

A Letter from Mr. Flamsteed concerning the Eclipses of Saturns Satellit's for the year following. 1684 with a Catalogue of them, and informations concerning its use.

S I R,

THe uses of the following *Catalogue* of all the *Eclipses* of *Jupiters Satellits* in the following year extending much further then that of a few only visible with us, which you were pleased to think worthy a place in the *September Transactions*; I find my self necessitated to give you a larger account both of it, and its Original; which I hope will be as kindly entertained by you as that was.

It has been my custome for some years past to make my self quarterly a small *Ephemeris* of the *Eclipses* of *Jupiters Satellits* visible with us, that so none of them might escape me unobserved when the weather permitted; having by this means obtained a good stock of observations of them of my own, besides what I had collected from the Works of *Galileo*, *Hodierna*, *Borelli*, the papers of Mr. *Rooke* late professor of *Geometry* at *Greesham Colledge*, (happily preserved and kindly imparted to me by his once intimate freind, and one of my honoured *Patrons*, the Right Reverend *Seth Lord Bishop of Sarum*,) and the communications of my honourd freinds and correspondents *Monseur Cassini*, and Mr. *Towneley*. I found my self well furnished, as I thought, for the restitution of their motions, which as I have formerly told you I attempted last Summer, and accomplished with such success; that having seen only 2 of the prædicted *Eclipses* of the first *Satellit*, I find neither of them differ above 2 Minutes from my calculations. I have also observed one of the third, not above 3 Minutes faulty, and another of the second erring but two; which makes me hope the
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inequality I suspected in this last, will not be found so large as I feared it might be : after I had finished the *Tables* of their *Mean Motions*, I set my self to Calculate others for finding the true times of their return to the *Heliocentrical* Conjunction of Ψ in all places of his *Orbite*, with some other which I foresaw would be requisite for the easie Calculation of their *Eclipses* : having this in readines, and being encouraged with the aforesaid good success, of my endeavours, I resolved to Calculate all the *Eclipses* of the following year 1684. and to impart them to the publik, if you consented, in the Tracts; they being much desired both at home and abroad, that so not only our freinds here, who have a respect for Novelties of this sort, but such forreigners also as are Studious of *Astronomy* and *Geography*, or those of our own people who Travail into remote Countries, and shall be accommodated with instruments for this purpose, may have the apportunity of foreknowing such appearances, as, if observed, will certainly shew the difference of *Meridians* betwixt them and us. And I must confess it is some part of my design, to make our more knowing Seamen ashamed of that refuge of Ignorance, their Idle and Impudent assertion *that the longitude is not to be found*, by offering them an expedient that will assuredly afford it, if their Ignorance, Sloth, Covetousness, or Ill-nature, forbid them not to make use of what is proposed.

Those of them that pretend to a greater talent of Skill than others, will acknowledge that it might be attained by Observations of the *Moon* if we had *Tables* that would answer her *Motions* exactly ; but after 2000 years experience (for we have some Observations of *Eclipses* much ancientser) we find the best *Tables* extant erring sometimes 12 Minutes or more in her apparent place, which would cause a fault of a half an hour, or $7\frac{1}{2}$ degrees in the longitude deduced by comparing her place in the heavens with that given by the *Tables* : I undervalue not this Method, for I have made it my business, and have succeeded in it, to get a large stock of good *Lunar* Ob-
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servations in order to the correction of her *Theory*, and as a ground work for better *Tables*; but the examination will be a work of a long time, and if we should happily afterwards attain what we seek, yet the Calculation will be so perplexed and tedious, that it will be found much more inconvenient and difficult then that I propose by observing the *Eclipses* of *Jupiters Satellites* which however at present I must prefer.

For I am persuaded, that the *Eclipses* of the first will scarcely be found above 4 Minutes of time different from my *Calculation* in the *Catalogue*, nor those of the third above twice as much; Now an error of 4 Minutes cannot cause a fault of more then one degree in the *Longitude* collected by comparing an observed *Ingress* of the first *Satellit* into \mathbb{Z}^s shadow or emersion from it, with the time given in the *Catalogue*; and I hope it will scarce ever be found to err so much. But if the same *Eclipse* may be observed in two distant places at the same time, or compared with an observation of the same *satellit* made within a Week elsewhere, the difference of *Meridians* will be had something better then by comparing two observations of the same *phasis* of a *Lunar Eclipse*, made in distant places.

