A *Correct* Tide-Table, *shewing the true Times of the* High-Waters *at* London-Bridge, *to every day in the Year* 1683. *By Mr.* Flamstead.

	Januar. H	M	Februa. H	M	March H	M	April. H	M	May. H	M	June. H	M	July. H	M	August. H	M	Septem H	M	Octob. H	M	Novem H	M	Decem. H	M
1. M	0	05	1	52	0	34	2	13	2	38	3	35	3	45	4	19	4	59	5	25	7	02	7	37
A	0	43	2	19	1	07	2	35	2	58	3	52	4	00	4	34	5	18	5	48	7	34	8	04
2. M	1	16	2	43	1	37	2	55	3	17	4	09	4	15	4	49	5	38	6	14	8	08	8	36
A	1	46	3	05	2	03	3	14	3	35	4	25	5	05	6	01	6	43	8	43	9	10		
3. M	2	14	3	24	2	27	3	22	3	53	4	42	4	05	5	22	6	26	7	15	9	18	9	43
A	2	39	3	42	2	49	3	50	4	11	5	00	5	02	5	41	6	55	7	48	9	53	10	17
4. M	3	01	4	00	3	09	4	08	4	29	5	19	5	15	6	01	7	23	8	25	10	26	10	50
A	3	22	4	18	3	28	4	25	4	47	5	39	5	38	6	23	7	57	9	02	11	01	11	24
5. M	3	42	4	36	3	44	4	44	5	08	6	00	5	57	6	48	8	34	9	32	11	35	11	57
A	4	01	4	55	4	02	5	05	5	29	6	22	6	17	7	15	9	12	10	17				
6. M	4	19	5	16	4	20	5	27	5	51	6	45	6	39	7	43	9	50	10	54	0	07	0	29
A	4	39	5	39	4	38	5	49	6	15	7	08	7	03	8	14	10	29	11	31	0	38	1	00
7. M	4	59	6	02	4	57	6	15	6	40	7	33	7	28	8	50	11	09			1	08	1	28
A	5	20	6	27	5	18	6	42	7	06	7	59	7	55	9	26	11	46	0	06	1	36	1	55
8. M	5	41	6	54	5	41	7	11	7	33	8	25	8	23	10	02			0	36	2	02	2	20
A	6	05	7	22	6	07	7	40	7	58	8	52	8	53	10	38	0	22	1	08	2	26	2	43
9. M	6	30	7	54	6	33	8	10	8	27	9	21	9	24	11	18	0	55	1	36	2	47	3	04
A	6	58	8	26	7	03	8	42	8	55	9	50	9	58	11	57	1	26	2	02	3	08	3	22
10. M	7	27	8	59	7	32	9	13	9	24	10	20	10	31			1	53	2	25	3	25	3	40
A	7	56	9	32	8	04	9	43	9	52	10	50	11	07	0	33	2	19	2	48	3	48	3	58
11. M	8	27	10	06	8	36	10	13	10	21	11	20	11	43	1	07	2	41	3	07	4	04	4	15
A	8	59	10	39	9	10	10	42	10	49	11	50			1	38	3	01	3	25	4	25	4	33
12. M	9	31	11	13	9	42	11	10	11	16	0		1	19	2	06	3	20	3	44	4	44	4	50
A	10	04	11	43	10	14	11	38	11	44	0	20	0	51	2	31	3	39	4	02	4	20	5	08
13. M	10	37			10	45					0	51	1	23	2	52	3	56	5	24	4	20	5	28
A	11	11	0	13	11	15	0	05	0	12	1	20	3	12	4	14	5	46	4	40	5	46		
14. M	11	43	0	40	11	44	0	30	0	38	1	46	2	19	3	32	4	33	6	10	5	01	6	07
A	0		1	05			0	55	1	05	2	12	2	44	3	50	4	52	6	35	5	25	6	28
15. M	0	14	1	29	0	13	1	17	1	29	2	37	3	05	4	08	5	13	5	48	7	01	6	52
A	0	43	1	51	0	39	1	39	1	52	3	00	3	25	4	26	5	37	6	15	7	27	7	14

M Stands for Morning. A Afternoon. ⊙ for Sunday.

