Overview

HOME: The Physics of Bruce Harvey

We have a conundrum in physics. Waves can behave like particles and particles can behave like waves. The idea that light consists of particles dates back to Newton, but light can produce diffraction patterns which need a wave theory for their explanation. So popular opinion favoured the wave theory of light. Planck and Einstein's work on black body radiation led to a reaffirmation of Newton's idea of particles of light which became called photons to distinguish them from Newton's corpuscles of light. Photons are more wavish than corpuscles.

Then de Broglie proposed that the allowed orbits of Bohr's model of the hydrogen atom corresponded to the allowed frequencies of a vibrating string, so the electron took on wave like properties.

These ideas matured in the quantum theory into a strong assertion that waves and particles are much the same thing and that while they may appear different because of the way in which we observe them, they are fundamentally wave-particles.

The author was never really convinced of this concept in his undergraduate studies: there had to be a more logical explanation. He was always aware that images produced as evidence of diffraction of electron beams never seemed to have the contrast and definition we find in experiments with light. More modern techniques used in crystallography do produce images of high resolution and contrast with near light speed electrons. Equally spectacular is the formation of Young's slit images with single photons, but are these true demonstrations of physics, or an unwitting conjuring trick.

The true scientist should always be predominantly sceptical: especially about his own observations and theories! A more reasoned approach is to confirm that waves can exhibit particle like behaviour and particles can exhibit wave like properties, then look for the underlying cause.

In our unified theory, both photons and electrons are composed of nothing but electric flux and magnetic flux. They differ in only three ways.

- The electric flux of an electron exists in its own right and can only be destroyed in annihilation with its antiparticle, while that of a photon will vanish if the photon is adsorbed.
- The electric field of the electron has spherical symmetry (or ellipsoidal symmetry under Lorentz contraction) while that of the photon is radial and perpendicular to its path.
- photons are most likely to be 8 phases long while electrons correspond to a single phase.

Photons must be distinguished from radio waves because each phase of a radio wave contains a large number of quantum strands of magnetic flux which are increasing in length at 2π times the speed of light whereas each phase of a photon usually contains only one short quantum strand of magnetic flux.

Photons should not have wave like properties. But light certainly has wavelike properties which we observe in interferometry and in polarisation.

The common factor is Maxwell's solution of the laws of electromagnetism to give the wave equation. Lorentz used the same interactions to show the effects of near light speed on electrons. Maxwell's wave equation must be understood as having two solutions. The traditional one in which the electric and magnetic flux are stationary and vary in intensity and the less obvious but immediate solution that the flux moves at the speed of light.

It is our belief that both solutions exist in nature and interact to produce the phenomena we call wave particle duality.