For whereas it is somewhat difficult by reason of the *Penumbra* to determine the true time of the application of either of the *Moons* limbs to the shadow, the *Satellites Eclipses*, especially those of the first, are almost momentany.

And whereas there can rarely happen 4 *Eclipses* of the *Moon* visible the same year, those of the *Satellites* happen so frequently, that there are more of them visible in one year then we count days in it, tho the *Planet* \mathbb{Z} lie hid under the *Suns* raies every year a whole moneth together.

I know our *Navigators* will object against this Method, that it is difficult to practice at Sea, because long *Telescopes* are required which the Motion of the Ship will not permit them to manage aboard, that it is hard to di-

ftinguish one *Satellit* from another, and that *Tables* or other contrivances for fhewing their Mutual pofitions are here wanting ; to which I anfwer.

That if it be not practicable at Sea they cannot deny but it is at land ; That the true *longitude* of remote *Coafts* from us are the firft thing defired for the correction of their *Charts* ; let them attempt thefe firft, and I doubt not but the fuccefs will encourage them fo much, that they will readily find means to put it in practice at Sea. That the *French* have ufed this method fuccesfully both in *Denmark* and their own Country ; That a *Telescope* of 14 foot long at moft, or for need one 8 foot, with broad eye glaffes, will be fufficient for this purpofe ; that the difficulty cannot be known till it be tried, and that ufe renders many things eafie which our firft thoughts concealed unpracticable.

That the *Satellites* may be diftinguifhed by their *Magnitudes*, the third from γ being the biggeft, the firft fomething lefs, the fecond yet lefs than the firft, and the fourth or outermoft the fmalleft. And to their laft objection, that if I find this method heeded by them, I fhall take care to publifh eafie *Tables* for finding their *Configurations* and *Eclipses* in good time. I delay it at prefent on no other account, then that by further *Observations* I may get a better knowledge of their Motions, for tho thefe *Satellites* were difcovered 74 years agoe, yet have we no *Observations* of their *Eclipses*, that we may rely on, before *Hodierna's*, and the firft of his is fcarce 42. years old as yet : I hope neverthelefs my prefent *Tables* will not erre fenfibly for half a dozen years further, and that in the mean time I may give them a further correction by the help of fuch *Observations*, as if God fpare me life and health, I intend to make, whereby they may be rendred ferviceable for a much longer time, without any confiderable faults.

As for the *Catalogue* it felf I give in it firft the *Moneth*, then the day, and to avoid miftakes I have prefixed the

Planetary Character for the day of the week to each; then the Hour and Minute of the appearance; counted (after the *Astronomical* manner from *Noone*, and lastly the Number of the *Satellit* that is *Eclipsed* with an *i* after it when its ingress, an *e* when its emerfion is the appearance observable at that time. And that it may be readily known which of these are visible in our *Horizon* I have marked them with a*betwixt the Number and the Letter. Thus in the sixth line of the *Catalogue* you find $\odot^6 | 12-29 | 4^*i$, which shews that on Sunday the sixth of that Moneth at $12^h 29'$ after Noon, the fourth or utmost *Satellit* makes its ingress, and is *Eclipsed* in \mathbb{Z}^s shadow; and the Numbers under it $| 15-39 | 4^*e |$ that the same day $15^h 39'$ after Noone, or that on the 7th day at $3^h 39'$ in the Morning, it again emerges from the shadow, and becomes visible betwixt it and the body, and the * added to them both, shews that both appearances are visible with us.

If it be required to know whether any one of those invisible with us be visible in any other given place. Convert the difference of *Meridians* betwixt it and *London* into time. And if the place lie to the East of *London*, add it to, if to the West, subtract it from the time of the appearance at *London*, the Sun or difference accordingly shall be the true time of the *Eclipse* under that *Meridian*, at which if \mathbb{Z} be above the *Horizon* the Sun beneath it, the *Eclipse* is there visible, otherways not.

Or by the help of the *Ephemerides* of the *Planets* places and a terrestrial *Globe*, the space on it in which any of these *Eclipses* will be visible may be found thus.

First seek the true places of the Sun and *Jupiter* with his Latitude in the *Ephemerides*, whereby you may find their declinations and right ascensions either by the vulgar Tables or the *Globe* it self exactly enough for this Method.

