A New Linear Theory of Light and Matter

JOHN WILLIAMSON

University of Glasgow
School of Engineering
R209 Level 2, Eng-Micro & Nanotechnology
74 Oakfield Avenue, Glasgow G12 8LP, UK
John.Williamson@glasgow.ac.uk

Abstract. A formal axiomatic mathematics has been developed which forces a sharpening of the principle of relativity. Using this, a new linear theory has been proposed which both generalizes relativistic quantum mechanics and reduces to the classical Maxwell equations in different limits. The new theory has new solutions, which must be expressed in four-component wave-functions rather than the merely two components (real and imaginary) of complex wave-functions. The new wave-functions reduce to the conventional complex wave-functions under certain simplifying projections. Though these four components are not simply the four components of relativistic space and time, they are related in a direct way to them. These relations prove to be not only mathematically beautiful, but also allow insight into such other mysterious entities as the electromagnetic field and the quantum-mechanical spin. In this new formalism, fully relativistic photon wave-functions are proposed, which scale seamlessly from radio to gamma wavelengths. More importantly, the new theory allows for the self-confinement of matter and light into four and only four single-wavelength states. Two of these have necessarily negative and two positive charge. Each charge state has two internal spin configurations. The charge may be calculated and is found to be close to the elementary charge. The spin of the new states may also be calculated and is half-integral. Accordingly, these new solutions are identified with the spin up and spin down electron and positron. The new insight allows an understanding of the origin, limits and underlying nature of the exclusion principle. The theory also affords an understanding of the nature of charge, both classically as an electric field divergence, and quantum-electrodynamically as a mass-energy exchange intermediated by photons. Not only the wave-functions, but also a proposal for the nature of the continuous transformation between them, are proposed for both mass-field (electron) and pure field (photon) states. The theory fits seamlessly with most of physics-as-it-stands, yet allows the proposal of new, though challenging experiments in the fields of cosmology, elementary particle physics and laser physics.