ASTRONOMY
OF THE
SATELLITES
OF THE
Earth, *Jupiter* and *Saturn*:

Grounded upon Sir *Isaac Newton*'s Theory of the Earth's SATELLITE.

The THEORY explain'd, and made easy to the meanest Capacity, in calculating the true Place of the Moon:

And freed from the Errors printed in the said Theory, by Dr. *Gregory*, Dr. *Harris*, and several other Authors.

By which now the Place of the Moon, and Eclipses of the Luminaries, are found to a very great Exactness.

ALSO

New Tables of the Motions of the Satellites of *Jupiter* and *Saturn*, (founded upon the Observations of Mr. *Flamsteed*, Mr. *Cassini*, Mr. *Hugens*, Dr. *Halley* and Mr. *Pound*,) from the Vernal Equinox:

By which their Places and Positions, in respect of one another, may be exactly determined at any given Time.

Adapted to the Meridian of London.

To which is added, A PROBLEM to find the Latitude of the Place by the Altitude of the Sun, Moon, or Star, upon any Azimuth; being very useful for all Sea-faring Men, as well as Gentlemen and others.

By *CHARLES LEADBETTER*,
Teacher of the MATHEMATICKS.

LONDON:
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ADVERTISEMENT.

THE following Mathematical Sciences are taught by the Author hereof, at his Houſe, at *The Hand and Pen* in *Cock-Lane*, *Shoreditch*, *London*; or at any Gentleman's Apartment, *viz.* Vulgar and Decimal Arithmetick, Geometry apply'd to the Menſuration of Superficies and Solids, by Pen and Sliding-Rule; Projection of the Sphere on any Circle; Trigonometry, plain and ſpherical; Surveying of Land, by any Inſtrument now in Uſe; Gauging of all ſorts of Veſſels, with all the practical Methods uſed by the Officers of the Exciſe; Aſtronomy in all its Branches; Navigation by the Plain and Mercator's Chart, and by the Arch of a great Circle; Geography and the Uſe of the Globes, with all other Mathematical Inſtruments whatſoever. Dialling upon any Plane for any Latitude.

Where may be had, *Firſt*, His Treatiſe of Eclipſes for 26 Years. 2. His Sheet of the Conjunction of ♄ ♃ and ♂ 1722, and *Mercury*'s Paſſage over the Sun, *October* 29, 1723. 3. His Aſtronomical Calendar for 28 Years, ending 1753. 4. His Syſtem of the Planets demonſtrated. 5. His Sheet of all the Luminarian Eclipſes for 35 Years, ending *Anno* 1761. 6. His Compleat Syſtem of Aſtronomy. 7. His Aſtronomy of the Satellites of the Earth, *Jupiter* and *Saturn*: Alſo ſold by *J. Wilcox*, at the *Green-Dragon* in *Little-Britain*, *London*.

READER,

I Here present you with my *Astronomy of the Satellites of the* Earth, Jupiter *and* Saturn. *What I mean by the Satellite of the Earth, is the Moon, with Sir* Isaac Newton'*s last Improvement of the Theory of that Planet, which I had published in my* Compleat System of Astronomy, *had it not been for some very gross Errors printed in the Theory, as laid down by Dr.* Gregory, *in Pag.* 334. *of his* Latin Astronomy, *and carried on in his* English Astronomy, *Vol. II. pag.* 563. *by Dr.* Harris *in his* Lexicon Technicum, *Vol. I. under the Word* Moon: *and by the Learned Author of* Prælectiones Astronomicæ, *pag.* 318. *and in the* English *Translation, pag.* 345. *The most material Faults are the greatest Equation of the Apogee, and the radical Place for the Year* 1681. *For whoever will be at the pains to examine the Numbers (as I have done) will find that the greatest* 66782, *and least* 43319, *Eccentricities, will give the greatest and least Equations of the Lunar Orbit* 7° 39′ 30″, 4° 57′ 56″; *and* 12° 18′ 15″ *for the greatest Equation of the Apogee, which, as they have it, is only* 12° 15′ 4″. *By comparing these Numbers with the Times of the visible Eclipses of the Sun in the Years* 1715, 1722, 1724, 1726, *which were carefully observed at* London, *I am satisfied that* *the greatest Equation of the Apogee is* 12° 18′ 15″ *as I have it in these my new Tables, and reduced them to the Meridian of* London.