Bring *London* on the *Globe* to the *Meridian*, and detaining it there note what degree of the *Aequator* is cut by
it

it From this subtract the time of the *Eclipse* after Noon converted into degrees and minutes, the remainder shews you the *Longitude* of that *Meridian* on the earth, where it is then Noon when the *Satellit* is *Eclipsed*; which, I therefore call the *Meridional Longitude of the Eclipse*. Bring this *Meridional Longitude* under the *Meridian*, and elevate the nearer Pole to the Sun as much as is his declination, keep the Globe in this position and if ζ be in *Consequence* of the Sun, draw a line on the Globe along the *Eastern Horizon*, it passes over all those places where the Sun is setting at that time, but if ζ be in *Antecedence* of the Sun, draw the said line on the Globe by the *Western Edge* of the *Horizon*, it passes over all those places where the Sun is then arising.

Jupiter being in *Consequence* of the Sun add the difference of his and the Sun's right ascensions to the *Meridional Longitude* aforementioned, bring the degree of the *Aequator* answering their summe under the *Meridian*. Raise the *Pole* next *Jupiter* equal to his declination, and detaining the Globe in this position, draw a line again by the *Eastern Horizon*, the space intercepted betwixt this and the line of the Sun's settings before described on the *Globe*, Comprehends all those places on the earth from Sun setting till ζ is set.

But if ζ were in *Antecedence* of the Sun, Subtract the difference of his and the Sun's right Ascensions from the *Meridional Longitude*, set the degree of the *Aequator* answering the remainder under the *Meridian*, and elevate the *Pole* next *Jupiter* equal to his declination. Keeping the *Globe* in this position draw a line by the *Western Edge* of the *Horizon*, the space included betwixt this, and the line of the Sun's risings contains all those places, on the Earth where this *Eclipse* is visible betwixt ζ 's rising and Sunrise.

When any *Eclipse* of these is observed, the difference betwixt the noted time and that in the *Catalogue*, shall

be the difference of *Meridians* betwixt the place of the observation and *London* which lies so near the *Meridian* of the *Observatory* that the distance need not be accounted for. And this determination may be relied on, if the first or third *Satellit* were observed; but I dare not be so confident of the second and fourth for the reasons formerly given. However I shall make it my business to observe all such *Eclipses* of as many of them as shall be visible with us, that by comparing my observations with such as shall be made abroad, the error, if any, may be discovered and Corrected.

When \mathcal{W} is in *Quartile* of the Sun: the distance of the first *Satellit* from his next limb when it falls into his shadow, and is *Eclipsed*, is one *Semidiameter* of \mathcal{W} . Of the second, two or a whole *Diameter* nearly. Of the third, three. Of the fourth, five of his *Semidiameters*, or something better when the parallax of the Orbe is greatest. But these quantities diminish gradually as he approaches the σ or ϱ of the Sun somewhat nearly but not exactly in the proportion of Sines.

As the Sun removes from the σ of \mathcal{W} the *Ingresses* of the *Satellites* into his shadow become observable. When he is about thirty degrees from it, the *Emerfions* of the fourth, and at sixty degrees of the third begin to be seen betwixt the shadow and body continuing so till the Sun be arrived within sixty degrees of the ϱ of \mathcal{W} , when the *Emerfions* of the third fall behind his body, but the *Emerfions* of the fourth continue visible till he be less than thirty degrees distant from the σ at which time they also are hid behind him, all the appearances being made really to the right hand or in antecedence of \mathcal{W} , tho with inverting *Telescopes*, they appear to the contrary, the left.

After the opposition of the \odot and \mathcal{W} we begin to see the *Emerfions* of all the *Satellites* from the shadow, now on the left hand or in consequence of \mathcal{W} , but through

inverting glasses on the right, when the ☉ is near thirty degrees from the opposition of the Ingresses of the fourth, when sixty degrees from it of the third, begin to be observable betwixt the body and shadow, continuing so till the Sun arrive at the same or rather within something a wider distance from the ☿ of ♃. Therefore all the *Eclipses* from the beginning of the year till the ☿ of the Sun and Jupiter on the twenty sixth of February are made in *antecedence* of ♃ but appear through the inverting *Telescope* on the left hand of him, afterwards till the ☿ in August they are made in *Consequence* but through the same glasses appear on the right. But when he *Emerges* again from the Sun in September they are made, and appear as in the beginning of the year.

