

An Abstract of a Letter from Mr J. Flamsteed. Math. Reg. & F. of the R.S. giving the description & uses of an Instrument for finding the distances of \mathbb{J} 's Satellites from his Axis, with the help of the Table of Parallaxes and Catalogue of Eclipses; printed in the preceding Transactions. See Tab. 2. Fig. 2.

THE little Circle in the middle represents the Planet *Jupiter*, the four concentrick Circles the proper Orbits of his four *Satellites*, duly proportioned to the breadth of his body; the distances betwixt the *parallel* lines intersecting them, being each equall to one of his Semidiameters.

The 4 divided Circles next without these, are distinguished into so many parts as there are days and hours in each *Satellites* revolution; the Innermost of them serving for the first, or innermost *Satellit*; that next it, for the 2^d, that next without this for the 3^d, and the outermost for the 4th; above which is a small divided Arch of 15 degrees.

By this with the aforementioned tables to find the distances of the *Satellites* from \mathbb{J} 's *Axis* to a proposed time.

1. In the Table of Parallaxes of the Orb, find the the Parallax to the time proposed, and note whether it be to be *Added* or *Subtracted*.

2. Extend the thrid from the center of the Instrument over the *Parallax* numbred in the small Arch: it cuts off in the 4 divided Circles, so many hours as each *Satellit* spends in passing from the *Axis* of the shadow to the *Axis* of \mathbb{J} viewed from our Earth; these I call the *Simple Parallaxick Intervalls*, which if the *Parallax* was to be added, are also *additionall*, if to be *Subtracted*, *Subductive*.

3. To these *Parallaxick Intervalls* add the times of half the duration of the *Eclips* of each *Satellit*, which for the 1st. may be assumed 1^h. 10', for the 2^d. 1^h. 30'.
greater

greater exactness being needless; but for the 3d, and 4th, when Eclipsed, (their Immersions into the shadow and emersion from it being commonly given in the Catalogue) take half the difference of these times at the next Eclipse to the time proposed, for the half duration, and add them to the *Simple Parallaxick Intervalls*, so have you them *Augmented*. But note that this year 1686, and so often as the 4th *Satellit* is not Eclipsed, (which is two years in every six) its Intervall needs no augmentation, the Catalogue shewing the very time when it passes the *Axis* of the shadow.

4. Find in the Catalogue the times of the Eclipses of each *Satellit* next preceding the time proposed, and when the 4th is not Eclipsed, of its passing the *Axis* of the shadow, to which, if the *Parallaxick Intervalls* augmented were *Additionall*, add them to, if *Subductive*, *Subtract them from*, each the time of its proper *Satellites* Eclipse, so have you very near the *Apparent times*, when each *Satellit* last past over the *Axis* of \mathcal{Z} viewed from our Earth.

5. Subtract each of the times thus got from the time proposed: the Remainders are the *Intervalls of the Motion of each Satellit from \mathcal{Z} 's Axis*.

6. Extend the thred from the Center over each of these Intervalls of Motion numbered severally in the divided Circles belonging each to its proper *Satellit*, where it cuts the proper Orbit of that *Satellit*, whose intervall was numbered in its peculiar Circle, it shews amongst the parallels, how many semidiameters of \mathcal{Z} that *Satellit* is distant from him, and on which side of him tis posited.

Note further, that the thred as it lay extended over the *parallax* of the *Orb* numbered in the small Arch, where it cut the several proper Orbits of each *Satellit*, shew'd amongst the Parallels, how many Semidiameters of \mathcal{Z} the center of the shadow was distant from the center

of ♃ viewed from our Earth. And that if the Parallax of the Orb were additionall, the shadow lies on the right hand from ♃, if Subductive, on the left.

To explain these precepts, I shall give two brief examples. Let it be then proposed to know how far each Satellit appears distant from ♃ on the 26th of December this present year 1685, at 16^h. 52'. p. m. when the 3^d Satellit falls into the Shadow; also on July the 16. 1686. at 10^h. 00'. p. m. when there is no Eclipse.

