, "Neutral Modes" have been invoked as a scheme to explain this unexpected heat transport upstream.[3][12]13][14][3] A much simpler and more logical explanation is that, under the given experimental conditions, electrons are being transformed into positrons. Just like electrons carry the downstream heat, positrons would carry it upstream.

No charge transport would be measured upstream since a positron would annihilate with an electron before any detection were possible. This simple idea explains everything without resorting to complex theoretical constructs. An easy test to see if this is happening is to look for the gamma ray signature of electron-positron annihilation. The formation of positrons would also resolve the "unknown microscopic origin" of the FQHE.

EXPERIMENTAL VERIFICATION

It is relatively easy to experimentally verify whether electrons are being transformed into positrons. The annihilation reaction of the electron and positron creates a unique gamma-ray signature of either 2 photons around .511 MeV (180 degrees apart -- normally what would be expected) or 1 photon twice that in energy. Placing gamma ray detectors around the sample to detect this radiation signature would be needed (the intensity in most cases would be very low). Sufficient shielding to eliminate background radiation is critical.

If the presence of positrons is confirmed, then experiments are needed to delineate the precise physical and external applied (electric) field conditions needed to cause this transformation.

CONCLUSION

A simple experimental fact may be that the electron exists in at least two charge states, negative and positive. But because of a mathematical equation with a really strange interpretation invented to explain its negative energy solutions, physics failed to consider whether the electron's charge state could be manipulated – a very simple plausible idea. To an experimentalist, math is just a tool like anything else in the lab to give understanding and insight into our physical world. The discovery of the positive electron was unfortunately a serendipitous and misleading "confirmation" of a theoretical assumption that does not make a lot of sense (Dirac's infinite negative energy sea of electrons construct).

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IMPLICATIONS

Inexpensive and limitless Green energy source

Ends our dependence on hydrocarbons

No need for nuclear reactors (eliminates a critical source for nuclear weapons)

Serves as a replacement for batteries (makes electric cars fully competitive)

Eliminates the need for electrical grids (no mass blackouts; no target for terrorists)

Serves as a viable energy source for desalination

This short paper is an enhanced subset of a previous paper. The Physics community should take this seriously. Unlike too many things in Physics, this is based on experimental measurements. Too much time has already been lost (first proposed in 2008).