

ON CHALLIS' PAPER ON STELLAR ABERRATION

paper: On the Course of a Ray of Light from a Celestial Body to the Earth's Surface, According to the Hypothesis of Undulations, Phil. Mag. and J. of Science, 3rd Ser., V. 30., pp. 168-70, 1847.

by: J. CHALLIS,

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W hittaker surprises us with a comment almost as outspoken as any we might make ourselves [1]:

The century which elapsed between the death of Newton and the scientific activity of Green was the darkest in the history of the [Cambridge] University. ... It is, however, to be remembered that in 1840 the Lucasian professor at Cambridge was a man who never wrote anything, that the Plumian professor was Challis, whose attention was engaged in his hydrodynamical researches, that the Lowndean professor was Dean of Ely and lived there

Challis was once director of the Cambridge Observatory but he is remembered today for having been the person who dropped the ball, bungling Adams' mathematical discovery of Neptune, costing Adams the priority of that planet's discovery. The Frenchman, Leverrier, had independently achieved the same thing but was wiser in going to Galle at the Berlin Observatory than Adams was in going to Airy and Challis. Galle efficiently searched for the new planet immediately and located it in an evening or so while Airy passed Adams' calculations over to Challis who failed to do anything over such a remarkable piece of work. The discovery was hailed in Europe as a sensation, reflecting on the glory of French science. Only then was Adams appreciated, but though Airy did his best to make amends, Adams remains a second runner.

We have gone over this paper by Challis at least twenty-five times. It is not a long one and contains nothing of mathematical sophistication or any form of subtle argument that should make it difficult to grasp its point. We were convinced that it had one with the first reading, and are still so convinced after the twenty-fifth; but we have not yet caught anything in the sieve of our feeble intellect despite continually refining the grade of the mesh. Some other epoch when we have just eons of time to devote to it, we shall come back to this paper and finally discover what was its import. There is not a single word used here that is not part of our vocabulary. Each sentence is grammatically correct with subject, verb and predicate and conveys even a meaning when taken by itself. It is when several of these sentences are assembled together that we become benumbed, groping for their significance. In delivering Challis we feel that the stork must have become confused, too, and left him in an English home rather than that of some high functionary of the court of Imperial China, for in the ancient regime of that country something called diplomatic Chinese was evolved. It was used by the Emperors to convey messages to other great potentates of the East. Disguised beneath an eloquent and graceful turn of phrase was the intended meaning of the message; so effectively

so, that it was a challenge to the advisors of the recipient monarch to figure out what it was. It might be a declaration of war or merely a happy birthday wish. At least twenty-five exchanges back and forth over the long caravan routes were required to determine which. This consumed a lot of time, the Chinese emperors living on in undisturbed enjoyment of their positions in the interim.

All that we have got out of Challis' paper was that he was, by the time he wrote it, satisfactorily brainwashed by Stokes into believing that, despite his prior objection, he was satisfied the existence of a velocity potential for the aether was essential. He bases this final conclusion on a hydrodynamical property that happens to apply only where the existence of such a velocity potential is already postulated; namely, where the circulation is zero to begin with. In other words, he fell inadvertently into a form of circular reasoning in arriving at this conclusion. Challis flubbed the ball another time.

The paper contains only one remark that is pertinent to an aether model. This is:

Now in the case before us it is clear that no part of the velocity [of the aether] can be constantly the same at a given point for any length of time; for in proportion as the earth recedes from this point, the velocity will become less and less and ultimately vanish. This is true whether the aether be disturbed by the earth or its atmosphere.

The so-called clarity of these words may well be disputed and more circularity of reasoning is evidenced by his stating first that the velocity of the aether can nowhere remain continuously constant and then stating that after the Earth has left the area the velocity reverts to the constant value of zero. Despite the double-Chinese, we get the intended meaning that in outer space the aether is to be assumed stagnant in its own inertial frame but that this condition is altered locally by the motion of the Earth and its atmosphere, (and so also for any other heavenly body), in motion in it through any particular area of it.

The justification for this assumption based in natural causes is not by any means so clear as Challis would pretend; in fact, there is no supporting evidence presented for it. There is real supporting evidence for the electromagnetic carrier to be accompanying Earth and its atmosphere in its motion through space but none is offered by Challis in his paper. Such evidence is the M & M experiment, the aberration of starlight, combined with the Airy experiment, and the street lamp example. We might believe this also took place in the local vicinity of any other heavenly body as well, and, indeed, there seems to be no other alternative by which DeSitter's remarks concerning double stars can be given a reasonable explanation. However, there is nothing whatever that the reviewer presently sees that implies a quiescent condition in what is generally referred to as the interstellar void. Indeed in looking at the gas clouds, the galaxies of matter, the nebulae and the solar winds of ejecta into space, the more likely conclusion is that the carrier is in a state of chaotic (but actually ordered) turmoil. However, statistical mean behaviour may be defineable, as is the motion of a gas which when it is considered at the microscopic level is also entirely turbulent. We have no detailed awareness of the characteristics of this turmoil in the present state of scientific awareness and may not have for centuries to come. If one hypothesized that its statistical mean behaviour were analogous to that of a highly rarified gas we might have some basis for an analytic treatment, albeit a most difficult undertaking even then. In that case, a first crude approximation would be what Challis has presumed; i.e., an everywhere quiescent state of that gas except where it is concentrated and condensed by gravitational and

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electric Coulomb forces about the heavenly bodies which it accompanies then in their motions.

There is nothing very much else that we can follow in this paper that holds much interest or value.

Bibliography

[1] **A History of the Theories of Aether and Electricity**, by Whittaker, Edmund, 2nd Edition, V. 1, p. 153, Humanities Press, 1973.