

14/106

Paington Devon
26 Feb 94

My dear Fitzgerald, Pray do not misunderstand me. My concluding remark was not meant to be pathetic at all, "but, on the contrary, quite the reverse," as Penn Waller said, viz. rather self-assertive! To make this clear, there is no reason why I should not tell you exactly what my private idea of the R.S. offer that was not made was. There appears to be a benevolent fund (though I didn't know it) in connection with the R.S., like the Action benevolent fund & so on, for the assistance of deceased men who have fallen in evil days, &c. &c. Well, it has somehow been represented that I am poor, & a fit object for assistance from the bene. fund; & the controllers thereof have virtually said, Well, why does not Mr H. make known to us his desire for a grant; it will then be considered, along with the other applications, & inquiries made, & if satisfactory results come out that Mr H. is a deserving person in the meaning of the Act (to the benevolent fund) we may probably make him a grant. Let him apply first.

Now I am not fallen so low as that yet. I want no benevolent funds to assist me. I am double dead if I do! But still it might happen at some future time, when I am deceased, that I may be forced to come down from my high

horse, &, metaphorically speaking, go on the Parish. So ^{only} may that time be far off!" I want no benevolent funds; though I have no objection to be paid for work I have done, explicitly. Who would? If my income is small, so are my expenses, and I can scrape along.

In another respect our present correspondence has been very gratifying. The milk of human kindness is such a scarce commodity in general, that it should be treasured when found, and I greatly appreciate your desire to serve me.

As regards books, there must be all sorts of books for all sorts of readers. Now if a man has a talent for ready writing & popular exposition, he will do well to exercise it, for the benefit of the many. I think this applies even when the man is good for higher work, though in that case he should be careful not to give too much of his time to the lower work, but leave ^{most of it} to be done by others, who may themselves be quite incapable of the higher, & yet be infinitely better fitted for writing elementary works. But if a man has no talent for popular exposition, & no liking for it either, I think it would be folly for him to undertake it. It can be done so much better by others. There are great works by Thomson & Tait, themselves the parents of many other books of an easier kind, for a different sort of reader. Thomson & Tait couldn't write the elementary works in a satisfactory manner, & could only be excused for doing so (and using up

time valuable for higher work) if they had the
knack of ready writing (like the professional
lecturer writer) and popular exposition.

Now Perry was so good, some time ago, as to
clad my writings with 'Thomson's & Moncawell's' (I
forget exactly how he put it.) I do not assume any
such high position. I do not write for the masses,
elementary books for learners, of which there are
scores, far more suitable for their purpose than
anything I could do in the same line. Neither
on the other hand, do I write merely for a few
scientific experts. ~~I~~ I do not refer to any special
paper etc. may belong to the latter kind of writing,
but to my papers generally, particularly the
vol. I El-mag. They ~~E~~ I take, I think, are
intermediate positions, and have an intermediate
kind of readers. They shall be beyond the elementary
works for learners, & yet may be unable to tackle
the highest expert work. If scientific experts
themselves learn from my writings as well, so
much the better. I am very well satisfied that
I have a public of my own, much smaller
than that of popular works, but still a
distinct one, which is rapidly increasing. I
am very well satisfied with the way my particular
ways of expounding electromagnetic theory are
spreading, even down amongst actual practical men.
I have an American public as well, I expect
to sell at least 1000 copies of vol I, Z.M.T.
500 in a few months, another 500 in a

year or two, and then a slow steady sale. I
have engaged myself to write a second volume,
to commence in a few months. I sh~~l~~ be doing it
now, but for the Ed's request to postpone it. He don't
like it, I know, and wants me to put in nothing that
he can't understand himself, & no matter is higher
than so and so. I decline absolutely to be fettered in
that way. I am the best judge of my own work. At
the same time I compromise by leaving out all
lengthy investigations, giving mostly only results and
outlines. To fill up, see elsewhere, my Electrical
Papers, for instance. I may say that I do not
much care for writing in this way. It demands
such a heap of trouble in expanding, and trying
to make readable, and to produce ^(i.e. me) connections,
and to deliberately leave out what you yourself may
be actually most interested in at the time, as
involving some knotty obscure point.