By finding the true Times of the Conjunction, and Opposition of the Sun and Moon by this Theory, it may seem, at first, to them unskill'd in these Matters, to be almost an Impossibility; but after due Consideration it will appear, that those Equations, that depend upon the Distance of the Moon from the Sun, vanish, which are the 5th, 6th and 7th; and the first, second, and third Equations, alter but little, in a small Space of Time; so that regard is chiefly to be had to the fourth Equation, with which work as I have shewed in my Compleat System, Precept *7th. until you find the Orbit-Place of the Moon the same with the Sun's true Place, and then you have the middle Time of the true Conjunction or Opposition in the Moon's Orb, to the greatest Exactness imaginable.*

Many ingenious Persons have often wish'd, that Tables of the Motions of the Satellites of Jupiter *and* Saturn *were published, that thereby they might know at any time before-hand, how they wou'd appear when observed: Therefore, for the sake of the diligent Observer, I here publish mine, constructed from the Observations of Mr.* Hugens, *Mr.* Flamsteed, *Mr.* Cassini, *Dr.* Halley, *and Mr.* Pound; *which, I dare to say, are the correctest the World ever saw. The Method of finding their Places is plain and easy to be understood by any one, though meanly versed in these things.*

I have only one thing more to remind my Reader of, and that is, If he has a mind to find the Times of the Eclipses of Jupiter's *Satellites, after the* Cassinian *Method, he must observe, that the periodical Time of the*

first

first Satellite is nearly $\frac{1}{2447}$ *Part of the periodical Time of* Jupiter *from one Alphelion to another; whence the Equations of the Jovial Orbit being turned into Minutes and Seconds of Time, and adapted to those particular Revolutions of the Satellites, will make good the principal Parts of the Equations of these Satellites. By which Directions and easy Tables, any Observer may truly know their Distances from* Jupiter, *and distinguish one Satellite from another at any given Time; which will both be pleasant and advantagious to him in rectifying the Longitude of Places at Land, by the Times of their Eclipses.*

I remain a Friend to the Astronomical Student,

CHARLES LEADBETTER.

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The

BOOKS

BOOKS juſt publiſh'd, and ſold by J. Wilcox *in* Little Britain.

I. A Compleat Syſtem of Aſtronomy, in two Volumes; containing the Deſcription and Uſe of the *Sector*; the Laws of *Spherick Geometry*; the *Projection of the Sphere* Orthographically and Stereographically upon the Planes of the Meridian, Ecliptic and Horizon; the *Doctrine of the Sphere*; and the Eclipſes of the Sun and Moon for thirty-ſeven Years: Together with all the Precepts of Calculation. Alſo, new Tables of the Motions of the Planets, fix'd Stars, and the firſt Satellite of *Jupiter*; of Right and Oblique Aſcenſions, and of Logiſtical Logarithms. To the whole are prefix'd, *Aſtronomical Definitions*, for the Benefit of young Students. By *Charles Leadbetter*, Teacher of the Mathematicks. Price 12 *s.*

II. Aſtronomy, or, the true Syſtem of the Planets demonſtrated: Wherein is ſhewn, by Inſtrument, their Anomalies, Heliocentric and Geocentric Places, both in Longitude and Latitude, their Aphelions, Perihelions, Retrogradation, Elongation, Parallaxes and Diſtances from the Sun and Earth, with the Method of computing the Times when *Venus* and *Mercury* may be ſeen in the Sun's Disk. Alſo the Moon's Phaſes and Eclipſes of the Luminaries, for any Time paſt, preſent, or to come; with proper Cuts to each Planet, by which any Perſon may in a few Hours, and with great Eaſe, attain to a perfect Knowledge of the Planetary or Solar Syſtem. By *Charles Leadbetter.* Price 5 *s.*

III. A new Treatiſe of the Conſtruction and Uſe of the *Sector*; containing the Solutions of the principal Problems, by that admirable Inſtrument in the chief Branches of Mathematicks, *viz.* Arithmetick, Menſuration, Plain Trigonometry, Projection of the Sphere, Geography, Aſtronomy, Dialling, *&c.* illuſtrated with Variety of neceſſary Obſervations and pleaſant Concluſions; containing ſeveral Applications intirely new. By the late Mr. *Samuel Cunn*, now carefully reviſed by *Edmund Stone*, F. R. S. Price 4 *s.*

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VI. The Modern Navigator's Complete Tutor, or a Treatiſe of the whole Art of Navigation, in its Theory and Practice, Curioſity and Utility. By *Joſhua Kelly.* Price 4 *s.*

SECTION I.

