NEWTONIAN ELECTRODYNAMICS AND SPECIAL RELATIVITY

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When Einstein first developed his theory of special relativity in 1905, it resolved the violation of Galilean invariance inherent in the velocity dependent Maxwell-Lorentz electromagnetic field theory. However, Einstein's experimentally unsupported replacement of the Newtonian principle of Galilean invariance with the Lorentz invariance caused a fundamental schism between the two theories, "Newtonian electrodynamics"[1] and "special relativity." The basis of Newtonian Electrodynamics was Ampère's law of the force of interaction between two current elements. This Newtonian action-at-a-distance law was hailed by Maxwell[2] as the cardinal law of electrodynamics, as it was the only one that always adhered to Newton's third law which still remains the bedrock of all physical observations and experiments.

By 1905, the arbitrary and unjustified replacement of the Ampère force with the Lorentz force in conjunction with Maxwell's famous field equations comprised the current generally accepted electromagnetic field theory. Einstein's effort to salvage this model with his invention of special relativity was intellectually consistent as long as the Lorentz force would stand up to all experimental tests. Unfortunately it took until the 1970s before a series of experiments emerged that demonstrated the invalidity of the Lorentz force law. Also at this time the advent of digital computers made it possible for the first time to explore the finite element nature of Newtonian electrodynamics and make calculations of the predictions of Ampère's force law. The earliest experiments that demonstrate the failings of the Lorentz force law and highlight the more accurate predictions of the Ampère force law are compiled in the book *Newtonian Electrodynamics*.[1] It is hoped that many further demonstrations will eventually emerge from labs around the world.

The Ampère force law confirms a number of important experimental facts. Amongst them is the behavior of the electro-dynamic impulse pendulum. Pappas[3] of the University of Athens was the first to discover that the performance of the impulse pendulum could not be explained without Ampère's force law which invalidates the Lorentz law and casts doubt over the entire edifice of the Maxwell-Einstein relativistic electromagnetism. This experiment is explained at length in *Newtonian Electrodynamics*,[1] plus other tests which specifically demonstrate the longitudinal force component which acts in the direction of current in a conductor. This component is entirely lacking in the Lorentz force which is always completely perpendicular to the direction of electric current. This longitudinal force component creates tension in conductors, which is often observed qualitatively in the behavior of exploding wires and more quantitatively in specifically constructed experiments. Most significantly, the Newtonian electrodynamics developed by Ampère, Neumann, Kirchoff and others simply disappeared from textbooks at the beginning of the 20th century. This is a serious scientific crisis which will hopefully inspire adventurous physicists to face the issue and return electromagnetic theory and its wider physical implications to their empirical early 19th century integrity.

References

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