Vide Tab. 2. Fig 3. 1685. Dec. 26^d. 16^h. 52'. p. m. the Parallax of the Orb is 9°. 20'. additional.

	d	1 h	'	d	2 h	'	d	3 h	'	d	4 h	'
Therefore.												
The simple Parallaſtick Intervals Add		1.	05		2.	10		4.	25.		10.	20
The half duration of the Eclipses to be Added.		1.	10		1.	30		1.	18.			
<hr/> The Parallaſtick Intervals Augmented		2.	15.		3.	40.		5.	43.			
Last Immerſions and ☽ in the Catalogue. Dec.	25.	09.	37.	25.	05.	47.	19.	12.	58.	10.	00.	30.
Times of laſt paſſing Jupiters Axis Dec.	25.	11.	52.	25.	09	27.	19.	18.	41.	10.	10.	50.
Subtracted from the time propoſed. Dec.	26.	16.	52.	26.	16.	52.	26.	16.	52.	26.	16.	52.
Leaves the Intervals of Motion. Over which numbered in their peculiar circles, the third being ſeverally layd, cuts the proper Orbit of each at their viſible diſtances from Jupiter.	1.	05.	00.	1.	07.	25.	6.	22.	11.	16	06.	02.
	5	Semid	dext.	6	$\frac{1}{2}$ Sin	;	3.	dext.	4	$\frac{1}{2}$ dext.		

Vide Tab. 2. Fig. 4.

Again, 1686. July the 16. 10^h. p. m. the Parallax of the Orb. is 10°. 46. ſubductive.

	d	1 h	'	d	2 h	'	d	3 h	'	d	4 h	'
Hence												
The ſimple Parallaſtick Intervals ſub.		1.	12.		2.	35.		5.	10.		12.	00.
Half duration of the Eclipses add.		1.	10.		1.	30.						

