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UNIVERSITY OF CAMBRIDGE
DEPARTMENT OF PHYSICS

Telephone : 0223-66477
Telex 81292

CAVENDISH LABORATORY
MADINGLEY ROAD
CAMBRIDGE CB3 0HE

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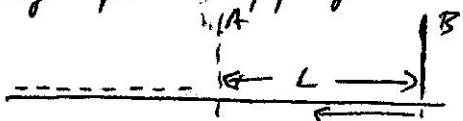
Dear Ivor,

Many thanks for your communication which I had been awaiting following Melvin's report on your phone conversation. Actually I had already seen some of it since Wireless World with its heretical letters section is taken by the Cavendish library!

It is interesting to see that the point of failure in electrodynamics which you identify now is rather more elementary than the ones we discussed previously when I recollect a kind of tar baby – bramble petal arrangement of interlocked problems! I feel a bit more confident with the electron theory of metals although I am far from sure that I can convince you that it can cope with your problem perfectly well.

To come swiftly and bluntly to the point, I believe that your apparent demolition job on Dave, Robinson and Brown (culminating in the picturesque but specious analogy of egg deliveries to Oxford) is quite invalid. I would be interested to know whether they actually concede defeat i.e. error or have merely given up realising that there is no hope of convincing you.

Consider the flow of charge on to and along a length $L = cT$ of the wire which the step function TEM wave has swept past in a time T. The maximum number of electrons already present in the wire N / unit length can bunch up the fresh charge density required simply by crowding a little closer together (shuffling to the right). If the charge per unit length required behind the step is q, then a charge qL must clearly flow past A in the time T but there is no need for any electron to travel from A to B in this time. In the time T electrons at distance x behind B move a distance $\Delta x = qx/Ne$ to the right. If you use some of the numbers quoted by Brown and Robinson in their somewhat different approach to the problem you will see that the velocities are quite small – the biggest value at $X = L$ being $qL/NeT = qc/Ne \ll c$. To pursue your dangerous egg sales analogy the egg salesman has previously dumped a large density of eggs all along the road to Oxford from London and all over the Oxford area. A small movement of all the eggs towards Oxford suffices. We are not entitled to ask for rebels on our elections but in the way we would demand eggs which had been laid in London a few hours before.



The only possible problems that I can see with this simple picture are

(1) In very thin wires with large voltage (i.e. large electric field and hence large q) steps the ratio q/Ne might imply a velocity approaching v_{Fermi} – although this is still much less than c, it might modify the conductivity of the wire.

(2) The electrons cannot pick up their velocity instantaneously even though it is small.

For eggs to Oxford see WW Dec 82, p.

Because of their finite mass there will be a finite acceleration time so that the steepness of the step will be slightly blunted. This is a problem of acceleration however not of velocity and quite different to the one you raised.

I cannot see the point of my inducing prominent people in the field to take part in this. In the first place I really believe that you are making an error and that it is really a problem of communication to get the correct picture over to you — these people are not particularly good at that being in general not willing to spend the time on it. Secondly I am not sure how I can induce them to take part.

I was glad to hear that there have been recent developments with your computer ideas and hope they prosper. It is just as well that the pulses continue to propagate along or near the axis despite the apparently confused state of the theory!

Best wishes

Archie (3) F.R.S.

Professor A. Howie