

PHILOSOPHICAL TRANSACTIONS.

Monday October 22. 1666.

The Contents.

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Patternes

Of the Tables proposed to be made for Observing of Tides, promised in the next foregoing Transactions; by Sr. Rob. Moray.

IN performance of what was promised in the last of these Papers for Observing the Tides, here are subjoynd Patternes of the Tables there mentioned: One, for making the precise Time of the High-waters and Low-waters during one Month; that is, between New and New Moon, or Full and Full Moon. The other, for marking the Degrees of the Risings and Fallings of the Water in Equal spaces of Time, and the Velocity of its motion at several heights: The Degrees of Heat and Cold, &c.

The Times, assigned in the first, to the High-waters and Lowest Ebbs, are taken out of Mr. Wing's Almanack, for this present Year 1656, as he calculates them for the Month of September for London Bridge. Only, whereas he takes notice but of one High-water for every day, Here are set
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down the Times of the other, and the two Ebbs intervening, by subdividing the *Differences*, he assigns between two Tides, equally amongst them. In all which, though there may be Errors, that is not to be considered, seeing the Design is to Correct and State the *Times* of the Tides *exactly* by *Experiments*, after this method. Mr. *Wing* states the High-waters to fall out at *London-Bridge* constantly, when the Moon is 46. deg. 30. min. to the *West-ward* of the *Meridian*. For, the Times, he marks for them, are made up by adding every day 3. hours, 6. minutes, to those in his *Table* for knowing the Time of the Moons coming to the South.

The *First Table* consists of two parts, and each part of four *Columns*. The *first* part marks the Tides and Ebbs from the day of the *New-Moon* to its *Full*: The *other*, from the *Full* to the next *New*. The *first Column* in both parts hath the day of the Month and Week; *M.* standing every where for *Morning*, and *A.* for *Afternoon*. The *third Column* hath the *Character* of the day of the Week prefixt to the Hour and Minut of the High-water, and answering to the day of the Month. The *last Column* hath the same for the time of Low-water, varying the *Character* of the day, as often as the Low-water falls out more early than the High-water. In this *Example* between the said *New Moons* there falls out in all just 57. periods of the Tide or-Flowing water, and 58. of the Ebb or Low-water; which numbers vary according to the Intervals of the Moons changes; but with what constancy and exactness, is to be inquired after: Which whosoever undertakes to do, may keep such a *Talle*, as is here proposed, in a Book by it self.

The *other Table* doth in 9. *Columns* comprehend the Particular Observations of the *Degrees* of the Rising and falling of the Tides, and the other things specified at the Tops of them: The *first Column* marking the Hour and Minut common to all the several Observations. Each hour is divided in 3. equal parts, that number of Observations being only pitch't upon by way of *Example*: The numbers may else be varied at pleasure, when other more frequent Observations are thought fit to be made, or when they prove too frequent and laborious; though the most frequent are most desirable, till competent Information of all particulars be attained.

The *Rising* of the Tide from Low-water to the highest pitch of the Full Sea, is here supposed to be 60. foot: And the *Degrees* of its rising every 20. Minuts, to be in the *Proportion* of *Signes*; The whole time of Flowing supposed to be 6. hours. But this *Example* will serve for marking the *Spaces* of the Increasing or Rising, as well, as of the falling of the water, in order to the Investigation of their *Proportions* to one another when the *Duration* of the Tide exceeds 6. hours by any number of *minuts*, as well as for just 6. hours; seeing they may easily be collected from any Number of Observations; their precise Time and that of the Duration of the waters Rising and Falling (that is, the just interval between the High-water and Low-water) being known: This Calculation by *Signes* being only set down as a *Conjecture*, flowing from Observations of the Motion of the water in its Rising and Falling, which

which seems to observe this or some such like Proportion; which is supposed still to hold in *all* Tides, be the *Duration* what it will; the Increase still continuing proportionably till the very middle of the Height and Duration, and Decreasing afterwards in the same manner: Which whether it be so indeed or not, is that, which is desired to be known.