The Par-

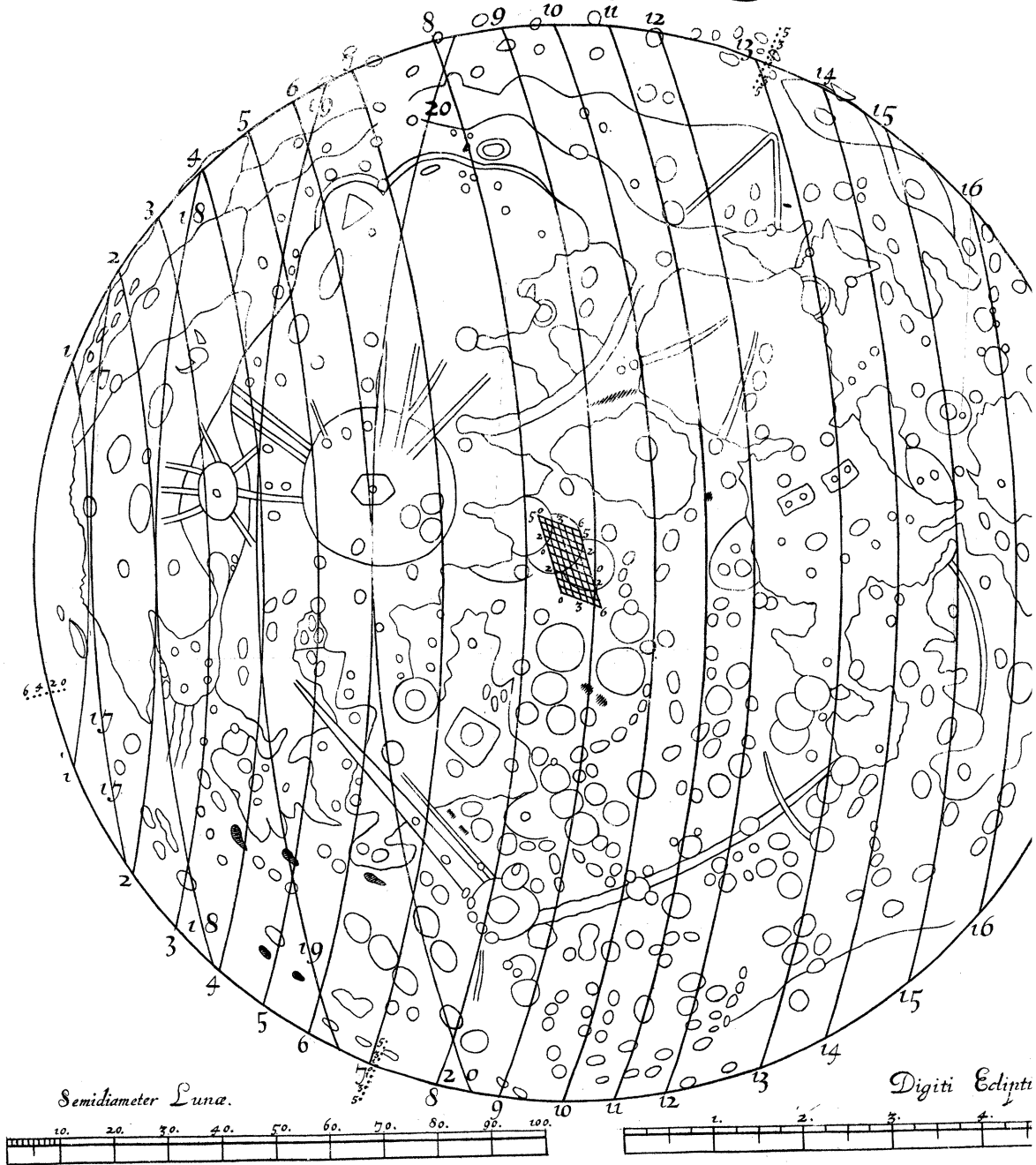
The Parallaſtick Intervals Augmented.	2. 22.	4. 05.		
The next laſt Emerſions and paſſing the Axis of the ſhadow July.	15. 05. 55.	15. 22. 02.	15. 09. 19.	15. 17. 52.
Time of laſt paſſing the viſible Axis of Jupiter	15. 03. 33.	15. 17. 57.	15. 04. 09.	15. 05. 52.
The time propoſed.	16. 10. 00.	16. 10. 00.	16. 10. 00.	16. 10. 00.
Intervals of Motion.	1. 06. 27.	0. 16. 03.	1. 0. 51.	1. 04. 08.
Therefore Diſtances from Jupiters Axis.	$5\frac{1}{2}$ Semid. dext.	$8\frac{1}{5}$ Sinif.	$12\frac{1}{2}$ Sin.	$10\frac{1}{2}$ Sin.

And the Satellites ſtand at the two propoſed times as in the two Figures.

