

VIII. *A Proposal concerning the Parallax of the Fixed Stars, in Reference to the Earths Annual Orb. In several Letters of May the 2d, June 29. and July 20 1693. from Dr. John Wallis to William Molineux Esq;*

S I R,

I Am obliged to you for two Books which you have been pleased to send me, that of your *Sciothericum Telesopicum*, and that of *Dioptricks*; which you have performed so well, that I have not been better satisfied with any that I have seen of that Subject. I should not so long have neglected to return my Thanks for them, but that I thought a Letter of bare Thanks to be too empty, unless I had somewhat else to send with it.

You will, I hope, give me leave (though I have not had the opportunity of being personally known to you) to suggest a Speculation, which hath been in my Thoughts these Forty Years or more; but I have not had the opportunity of reducing it to Practice, as being not so well stored with necessary Instruments of that kind, nor much exercised to Telesopic Observations. And though I have many Years since suggested it to others, yet neither have they had leisure or convenience of putting it in Practice.

It is concerning the Parallax of the fixed Stars, as to the Earths Annual Orb.

Galileo complains of it a great while since (in his *Sy-
stema Cosmicum*) as a thing not attempted to be obser-
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ved with such diligence as he could wish, and I doubt we have the same cause of complaining still. I know that Dr. *Hook* and Mr. *Flamsteed* have attempted somewhat that way, but have desisted before they came to any thing of Certainty. What hath been done to that purpose abroad I know not.

Galileo hath suggested divers things considerable in order to it.

As to the times of Observation; That it should be when the Sun or Earth are in the Tropicks, or as near thereto as may be: Because at those times, if any, will be the greatest difference observable in their Meridional Altitude.

As to the Stars to be observed, That they should be such as are as near as may be to the Pole of the Ecliptick: For such as are in the Plain of the Ecliptick, or near unto it, though they may be sometime nearer, sometime farther from us, (which might somewhat alter their apparant Magnitude, if it were so much as to be observable) yet it would little or nothing alter the Parallax Angle, as *Galileo* doth there demonstrate.

He notes also, that in a business so nice, the ordinary Instruments of Observation (though pretty large) would be insufficient (he doubts) for this purpose, and doth propose, that by the side of some Edifice or Mountain, at some miles distance, the setting of some noted Star (as that of *Lucida Lyræ*) might be observed at those different times of the Year, which might be equivalent to an Instrument whose Radius were so large.

Which were a good Expedient if Practicable; but I doubt the Density of our Atmosphere is so great, as that it will be hard to discern a Star just at the Horizon, or even within some few Degrees of it: And that the Refraction would be there so great, and so uncertain, as not to comply with so curious an Observation.

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That which occurred to my Thoughts upon these Considerations, was to this purpose ; That some Circumpolar Stars (nearer to the Pole of the Equator than is our Zenith, and not far from the Pole of the Zodiac) should be made choice of for this purpose. And in case the Meridional Altitude be discernably different at different times, so will also be their utmost East and West Azimuth, which may be better observed than their Rising or Setting: And this will be not obnoxious to the Refraction, as is the Meridional Altitude ; (for though the Refraction do affect the Altitude, yet not the Azimuth at all) ; and we may here have choice of Stars for the purpose ; which in Observations from the bottom of a Well we cannot have ; being there confined to those only which pass very near our Zenith, though very small Stars.

I would then take it for granted, as a thing at least very probable, that the Fixed Stars are not all (as was wont to be supposed) at the same distance from us ; but the distance of some, vastly greater than of others ; and consequently, though as to the more remote, the Parallax may be undiscernable ; it may perhaps be discernable in those that are nearer to us.

And those we may reasonably guess (though we are not sure of it) to be nearest to us, which to us do appear biggest and brightest, as are those of the First and Second Magnitude ; and there are at least of the Second Magnitude, pretty many not far from the Pole of the Ecliptick, (as that in particular, in the Shoulder of the lesser Bear): And in case we fail in one, we may try again and again on some other ; which may chance to be nearer to us than what we try first. And Stars of this bigness may be discerned by a moderate Telescope, even in the day-time ; especially when we know just where to look for them.