		Januar.		Februa.		March.		April.		May.		June.		July.		Auguft.		Septem		Octobe.		Novem		Decem.	
		H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
16.	M	1	10	2	12	1	03	2	00	2	14	3	20	3	44	4	46	6	02 ☉	6	42	7	54	7	38
	A	1	35	2	31	1	26	2	20	2	35	3	39	4	04	5	04	6	30	7	12	8	22	8	04
17.	M	1	58	2	47	1	47	2	39	2	56	3	59 ☉	4	22	5	26	7	00	7	42	8	49	8	30
	A	2	19	3	03	2	07	2	56	3	15	4	18	4	40	5	49	7	31	8	13	9	17	8	56
18.	M	2	39	3	18 ☉	2	26 ☉	3	13	3	34	4	38	5	00	6	15	8	03	8	43	9	44	9	24
	A	2	56	3	32	2	43	3	29	3	53	4	59	5	21	6	42	8	37	9	14 ☉	10	11	9	53
19.	M	3	12	3	46	2	58	3	46	4	12	5	20	5	43	7	12	9	11	9	44	10	38	10	22
	A	3	27	4	00	3	13	4	04	4	31	5	44	6	08	7	43	9	44 ☉	10	14	11	06	10	53
20.	M	3	41	4	14	3	28	4	22	4	51	6	09	6	33	8	17	10	17	10	43	11	33	11	34
	A	3	55	4	29	3	43	4	41	5	14 ☉	6	34	7	02	8	51	10	48	11	11	11	59	11	24
21.	M	4	09 ☉	4	45	3	58	5	02	5	38	7	03	7	30	9	26	11	19	11	39 ☉				
	A	4	23	5	02	4	14	5	26	6	05	7	32	8	02	10	00	11	48			0	26	0	25
22.	M	4	38	5	21	4	31	5	50	6	22	8	03	8	34	10	34			0	05	0	52	0	53
	A	4	53	5	42	4	48	6	18	7	03	8	34	9	09 ☉	11	09	0	16	0	29	1	16	1	22
23.	M	5	09	6	06	5	09	6	48	7	34	9	07	9	43	11	41	0	42	0	52	1	39	1	48
	A	5	28	6	31	5	31	7	20	8	07	9	40	10	18	1	05	1	14 ☉	1	36	2	02	2	14
24.	M	5	48	7	00	5	55	7	53	8	39	10	14	10	54	0	12	1	28	1	36	2	23	2	38
	A	6	09	7	32	6	23	8	28	9	13	10	47 ☉	11	28	0	39	1	48	1	56	2	44	2	59
25.	M	6	32	8	07 ☉	6	54 ☉	9	04	9	47	11	22			1	06	2	08	2	15	3	03	3	19
	A	6	58	8	43	7	26	9	41	10	10	11	54	0	01	1	30	2	26	2	34	3	21 ☉	3	28
26.	M	7	26	9	22	7	59	10	16	10	52			0	32	1	52	2	42	2	51	3	39	3	55
	A	7	56	10	02	8	37	10	51	11	26	0	26	1	00	2	12	2	58	3	08	3	57	4	14
27.	M	8	28	10	42	9	16	11	26	11	58	0	57	1	26	2	30	3	13	3	24	4	17	4	33
	A	9	03	11	22	9	55					1	24	1	50	2	47	3	27	3	40	4	36	4	53
28.	M	9	40			10	34	0	00 ☉	0	29	1	52	2	13	3	03	3	42	3	57	4	57	5	13
	A	10	18	0	00	11	11	0	31	0	59	2	14	2	33	3	17	3	57	4	14 ☉	5	19	5	36
29.	M	10	58			11	47	1	00	1	26	2	35 ☉	2	51	3	31	4	12	4	32	5	41	5	59
	A	11	37					1	28	1	51	2	55	3	08	3	44	4	28	4	51	6	06	6	24
30.	M					0	22	1	53	2	15	3	13	3	23	3	58	4	44	5	13	6	33	6	52
	A	0	15			0	54	2	16	2	38	3	29	3	38	4	13	5	03 ☉	5	37	7	03	7	20 ☉
31.	M	0	51			1	22			2	58			3	51	4	27			6	03			7	46
	A	1	23			1	48			3	17			4	05	4	43			6	30			8	20

M Stands for Morning. *A* Afternoon. ☉ for Sunday.