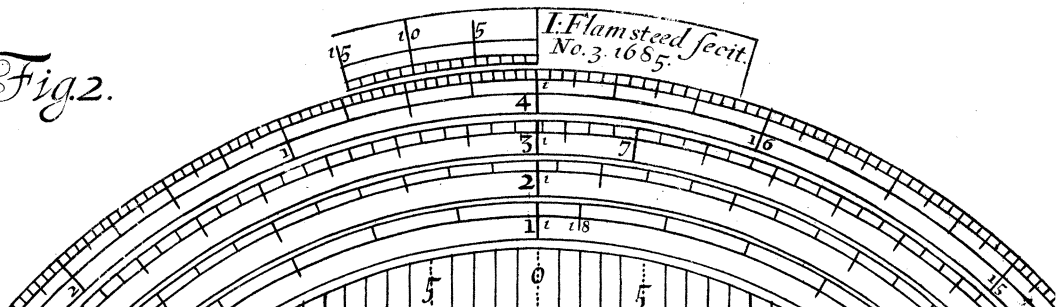
In drawing of which, tho' I have conſidered their Latitudes from the line of their utmoſt Elongations paſſing through \mathbb{Z}^s center, yet I give no rules for determining it, the contrivances and directions neceſſary on that account, being too many and troubleſome to be inſerted here: my deſign is only to ſhew the Ingenuous obſerver, how to find at what diſtance from \mathbb{Z}^s , each Satellit appears, that ſo he may not miſtake one for another when he is to obſerve any of their Eclipſes. But thus much I ſhall adviſe him, That from the beginning of the year 1686. for 3 years following, the Satellites, in the upper or remoter Semi-Circles of their Orbits from us, have South Latitude from the line of their utmoſt Elongations, paſſing over \mathbb{Z}^s center; in the under or nearer North, but continually decreasing till the end of 3 years, when they change for the contrary. That the Latitude of the 4th Satellit is never more then $1\frac{1}{5}$ Semidiameter of \mathbb{Z}^s , of the 3^d little more then half as much, of the two innermoſt ſtill leſs. And that towards the end of the year, the 4th Satellit (which will then have paſſed uneclipſed near two years) will begin to fall into the *Penumbra* again, for which reaſon he may doe well to attend its tranſits at its firſt appearing, leaſt perhaps it be really Eclipſed.

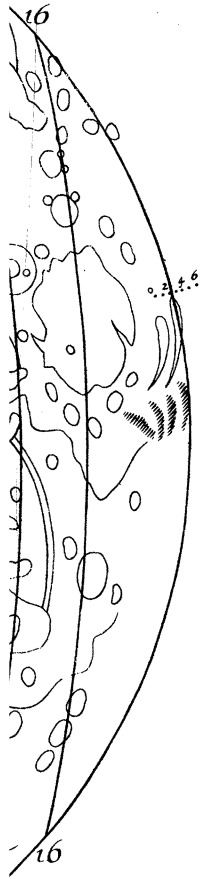
The Obſervatory, Novemb. 17. 1685.

Tab. 2. Fig. 1.

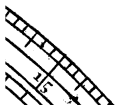
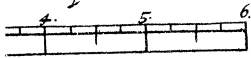


Tab. 2. Fig. 2.