To Calculate the true Place of the Moon, *according to Sir* ISAAC NEWTON's *last Improvement of his Theory.*

1. FROM the Tables of the Sun's Motions in my compleat Syſtem of Aſtronomy, calculate the true Place of the Sun, its Diſtance from the Earth, and Parts anſwering the Logarithm, and ſubtract the Mean Anomaly from the Mean Longitude, and you will have the Place of the Sun's Apogæum, as is ſhewed in the Examples for the firſt and ſecond Days of *January* at Noon, equal Time, *Anno* 1729.

2. Out of theſe Tables of the Moon's Mean Motions, take out the Longitude, Apogee and Node, to the Equal Time of the Queſtion propoſed, and gather the Mean Longitude and Apogee into two diſtinct Sums; but the Mean Motion of the Node being Retrograde, you muſt ſubtract the Motions for Months and Days from the Radical Place, as is uſually done, and as you ſee in the Examples following.

3. Before you can find any of the Moon's Equations, you muſt obſerve that theſe are ſtanding Numbers, *viz.*

The Earth's { Eccentricity -- -- 1692
Greateſt Equation $1^\circ 56' 20''$

The greateſt Annual Equation ☽ { Longitude $11' 49''$
Apogee 20 0
Node -- 9 30

And theſe four are always proportional to each other.

4. To find the firſt Equation of the Moon's Longitude. The Sun's Equation for the Time of the Queſtion is 28′ 6″, then by the Logiſtical Logarithms you muſt always ſay,

As 1° 56′ 20″ the Sun's greateſt Equation. —	116′	20″	LL. 2875	+
To its preſent Equation,	28	6	3294	
So ☽ Annual greateſt Equation,	11	49	7057	
To ☽ firſt Equation in Longitude	2	51	13226	

Note, this Equation muſt always be added to the Mean Longitude of the Moon, when the Sun's Mean Anomaly is 0,1,2,3,4,5 Signs; but muſt be ſubtracted, if the Sun's Mean Anomaly be 6,7,8,9,10,11 Signs: from which Theory I have fram'd the following Table.

Enter the Table with the Sign on the Head and Degree of the Sun's Mean Anomaly on the Left hand deſcending, but with the Degree on the Right hand aſcending, if the Sign fall at bottom of the Table, and in the place of meeting, you will have the firſt, or Annual Equation of the Moon's Longitude; which in this Example (as above) you will find to be 2′ 51″ to be ſubtracted. See *Gregory*'s *Aſtr.* p. 544.

A Table of the first Equation of the Moon.