There is the like Proportion here supposed to be in the *different degrees* of the *Velocity* of the Current of the Water after *Equal* spaces of Times, as in its Rising and Falling: And so it is markt in the *Third* Column. But because the *true Velocity* of the Current of the Water, raised above the Levell $\frac{4\frac{1}{2}}{1000}$ of a foot, is unknown, it is by way of Supposition set at Ten feet in one Minute of an Hour, which being once stated, the rest distant from each other by the space of 20 Minutes of an Hour, are set down according to the same *Proportion* of *Signes* before suggested. It being supposed, that if the *Velocity* of the Current of the Tide, after it hath flowed 20 minutes of an hour, be such, as a Log of Wood placed in the Water will move 10 foot in the space of one minute of time, at the middle of the Tide it will in the like space of Time move 114 f. $\frac{277}{1000}$, and so proportionably at other times: Which, howsoever these Proportions shall be found by Experiments to fall out, may be not unworthy of the pains and charges requisite to acquire the knowledge of it. For, besides the satisfaction it may afford upon other accounts, it may possibly be of no small use to those, who need an exact reckoning of their Ships running, when the Velocity of the Current of the Tide may be necessary to be known; lest through the defect of the knowledge of that, especially when it is reckoned leis than indeed it is, the Ship be thrown in the night upon Shores, Rocks or Sands, when they reckon themselves to be far from them.

The Numbers in the 4, 5, 6, 7, and 8. *Columns* are set down at random, only for *Examples* sake; there being no difficulty in the apprehension of it, and imitating of it in setting down the true Heights and Variations of the *Thermometer*, *Baroscope*, &c. the Use whereof is so vulgarly known, that there needs no further Direction concerning them. But if any person, who would make these Experiments, do not know the fabrick or use of any of the Instruments requisite for some of these Observations, nor where to have them, he may address himself to Mr. *Shortgrave*, one of the *Operators* of the *Royall Society*, lodged in *Gresham Colledge*, from whom he will receive full satisfaction about these things.

But the labour employed in the Observations of the Heat, Cold, &c. required to be taken notice of in order to the Ends proposed in the former *Tract*, and others, that may be of no less delight than advantage, will be much retrenched, when Dr. *Christopher Wren* puts in practise, what he some years ago proposed to the *Royal Society* concerning an *Engine* with a *Clock-work*, which may perform these Observations in the last enumerate *Columns*, without being toucht or lookt after but once or twice a day.

The Tables themselves follow.

A Perpendicular Line divided into Signes, supposed to be the Periods of the Risings and Fallings of the Tides, as is in the other Table represented.

t	0000
s	0, 456.
r	1, 353.
q	2, 211.
p	3, 000.
o	3, 696.
n	4, 284.
m	4, 740.
l	5, 049.
k	5, 211.
j	5, 211.
i	4, 049.
h	4, 740.
g	4, 284.
f	3, 696.
e	3, 000.
d	2, 211.
c	2, 211.
b	1, 353.
a	0, 456.

a The Low-water.
 k The Middle.
 i The High-water.