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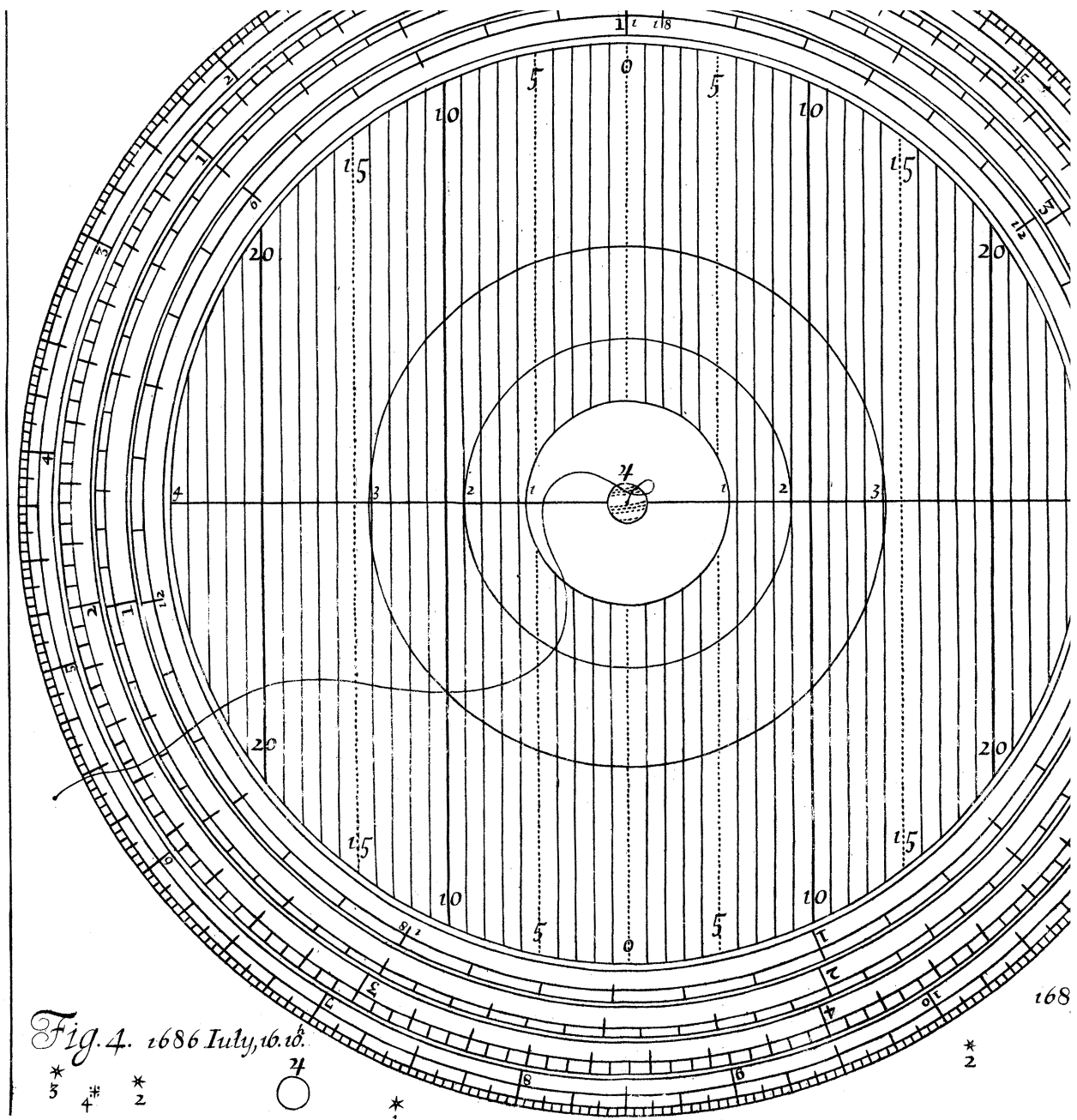


Fig. 4. 1686 July, 16. 16.

