



XXIV. On the solar and lunar periods

Mr. James Utting

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creasing, founded on any registered observations of mortality, that have as yet been published, the computist may lean with due confidence on its accuracy; it contains, I believe, no error of moment, the numbers respectively were derived from a double operation pursued, logarithmically and by calculation, the former to check and verify the latter; and though this is indispensable, yet the process by logarithms is not invariably critically exact in any specific inquiry, as will happen in fact from such tables, having been mostly by interpolation of differences compiled and extended: when then any result occurs so, as dissonant, it is only to be settled by a distinct revision, the work collated anew, or by some independent mode of verification.

Of all the chartered companies established, they avowedly profess to blend with their customary the life annuity business in every species of variety and form: it is unaccountably strange, then, they evince not partially a wish to promote the cause of that science, by which it is, that the stability of their plans is to be determined, and even existence vitally depend; and if we look unto those mushroom societies spontaneously emerging out of obscurity, ignorance or corrupt motives, it is but too visibly beheld that the age of bubble scheme and system has revived again, or is rapidly reviving: it would be a truly laudable task for any one possessing abstractedly the means, to devote some portion of time and talent to the discussion of their principles, views and measures; if however, and I must so qualify the expression, they can sustain this test and scrutiny of examination. I am aware of what is to be done, but, much as inclined, the engagement is such that few cheerfully and with alacrity would undertake and prosecute it through all its minutiae of condition.

Aske Terrace, Hoxton, Feb. 1821.

J. B. BENWELL.

XXIV. *On the Solar and Lunar Periods.* By Mr. JAMES
UTTING, of Lynn Regis.

To Mr. Tilloch.

SIR, — I HAVE sent you for insertion in the Philosophical Magazine (if approved) a few extracts and remarks relative to the solar and lunar periods, as stated by modern astronomers, in order (in part) to meet the wishes of Mr. Yeates: as probably some of your astronomical correspondents are in possession of the means of a more extensive reference, my selections are but few, but I believe them to be the most correct published, agreeable to the present improved state of the science.

I remain, sir, yours truly,

Norfolk-street, Lynn Regis, Feb. 8, 1821.

JAMES UTTING.

M. DE

M. DE LA LANDE. *Astronomy*, in 3 vols. Quarto, 3d Edit.
Paris, 1792.

				Days.	hrs.	min.	sec.
Tropical year	..	..	..	365	5	48	48
Sidereal do.	..	..	..	365	6	9	11.6
Tropical rev. of the ☽	..	..	..	27	7	43	4.6795
Sidereal do.	..	..	..	27	7	43	11.5259
Synodic do.	..	..	..	29	12	44	2.8283
Anomalistic do.	..	..	..	27	13	18	33.9499
Rev. of the ☽ to her ☿	..	..	..	27	5	5	35.6030
Tropical rev. of the ☽'s perigee				3231	8	34	57.6177
Sidereal do.	..	..	..	3232	11	11	39.4089
Tropical rev. of the ☽'s ☿	..	..	..	6798	4	52	52.0296
Sidereal do.	..	..	..	6793	7	13	17.7440
Diurnal mot. of the ☽ to the equinox				13°	10'	35"	0.027843940
Do. of the ☽'s perigee	..	..	..	0	6	41	0.069815195
Do. of the ☽'s ☿	..	..	..	0	3	10	0.638603696
The motion of the ☽ to the fixed stars being represented by unity, that of her perigee is						0.008452264448	
And that of her node	..	..	..			0.004021853526	
Sec. mot. of equinoctial points	..	..	..			1° 23' 45"	

M. LAPLACE. *System of the World*. Edit. 4th. Paris (Quarto, 1813).

				Days.	hrs.	min.	sec.
Tropical year	..	..	..	365	5	48	51.6096
Sidereal do.	..	..	..	365	6	9	11.5344
Sidereal rev. of the ☽	..	..	..	27	7	43	11.50107
Do. ☽'s perigee	..	..	..	3232	13	48	53.0496
Do. ☽'s ☿	..	..	..	6793	9	22	45.9840
Synodic rev. of the ☽	..	..	..	29	12	44	2.79914
Sec. motion of equinoctial points	..	..	..			1° 23' 30"	

M. DELAMBRE. *Astronomy* (Theoretical and Practical),
3 vols. Quarto, 1814.

				Days.	hrs.	min.	sec.
Tropical year	..	..	..	365	5	48	50
Sidereal do.	..	..	..	365	6	9	11.5344
Tropical rev. ☽	..	..	..	27	7	43	4.7183
Sidereal do.	..	..	..	27	7	43	11.8459
Anomalistic do.	..	..	..	27	13	18	35
Synodic do.	..	..	..	29	12	44	2.8498
Rev. of the ☽ to her ☿	..	..	..	27	5	5	36
Rev. of the ☽'s perigee	3231	8	34	57
Sec. motion of equinoctial points						1° 23' 30"	

Vol. 57. No. 275. *March* 1821.