After which time the Latitude of the fourth *Satellit* becomes so great that it escapes the shadow and body both of ♃ and suffers no more *Eclipses* by either of them according to my *Tables* this year; it will be therefore worth the while for those who are accommodated with good glasses to look for the following *Conjunctions* of the fourth *Satellit* with the *Axis* of the shadow, of which that on *November* the nineteenth is visible with us. For if its Latitude be any thing less than I esteem'd, it may be *Eclipsed*.

	<i>d</i>	<i>h</i>
The <i>Conjunctions</i> of the 4th <i>Satellit</i> with the <i>Axis</i> of the shadow when it suffers no <i>E-</i> <i>clipses</i> 1684. are	Octob. ♀	17--07--53
	Nov. ☾	3--01--47
	♃	19--19*37
	Decem. ♁	6--13--24
	♄	23--07--10

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Next year I intend (God willing) to gve you the like *Catalogue* with corrections if I find them requisite, something earlier that so our freinds abroad may have timely notice and be incited to mind and observe these appearances.

J. F.

The *Observatory* at *Greenwich*,
Dec. 18. 1683.

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A Catalogue of the Visible Eclipses of the Satellites, shewing the apparent times of their Ingresses into the Shadow and Emergions, from it under the Meridian of the Observatory in the year 1684. Calculated from new Tables of their Motions. by John Flamsteed M. R. & R. S. S.

1684															
Jan.	h	'		Feb.	h	'		Mar.	h	'		Apr.	h	'	
♂	1	13-03	1 * i	♀	1	5-22	2 i	♃	1	19-24	1 e	♂	1	18-23	2 e
♀	2	23-30	3 i	♃	2	9-47	1 * i	♃	3	13-53	1 * e	♀	2	16-09	1 e
♃	3	7-31	1 i	♃	4	3-16	1 i	♂	4	7-54	2 * e	♀	4	10-38	1 * e
		19-09	2 i			19-39	2 i	♀	5	8-22	1 * e	♃	5	6-26	3 e
♃	5	1-58	1 i	♂	5	22-22	1 i	♀	7	2-51	1 e			7-42	2 * e
⊙	6	12-29	4 * i	♃	7	6-53	1 * i			14-24	3 * e	⊙	6	5-07	1 e
		15-39	4 * e			19-13	3 i			21-12	2 e	♃	7	23-36	1 e
		20-26	1 i	♀	8	7-57	2 * i	♃	8	21-20	1 e	♂	8	21-01	2 e
♃	7	8-25	2 i	♃	9	0-26	4 i	♃	10	15-50	1 * e	♀	9	18-05	1 e
♂	8	14-54	1 * i			3-19	4 e	♂	11	10-30	2 * e	♀	11	12-34	1 * e
♃	10	3-36	3 i			11-21	1 * i	♀	12	11-19	1 * e	♃	12	10-19	2 * e
		10-22	1 * i	♃	11	5-50	1 i	♃	13	15-13	4 * e			10-26	3 * e
		21-42	2 i			21-15	2 i	♀	14	4-48	1 e	⊙	13	7-03	1 e
♃	12	4-49	1 i	♀	13	0-19	1 i			18-25	3 e	♂	15	1-32	1 e
⊙	13	22-17	1 i	♃	14	18-47	1 i			23-49	2 e			23-38	2 e
♃	14	10-58	2 * i			23-13	3 i	♃	15	23-17	1 e	♀	16	0-54	4 i
♂	15	16-40	1 * i	♀	15	10-34	2 * i	♃	17	17-40	1 e			3-06	4 e
♃	17	7-22	3 i	♃	16	13-16	1 * i	♂	18	13-09	2 * e			20-01	1 e
		11-13	1 * i	♃	18	7-45	1 * i	♀	19	12-15	1 * e	♀	18	14-30	1 * e
♀	18	0-16	2 i			23-52	2 i	♀	21	6-44	1 * e	♃	19	12-46	2 e
♃	19	5-41	1 i	♀	20	2-14	1 i			22-26	3 e			14-26	3 * e
♃	21	0-10	1 i	♃	21	20-42	1 i	♃	22	2-28	2 e	⊙	20	18-59	1 e
		13-32	2 * i	♀	22	3-13	3 i	⊙	23	1-13	1 e	♂	22	3-28	1 e
♂	22	18-38	1 * i			13-11	2 * i	♃	24	19-43	1 e	♀	23	2-15	2 e
♀	23	6-27	4 i	♃	23	15-12	1 * i	♂	25	15-46	2 * e			21-57	1 e
		9-24	4 * e	♃	25	9-41	1 * i	♀	26	14-12	1 * e	♀	25	16-26	1 e
♃	24	11-19	3 * i	♂	26	♂ ♃		♀	28	8-41	1 * e	♃	26	15-33	2 e
		13-06	1 * i	♀	27	6-26	1 e			2-26	3 e			18-26	3 e
♀	25	2-47	2 i			0-55	1 e	♃	29	5-05	2 e	⊙	27	10-55	1 * e
♃	26	7-34	1 i	♂	29	10-24	3 * e	⊙	30	3-10	1 e	♂	29	5-24	1 e
♃	28	2-00	1 i			18-35	2 e			9-09	4 * e			4-51	2 e
		16-05	2 * i					♃	31	21-39	1 e	30		23-53	1 e
♂	29	21-30	1 i												
♃	31	14-51	1 * i												
		15-16	3 * i												