In fact, the work I like best is not writing
at all, but investigation, & if I did what some
scientists have done (of the math. kind, or
math. especially) and publish as I went along,
all I did, (or a great lot thereof) with pretty
full detail, I sh~~l~~ want not 2 but 20
vols. for my "Elec. Papers". If, however, you keep
your work, its value decreases amazingly, and
you may forget it, or in the end publish only
an abstract of a large number of investigations,
rejecting the bulk of it. Perhaps this is why

for ordinary motions. I feel it myself. Modern algebra, matrices, etc., is ample compared with those refractory symbols quaternions. There is absolutely no chance for Quats. There is for Vector Algebra, & not only a chance, but a certainty, and I am as sure of this that I have taken much trouble to bring it about, though I expect nothing unreasonable in the way of startlingly rapid extension of its use. It is impossible to think in Quats., you can only pretend to do it. But one can think in Vectors, and all the physically valuable results & ideas belong to vectors, not quaternions, & lose their physical distinctness when made quaternionic theorems. I conceive that I am better employed in doing the work that comes to me naturally than in any attempt to do what I am not fitted for so well as plenty of others, and a part of my work has to bring down electromagnetic theory (wh. as in Maxwell's works, is far beyond ^{him} day, but experts) to a much lower level, Not to the bottom. Others may bring it to the bottom in the best way they can, & they are welcome to any help they can get from my work. I claim it to be distinctly practical in its tendency employing the same ideas (generalized, it may be) as occur in real practice. Practice & theory were wholly divorced when practitioners dealt with one kind of quantity, e.g. voltage, and theorists

with another, viz. a vector potential, involving quite different ideas & processes. This was the old way. I think I have changed it for good, perhaps. I must confess to some degree of surprise that you should be seized with the text book mania, especially as you confess you never got beyond Thales in the work you undertook for W. Scott. You have been so open that perhaps you will not take offence if I suggest that there is presumptive evidence that that kind of work does not suit you. If it did, you would have taken to it naturally. And in fact, you make the confession yourself, "the drudgery of writing descriptions of magnetometers", you can't do it. Exactly so! I should not have thought you could. It is precisely that sort of thing that I can't do myself. I simply hate it. There is no other word possible. Now there are lots of men who can do that sort of work. Let em do it! You will like to have a set of text books to suit yourself, naturally, but you can bear the drudgery part of it. I am quite sure that the two of us together, under the circumstances, will not get on very fast, and not at all satisfactorily. And yet there are, I am sure, many men who could easily do what you want, because there are so many elementary writers. But then you would have to make it worth their while. For a similar reason I cannot favour Perry's notion of a joint book. I am sure he could do it better by himself, if he is aiming at popularity, for learners' use, that is to

physico-math! papers are so hard to read, and as Perry says, math's are so selfish as not to write more fully & explain what they mean, in fact do the intermediate work they perhaps went through. But there is really no room for it let alone the time and trouble. I had some notion when publishing 1st. Pap. of expanding it, except the 2nd vol., giving it about twice as long, and more like the original investigations. But it was out of the question. My publisher wanted me to make it as little as possible. The bulk of my work is unpublished, & never will be published, as it consisted largely of rediscoveries. Having no books to quote of, I have had to do ^{most} everything myself. Sometimes only on the basis of hints or references. Now work of this kind, even with a physical basis, does not make papers that would be read, and that can have permanent value. Then again, as one gets older, one loses the desire to publish at all. A sort of inertia comes on. You may go on investigating, & yet be unable to work yourself up to the agony point of putting your results together to make something definite & instructive. I know it is so with me, at any rate, & it is likely to get worse. Like the man who slapped his bills on a file & said, "There, thank you. Most settled," I am tempted to put what ^{should} be the result of a distinct detailed paper into a few words, for passing, & congratulate

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I have a sight more of neglected duty.
The task of writing Parts 3 and 4
of "Operations in Phys. Math."
and I can't get started.