An Account of the foregoing Tide-Table. By the same Hand.

Sir,

COnfidering how much the River of *Thames* is fre-quented by Shipping, and how long it has been the Chief Place of *Commerce* in thefe Parts of the World, one would think our *Seamens Accounts* of its *Tides* fhould be very exact, and their Opinions concerning them Rational ; whereas if they be enquired into, no-thing will be found more Erroneous and Idle.

For they taking notice that the *High-waters* at and near the *New* and *Full Moons*, run an hour and a half, or two *Points* of the *Compafs* longer than at the *Quar-ters*, conclude generally, that 'tis the Inconftancy of the *Winds* that caufes it, never confidering how improbable it is, that fo inconftant and changeable a *Caufe* fhould effect fo conftant an *Inequality*.

In which Opinion the *Tide-Tables* of our *Almanacks* have contributed much to confirm them ; for therein the *Moons Age* is got by the *Epacts*, thence the Time of her *Southing* by the allowance of 48 minutes of Time for every Days Age, as if her *Diurnal Motions* and *Returns* to the *Meridian* were altogether equable, than which nothing is more falfe ; and then the Time of the *High-Water* at *London-Bridge* is made by adding 3 hours to the Time of her *Southing* fo got, as if there were the fame conftant fpace of Time betwixt the *Moons Southing*, and the *High-Waters*, which by this means are often made two hours different from Truth and Experience.

To amend this fault, fome of the more skilful have Calculated the Times of the *Moons Southings* exactly, and then made their *Tide-Tables* by adding 3 hours conftantly to them, by which means, tho they agreed nearer with Experience at the *Spring-Tides*, or near the *New* and *Full Moon*, yet they erred not much lefs (than by the old way of account they would have done) at the *Quarters*, or in the *Neap-Tides* ; the Inequality of the *Tides* being

above

above double to the Errour committed in finding the *Moons Southings* by her *Age.*

Mr. *Booker* was the firft that gave any Directions for the amendment of this Reckoning, and that was only to fubftract an hour from the Times in his *Tide-Table,* about the firft and laft *Quarters* of the *Moon,* becaufe the *Neap-Tides* did not flow fo long as the *Springs,* by one *Point* of the *Compafs.* But Mr. *Henry Philips,* a Perfon well known by his Works of *Navigation,* was certainly, the firft that brought the Inequality to a *Rule,* whofe *Theory* of the *Tides,* and a *Table* grounded on it, for the *Year* 1668, was printed in Mr. *Oldenburgh's Philofophical Tranfactions,* for the Month of *April* that Year, Numb. 34. which was found much more conformable to Experience than was expected.

Having frequent Occafion to pafs betwixt *London* and *Greenwich* by Water, fome two Years agone, I took notice that the *Tides* feldom held out fo long as Mr. *Philips's* Calculation gave them, and therefore in the Months of *October* and *November,* I began to obferve them more diligently, and procured them to be carefully noted by an ingenious Friend at *Tower-Wharfe.* From thefe Obfervations I raifed a Correction of Mr. *Philips's Numbers,* and caufed a *Tide-Table* to be made agreeable to it, which was Printed by Mr. *Hook* in his *Philofophical Collections,* Numb. 4.

But the Weather then proving ftormy and unfeafonable, I durft not rely on thofe *Obfervations,* nor that *Correction,* and therefore in the *Spring* and *Summer Months* following of the *Year* 1682, I fet to obferve them again, and with the help of my Friends and Servants, I noted the Times of above 80 *High-Waters* at *Tower-Wharfe* and *Greenwich,* whereby I found that the greateft and leaft differences betwixt the *Moons true Southing;* and the *High-waters,* were not, as Mr. *Philips* had placed them, at the *Full* or *New* and *Quarter Moons,* but the greateft nearer to the *Neaps,* the leaft to the *Higheft Spring-Tides.* I found alfo, that the Inequality was not the fame that he had made it, and after a Trial or two, that I could reprefent and anfwer above 60 of thefe *Obfervations* wit'

lefs

less than one quarter of an hours difference; which, considering how difficult it is to determine the Time of an *High-Water* exactly, I cannot but esteem a very good Agreement.