The manner of Observation I conceive, may be thus : Having first pitched upon the Star we mean to observe , and having then considered (which is not hard to do) where such Star is to be seen in its greatest East or West Azimuth ; it may be then convenient to fix (very firm and steadily on some Tower, Steeple, or other high Edifice (in a convenient situation) a good Telescopic Object-glass in such position, as may be proper for viewing that Star. And at a due distance from it near the Ground, build on purpose (if already there be not any) some little Stone Wall, or like place, on which to fix the Eye-glass, so as to answer that Object-glass : And having so adjusted it, as through both to see that Star in its desired Station, (which may best be done while the Star is to be seen by Night in such situation, near the time of one of the Solstices), let it be there fixed so firmly, as not to be disturbed, (and the place so secured, as that none come to disorder it), and care be taken so to defend both the Glasses, as not to be endangered by Wind and Weather. In which contrivance I am beholden to Mr. *John Caswel* M. A. of *Hart-hall* in *Oxford*, for his Advice and Assistance ; with whom I have many Years since, communicated the whole matter.

This Glass being once fixed (and a Micrometer fitted to it, so as to have its Threads perpendicular to the Horizon, to avoid any inconvenience which might arise from diversity of Refraction if any be) the Star may then be viewed from time to time (for the following Year or longer) to see if any change of Azimuth can be observed.

This I thought fit to recommend to your Consideration, who do so well understand Telescopes, and the managery of them ; not knowing any who is more likely to reduce it to Practice. If you shall think fit to give your self the trouble of attempting the Experiment, and that it succeed well, it will be a noble Observation, and worth
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the Labour : And, if it should miscarry, the charge I hope would not be great.

But when I suggest (as a convenient Star for this purpose) the shoulder of the lesser Bear (as being the nearest to the Pole of the Zodiack of any Star that is of the first or second Magnitude), I do not confine you to that Star ; but (without retracting that) suggest another ; namely, the middle Star, in the Tail of the Great Bear, which (though somewhat farther from the Pole of the Zodiack) is a Brighter Star than the other, and may be nearer to us.

But I do it principally upon this Consideration : namely, That there is adhering to it a very small Star, (which the *Arabs* call *Alcor*, of which they have a Proverbial saying, when they would describe a sharp-sighted Man ; That he can *discern the Rider on the middle Horse of the Wayn*; and of one who pretends to see small things but over-look much greater ; *Vidit Alcor at non Lunam plenam*) : Which *Hevelius* in his Observations, finds to be distant from it about 9 Minutes, and 5 or 10 Seconds : So that besides the advantage of discovering the Parallax of the greater Star, if discernable. The difference of Parallax of that and of the lesser Star (being both within the reach of a Micrometer) may do our Work as well. For if that of the greater Star be discernable, but that of the lesser be either not discernable, or less discernable. Their different distances from each other at different times of the Year, may, perhaps (without farther *Apparatus*) be discerned by a good Telescope of a competent length, furnished with a Micrometer, if carefully preserved from being disordered in the Intervals of the Observations ; and discover at once, both, that there is a Parallax, and that the Fixed Stars are at different distances from us, wherein, that I be not mistaken, my meaning is not, that the Instrument or Micrometer should be removed for the observing of the lesser Star ; but that (when the Azi-
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ment of the greater Star is taken) by a Micrometer (consisting of divers fine Threads parallel and transverse) may (at the same time) be observed the Distance of the two Stars, each from other, in that Position (both being at once within the reach of the Micrometer ;) which distance (the Instrument remaining unmoved) if it be found (at different times of the Year) not to be the same; this will prove, that there is a *different* Parallax of these two Stars.

This latter part of the Observation (of their different distances at different times) I suggest, as more easily practicable though not so nice as the former. For it may be done, I think, without any further *Apparatus* there than a good Telescope, of ordinary form, furnished with a Micrometer, (this being carefully kept unvaried during the Interval of these Observations.) And if this part only of the Observation (without the other) be pursued; it matters not though the two Observations (near the two Solstices) be, one at the Eastern, the other at the Western Azimuth (whereby both may be taken in the Night-time,) for the distance must (at both Azimuths) be the same, if after observing the Azimuth of the greater Star it be necessary to move the Micrometer for measuring its distance from Alcor that may be done another Night (and it is not necessary to be done at one Observation) for that distance cannot be discernably varied in a Night or two.

I shall give you no farther trouble at present, but subscribe my self, Sir,
Yours, &c.

IX. An Account of a BOOK.

Synopsis Methodica Animalium Quadrupedum & Serpentim Generis Auth. Joanne Raio, S.R.S.

THE Excellent Author of this *Synopsis* of Quadrupeds and Serpents, continues to oblige the World with fresh and frequent Specimens, not only of his great Penetration in discovering, but of his particular Sagacity in ranging and digesting the vast Body of *Nature* in most proper Classes and Orders; whereby the Memory is extremely assisted, and the Beauty of