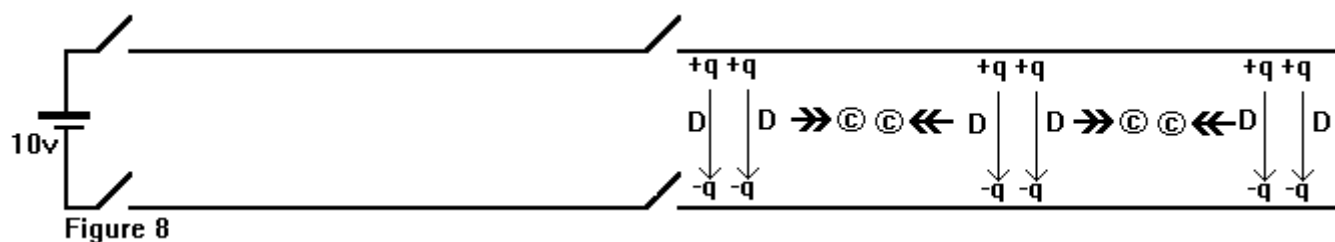
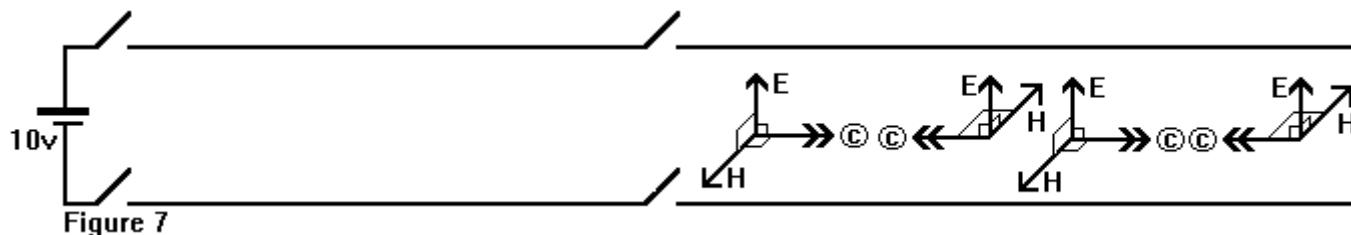


The Pulse.

This time, we will close the switches and open them again after 1 microsecond. Since the wave front travels 1000 feet in $1\mu\text{sec}$, it has reached the open circuit at the end at the moment when the switches reopen.

$\frac{1}{2}\mu\text{sec}$ later, when the pulse is as in Figs.7,8, we open two new switches in the centre of the lines.



All the energy is now trapped in the right hand 500ft, which appears to become a steady charged capacitor with voltage 20v and no magnetic field.

However, we know that this is an illusion, because

- if at any time we close the central switches, the energy current [\[1\]](#) proceeds towards the left;
- there is no mechanism for the reciprocating energy current to slow down. The reciprocating process is loss-less [\[2\]](#) (so that dispersion does not occur).

The Capacitor.

The whole of the foregoing argument remains valid if the two conductors are large flat parallel plates. Therefore the second half in Figures 7, 8 are indistinguishable from a rectangular charged capacitor. The fact that a capacitor has a medium other than vacuum does not affect the theory, since a transmission line may contain a dielectric material. The cross section of the two conductors, Fig.2, is irrelevant to the argument, and the conductors might equally well be rectangular, making the second half of Figs.7,8 a conventional charged capacitor.

The difference is that in our capacitor, a TEM wave vacillates from end to end of the capacitor plates, and there is no mechanism for it to slow down.

Ockham's Razor, "Entities are not to be multiplied beyond necessity" [\[3\]](#), tells us that the scientifically correct theory is the simplest theory which explains the observables. Now we have seen that the new contrapuntal model for the charged capacitor is necessary to explain the situation described above and pictured in

Figures [fig3](#), [fig4](#), [fig5](#), [fig6](#), [fig7](#) and [fig8](#). This new theory also explains all the effects

covered by the old model [\[4\]](#). It follows that either the traditional theory for the charged capacitor must in future be rejected, or Ockham's Razor must be rejected by the scientific community.

Let us summarize the argument which erases the traditional model;

- a) Energy current can only enter a capacitor at the speed of light.
- b) Once inside, there is no mechanism for the energy current to slow down below the speed of light.
- c) The steady electrostatically charged capacitor is indistinguishable from the reciprocating, dynamic model.
- d) The dynamic model is necessary to explain the new feature to be explained, the charging and discharging of a capacitor, and serves all the purposes previously served by the steady, static model.
- e) The static model, since it requires electric charge, collides with the [Catt Anomaly](#).

The spherical capacitor, the square capacitor.

We start with a capacitor made up of two concentric spherical conductors close together ([Ref.7](#)). Their radii are a and $(a+d)$. The capacitance is

$$C_0 = 4\pi\epsilon a \frac{a+d}{d}$$

Now let us cut out a small square section. This gives us a charged square capacitor.

$$C_{\square} = \frac{\epsilon A}{d}$$

Previous sections show that the situation in a charged square capacitor must follow a new model, or else we must repudiate Ockham's Razor.

