LXXVIII. *A Propoſal for diſcovering the Annual Parallax of* Sirius; *by the Rev.* Nevil Maſkelyne, *A. M. Fellow of* Trinity *College*, Cambridge, *and F. R. S.*

Read June 26, 1760. THE Royal Society having come to a reſolution to ſend perſons of ability to proper places, in order to obſerve the approaching paſſage of Venus over the Sun, the 6th of June next year; (which phænomenon was firſt propoſed to this Society, by the late excellent Dr. Halley, forty-four years ago, as a proper means of determining the Sun's parallax, to a great degree of exactneſs) I take this opportunity of recommending to the conſideration of this learned body another very important object in aſtronomy, which, I apprehend, may be cleared up at the ſame time, by the aſtronomers ſent to one of thoſe places, which will probably be judged convenient for the obſervation of Venus's tranſit; I mean the iſland of St. Helena.

The aſtronomical object, in favour of which I deſire to engage your attention, is no leſs than the determination of the annual parallax of the Orbis Magnus; the finding out of which, from obſervation, would be the fulleſt and directeſt proof of the Copernican ſyſtem, as the want of this proof, hitherto, has been the ſtrongeſt argument made uſe of by thoſe, who have with-held their aſſent to an hypotheſis, which ſo fully, and yet ſimply, ſatisfies all the other phænomena.

No

No one, indeed, at this time of day, will venture to aſſert, that, even if no annual parallax could be found, after the greateſt exertion of human art and induſtry, the Copernican ſyſtem was not, therefore, true; ſince the quantity of this parallax may be ſo ſmall, as to eſcape the reach of our ſight, though aſſiſted to the utmoſt. But though the defect of it would be no juſt argument againſt the Copernican ſyſtem, yet the actual demonſtration of it, from obſervation, would be a direct and convincing proof of the truth of that ſyſtem.

It remains then to be conſidered, what hope there is now left, after aſtronomy has been brought to ſuch a great degree of perfection, of being able to find out an annual parallax in any of the fixed ſtars.

I am ſenſible I may here ſeem to be preſumptuous, in venturing to treat upon this ſubject, after the many accurate obſervations made by the learned Dr. Bradley, with an inſtrument conſtructed for this very purpoſe. No one can have a higher veneration than I have for the diſcernment and exactneſs of this illuſtrious aſtronomer, whoſe merit I have the greater opportunity of being acquainted with, by having the honour of calling him my friend. I would juſt beg leave to take notice, that the ſtars, which this aſtronomer obſerved, were ſuch only as lay within a few degrees of his zenith: and though his obſervations do not ſeem to ſhew a ſenſible parallax in any of them, yet we cannot thence abſolutely conclude, that, amongſt the great number of viſible ſtars, there are none in which it may be perceptible, till they have all of them, eſpecially thoſe of the greateſt luſtre, been obſerved in proper places, near the zenith, with the like

like care and accuracy, which he has uſed: for, as Dr. Bradley has himſelf remarked, where any ſtars are remote from the zenith, the uncertainties of refraction, and the irregular motions of the air, become ſo great, as to take away from us all hopes of obſerving them to an equal degree of exactneſs.

The particular ſtar, which, I propoſe, ſhould be carefully obſerved, with a view of diſcovering its annual parallax, if ſenſible, is Sirius, the brighteſt of all the ſtars in the firmament, and which is therefore, probably, the neareſt to us of them all. With us, this ſtar paſſes the meridian, at the altitude of 22°, where the refractions are too irregular to admit of our diſcovering a very minute quantity, by obſervation: but, at the iſland of St. Helena, Sirius paſſes only half a degree ſouth of the zenith; and, on this account, I have, for ſome time, looked upon that as the moſt proper place to make obſervations at, for this purpoſe.

I ſhall now beg leave, with great deference, to lay before you a particular argument, which has, for theſe two years, induced me to think it probable, that the annual parallax of Sirius is not ſo ſmall, as to elude the nice diſcernment of our modern aſtronomers; and ſhall be glad to be determined by your opinion, whether it affords a ſufficient preſumption to us, to undertake a careful and aſſiduous ſeries of obſervations of the diſtances of Sirius, from the zenith of the iſland of St. Helena. This argument is drawn from an examination, which I have made, of the obſervations of the zenith diſtances of Sirius, taken at the cape of Good Hope, in the years 1751 and 1752, by that excellent aſtronomer, and diligent

obſerver, the Abbé de la Caille, recited in his Fundamenta Aſtronomiæ, printed about two years ſince, wherein alſo are contained all the obſervations, which he has taken of the principal fixed ſtars; a work truly worthy of its name! Every particular obſervation of the ſame ſtar is reduced to one epoch, that of the beginning of the year 1750, by applying the equations of aberration, preceſſion, and deviation, to the obſerved places; ſo that the places corrected ought all to agree together, if the obſervations were perfectly exact, and the ſtar was affected with no ſenſible motion, that was unaccounted for. Being ſatisfied with the excellence of the obſervations, I was tempted to examine thoſe of ſome of the principal fixed ſtars, in hopes of diſcovering ſome ſenſible differences in the obſervations made at different times of the year, when a parallax, if there had been any, would have had the greateſt effect. But I found very few ſtars, the obſervations of which were ſufficient in number, or taken at proper ſeaſons of the year, to give room for any inference at all. Fortunately, however, the obſervations of the zenith diſtances of Sirius were more in number, and, what is ſtill of more conſequence, in this caſe, made in various, and ſome in oppoſite ſeaſons of the year: and, upon looking them over, I was agreeably ſurprized to find a very ſenſible difference in the obſervations made at different times, agreeing in direction with what a parallax ought to produce, the zenith diſtance of Sirius in July coming out no leſs than 8″ greater than in the oppoſite ſeaſon of the year, namely in December and January: the zenith diſtance alſo in March and

