

A Demonstration concerning the Motion of Light, communicated from Paris, in the Journal des Scavans, and here made English.

Philosophers have been labouring for many years to decide by some Experience, whether the action of Light be conveyed in an instance to distant places, or whether it requireth time. M. Romer of the *R. Academy* of the Sciences hath devised a way, taken from the Observations of the first Satellit of *Jupiter*, by which he demonstrates, that for the distance of about 3000 leagues, such as is very near the bigness of the Diameter of the *Earth*, Light needs not one second of time.

Let (in *Fig. 11.*) A be the *Sun*, B *Jupiter*, C the first Satellit of *Jupiter*, which enters into the shadow of *Jupiter*, to come out of it at D; and let EFGHKL be the *Earth* placed at divers distances from *Jupiter*.

Now, suppose the *Earth*, being in L towards the second Quadrature of *Jupiter*, hath seen the first Satellit at the time of its emersion or issuing out of the shadow in D; and that about $42\frac{1}{2}$ hours after, (*vid.* after one revolution of this Satellit,) the *Earth* being in K, do see it returned in D; it is manifest, that if the Light require time to traverse the interval LK, the Satellit will be seen returned later in D, than it would have been if the *Earth* had remained in L, so that the revolution of this Satellit being thus observed by the Emersions, will be retarded by so much time, as the Light shall have taken in passing from L to K, and that, on the contrary, in the other Quadrature FG, where the *Earth* by approaching goes to meet the Light, the revolutions of the Immersions will appear to be shortned by so much, as those of the Emersions had appeared to be lengthned. And because in $42\frac{1}{2}$ hours, which this Satellit very near takes to make one revolution, the distance between the *Earth* and *Jupiter* in both the Quadratures varies at least 210 Diameters of the *Earth*, it follows, that if for the account of every Diameter of the *Earth* there were required a second of time, the Light would take $3\frac{1}{2}$ minutes for each of the intervals GF, KL; which would cause near half a quarter of an hour between two revolutions of the first Satellit, one observed in FG, and the other in KL, whereas there is not observed any sensible difference.

Yet doth it not follow hence, that Light demands no time. For, after *M. Romer* had examin'd the thing more nearly, he found, that what was not sensible in two revolutions, became very considerable in many being taken together, and that, for example, forty revolutions observed on the side *F*, might be sensibly shorter, than forty others observed in any place of the Zodiack where *Jupiter* may be met with; and that in proportion of twenty two for the whole interval of *H E*, which is the double of the interval that is from hence to the Sun.

The necessity of this new Equation of the retardment of Light, is established by all the observations that have been made in the *R. Academy*, and in the *Observatory*, for the space of eight years, and it hath been lately confirmed by the Emerision of the first Satellit observed at *Paris* the *9th* of *November* last at 5 a Clock, 35'. 45". at Night, 10 minutes later than it was to be expected, by deducing it from those that had been observed in the Month of *August*, when the *Earth* was much nearer to *Jupiter*: Which *M. Romer* had predicted to the said Academy from the beginning of *September*.

But to remove all doubt, that this inequality is caused by the retardment of the Light, he demonstrates, that it cannot come from any excentricity, or any other cause of those that are commonly alledged to explicate the irregularities of the *Moon* and the other Planets; though he be well aware, that the first Satellit of *Jupiter* was excentrick, and that, besides, his revolutions were advanced or retarded according as *Jupiter* did approach to or recede from the Sun, as also that the revolutions of the *primum mobile* were unequal; yet saith he, these three last causes of inequality do not hinder the first from being manifest.

Fig. 1.

Fig. II.