myself that I have settled that bill. Or, perhaps, shove the investigations away, & forget them. I think you are in the same boat, for I observe you only publish notes, which are indicative sometimes of a lot of work behind. However, leaving these pending remarks, come back to books. It is no use for Perry or anyone else to complain that I am hard to read. He must make the best of me that he can, if he honours me with his attention at all. Besides, why shouldn't I be singled out? Are not all math's hard to read? Fourier was the only man to write an entertaining work in phys. math's. That reminds me that I practically rediscovered all Fourier's math's and a lot more too, & when I came later to read the Eng. translation, I was able to appreciate its beauty fully at once without the painful process of learning it first, & waiting for the unfolding of its merits. And it is no use for Perry or anyone else to think that valuable results can come from trying to make a man do work for which he is unfitted, & which he does not proper to do. Why not level up, instead of down? At any rate, writers of books for learners, are (exceptions excepted) all the better for not knowing too much. They will understand difficulties better. I feel that with respect to Quaternions. It is easy for Tait, of course, born & bred to it. It is one of the hardest subjects in the world

say. I shall have ~~assistance~~^{enough} to do in the way of attempted easing of it. My when I go on with my second vol. of E.m.T.

26 Feb 94

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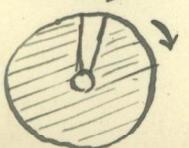
yours sincerely

Olive Heaviside

P. S. I will try to put a little science in, to leave the lump. You may have seen Charpentier's curious experiment of the black sector, described in Nature some months ago. It is very distinct when done in sunshine; not otherwise. Now in repeating these except in my own way, I discovered a new kind of sector, a grey sector. Charpentier has a kind of theory to account for the black sector, & oscillations & wave movement. There may be something in it, if it be not altogether clear.

But my grey sector is altogether outside the theory, & I can't imagine one at present, which is why I write. I must first describe it. I take a well mounted bicycle wheel, which will revolve slowly for a long period without assistance, and put a disc round the central part, with black and white sectors on it of different sizes for experiment, and watch the phenomena which occurs at various speeds. They are of three kinds. The black bands, the shivering, and the grey bands.

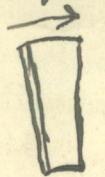
To describe only the last, simplified. Suppose disc is 7 or 8 inches across, and is all black, except a white sector of $\frac{2\pi}{12} = 30^\circ$ or thereabouts.



You have to fix your eyes steadily on the axis or hub, & your mind's eye on the white sector which is slowly revolving. Now the phenomenon of the grey sector is this. That when the disc is stationary, there is a grey band in the centre of the white ~~sector~~ sector. But this is theoretical, as it were, for you can't see it. To see it, set the disc revolving slowly. The grey band then becomes visible, but it moves away from the centre a little, to the left, lagging behind, as shown by the dotted line. Increase the speed slowly; the grey band, which is quite steady and continuous, moves still further to the left (if above, & right if below).



That is, it is carried round with the disc, & becomes more distinct. More speed, it goes more to the left, & gets darker. And so you go on till the grey band gets close to the hinder side of the white sector.



It then becomes indistinct, further increase of speed is no use, because of the other phenomenon, the shivering of the whole moving white sector (frequency $\frac{1}{12}$ to 20 per sec.)

That comes on, and which continues at higher speeds. 8 sec. to 2 sec. per revolution of disc is a good range for the grey sector. Slowing down from 2 sec to 8 sec or more per rev. The grey sector goes from the side up to the middle, and vanishes when it reaches the middle.

Charpentier's black sector is on the other

side; it comes out from the edge, & the farther

the rotation, the further away it
gets from the edge; the opposite
of the grey band.



The shivering is a singular phenⁿ. Speed must not be too slow. It is literally a rapid trembling or shivering of the whole white sector, or of any collection of white & black sectors, in virtue of the thudding of their edges. The frequency is not constant, & yet it is not proportional to the speed of rotation. Doubling the speed only makes a smallish increase, as from 12 to 15. We can only guess the frequency, of course.

N.B. To see the grey ^{band} sector, you have to employ the opposite conditions as regards illumination to what the black band of Charpentier requires. You can't see the grey sector at all in sunshine. Nor in daylight. But by gaslight you can, & notably, by turning down the gas to 2 or 3 Candles, when less than this, say 1 candle at distance 6 feet it gets boggy & indistinct. On the other hand Charpentier's black band is hardly seen at all, & improves by increasing the light, and is lost in sunshine. The shivering can be seen either in faint or strong light.

I meant to send an account to Nature,

but I was stopped by inability to account for the grey bands.

O.H.

14/10