The electric field

A new type of acceleration is required to deal with electrical attraction. The traditional acceleration is defined as ‘active’, where a mass ring absorbs energy. Here, the action around the ring is maintained while the additional action is directed into linear motion. With the new ‘passive’ acceleration there is no energy absorption. Here, the ring action is reduced, and the deficit is redistributed into linear motion. The former is associated with the acceleration of repulsion while the latter allows an acceleration of attraction.

For an electric field to affect a charge, the axis of a source charge must pass through the aperture of the target ring, otherwise there is no effect. When the positive momentum rotation around the ring axis of the source and target reinforce there is a repulsion.

There is an attraction when they are in opposition.

Delta-momentum fields

If the axis of a source charge does not pass through the target ring then only a changing electric or magnetic momentum interacting with the target ring can affect the total action around it. These are denoted as ‘delta fields’. A changing electric momentum field occurs when two coplanar rings with parallel axes are brought together or apart. This effect is responsible for electromagnetic induction. A changing magnetic field, such as that which occurs with the Lorentz force deflection, can occur when a target ring is subjected to constant momentum fields from changing sources passing through it.

The new vortex theory is yet to account for the hydrogen atom but its application to electrodynamics seems to be a promising start.

A new visualizable theory of mass, charge, and field might provide a deeper understanding of Nature, writes Barry R. Clarke.

When Charles Wilson observed the tracks of β-rays emanating from the walls of his cloud chamber in 1911, he thought he had found the solution — electrons were particles. However, Clinton Davison and Lester Germer’s observation of the diffraction of electrons passing through a crystal of nickel in 1927 seemed to suggest otherwise — electrons were waves.

The classic two-slit experiment, designed to detect the interference of waves, only compounded the confusion. If electrons are sent one at a time through two closely spaced slits in a screen, and a scintillation detector is placed behind it, localized flashes can be seen which suggest that particles have travelled through the apparatus. However, allowing a significant time to elapse, the pattern of hits that builds up is an interference effect, one that could only result if the electron was laterally extended in a wave-like manner. Electrons seem to be exhibiting both particle- and wave-like behaviour.

In an attempt to rescue the situation, Joseph Larmor proposed that a resistance-less fluid should form the aether, suggesting that “matter may be likely is a structure in the aether, but certainly aether is not a structure made of matter”. However, no one could make it work and left Sir Oliver Lodge to confess in 1909 that “the way in which portions of it [ether] are modified to form atoms and other constituents of matter has not yet been solved”.

Over 80 years later, the Nobel prize-winner Richard Feynman confessed that as far as visualizable models of mass, charge, and field are concerned “theoretical physics has given up on that”. Today, many physicists believe that the loss of conceptual imagery began with Heisenberg’s matrix mechanics of observables in 1925, but the reality is that the difficulties really began in the latter half of the nineteenth century. Einstein was acutely aware of the problem, remarking to his colleague Vally Bargmann in the late 1930s “you know, it would be sufficient to really understand the electron”.

A circularly polarized ray rotating in a circle around the imaginary tube is an SAM mass ring at rest. Its rest mass is proportional to the tube radius.

**Vortex experiments**

In 1993, Marco Beijersbergen at Leiden University in the Netherlands discovered that so-called Laguerre-Gaussian laser light beams could carry orbital angular momentum (OAM). A circularly polarized light ray carrying spin angular momentum (SAM) is diverted into a helical trajectory using a cylindrical lens, its longer path resulting in a reduction of the linear speed \( v \) of the light beam to less than the speed of light. Electron beams carrying OAM were created in 2010 by Masaya Uchida and Akira Tonomura at RIKEN, a Japanese research laboratory. They achieved by passing a plane electron wave through a spiral phase plate to obtain a helical wave-front or electron vortex.

**Mass vortex theory**

A theory of ‘particle’ vortices was subsequently developed by Barry R. Clarke in *The Quantum Puzzle: Critique of Quantum Theory and Electrodynamics*. An optical vortex is a circularly polarized ray running along the surface of an imaginary tube (top left diagram). A momentum field arises around it (green dotted line) due to the curvature of the Poynting vector, which indicates its direction of travel. Since the linear momentum of the field is constant at all radii, it is able to interfere with the vortex in a two-slit experiment (middle right diagram). Arranging the linear motion confines the circularly polarized ray to a closed circle (bottom diagram) to form a spin angular momentum (SAM) mass ring at rest. Here the rest mass is inversely proportional to the ring radius.

There are two circular polarizations, left and right, which consist of a right- and left-handed screw thread (red line) moving with the speed of light \( c \). Defining a direction of motion for the SAM ring with a vector \( \mathbf{n} \), there are two rotation senses for each polarization. This gives four possible SAM rest mass rings (a)–(d). Each one is a SAM mass ring at rest.

Curving the trajectory of a circularly polarized ray gives an optical vortex, a light ray with OAM. This is also a SAM mass ring in motion.

However, this is not yet the structure of an electron or proton. Several SAM mass rings in motion must be linked into a chain and curved round into a circle. This then becomes an OAM mass ring which is the inner structure of all ‘particles’ such as the electron and proton (bottom diagram).

**Definition of charge**

There are eight possible configurations in relation to a defined direction of motion of the OAM ring. These divide into two possible candidate sets of four to obtain positive and negative charges, with only one set shown (middle diagram). Since an lcp ray has positive momentum and an rcp has negative, a positive charge results from anti-clockwise positive momentum or clockwise negative momentum about both \( \mathbf{n} \) and the curved tube axis (when viewing anticlockwise about \( \mathbf{n} \)). A negative charge arises from the opposite rotations. The arrowed + and – signs show the sign and direction of the momentum viewed from above the page. So in the bottom diagram, (a) and (b) have positive charge while (c) and (d) are negative.

**A new vortex theory of an OAM mass ring and its momentum fields employs curved tubes of helically wound circularly polarized light rays to account for the following.**

- Geometrical definition of mass
- Mechanical definition of charge
- Two-slit interference experiment
- Lorentz force deflection
- Parallel current-carrying conductors
- Coulomb’s law
- Electromagnetic induction
- Bound proton–electron hydrogen ground state

A consequence of the theory is that an OAM mass ring is surrounded by a magnetic field even when at rest. This is neutralized by a ring carrying opposite charge.