Anom. ⊙	Sign 0 Add. ′	″	Sign 1 Add. ′	″	Sign 2 Add. ′	″	Sign 3 Add. ′	″	Sign 4 Add. ′	″	Sign 5 Add. ′	″	Anom. ⊙
0	0	0	5	47	10	7	11	49	10	21	6	0	30
1	0	12	5	58	10	14	11	49	10	15	5	49	29
2	0	24	6	9	10	21	11	49	10	7	5	38	28
3	0	36	6	19	10	26	11	48	10	1	5	27	27
4	0	48	6	29	10	31	11	48	9	55	5	16	26
5	1	0	6	39	10	37	11	47	9	47	5	5	25
6	1	12	6	49	10	42	11	47	9	40	4	53	24
7	1	24	6	59	10	47	11	45	9	33	4	42	23
8	1	36	7	9	10	52	11	44	9	26	4	30	22
9	1	48	7	19	10	56	11	42	9	19	4	18	21
10	1	59	7	28	11	1	11	41	9	11	4	6	20
11	2	11	7	37	11	5	11	39	9	2	3	54	19
12	2	23	7	46	11	9	11	36	8	54	3	43	18
13	2	35	7	55	11	14	11	34	8	46	3	31	17
14	2	46	8	4	11	19	11	31	8	37	3	19	16
15	2	58	8	13	11	22	11	29	8	28	3	7	15
16	3	10	8	22	11	25	11	25	8	20	2	54	14
17	3	22	8	31	11	28	11	22	8	11	2	42	13
18	3	34	8	39	11	30	11	19	8	1	2	30	12
19	3	46	8	47	11	32	11	15	7	52	2	18	11
20	3	57	8	55	11	35	11	11	7	43	2	5	10
21	4	9	9	3	11	38	11	6	7	34	1	52	9
22	4	20	9	11	11	40	11	2	7	24	1	40	8
23	4	32	9	19	11	42	10	58	7	14	1	28	7
24	4	43	9	27	11	43	10	53	7	3	1	15	6
25	4	54	9	34	11	45	10	48	6	53	1	2	5
26	5	4	9	41	11	46	10	43	6	43	0	49	4
27	5	15	9	47	11	47	10	38	6	33	0	37	3
28	5	27	9	54	11	48	10	32	6	22	0	25	2
29	5	37	10	1	11	48	10	26	6	11	0	12	1
30	5	47	10	7	11	49	10	21	6	0	0	0	0
	Sign 11 Sub.		Sign 10 Sub.		Sign 9 Sub.		Sign 8 Sub.		Sign 7 Sub.		Sign 6 Sub.		

5. *To find the Annual or first Equation of the Moon's Apogee.*

BY remembring what the Sun's Equation is for the present Time, you must say,

As 1° 56′ 20″ the greatest Equation,	116′ 20″	LL 2875	} +
To its present Equation. -- --	28 6	3294	
So greatest Annual Equation Apog.	20 0	4771	
To present Equation Apogee.	4 50	10940	

This Equation is always to be added to the Mean Place of the Moon's Apogee, if the Sun's Mean Anomaly be 6,7,8,9,10,11 Signs; but subtracted when the Sun's Mean Anomaly is 0, 1, 2, 3, 4, 5 Signs, as the following Table sheweth, which I have made from the Theory.

Enter the following Table with the Sun's Mean Anomaly, as directed in the 4th, and you have the Equation answering, to be added to, or subtracted from the Mean Place of the Moon's Apogee; and you will have it Equated the first time.

A Table of the first Equation of the Moon's Apogee.

⊙ Anom.	Sign 0 Subt. ′	″	Sign 1 Sub. ′	″	Sign 2 Sub. ′	″	Sign 3 Sub. ′	″	Sign 4 Sub. ′	″	Sign 5 Sub. ′	″	⊙ Anom.
0	0	0	9	49	17	8	20	9	17	30	10	11	30
1	0	20	10	7	17	19	20	0	17	20	9	52	29
2	0	41	10	24	17	29	20	0	17	9	9	33	28
3	1	1	10	42	17	39	19	59	16	58	9	15	27
4	1	22	10	59	17	48	19	58	16	46	8	56	26
5	1	42	11	16	17	58	19	57	16	34	8	37	25
6	2	3	11	33	18	7	19	56	16	23	8	17	24
7	2	23	11	49	18	16	19	54	16	11	7	58	23
8	2	43	12	6	18	24	19	51	15	58	7	38	22
9	3	4	12	22	18	32	19	49	15	45	7	18	21
10	3	24	12	39	18	39	19	46	15	32	6	58	20
11	3	44	12	55	18	46	19	42	15	18	6	38	19
12	4	4	13	10	18	53	19	38	15	4	6	18	18
13	4	24	13	26	19	0	19	34	14	50	5	58	17
14	4	44	13	41	19	6	19	30	14	36	5	38	16
15	5	4	13	56	19	12	19	25	14	21	5	17	15
16	5	24	14	10	19	18	19	20	14	6	4	56	14
17	5	44	14	25	19	23	19	14	13	51	4	35	13
18	6	3	14	39	19	28	19	8	13	35	4	14	12
19	6	23	14	53	19	33	19	2	13	20	3	54	11
20	6	43	15	7	19	37	18	55	13	4	3	33	10
21	7	2	15	21	19	41	18	48	12	48	3	12	9
22	7	21	15	33	19	44	18	41	12	31	2	51	8
23	7	40	15	46	19	48	18	33	12	15	2	30	7
24	7	59	15	58	19	51	18	25	11	58	2	8	6
25	8	18	16	11	19	53	18	18	11	41	1	46	5
26	8	36	16	23	19	55	18	8	11	23	1	25	4
27	8	54	16	35	19	57	17	59	11	5	1	4	3
28	9	13	16	46	19	58	17	50	10	47	0	43	2
29	9	31	16	57	19	59	17	40	10	29	0	21	1
30	9	49	17	8	20	0	17	30	10	11	0	0	0
	Sign 11 Add.		Sign 10 Add.		Sign 9 Add.		Sign 8 Add.		Sign 7 Add.		Sign 6 Add.		