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M. BIOT.

M. BIOT. Astronomy (Physical and Elementary), 2d Edit.
3 vols. Oct. 1811.

				Days.	hrs.	min.	sec.
Tropical year	..	..	..	365	5	48	51.6
Sidereal do.	..	..	..	365	6	9	11.5776
Sidereal rev. \mathcal{D}	..	..	..	27	7	43	11.5104
Anomalistic do.	..	..	..	27	13	18	37.44
Synodic do.	..	..	..	29	12	44	2.8032
Tropical rev. \mathcal{D} 's perigee	..	..	..	3231	11	24	8.64
Sidereal do.	..	..	..	3232	13	56	12.48

Sec. mot. of equinoctial points .. $\overset{\circ}{1}$ $\overset{'}{23}$ $\overset{''}{30}$

BURCKHARDT. Lunar Tables, Quarto. Paris, 1812.

				S.	$\overset{\circ}{0}$	$\overset{'}{52}$	$\overset{''}{53.5}$
Sec. mot. in long. in 100 Julian years	10	7	52	53.5	} *		
Do. of the \mathcal{D} 's anomaly	..	6	18	49			
Do. of the \mathcal{D} 's \mathcal{Q}	..	4	14	10			

Mr. Vince in the 2d edit. of his Complete System of Astronomy, 3 vols. quarto. 1814, has adopted the solar and lunar motions as given by M. de la Lande, in the 3d edition of his Astronomy, as before stated, which have also been copied into several of our modern astronomical works and Encyclopædias. In Taylor's Sexagesimal Tables, and in Hutton's Math. and Phil. Dictionary, the tropical year is stated at 365 days 5 hours 48 min. 45 sec. Bonnycastle's Astronomy states it at half a second more. Barlow (Phil. Dictionary); Edinburgh and Imperial Encyclopædias; Lalande (*Astronomie*); Laplace (*Système du Monde*, 1st edit.); Squire (Grammar of Astronomy); Vince (Astronomy); Woodhouse (Astro.); Whiting (Astronomy now publishing); and Dr. Young in his Treatise on Philosophy, in 2 vols. quarto, state the mean length of the solar year at 365 days 5 hours 48 min. 48 sec. Dr. O. G. Gregory (Astro.) states it at one second more. Mr. Burckhardt, 365 days 5 hours 48 min. 49.732 seconds. Laplace (*Système du Monde*, 4th edit.); Delambre (Solar Tables); Biot (Astronomy) state the solar year

* From which I have deduced the following periods :

				Days.	hrs.	min.	sec.
Trop. rev. of the \mathcal{D}	..	..	..	27	7	43	4.70539
Sid. do.	..	..	..	27	7	43	11.53824
Anomalistic do.	..	..	..	27	13	18	33.35681
Synodic do.	..	..	..	29	12	44	2.84517
Rev. of the \mathcal{D} to her \mathcal{Q}	..	..	..	27	5	5	35.71380
Trop. rev. of the \mathcal{D} 's perigee	..	..	..	3231	10	56	57.02423
Sidereal do.	..	..	..	3232	13	30	33.93601
Trop. rev. of the \mathcal{D} 's \mathcal{Q}	..	..	..	6798	6	21	26.4000
Sidereal do.	..	..	..	6793	8	55	46.78841

Sec. mot. equinoctial points being taken at $\overset{\circ}{1}$ $\overset{'}{23}$ $\overset{''}{35}$

at

at 365 days 5 hours 48 min. 51.6 seconds. M. Delambre in his Astronomy has finally fixed it at 365 days 5 hours 48 min. 50 sec. being nearly the same result as that obtained by M. Burckhardt. The tropical year of 365 days 5 hours 48 min. 48 sec. appears from the latter statements to be rather too little; but as the solar year is decreasing, it is evidently the best to be adopted in the reformation of the calendar—*Vide* my remarks on the proposal for establishing a more correct account of civil time, in Phil. Mag. vol. 55. p. 350. The true solar year at the commencement of the present century appears to be

	Days.	hrs.	min.	sec.
	365	5	48	50
Sid. year (<i>Syst. du Monde</i> , ed. 4th)	365	6	9	11.5344*.
Synodic period D (do.) ..	29	12	44	2.8 (very nearly).