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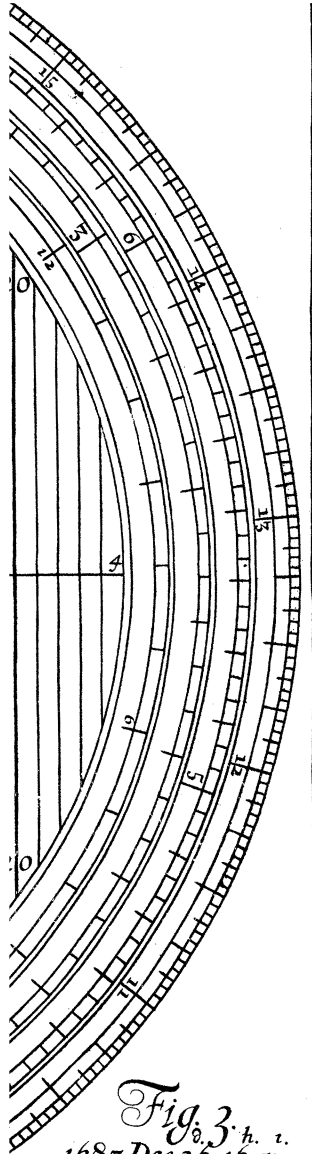
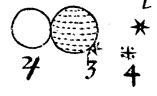
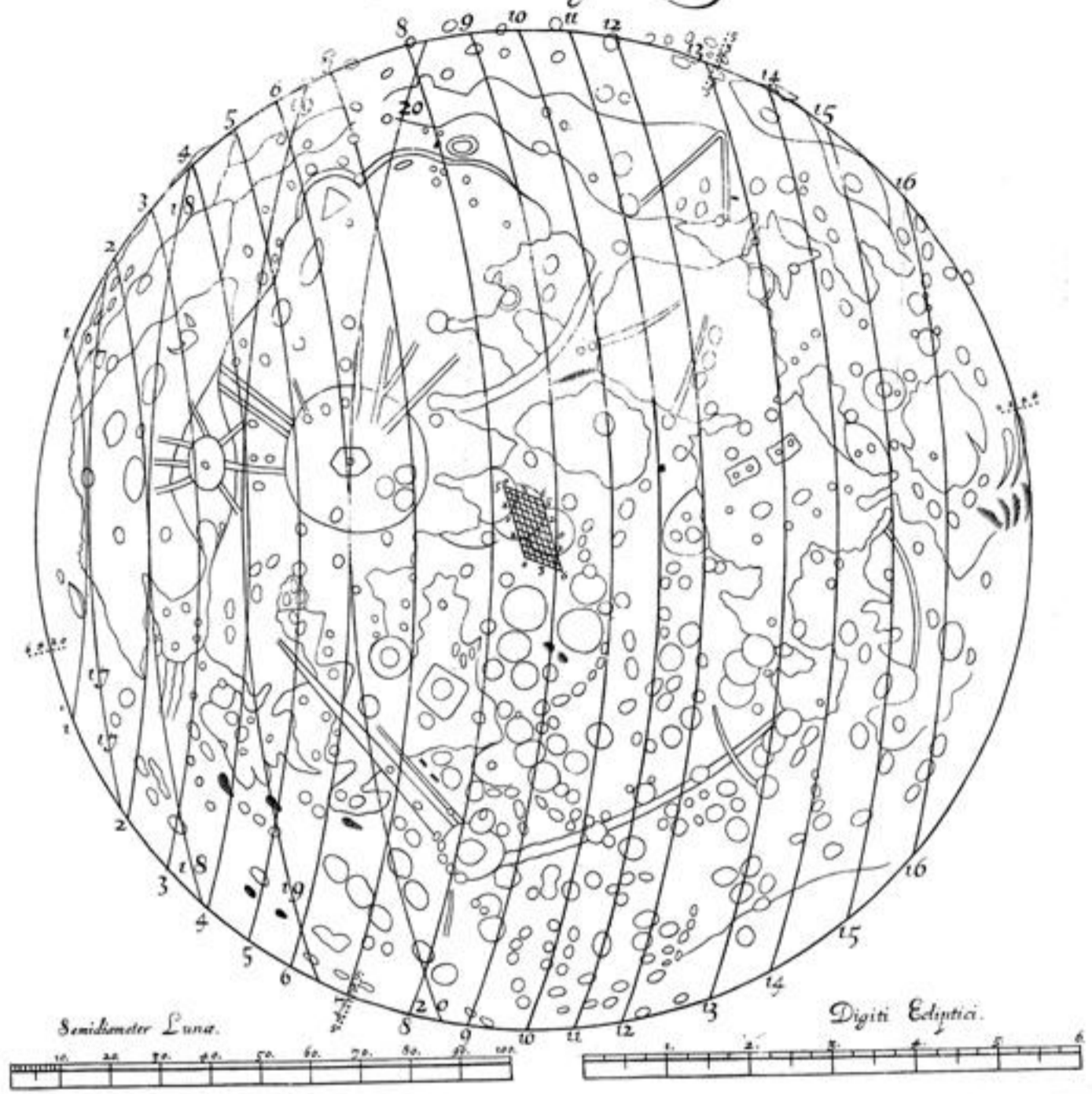


Fig. 3. h. 1.
1685 Dec. 26. 16. 52.



Tab. 2. Fig. 1.



Tab. 2. Fig. 2.