6. *To find the Annual or first Equation of the Moon's Node.*

HEre you muſt take the preſent Equation of the Sun and by the Logiſtical Logarithms in my Aſtronomy, ſay,

As 1° 56′ 20″ the Sun's greateſt Equation,	116′ 20″	LL 2875	+
To its preſent Equation, --	28 6	3294	
So greateſt Equation of the Node,	9 30	8004	
To the preſent Equat. of the Node,	2 18	14173	

This Equation is always to be added to the Mean Place of the Node, if the Sun's Mean Anomaly be 0, 1, 2, 3, 4, 5 Signs, but ſubtracted if it be 6, 7, 8, 9, 10, 11 Signs, the Sum or Difference is the Place of the Node the firſt time Equated.

A Table of the Annual, or first Equation of the Moon's Node.

⊙ Anom.	Sign 0 Add.		Sign 1 Add.		Sign 2 Add.		Sign 3 Add.		Sign 4 Add.		Sign 5 Add.		⊙ Anom.
	′	″	′	″	′	″	′	″	′	″	′	″	
0	0	0	4	40	8	9	9	30	8	19	4	50	30
1	0	9	4	48	8	14	9	30	8	14	4	41	29
2	0	19	4	57	8	19	9	30	8	9	4	32	28
3	0	29	5	5	8	24	9	30	8	4	4	23	27
4	0	39	5	13	8	28	9	29	7	58	4	14	26
5	0	48	5	21	8	32	9	29	7	53	4	5	25
6	0	58	5	29	8	36	9	28	7	48	3	56	24
7	1	8	5	37	8	40	9	27	7	42	3	47	23
8	1	18	5	45	8	44	9	26	7	35	3	38	22
9	1	27	5	53	8	48	9	25	7	29	3	29	21
10	1	37	6	0	8	52	9	24	7	23	3	19	20
11	1	46	6	8	8	55	9	22	7	16	3	9	19
12	1	56	6	15	8	58	9	20	7	9	2	59	18
13	2	5	6	22	9	2	9	18	7	3	2	50	17
14	2	15	6	30	9	5	9	16	6	56	2	40	16
15	2	24	6	37	9	7	9	14	6	49	2	30	15
16	2	34	6	44	9	10	9	12	6	42	2	20	14
17	2	43	6	50	9	12	9	9	6	35	2	10	13
18	2	53	6	57	9	15	9	6	6	27	2	0	12
19	3	2	7	4	9	17	9	3	6	20	1	50	11
20	3	11	7	11	9	19	8	59	6	12	1	40	10
21	3	20	7	17	9	21	8	56	6	4	1	30	9
22	3	29	7	23	9	22	8	52	5	56	1	20	8
23	3	38	7	29	9	24	8	49	5	49	1	10	7
24	3	47	7	35	9	25	8	45	5	41	1	0	6
25	3	56	7	41	9	26	8	41	5	33	0	50	5
26	4	5	7	46	9	27	8	37	5	24	0	40	4
27	4	14	7	52	9	28	8	33	5	16	0	30	3
28	4	23	7	58	9	29	8	28	5	8	0	20	2
29	4	31	8	4	9	29	8	23	4	59	0	10	1
30	4	40	8	9	9	30	8	19	4	50	0	0	0
	Sign 11 Sub.		Sign 10 Sub.		Sign 9 Sub.		Sign 8 Sub.		Sign 7 Sub.		Sign 6 Sub.		

