Peer review: The role of the author.

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I have previously posted on the role of the editor (see my blog on 09/07/2020) and had intended to go on to discuss the role of the referee. However, before doing that it occurred to me that it might be helpful to first discuss the role of the author. Of course probably every journal lays down rules for author and referee alike: but who pays any attention to these? (Just joking! Although, life is short and if you are having to try more than one journal, then the fact that these detailed rules vary from one journal to another can add to the labour involved.) But what I have in mind are the unwritten rules. These are generally taken for granted and perhaps should be spelled out occasionally in order to ensure that everyone is on the same wavelength.

One basic rule for authors is that they should provide some basic introduction to the problem, discuss previous work and show how their own new work advances the situation. This is very much in our own interest, as it is a key part of demonstrating to our co-workers that our paper is worth reading. However, as I found out at the beginning of my career, this is can be a fraught process. For instance, writing the introduction to a paper on the statistical theory of turbulence was perfectly straightforward, but in the case of an attempted theory of drag reduction by additives this turned out to be quite another matter.

My attention was drawn to this problem when I was in the Theoretical Physics Division at Harwell. At first this involved polymer molecules; but, when I looked into it further, I found out that there was a parallel activity based on the use of macroscopic fibres such as wood-pulp or rayon. This latter activity generally seemed to have originated

within the relevant industry, and was often carried on without reference to the better known use of polymer additives.

I found the fibre problem more attractive, because it seemed easier to think about a macroscopic fibre as a linear object which could only have two-dimensional interactions with a three-dimensional eddy of comparable size. If one added in the possibility of elastic deformation of the fibre by the fluid, then one could think in terms of a non-Newtonian relationship between stress and rate of strain for the composite fluid which could act as a model for the fibre suspension. On the assumption that the fibres would tend to be aligned (on average) with the mean flow, physical reasoning led to an expression for a nonlinear correction to the usual Newtonian viscosity, which could be further decomposed into the difference between two-dimensional and three-dimensional inertial transfer terms, both of which represented reversals of the usual energy cascade. This theory offered a qualitative explanation of the changes in turbulent intensities which had been observed in fibre suspensions and was published as a letter in Nature [1].

So far so good! The problems arose when I extended this work and submitted it to JFM. All three referees were unanimous in rejecting the paper. Part of the trouble seemed to be that the work was carried out in spectral space. An account of this can be found in my blog of 20/02/2020, including the infamous description of my analysis as ‘the usual wavenumber murder’! But, as was kindly pointed out to me by George Batchelor, the problem was that I was ‘treading on the toes’ of those who worked in this field (i.e. microrheology). This editorial advice was helpful; because, from my background in physics, I knew very little about fluid mechanics and was happily unaware that the subject of microrheology even existed.

Of course, in the spirit of ‘poacher turned gamekeeper’ I ultimately became very keen on making sure that any paper of mine had a proper literature survey. I owe this mainly to my

PhD students, who have always been very assiduous in tracking down references, and who have set me a good example in this respect!
Nowadays, in view of the great increase in publications, I tend to take a more tolerant attitude to others who fail to cite relevant papers. But I'm not sure that this is really justified. After all, although we have had a positive explosion of publications in fluid mechanics, most of this is in practical applications. The amount of truly fundamental work is still quite small. And we do have the power of Google to help us find anything that is relevant to what we are currently publishing. I must say that I am rather sceptical about papers that purport to present applications of theoretical physics to turbulence yet do not mention the name 'Kraichnan'. I suspect them of being *fake theories*. This is something that I may expand on sometime.

For those who are interested, a further account of developments in the study of drag reduction may be found in my book cited as [2] below.

[1] W. D. McComb. The turbulent dynamics of an elastic fibre suspension: a mechanism for drag reduction. Nature Physical Science, 241(110):117-118, 1973.
[2] W. D. McComb. The Physics of Fluid Turbulence. Oxford University Press, 1990.