Hitherto our *Tide-Tables* have only shewed the time of that *one High-water* which next follows the *Moons Southing*, but in this new *Table* I have given the times of both, concerning which, I desire it may be noted.

That when by reason of great *Droughts* in *Summer*, or extreme *Frosts* in *Winter*, the *Springs* are low, and the *Fresh Waters* less than usual, the *Tides* may hold up longer than the Times noted in the *Table*; as also when strong *North-Westerly* or *Northerly Winds* blow, which bring in an Extraordinary Floud from the *Northern Seas*, and keep it up longer than other times.

So on the contrary, when the Winds blow hard on the *Opposite Points* of the *Compass*, or when we have much *Rain* and great *Freshes*, the *Tides* hold not out so long as the Times shewed in the *Table*, the *Freshes* overpowring and checking them sooner; Yet have I never found that the differences betwixt the *Calculated* and *Observed High-Waters* have much exceeded half an hour; Most commonly they are scarce half so much.

This *Table* may be reduced and made to serve for any other *Port* of His Majesties Dominions or Neighbouring Countrys, by only substracting or adding so much time to the *High-Waters* noted in it, as the *High-Water* observed in the said place shall be found to precede, or follow the Time of the *High-Water* the same Day herein noted. For by such Accounts as I have met with and received of the *Tides* in remote Places, I find there is every where, about *England*, the same difference betwixt the *Spring* and *Neap-Tides*, that is here observed in the River of *Thames*.

I could easily have made and given you a *Table* for this *Reduction*, if I durst have relied, on the Account our *Mariners* give of the *Tides* in other Ports, but I find their Opinions different, except where they have copied from one another in their *Kalendars*, by reason of the aforemention'd difference betwixt the Times of the *Moons*
southings,

Southings, and the True *High-Waters*, for which reason I forbear it, till further Experience shall have informed us better.

An Observation of the Beginning of the Lunar Eclipse which hapned Aug. 19. 1681. in the Morning, made on the Island of St. Lawrence or Madagascar, by Mr. Tho. Heathcot, and communicated by Mr. Flamstead.

MR. *Heathcot* was Chyrurgeon to a Ship which lay then at the bottom of a deep *Bay* on the *Western Shore* of the *Island*, and that part which the *Portugese* and our Maps call the *Terra del Gada*, he had with him then on Shore, a *Quadrant* of 2 Foot *Radius*, and a *Telescope* of 9 Foot, but no *Clock*; to supply which defect, he made a *Pendulum* of a String and a Bullet 39 Inches long, that each single *Vibration* might answer a *Second* of Time: Waiting the beginning of the *Eclipse* with his Glass, as soon as he saw the True *Shadow* enter on the *Moons Limb*, he caused his Friends, who assisted him, to make the *Pendulum* Vibrate, and count its Vibrations; of which they had numbred 140 $\frac{1}{2}$ $\frac{''}{10}$ of time when he took the height of *Procyon* (then East of the *Meridian*) $\overset{0}{25}$ $\overset{---}{30}$ the next day he observed the Suns *Meridional* height with the same *Quadrant*, whence he found the *Latitude* of that Place $\overset{0}{19}$ $\overset{'}{19}$ South, hence the time when he took the Height of *Procyon* is found $\frac{h}{4}$ $\overset{'}{11}$ *mane*, and substra-cting the $\frac{1}{2}$ $\overset{''}{10}$ past since the observed beginning of the Eclips, its

	h	*'*	*''*
True Beginning was at	4	48	40
Which at the Observatory, here, I noted at	1	50	40
therefore this part of *Madagascar* more *easterly*	2	58	00

or 44 $\overset{o}{30}$, which our Maps make 52 *gr*; that is 7$\frac{1}{2}$ *gr* more remote from it than it really is.