

AN ANALYSIS OF ENERGY AND CHARGE

By Arnold G. Gulko

It is interesting to compare energy and charge, for the two are sometimes confused. To illustrate this confusion, in quantum mechanics the electron is considered to be a point charge, though this writer does not agree. However, this simple assumption has not only confused those who accept quantum mechanics, but it has also confused others who neglect to recognize that this mistake is part of what is today perceived as science. So it infects even those who find the assumptions and non-objective analysis of quantum mechanics unacceptable

Let us examine energy and charge from various perspectives, starting with the size of the stable charged particles. The energy in the electron has a length, its Compton wavelength, of E to the minus 10 power centimeters. All of the sizes noted herein are also set forth in centimeters. So the radius of the electron (assumed to be its Compton wavelength divided by 2π) is also of the order of E to the minus 10 power. Also, its energy radius determined by calculation (and as confirmed by A. Compton's scattering measurements) is about E to the minus 10 power. In contrast, its charge radius conventionally determined by calculating its charge energy using calculus and then assuming the charge energy equals its rest energy, is of the order of E to the minus 13 power. So the electron's radius from the perspective of its charge is more than 100 times smaller than its physical radius based on its energy content. These radii are real as one can see by dividing the energy radius by the charge radius which yields the fine structure constant of atomic spectra.

As a matter of interest, this writer has calculated the electron's charge radius from the structure and action of the electron and confirms both of the radii discussed above. So a simple analysis of size suggests the charge of the electron is released to the outside world deep within the physical confines of the electron. This should not be possible if energy and charge were the same thing. Thus, if charge was simply an attribute of energy or some special substance instead of something generated by the action of energy in a charged particle, then the concept of charge being released deep within the physical confines of the particle is nonsense on its face.

Continuing our examination of energy and charge from the perspective of size, the proton and antiproton have a radial size of the order of E to the minus

13 power. Here we have more accurate measures of the proton's size (the mass-density of the electron is tiny in comparison with the mass-density of the proton, and it, unlike the smaller and higher energy proton, tends to allow a probe particle to simply pass through it) and that radial size conforms with what would be calculated from the circumferential length of the proton's energy. In existing physics, charge is calculated by multiplying the charged particle's energy content by its radius squared, and then taking the square root. So the charge radius of the proton, like the charge radius of the electron, is far smaller than its energy radius. Again, we find no connection between the size of where charge is released by a charged particle and the size of that particle suggested by its energy content.

The clear suggestion of this consideration of the size of charged particles based on their energy content and the size of the region where charge first becomes available is that energy and charge are two different things.

Let us consider charge and energy from the perspective of simplicity in nature. We know nature demands the existence of space, for that space is all around us, but what else is present? Simplicity further suggests that few things fill space, and the greatest likelihood suggested by simplicity is for there to be only a single substance. Everything else must be produced from that energy because, if something else existed it would increase the complexity of nature.

So if we take the view that nature in its fundamentals must be as simple as possible, the existence of energy and charge as two separate substances is inconsistent with that concept. Also, this writer has been able to demonstrate how everything, including the existence and action of two opposite electrical charges, can be provided by the existence of energy as the only substance in space. So the desire for a nature which is as simple as possible at the fundamental level is reinforced by the fact that our complex nature appears to be capable of being formed if space contained only the single substance we call energy. One should here note that energy is transported through space as photons, and these lack charge as evidenced by their refusal to be deflected by a charged plate.

Let us now consider charge and energy from the perspective of the actions of charge. Charge exists in two forms, called negative and positive. If energy is provided by one substance and charge by another substance, then we need two substances to provide charge because two different charges requires two different substances, one for each of the two opposite charges. Considered from

the perspective of simplicity, we need a first substance called energy and two additional substances to form the two opposite charges.

But now with three substances we have the problem of how opposite charges physically attract each other while entities with the same charge repel one another. Attraction and repulsion require a charged particle to be physically accelerated. If each opposite charge were a substance having that charge, then what enables attraction and repulsion? These actions are not properly attributed to the mere existence of two different substances because there is no explanation of how different substances attract while like substances repel. Moreover, if opposite charges attract, following the inverse square law, how is it that the electron and proton remain far apart in the hydrogen atom? At the same time, the antiproton and proton come together and annihilate one another. So when we try to explain the particle separation which enables hydrogen to exist we must simultaneously explain the annihilation process in which the particles do not remain apart. These two differing complexities are not easy to deal with, as evidenced by the inability of modern physics to comprehend them.

The above problem is especially confusing because if negative and positive charges neutralize one another in order that particles are formed by photon decay in oppositely charged pairs which suggests that both charges are present in the photon, then how is it that annihilation, as illustrated by the annihilation of an electron by a positron, yields two photons instead of one, with both of these photons lacking electrical charge?

Moreover, some of the actions of charged particles involve even greater complexity than those noted above, and these complexities require further consideration. For example, if we pack electrons onto two spaced apart parallel wires, these wires will electrostatically repel one another. But simultaneously ground both of these charged wires at the same end, and the electrons on each wire will flow to ground in the same direction. As they do this, the two wires will attract one another. How, does the motion of the normally repellent electrons in the same direction in each wire cause the normal repulsion to be replaced by attraction? If charge involved some fundamental substance, then how is a magnetic field provided?

Then we have the superconductive state. When electrons move through a coiled wire they produce a polar magnetic field. The coil will have a north pole at one end and a south pole at its other end. But at very low temperature in a suitable wire, when electrons move through a coiled wire they will again

produce a magnetic field, but this superconductive magnetic field has no poles. Either pole of a permanent magnet will be repelled by the superconductive magnetic field. If charge is constituted by some fundamental substance, as opposed to being generated by the structure and action of the electron, what is going on?

We can also consider the question at issue herein from the perspective of force. This is because the electrostatic field produced by a charge particle extends through space to exert its action (and thus be detected) at a considerable distance from the charged particle which was the source of the electrostatic field. If charge were a substance, then it would have to be ejected to provide the field of charge extending through space, and this would cause the electron to dissipate quickly because charge is quite strong. In contrast, if some medium fills space and the charge field is a modification of that medium, then only a modification of the medium (the substance filling space) could provide a field of any force. That assumed action would divorce charge from the entity providing it.

Since negative and positive charges provide fields of which act oppositely, this would require space to be filled with two different substances unless a field is instead constituted by something which is different from the substance of either field in order to provide something remote from the source of the charge which is different depending upon what type of charge is present at the source. From these several different perspectives, one must be very careful before confusing energy and charge, for it appears they are constituted by two entirely different things. What we call energy is the substance forming particles. In contrast, charge is something separate from the particle which extends through space as a modification of the substance which fills space.