XVI. *An Account of the Diſcovery of Two Satellites revolving round the* Georgian *Planet.* *By* William Herſchel, *LLD. F. R. S.*

Read Feb. 15, 1787.

THE great diſtance of the Georgian planet, and its preſent ſituation in a part of the zodiac which is ſcattered over with a multitude of ſmall ſtars, has rendered it uncommonly difficult to determine whether, like Jupiter and Saturn, it be attended by ſatellites. In purſuit of this inquiry, having frequently directed large teleſcopes to this remote planet, and finding myſelf continually diſappointed, I aſcribed my failure to the want of ſufficient light in the inſtruments I uſed; and, for a while, gave over the attempt.

In the beginning of laſt month, however, I was often ſurpriſed when I reviewed nebulæ that had been ſeen in former *ſweeps*, to find how much brighter they appeared, and with how much greater facility I ſaw them. The cauſe of it could be no other than the quantity of light that was gained by laying aſide the ſmall ſpeculum, and introducing the *Front-view*; an account of which has been inſerted, by way of note, to the Catalogue of Nebulæ contained in the Philoſophical Tranſactions, vol. LXXVI. p. 499.

It would not have been pardonable to neglect ſuch an advantage, when there was a particular object in view, where an acceſſion of light was of the utmoſt conſequence; and I wondered

dered why it had not ſtruck me ſooner. The 11th of January, therefore, in the courſe of my general review of the heavens, I ſelected a *ſweep* which led to the Georgian planet; and, while it paſſed the meridian, I perceived near its diſk, and within a few of its diameters, ſome very faint ſtars whoſe places I noted down with great care.

The next day, when the planet returned to the meridian, I looked with a moſt ſcrutinizing eye for my ſmall ſtars, and perceived that two of them were miſſing. Had I been leſs acquainted with optical deceptions, I ſhould immediately have announced the exiſtence of one or more ſatellites to our new planet; but it was neceſſary that I ſhould have no doubts. The leaſt hazineſs, otherwiſe imperceptible, may often obſcure ſmall ſtars; and I judged, therefore, that nothing leſs than a ſeries of obſervations ought to ſatisfy me, in a caſe of this importance. To this end I noticed all the ſmall ſtars that were near the planet the 14th, 17th, 18th, and 24th of January, and the 4th and 5th of February; and though, at the end of this time, I had no longer any doubt of the exiſtence of at leaſt one ſatellite, I thought it right to defer this communication till I could have an opportunity of ſeeing it actually in motion. Accordingly I began to purſue this ſatellite on Feb. the 7th, about ſix o'clock in the evening, and kept it in view till three in the morning on Feb. the 8th; at which time, on account of the ſituation of my houſe, which intercepts a view of part of the ecliptic, I was obliged to give over the chace: and during thoſe nine hours I ſaw this ſatellite faithfully attend its primary planet, and at the ſame time keep on, in its own courſe, by deſcribing a conſiderable arch of its proper orbit.

While I was chiefly attending to the motion of this ſatellite, I did not forget to follow another ſmall ſtar, which I was pretty

pretty well aſſured was alſo a ſatellite, eſpecially as I had, on the night of the 14th of January, obſerved two ſmall ſtars which were wanting the 17th, and again miſſed other two the 24th which had been noticed the 18th; but, whether owing to my great attention to the former ſatellite, or to the cloſeneſs of this latter, which was nearly hidden in the rays of the planet, I could not be well aſſured of its motion. Indeed, towards morning, when a change of place, in ſo conſiderable an interval as nine hours, would have been moſt conſpicuous, the moon interfered with the faint light of this ſatellite, ſo that I could no longer perceive it.

The firſt moment that offered for continuing theſe obſervations was on February the 9th, when I ſaw my firſt diſcovered ſatellite nearly in the place where I expected to find it. I perceived alſo, that the next ſuppoſed ſatellite was not in the ſituation where I had left it on the 7th, and could now diſtinguiſh very plainly that it had advanced in its orbit, ſince that day, in the ſame direction with the other ſatellite, but at a quicker rate. Hence it is evident, that it moves in a more contracted orbit; and I ſhall therefore call it in future the firſt ſatellite, though laſt diſcovered, or rather laſt aſcertained; ſince I do not doubt but that I ſaw them both, for the firſt time, on the ſame day, which was January the 11th, 1787.

I now directed all my attention to the firſt ſatellite, and had an opportunity to ſee it for about three hours and a quarter; during which time, as far as one might judge, it preſerved its courſe. The interval which the cloudy weather had afforded was, however, rather too ſhort for ſeeing its motion ſufficiently, ſo that I deferred a final judgment till the 10th; and, in order to put my theory of theſe two ſatellites to a trial, I made a ſketch on paper, to point out before-hand their

ſituation

ſituation with reſpect to the planet, and its parallel of declination.

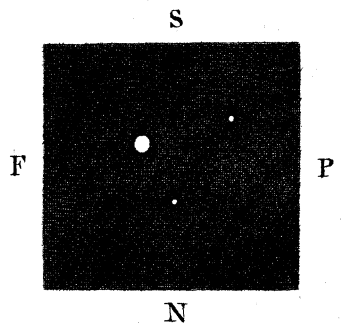
The long expected evening came on, and, notwithſtanding the moſt unfavourable appearance of dark weather, it cleared up at laſt. And the heavens now diſplayed the original of my drawing, by ſhewing, in the ſituation I had delineated them, *The Georgian Planet attended by two Satellites.*

I confeſs that this ſcene appeared to me with additional beauty, as the little ſecondary planets ſeemed to give a dignity to the primary one, which raiſes it into a more conſpicuous ſituation among the great bodies of our ſolar ſyſtem.

For upwards of five hours I ſaw them go on together, each purſuing its own track; and I left them ſituated, about two o'clock in the morning on February the 11th, as they are repreſented in the figure, Tab. VII. The letters S, N, P, F, denote the ſouth, north, preceding, and following parts of the heavens, as they are ſeen, by the *front-view*, in my teleſcope. The ſouth preceding ſatellite is the ſecond, or that whoſe motion was firſt aſcertained; the other is that which moves in a ſmaller orbit, or what I have called the firſt ſatellite; and the direction of their motion is according to the order P, S, F, N, of the letters.

I have not ſeen them long enough to aſſign their periodical times with great accuracy; but ſuppoſe that the firſt performs a ſynodical revolution in about eight days and three-quarters, and the ſecond in nearly thirteen days and an half.

Their orbits make a conſiderable angle with the ecliptic; but to aſſign the real quantity of this inclination, with many other particulars, will require a great deal of attention, and much contrivance: for, as eſtimations by the eye cannot but be extremely fallacious, I do not expect to give a good account of their


S
F
P
N

their orbits till I can bring ſome of my micrometers to bear upon them; which, theſe laſt nights, I have in vain attempted, their light being ſo feeble as not to ſuffer the leaſt illumination, and that of the planet not being ſtrong enough to render the ſmall ſilk-worm's threads of my delicate micrometers viſible. I have, nevertheleſs, ſeveral reſources in view, and do not deſpair of ſucceeding pretty well in the end.

W. HERSCHEL.

Slough, near Windſor,
February 11, 1787.