

3/17

Trinity College

Cambridge

March 23rd /84

Dear Prof. Fitzgerald,

I must apologize for my delay in answering your letter but I have been so busy with lectures and papers that I have not had time. The point in your proof that I do not admit is the assumption that a vortex ring cannot move backwards. I do not see why it should not - the velocity at any

point of the fluid ~~may be due~~ and therefore of the vortex ring at that point may be due to a good many causes besides the presence of the vortex ring - such as the presence in the neighborhood of other vortices or the existence of currents in the fluid - and if these are sufficiently powerful to move than counterbalance the velocity due to the vortex at the point this vortex must move backwards. There are a good many cases in which a vortex is known to go backwards. For example if a vortex ring be sent up a cylinder closed at one end it will swell out as it goes up the cylinder and when it gets to the end expand until its radius is nearly the same as that of the cylinder. It will then creep back clinging to the sides of the cylinder.

Unless you assume that a vortex ring cannot go backward
it does not follow that if Σ be the number of molecules
which cross any section in a certain direction then ΣM
is the momentum of these in that direction. I doubt
see any objection to looking at a current of gas in the
following way. Suppose we have a mass of ether with
vortex rings moving so that their velocities are uniformly
distributed then if we give to the whole a velocity of
translation v in the direction in which the current flows
we shall only have a current of velocity v and the
momentum will be Mv when M is the mass of the ether
in the current. I may say that I think the result of
the vortex atom theory that the velocity and momen-
tum do not increase together is a serious difficulty.
Another difficulty (and this is really the fundamental one
the other one being a consequence of it) is that practically
all the energy is in the ether and not in the molecules.
I have lately been working at a theory which supposes
that the vortex atoms are made of a fluid which is
much denser than the surrounding one. This theory though
not so simple from a metaphysical point of view is
yet I think preferable from a physical one. I have
found it work very well when applied to chemistry.
I have lately also got a solution of the problem of
the moving electrified sphere taking into account
the self induction of the displacement currents.
I have also got a case of electrical oscillation
which I think will interest you. It is this suppose

by any cause you produce an ^{uneven} distribution of electricity over
a thin metal ^{spherical} shell and that then you will find this
cause being suddenly the electrical distribution on the
shell will oscillate, if the distribution was as the
first harmonic the time of oscillation is the same
as that of a ray of light whose wave length is 1.14
times the diameter of the sphere.

Believe me

Yours very truly
J. J. Thomson

3/17.