May

1684	May	b	'	June	b	July	b	'	Aug.	b	'
	♂ 2	18-21	1	☉ 1	4-30	2	♂ 01	22-30	1	♂ 1	0-38
		19-00	4	i	11-14	3	♂ 3	4-05	2	♂ 2	19-07
		21-02	4	e	14-18	3	♂ 4	16-58	1	♂ 4	3-48
	♂ 3	18-09	2	e	20-27	1	♂ 5	11-27	1	♂ 5	13-36
		19-20	3	i	3 14-55	1	♂ 6	17-23	2	♂ 7	5-20
		22-25	3	e	4 17-47	2	♂ 7	5-55	1	♂ 8	8-05
	☉ 4	12-51	1	*e	5 7-10	4	♂ 8	7-04	3	♂ 9	2-34
	♂ 6	7-19	1	e	8-41	4	♂ 9	10-05	3	♂ 10	2-03
	♂ 7	7-27	2	e	9-24	1	♂ 10	19-18	4	♂ 11	6-25
	♂ 8	1-47	1	e	7 3-52	1	♂ 11	20-18	4	♂ 12	7-32
	♂ 9	20-16	1	e	8 7-04	2	♂ 12	0-24	1	♂ 13	8-40
	♂ 10	20-45	2	e	15-12	3	♂ 13	5-41	2	♂ 14	15-32
		23-18	3	i	18-15	3	♂ 14	18-52	1	♂ 15	6-01
	☉ 11	2-24	3	e	22-20	1	♂ 15	13-21	1	♂ 16	10-01
		14-45	1	e	♂ 10 16-49	1	♂ 16	19-59	2	♂ 17	19-43
	♂ 13	9-14	1	e	♂ 11 20-21	2	♂ 17	7-50	1	♂ 18	4-30
	♂ 14	10-03	2	*i	♂ 12 11-17	1	♂ 18	11-03	3	♂ 19	22-59
	♂ 15	3-43	1	e	♂ 14 5-46	1	♂ 19	14-03	3	♂ 20	9-02
	♂ 16	22-11	1	e	♂ 15 9-39	2	♂ 20	2-19	1	♂ 21	17-28
	♂ 17	23-21	2	e	19-10	3	♂ 21	9-16	2	♂ 22	10-01
	☉ 18	3-17	3	i	22-12	3	♂ 22	20-47	1	♂ 23	11-58
		6-22	3	e	♂ 16 0-14	1	♂ 23	15-16	1	♂ 24	22-22
	☾ 19	13-05	4	*i	♂ 17 18-43	1	♂ 24	22-34	2	♂ 25	6-27
		14-55	4	e	♂ 18 22-56	2	♂ 25	9-45	1	♂ 26	0-56
	♂ 20	11-08	1	*e	♂ 19 13-11	1	♂ 26	18-02	3	♂ 27	11-40
	♂ 21	12-38	2	*e	♂ 21 7-39	1	♂ 27	4-14	1	♂ 28	19-25
	♂ 22	5-36	1	e	♂ 22 1-13	4	♂ 28	11-53	2	♂ 29	14-01
	♂ 24	0-05	1	e	2-30	4	♂ 29	22-42	1	♂ 30	13-54
	☉ 25	2-55	2	e	12-14	2	♂ 30	13-27	4	♂ 31	0-59
		7-16	3	i	23-08	3	♂ 31	14-07	4		8-24
		10-20	3	*e	♂ 23 2-09	1	♂ 32	17-11	1		2-53
		18-33	1	e	2-10	3	♂ 33	1-11	2		
	♂ 27	13-02	1	i	♂ 24 20-36	1	♂ 34	11-40	1		
	♂ 28	15-13	2	e	♂ 26 1-31	2	♂ 35	22-02	3		
	♂ 29	7-30	1	e	15-05	1	♂ 36	6-10	1		
	♂ 31	1-59	1	e	♂ 28 9-33	1	♂ 37	14-29	2		
					29 14-48	2					
					30 3-06	3					
					4-01	1					
					6-07	3					

