the other operating in the direction of its motion and retarding it. Besides these two there would be the orbital motion which (except in some rare instances) would change the direction of the motion of the meteor — and no doubt its velocity also. In fact what I have been hammering at (in the Observatory) is that the action of the atmosphere ~~is~~ at right angles to the course of the meteor is not negligeable and that therefore you cannot simply correct the observed radiant-points for the motion of the earth in order

1/109

13 Belvidere Place
Feb 1st 86

My dear Fitzgerald

I suppose I did not express myself clearly in my last, for I think you have in some respects misunderstood me. I intended to distinguish between the effects which the atmosphere would have in resisting the passage of a meteor through it if it was stationary and the effects of the motion of the atmosphere (or of the earth) as a whole in impressing a similar motion on the meteor. Of course the

molecules would partake in thus latter motion but it was what I meant by molar as distinct from molecular motion. No doubt a part of thus molar motion (as I called it) would also be expended in heating the meteor rather than in moving it; but I don't know of any reason why that part should increase more rapidly than the density of the atmosphere. But of the velocity of molecular motion at the earths' surface is $\frac{1}{3}$ of a mile per second while at 50 miles up it is 30 miles per second the former effect would be insignificant (compared with the molar or ⊕ orbital motion) in the case of a meteor which actually fell to the earth whereas the latter would probably exceed the orbital or molar motion and be the chief agent in influencing the motions &c of a meteor which was dissipated at a height of 50 miles. The molecular motions, as independent of thus molar or orbital motion, would I think be divisible into two parts one operating at right angles to the course of the meteor and simply heating it,

atmosphere before the full motion of "the earth drift" (as you call it) is impressed on it (or compounded with its original motion)? And Secondly What is the prospect of its being vaporised before this takes place? Of Course it is not seen until it has entered the atmosphere and it ceases to be seen when it is vaporised. To what extent during this period of visibility does it partake of the earth-drift? (in addition to its original motion).

Still think that the solution of the problem of Meteors with Stationary Radiants is to be found in the answer to this question. But some Radiants undoubtedly shift.

Yours sincerely
W H S Monck

to find the true ones. My first idea was that the observed radiant-points are the true ones without any correction, inasmuch as the meteor is carried along by the atmosphere during the whole period of its visibility. But if the molecular velocity of the atmosphere particles in the upper regions of the air was very great this might not be true at least of small meteors. They might be completely vaporised before the orbital motion of the air was fully impressed on them.

Still the relative velocity of the earth and meteor is I fancy seldom

under 10 miles per second; and if we assign a higher molecular velocity than this to the particles of air near the limits of the atmosphere would they not leave the earth and fly away into space? And as you remark the low temperature would also reduce the molecular velocity of the particles perhaps as much as the low pressure increased it.

In the case of the Leonids the relative velocity of the earth and meteors is I believe something like 44 miles per second. I cannot understand their being vaporised before their contact with air moving at this tremendous speed has produced a very perceptible effect on the direction of their motion. But the relative velocity of the Andromedes is only 10 or 12 miles per second and if the particles of the upper air had a molecular velocity of 40 or 50 miles per second I think they might be vaporised when still moving almost in their original direction — especially as most of them seem to be of small size. 1/10/09

The questions appear to be, How far must a meteor penetrate into the