From which I have calculated the following particulars (and which I trust are as correct as any at present published).

	Circles.	S.	°	'	°	'	°	'
Sec. mot. of the \odot to the equinox	100	0	0	45	51	5985		
Do. of the \odot 's perigee ..	0	0	1	43	18	0900		
Do. of the \odot 's anomaly ..	99	11	29	2	33	5085		
Do. of the equinoctial points ..	0	0	1	23	86	5872		
Sid. and sec. motion \odot ..	99	11	29	22	15	0112		
Do. .. D ..	1336	10	6	29	44	7884		
Sec. mot. of the D to the equinox	1336	10	7	53	21	3756		
Sec. mot. of the D α' \odot ..	1236	10	7	7	29	7771		
Do. .. D 's perigee ..	11	3	19	2	51	9599		
Do. .. D 's anomaly ..	1325	6	18	50	29	4157		
Do. .. D 's S ..	5	4	14	9	51	1904		
Do. .. D to her S ..	1342	2	22	3	12	5660		
Do. .. \odot to the D 's S ..	105	4	14	55	42	7889		
	Days.	hrs.	min.	sec.				
Trop. rev. of the D ..	27	7	43	4.666725				
Sid. rev. of the D ..	27	7	43	11.501745				
Anom. rev. of the D ..	27	13	18	33.239828				
Synodic rev. of the D ..	29	12	44	2.800000				
Rev. of the D to her S ..	27	5	5	35.703570				
Rev. of the \odot to the D 's S ..	346	14	52	36.760457				
Trop. rev. of the D 's perigee ..	3231	11	14	45.133018				
Sid. rev. of the D 's perigee ..	3232	13	48	53.049600				
Trop. rev. of the D 's S ..	6798	6	50	41.814208				
Sid. rev. of the D 's S ..	6793	9	22	45.984000				
One synodic rev. D contains ..	29	12	44	2.8				

* N. B. The anomalistic year contains 365 6 13 59.24260

			Circle.	S.	°	'	"
Motion of the ☽'s anom. in	}	1	0	25	49
this period		0	25	49	0·8491040724
Do. ☾'s anom.		0	0	29	6
Do. ☾ to the ☽'s ☿				0	1	0	40
							13·8721465646

Hence a Chaldean period of 223 lunations

				Days.	hrs.	min.	sec.
contains	..	..	..	6585	7	42	24·4
Nineteen rev. of the ☾ a' ☽'s ☿				= 6585	18	39	58·4

		Circles.	S.	°	'	"
Motion of the ☽'s anom.	238	11	27	10		9·3502
Do. ☾'s anom.	18	0	10	29		34·7006
Dist. of the ☾ a' ☽'s ☿	18	11	29	31		33·4887

Whence the comp. of the motion of the ☾ to the ☽'s ☿ in each Chaldean period amounts to 28' 26"·5113, as I before stated.

XXV. On the Division of the Circle into seventeen equal Parts.

To Mr. Tillock.

SIR, — A CURIOUS discovery lately made in pure mathematics, we owe to M. Gauss of Göttingen, who has shown, contrary to the opinion that has prevailed from the most ancient times, that a regular polygon of seventeen sides may be inscribed in a circle, without having recourse to any other principles than those admitted in the plane geometry. As the author's own solution of this problem is a part of a peculiar and very abstruse and recondite theory, the following communication, in which the problem is solved without any reference to that theory, may not be unacceptable.

Let $a = \frac{360^\circ}{17} = 21^\circ \frac{3}{17}$. If we set about solving the problem in the usual way, by seeking a value of $\cos. a$, we shall obtain an equation of sixteen dimensions; because, in this mode of proceeding, the cosines of the several arcs, a , $2a$, $3a$, &c., sixteen in number, are not distinguished from one another, and are all comprehended indiscriminately in the same result. The equation thus obtained, although of sixteen dimensions, is however only of the eighth order, every two arcs that together make the whole circumference having the same cosine, viz. $\cos a = \cos 16a$, $\cos 2a = \cos 15a$, $\cos 3a = \cos 14a$, &c.

Supposing n to denote any whole number, let $\phi = 4na$; then,

$$4\phi + \frac{\phi}{4} = n \times 17a = n \times 360^\circ. \quad (1)$$

where-