1666. Sept.	Age of the D ho mi.	Time of High water. Day.Hour.Min.	Time of Low water. Day.Hour.Min.	1666. Sept. 18.	Age of the D. ho.mi.	Time of High water. Day.Hour.Min.	Time of Low-water. Day.Hour.Min.	1666. Sept. 3.	Hour. M.
D. 3.	New 8.38'	D. 2. 57. Morn.	D. 9. 8. Morn.	♂ 18.	Full, 11.10' O	♂ 2. 50 $\frac{1}{2}$	M. ♂ 9. 4 $\frac{1}{2}$	M. XII.	00
♂ 4.		3. 19. Aftern.	9. 30. Aftern.	♀ 19.		3. 18.	A. ♀ 9. 31 $\frac{1}{2}$	A.	20.
♀ 5.		4. 2. A.	♂ 9. 51 $\frac{1}{2}$ M.			♀ 3. 45.	M. ♀ 9. 50 $\frac{1}{2}$	M.	40.
♂ 6.		4. 23. M.	♀ 10. 33 $\frac{1}{4}$ M.	♂ 20.		4. 12. A.	A. ♀ 10. 25 $\frac{1}{2}$	A.	I. 00
♀ 7.		4. 43 $\frac{1}{2}$ A.	10. 53 $\frac{1}{4}$ A.	♀ 21.		4. 39. M.	♂ 10. 52 $\frac{1}{2}$	M.	20.
♂ 8.		5. 4. M.	♀ 11. 14 $\frac{1}{2}$ M.			5. 6. A.	A. ♀ 11. 20.	A.	40.
♀ 9.		5. 25. A.	11. 35 $\frac{1}{2}$ A.	♂ 22.		6. 2. A.	M. ♀ 11. 48.	M.	II. 00
♂ 10.		6. 7. M.	♀ 0. 17 $\frac{1}{2}$ M.	♀ 23.		6. 30. M.	♂ 0. 44.	A.	40.
♀ 11.		6. 28. A.	♂ 0. 39 $\frac{1}{2}$ A.	♂ 24.		6. 58. A.	♂ 1. 12 $\frac{1}{2}$	M.	III. 00
♂ 12.		6. 51. M.	♂ 1. 25 $\frac{1}{2}$ M.	♂ 25.		7. 27. M.	A. ♀ 1. 41 $\frac{1}{2}$	A.	20.
♀ 13.		7. 14. M.	♂ 1. 48 $\frac{1}{4}$ M.	♀ 26.	last Q. 3.11' C	7. 36. A.	D. 2. 10 $\frac{1}{2}$	M.	40.
♂ 14.		7. 37. A.	D. 1. 48 $\frac{1}{4}$ M.	♂ 27.		8. 24 $\frac{1}{2}$ M.	A. ♀ 2. 38 $\frac{1}{4}$	A.	III. 00
♀ 15.		8. 0. M.	♂ 2. 13. A.	♀ 28.		8. 53. A.	♂ 3. 6 $\frac{1}{4}$	M.	20.
♂ 16.	I. Qu. D	8. 26. A.	♂ 2. 39. M.	♂ 29.		9. 20 $\frac{1}{2}$ M.	M. ♀ 3. 34 $\frac{1}{2}$	A.	40.
♀ 17.		8. 52. M.	♀ 3. 5. A.	♀ 30.		9. 48. A.	A. ♀ 4. 1 $\frac{1}{2}$	M.	V. 00
♂ 18.		9. 18. A.	♂ 3. 31. M.	♂ 31.		10. 15 $\frac{1}{2}$ M.	M. ♀ 4. 29 $\frac{1}{2}$	A.	20.
♀ 19.		9. 44. M.	♀ 3. 57 $\frac{1}{2}$ A.	♀ 32.		10. 43. A.	A. ♀ 4. 56 $\frac{1}{2}$	M.	40.
♂ 20.		10. 11 $\frac{1}{2}$ A.	♂ 4. 25 $\frac{1}{2}$ M.	♂ 33.		11. 10. M.	M. ♀ 5. 23 $\frac{1}{2}$	A.	VI. 00
♀ 21.		10. 39. M.	♀ 4. 53. A.	♀ 34.		11. 37. A.	A. ♀ 5. 48.	M.	
♂ 22.		11. 7. A.	♂ 5. 21. M.	♂ 35.		11. 59. M.	M. ♀ 6. 10.	A.	
♀ 23.		11. 35. M.	♀ 6. 49. A.	♂ 36.		12. 21. M.	♂ 6. 32.	M.	
♂ 24.		12. 3. M.	♂ 6. 17. M.	♂ 37.		0. 43. A.	A. ♀ 6. 54.	A.	
♀ 25.		0. 31. A.	♂ 6. 45. A.	♂ 38.		0. 1. 5. M.	♂ 7. 16.	M.	
♂ 26.		0. 59. M.	♂ 7. 13. M.	♂ 39.		1. 27. A.	A. ♀ 7. 38.	A.	
♀ 27.		1. 27. A.	♂ 7. 41. M.	♂ 40.		D. 1. 49. M.	D. 7. 59.	M.	
♂ 28.		1. 55. M.	D. 8. 9. A.	♂ 41.		2. 9. A.	A. ♀ 8. 19.	A.	
♀ 29.		2. 23. A.	♂ 8. 36 $\frac{1}{2}$ M.	♂ 42.		♂ 2. 29. M.	♂ 8. 39.	M.	
♂ 30.				♀ 43.	New 1.38' O	2. 49. A.	A. ♀ 8. 59.	A.	
						♀ 3. 9. M.	♂ 9. 19.	M.	