Septembre toto ♄
sub radijs Solis
latet.

1684											
Octo.	h	'		Nov.	h	'		Dec.	h	'	
♀ 1	7-08	3	i i	☉ 2	17-53	1	i i	☾ 1	1-10	1	i i
	21-21	1	i i	♂ 4	10-58	2	i i	♂ 2	19-43	1*	i i
♀ 3	11-21	2	i i		12-21	1	i i		21-00	2	i i
☉ 5	15-59	1	i i	♄ 6	1-58	3	i i	♄ 4	14-10	1*	e i
♂ 7	10-18	1	i i		6-49	1	i i		18-37	3*	e i
	0-40	2	i i	♃ 8	0-14	2	i i	♃ 6	21-26	3	e i
	4-47	1	i i		1-17	1	i i		8-38	1	i i
♀ 8	11-08	3	i i	☉ 9	19-44	1*	i i	☾ 8	10-20	2	i i
	23-16	1	i i	♂ 11	13-30	2	i i		3-05	1	i i
♀ 10	13-58	2	i i		14-12	1	i i		23-36	2	i i
	17-44	1*	i i	♄ 13	6-54	3	i i	♂ 9	21-33	1	i i
☉ 12	12-13	1	i i		8-40	1	i i	♄ 11	16-00	1*	i i
♂ 14	3-16	2	i i		9-44	3	e i		22-31	3	i i
	6-41	1	i i	♃ 15	3-07	1	i i	♀ 12	1-19	3	e i
♀ 15	15-07	3	i i		3-46	2	i i	♃ 13	10-27	1	i i
♄ 16	1-10	1	i i	☉ 16	21-35	1	i i		12-50	2	i i
♀ 17	16-33	2	i i	♂ 18	16-03	1*	i i	☾ 15	4-55	1	i i
	19-39	1	i i		16-04	2*	i i	♂ 16	23-22	1	i i
☉ 19	14-07	1	i i	♄ 20	10-31	1	i i	♀ 17	2-06	2	i i
♂ 21	5-51	2	i i		10-49	3	i i	♄ 18	17-47	1*	i i
	8-35	1	i i		13-39	3	e i	♀ 19	2-24	3	i i
♀ 22	19-04	3*	i i	♃ 22	4-58	1	i i		5-12	3	e i
♄ 23	3-04	1	i i		5-18	2	i i	♃ 20	12-17	1	i i
♀ 24	19-08	2*	i i	☉ 23	23-26	1	i i		15-22	2	i i
	21-32	1	i i	♂ 25	17-53	1*	i i	☾ 22	6-45	1	i i
☉ 26	16-00	1	i i		18-34	2*	i i	♀ 24	1-12	1	i i
☾ 28	8-24	2	i i	♄ 27	12-21	1	i i		4-36	2	i i
	10-28	1	i i		14-43	3*	e i	♄ 25	19-39	1*	i i
♀ 29	23-01	3	i i		17-32	3*	e i	♀ 26	6-19	3	i i
♄ 30	4-57	1	i i	♃ 29	6-48	1	i i		9-06	3	e i
♀ 31	21-41	2	i i		7-49	2	e	♃ 27	14-00	1*	i i
	23-25	1	i i						17-51	2*	i i
								☾ 29	8-34	1	i i
								♀ 31	3-01	1	i i
									7-07	2	e

Describe Dec. 11. ♂ 1683.