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

Read Feb. 15, 1787.

THE great diffance of the Georgian planet, and its prefent fituation in a part of the zodiac which is fcattered over with a multitude of fmall ftars, has rendered it uncommonly difficult to determine whether, like Jupiter and Saturn, it be attended by fatellites. In purfuit of this inquiry, having frequently directed large telefcopes to this remote planet, and finding myfelf continually difappointed, I afcribed my failure to the want of fufficient light in the inftruments I ufed; and, for a while, gave over the attempt.

In the beginning of laft month, however, I was often furprifed when I reviewed nebulæ that had been feen in former *fweeps*, to find how much brighter they appeared, and with how much greater facility I faw them. The caufe of it could be no other than the quantity of light that was gained by laying afide the fmall fpeculum, and introducing the *Front-view*; an account of which has been inferted, by way of note, to the Catalogue of Nebulæ contained in the Philofophical Tranfactions, vol. LXXVI. p. 499.

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



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dered why it had not ftruck me fooner. The 11th of January, therefore, in the courfe of my general review of the heavens, I felected a *fweep* which led to the Georgian planet; and, while it paffed the meridian, I perceived near its difk, and within a few of its diameters, fome very faint ftars whofe places I noted down with great care.

The next day, when the planet returned to the meridian, I looked with a most forutinizing eye for my fmall stars, and perceived that two of them were milling. Had I been lefs acquainted with optical deceptions, I should immediately have announced the existence of one or more fatellites to our new planet; but it was neceffary that I should have no doubts. The leaft hazinefs, otherwife imperceptible, may often obfcure fmall ftars; and I judged, therefore, that nothing lefs than a feries of obfervations ought to fatisfy me, in a cafe of this importance. To this end I noticed all the fmall ftars 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 fatellite, I thought it right to defer this communication till I could have an opportunity of feeing it actually in motion. Accordingly I began to purfue this fatellite on Feb. the 7th, about fix 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 fituation 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 faw this fatellite faithfully attend its primary planet, and at the fame time keep on, in its own courfe, by defcribing a confiderable arch of its proper orbit.

While I was chiefly attending to the motion of this fatellite, I did not forget to follow another fmall ftar, which I was pretty Two Satellites of the Georgian Planet.

pretty well affured was alfo a fatellite, efpecially as I had, on the night of the 14th of January, obferved two fmall flars which were wanting the 17th, and again miffed other two the 24th which had been noticed the 18th; but, whether owing to my great attention to the former fatellite, or to the clofenefs of this latter, which was nearly hidden in the rays of the planet, I could not be well affured of its motion. Indeed, towards morning, when a change of place, in fo confiderable an interval as nine hours, would have been moft confiderable an interval of this fatellite, fo that I could not longer perceive it.

The first moment that offered for continuing these observations was on February the 9th, when I faw my first discovered fatellite nearly in the place where I expected to find it. I perceived also, that the next supposed fatellite was not in the fituation where I had left it on the 7th, and could now distinguish very plainly that it had advanced in its orbit, fince that day, in the fame direction with the other fatellite, 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 fatellite, though last discovered, or rather last associated; fince I do not doubt but that I faw them both, for the first time, on the fame day, which was January the 11th, 1787.

I now directed all my attention to the first fatellite, and had an opportunity to fee it for about three hours and a quarter; during which time, as far as one might judge, it preferved its courfe. The interval which the cloudy weather had afforded was, however, rather too short for feeing its motion fufficiently, fo that I deferred a final judgment till the 10th; and, in order to put my theory of these two fatellites to a trial, I made a sketch on paper, to point out before-hand their fituation Dr. HERSCHEL'S Account of

fituation 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.

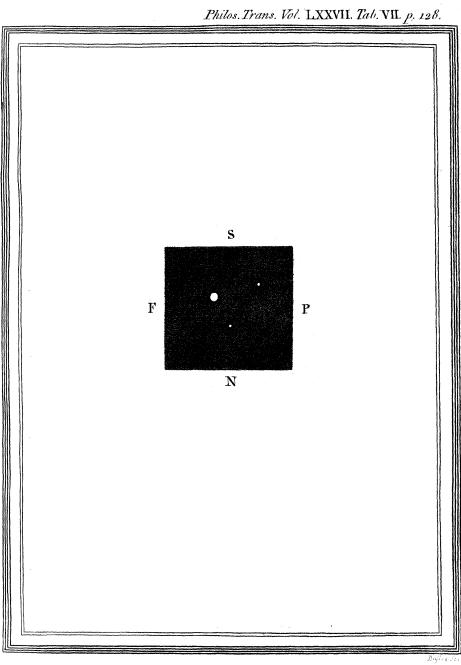
I confess that this scene appeared to me with additional beauty, as the little secondary planets seemed to give a dignity to the primary one, which raises it into a more confpicuous fituation among the great bodies of our folar fystem.

For upwards of five hours I faw them go on together, each purfuing its own track; and I left them fituated, about two o'clock in the morning on February the 11th, as they are reprefented in the figure, Tab. VII. The letters S, N, P, F, denote the fouth, north, preceding, and following parts of the heavens, as they are feen, by the *front-view*, in my telefcope. The fouth preceding fatellite is the fecond, or that whofe motion was first afcertained; the other is that which moves in a fmaller orbit, or what I have called the first fatellite; and the direction of their motion is according to the order P, S, F, N, of the letters.

I have not feen them long enough to affign their periodical times with great accuracy; but fuppofe that the first performs a fynodical revolution in about eight days and three-quarters, and the fecond in nearly thirteen days and an half.

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

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their orbits till I can bring fome of my micrometers to bear upon them; which, thefe laft nights, I have in vain attempted, their light being fo feeble as not to fuffer the leaft illumination, and that of the planet not being ftrong enough to render the fmall filk-worm's threads of my delicate micrometers vifible. I have, neverthelefs, feveral refources in view, and do not defpair of fucceeding pretty well in the end.

W. HERSCHEL.

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Slough, near Windfor, February 11, 1787.