April

April being of an intermediate quantity, as it ought to be: for, Sirius being in conjunction with the Sun in June and July, it is evident he muſt be then farther from the Earth than in December and January, when he is in oppoſition to the Sun, and, conſequently, his latitude and declination, which are both ſouth, muſt be leſs in the former caſe, than in the latter; and therefore, as he paſſes north of the zenith at the cape of Good Hope, his zenith diſtance muſt be greater in the former ſeaſon, than in the latter, as the obſervations indicate: but, in March and April, when Sirius is in quadrature with the Sun, and equally diſtant from the Sun and Earth, his apparent latitude and zenith diſtance muſt be the ſame as the true, or that which would obtain, if the Earth was tranſlated to the Sun, and conſequently, a mean between the zenith diſtances in July and December, agreeably to the obſervations.

I ſhall now lay before you the obſervations themſelves, together with the calculations, which I have made of the values of the parallax for each, the maximum being aſſumed 9″, which I find will beſt reconcile the obſervations with one another.

			Zenith distance of Sirius at Cape, observed and reduced.			Annual parallax to reduce observat. to mean.		Zenith distance corrected for annual parallax.			Difference between each observation corrected, and the mean of the distances corrected.	
			°	′	″		″					
1751.	July	12.	17	31	19.1	−	4.3	17	31	14.8	−	1.1
	July	13.	17	31	19.3	−	4.3	17	31	15.0	−	0.9
	July	14.			21.7	−	4.3			17.4	+	1.5
	July	15.			19.7	−	4.3			15.4	−	0.5
	July	16.			19.0	−	4.3			14.7	−	1.2
1752.	April	5.			16.7	−	1.0			15.7	−	0.2
	April	3.			15.7	−	0.8			14.9	−	1.0
	March	28.			14.0	−	0.4			13.6	−	2.3
	March	14.			13.1	+	0.7			13.8	−	2.1
	March	8.			15.2	+	1.2			16.4	+	0.5
	March	5.			18.8	+	1.4			20.2	+	4.3
	March	4.			17.3	+	1.5			18.8	+	2.9
	March	1.			15.9	+	1.6			17.5	+	1.6
	Feb.	17.			12.8	+	2.6			15.4	−	0.5
	Jan.	21.			11.1	+	4.0			15.1	−	0.8
1751.	Dec.	31.			11.6	+	4.5			16.1	+	0.2

Mean of zenith distances corrected for parallax - - - - - - } 17 31 15.9

The first column shews the year and day of the observations; the second the zenith distances of Sirius at the cape of Good Hope, as delivered in Abbé de la Caille's recital; the third contains the computed values of the parallax at different times, taking that of the maximum 9″; the fourth column gives observations reduced to the mean, by applying the parallax computed in the third column to the observations in the second; which quantities ought all to agree together, if the observations were liable to no error, and the parallax was rightly assumed: but, taking a mean of them all, the last column shews how much each of them differs from that mean,

mean, which, in general, is very ſmall, and ſcarce exceeds 2″, except in two obſervations, in one of which it amounts to 3″, and the other to 4″: but theſe differ as much from the mean of the ſix other obſervations made at the ſame ſeaſon of the year. Thus, aſſuming a parallax, the obſervations will be found to agree as well with that ſuppoſition, as they do with one another. But if the obſervations are conſidered in themſelves, without any allowance for parallax, they will differ ſenſibly from one another: nor is this difference to be found only in two obſervations, in which caſe, it may eaſily be attributed to the account of the unavoidable errors; but five obſervations in July oppoſed to two in December and January, make the zenith diſtances vary 8″ in the direction, which a parallax ought to produce.

I am aware, that it may be objected, that two obſervations made in the winter ſeaſon in December and January, at one of the maxima of the parallax, are too few to determine a point of ſuch conſequence, and readily agree, that the argument is weakened in proportion to the paucity of the obſervations: but then, it ſhould alſo be conſidered, that the obſervations made in March and April concur with the reſt in ſupporting the ſuppoſition of a parallax; and, upon the whole, the obſervations will, perhaps, be judged to afford a ſufficient preſumption of the exiſtence of a parallax, to encourage the undertaking a careful trial. It is upon the ſtrength of this preſumption, principally, that I have ventured to lay theſe thoughts before the Royal Society, whoſe members may juſtly claim the honour of having made the greateſt attempts towards demonſtrating this important, but yet undetermined point in aſtronomy.

LXXIX. *Far-*