Again using Ockham's Razor, we have to impose our new model onto the full sphere if it works, which it does. We also have to excise the traditional model with its stationary electric charge on the spheres and electrostatic field in the space (dielectric) between the spheres.

Now we notice the hidden weakness in our new model for the rectangular charged capacitor. Study of the battery, switches and transmission line (Figs.3thru8: [fig3](#), [fig4](#), [fig5](#), [fig6](#), [fig7](#) [fig8](#)) led us to conclude that a so-called steady charged capacitor is not steady at all. Necessarily, a TEM wave containing (hidden) magnetic field as well as electric field is vacillating from end to end.

Common sense tells us that our new model applies to the square capacitor as well as the rectangular capacitor.

If we charged the square capacitor by delivering energy down the west side, we have to decide whether it would behave exactly the same whether the energy is later extracted from the same west side or from the north or south side. Common sense (and Ockham's Razor) tells us that the capacitor's response will be the same. That is, the square capacitor does not remember which was the edge through which energy was delivered into it.

It follows that, to the assertion that a TEM wave continuously vacillates from west to east, we must add the assertion that a TEM wave vacillates from north to south. Possibly the total velocity of propagation is not C but $C\sqrt{2}$, and the behaviour of the energy current is something like the Huygens model for light propagation (Ref.8).

The isolated, charged sphere.

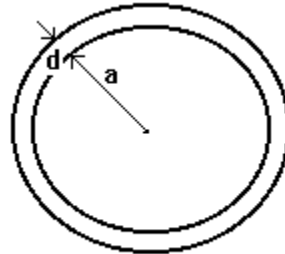


Figure 9

We reverse the picture (Fig.9) so that we start with negative charge on the inner sphere (and positive charge on the outer sphere). If we increase the outer radius ($a+d$) to infinity, $(a + d) \approx d$. We find that the capacitance does not decrease to zero, but to

$$C_o = 4\pi\epsilon_0 a.$$

If $a=1\text{cm}$, $C \approx 1\text{pF}$ (Ref.7).

This leaves us with an isolated negative charge^[5].

The electron.

We have seen that energy current travels around the isolated charged sphere. Each unit of energy current is matched by an equal amount travelling through it in the opposite direction, so that the total electric current and therefore i^2R losses in the sphere are zero.

The next step is to reduce the diameter of the inner sphere. If the total (negative) charge is kept constant, the energy in the surrounding field increases towards infinity. When $a = 0$, the energy is infinite while the charge is finite. Note that the energy (current) is concentrated near the centre, but extends throughout space (because the outer sphere which terminates the lines of electric flux is at infinity). This echoes Faraday's idea that unit charge extends throughout space (and is merely concentrated at a point). Total electric current on the surface of the disappearing inner sphere remains at zero. If this were the true model for the electron (and for other elementary particles), the fact that it contained infinite energy would explain the near-indestructibility of fundamental particles, in the same way as it is more difficult to destroy an elephant than a gnat.

Two concentric conducting spheres were charged up. A square section was cut out. This became a charged square capacitor. In the latter, Occam's Razor says that under the contrapuntal model for a charged capacitor, energy current will be reciprocating, not only between west and east edges, but simultaneously between north and south edges, in a manner not fully understood by us.

We then increased the radius of the outer sphere to infinity, and the capacitance did not drop to zero. This became our model for the electron.

Consider instead an array of concentric spheres, charged such that (Theory N) the negative charge on one (outer) face of any one sphere equals the positive charge on the other (inner) face, leading to zero net charge.

As before, energy current travels in a great circle between any pair of spheres, with equal energy current travelling in the opposite direction. However, note that, due to the increasing radius between pairs of spheres, the energy current trapped between two outer spheres, having to travel further, falls behind that trapped between two inner spheres. All the same, the electric current and electric charge on the two faces of a particular sphere cancel, so that the sphere may be removed without changing the situation.

This enhancement of the model for the electron occurred to me some years ago. All energy current travels at 300,000 km/sec.

^[1] Oliver Heaviside devised the term "Energy Current" (Ref.5) for the TEM pulse which travels down a transmission line guided by two conductors. It is also called the "Poynting Vector" and usually given the value $EH\sin q$, where q is the angle between the direction of E and the direction of H . However, since in our theory E and H are always at right angles to each other, the Poynting Vector is simply EH .

^[2] Since forward and returning waves have equal and opposite electric currents, resistive (I^2R) losses do not occur (even if the conductors are imperfect).

^[3] "Entia non sunt multiplicanda praeter necessitatem."

^[4] The traditional, old, theory for the charged capacitor is that static electric charge resides on the inside surfaces of the plates, and electrostatic field sits between the plates. There is no magnetic field.

The old, static theory cannot explain the situation outlined in figures 3 thru 8.

Further evidence against the old model is that the 'charging' of such a device can only be achieved by energy being fed in via a transmission line at the speed of light, since TEM waves cannot travel in a transmission line slower than the speed of light (p15, col.3).

^[5] Actually, see Ref. 7, the argument should start with the isolated sphere and end with concentric spheres. However, the reversal illustrates the new model for an electron.