

VIII. *Some Remarks upon the Method of observing the differences of Right Ascension and Declination by Cross Hairs in a Telescope.* By Dr. Edm. Halley, *Astr. Reg. R. S. S.*

Those that are curious in observing the Heavenly Motions, and particularly myself, whose Business it is, are greatly obliged to the late Signior *Cassini*, for his Thought of applying Threads at half Right Angles in the common *Focus* of a Telescope, to determine thereby the differences of Right Ascension and Declination of any two Stars, whose situation is such, that by their diurnal Motion they follow each other through the Aperture of the Telescope, so fixt as that the first of them may pass over the Centre of the Glais, and move exactly along one of the Threads, whilst the interval of time between the Transit thereof, and that of the following Star, is exactly measured by a *Pendulum* Clock well adjusted to the mean motion of the Sun, or else to the Revolution of the fixt Stars, whereby the difference of Right Ascension is given; as is the difference of Declination, by the time the following Star takes to pass from one diagonal Thread to the other. This manner of observing being long since published, will not in this place need any further Explanation; but it may not be amiss to say something of the sufficiency thereof, and of the exactness of which an Instrument of so little charge and *Apparatus* is capable; especially being at this time obliged to make use of it and the *Micrometer* only, for
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my Observations. I need not say with what exactness Dr. *Pound*, and his Nephew Mr. *Bradley* did, myself being present, in the last Opposition of the Sun and *Mars*, this way demonstrate the extream minuteness of the Sun's Parallax, and that it was not more than 12", nor less than 9", upon many repeated Trials, it having been soon after the time laid before the Society. But being mindful that in *October* next, *Mars* would be again in Opposition to the Sun, about the tenth degree of *Taurus*, but would not come very near any fixt Star that has a place in Mr. *Flamsteed's* Catalogue; I was solicitous to see if there were any Telescopic Stars to which he would very nearly approach; and on the 28th of *February* last, the Heavens being very serene and clear in the Evening, and *Venus* having nearly the Declination in which *Mars* will move in *October* next, I fixt my Telescope on her, at 7^h. 28' equal time, and noted the moment she pass'd over the Center of my Glass, or rather the common intersection of the four cross Hairs; and in half an Hours time I noted eight very conspicuous Stars, four of which being within the compass of one Degree, fell very nearly in the said way of *Mars*, and from the intervals of Time I then observed, with their difference of Declination from *Venus*, I determin'd their Right Ascensions and Declinations, as well as her Place from my Tables, (which by Observation I found at this time needed no correction) would allow me; they all falling between the ninth and tenth degree of *Taurus*, with very little Latitude. But what confirm'd me that all was right was, that on *Tuesday* last *March* 21. *Mercury* appearing very fair, and newly past his greatest Elongation, I found by *Senex's* Zodiack that he was nearly in the same parallel that *Venus* had before described; and though the brightness of the *Crepusculum* effaced the smaller Stars, yet in a
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quarter of an Hour I had one past $10' \frac{1}{2}$ more Southerly than the Planet, which in less than $3'$ of Time was succeeded by another, which was but one Minute more Northerly than the former; when after an interval of about 14 Minutes of time, in which I was surpris'd to find the Sky so void of Stars, the four before mentioned Stars past successively over my Glass, with the same interval of time in which I had seen them follow one another, on the 28th of *February*; whereupon I was desirous to try, whether, if the place of *Mercury* in my Tables were assumed, the same Right Ascensions and Declinations of those Stars would be deduced from him, as from *Venus*; and to my great Satisfaction, I found on trial by an exact *Calculus*, that I had the same Right Ascensions now as before, in none of the four differing fully half a Minute, so that these Stars may securely be added to the Catalogue, and the appulie of *Mars* to them be observed in very long Telescopes, in *October* next, to a further ascertaining the immense distance between the Sun and Earth.

Hence it will also appear that our *Mercurial* Numbers are, at least at this time, and in this part of his Orb, not less exact than those of *Venus*. And whereas this Planet scarce ever appears with us out of the Sun's Beams, and always low, and therefore under great Refraction; this way of observing takes off all the uncertainty, that accrues therefrom; and when once the *Zodiack* shall be compleated with the Stars that are wanting to fill up the vacant places, it will be easy at any time, by this method, to observe *Mercury* or a *Comet* within the Sun's Beams, with the same certainty, as if it were remote, and out of the neighbourhood of the Horizon, where the different Vapours that lie near the Earth, render the appearances of the Stars

somewhat dubious upon the account of the irregular Refractions.

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IX. *A Proposal for measuring the height of Places, by help of the Barometer of Mr. Patrick, in which the Scale is greatly enlarged. By the same.*

SINCE *Torricelli* first found that the *Mercury* in an inverted Tube was in *Æquilibrio* with the whole Column of Air that was over it, and that the weight of the incumbent Column was various according to the different Dispositions of the Air, in respect of serene fair Weather, and of rainy, windy, or otherwise tempestuous Weather: there have been several attempts and contrivances to make the minute variations thereof more sensible. And first the Wheel Barometer was thought of, which certainly shews these variations with great exactness, but is only proper for a fixt Station, nor easy to be removed; which Circumstance is required for the principal use this Instrument is applicable to, and which I would recommend it for.

The next thought for this purpose was that of Mr. *Hubin*, described in *Phil. Trans.* N^o 184, who returning the Tube of the Barometer, as an inverted Syphon, made a large dilatation in the ascending Leg thereof, wherein the *Mercury* ascended, as its Altitude in the other part thereof abated, and *à contra*: over this he drew out a narrow Glass Cane, which he fill'd with a tinged Spirit, and which being about fifteen times lighter