7. *To find the Second Equation of the Moon.*

THis Equation is greateſt when the Sun is in the Octants, or 45° diſtant from the Moon's Apogee, and is then 3′ 56″ if the Sun be in Perigeon; but only 3′ 34″ in Apogeum, and at a mean Diſtance from the Earth 3′ 45″: Therefore, ſubtract the Place of the Moon's Apogee the firſt time Equated, from the Sun's true Place, double the Remainder and ſay, As Radius, to Sine of that double Diſtance of the Sun from the Moon's Apogee; ſo is the Minutes and Second (reduced into Seconds) taken out of the following Table by help of the Sun's mean Anomaly, to the ſecond Equation of the Moon in Second.

Operation.	ſ. ° ′ ″
Sun's true Place — —	9 22 23 46
Moon's Apogee firſt time Equated, ſub.	1 7 53 51
Diſt. Sun from Moon's Apogee,	8 14 29 55
Double, — —	4 28 59 50
Complement, — —	1 1 00 10

Now ſay,

	° ′ ″	
As Radius — —	90 0 0	10.000000
To S. double Diſt. ☉ à ☽ Apog.	31 0 10	9.711874
So 3′ 54″ out of the following Table,	234	2.369216
To the ſecond Equation in Seconds,	120	2.081090

This Equation muſt always be added to the firſt Equated Place of the Moon, while her Apogee paſſes from the Square of the Sun to the Conjunction; but is ſubtracted from thence in the Tranſit of the Apogee from a Conjunction, to a Quadrature. That is, if the Diſtance of the Sun from the Moon's Apogee be

Signs { 0 1 2 6 7 8 ſubtr.
3 4 5 9 10 11 add. }

So in the Example before us, the ſecond Equation 2′ is ſubtracted from 2 ſ. 23° 27′ 23″, and there remains 2 ſ. 23° 25′ 23″ the Moon's Place equated the ſecond time.

Note, always in your Work, reſerve the Logar. Sine of the double Diſtance of the Sun from the ☽ Apogee; for you will have Occaſion to uſe it in finding the ☽ preſent Eccentricity in the 10th Precept following.

A Table of the proportional Part of the ſecond Equation of the Moon, with the Logarithm.

⊙ Ano.	Eq.	Sign 0 Logar.	Eq.	Sign 1 Logar.	Eq.	Sign 2 Logar.	⊙ Ano.
	″		″		″		
0	214	2.330414	217		221		30
1	214		217		221		29
2	214		218	2.338456	221		28
3	214		218		221		27
4	214		218		221		26
5	214		218		222	2.346353	25
6	214		218		222		24
7	214		218		222		23
8	215	2.332438	218		222		22
9	215		218		222		21
10	215		219	2.340444	222		20
11	215		219		222		19
12	215		219		222		18
13	215		219		223	2.348305	17
14	215		219		223		16
15	215		219		223		15
16	216	2.334454	219		223		14
17	216		219		223		13
18	216		219		223		12
19	216		220	2.342423	223		11
20	216		220		223		10
21	216		220		224	2.350248	9
22	216		220		224		8
23	216		220		224		7
24	217	2.336460	220		224		6
25	217		220		224		5
26	217		220		224		4
27	217		221	2.344392	224		3
28	217		221		224		2
29	217		221		225	2.352182	1
30	217		221		225		0
	Sign 11		Sign 10		Sign 9		

A Table of the Proportional Part of the ſecond Equation of the Moon, with the Logarithm, continued.

☉Ano.	Eq.	Sign 3 Logar.	Eq.	Sign 4 Logar.	Eq.	Sign 5 Logar.	☉Ano.
	″		″		″		
0	225		228		232		30
1	225		229	2.359836	232		29
2	225		229		232		28
3	225		229		233	2.367356	27
4	225		229		233		26
5	225		229		233		25
6	226	2.354108	229		233		24
7	226		229		233		23
8	226		229		233		22
9	226		230	2.361728	233		21
10	226		230		233		20
11	226		230		234	2.369216	19
12	226		230		234		18
13	226		230		234		17
14	227	2.356026	230		234		16
15	227		230		234		15
16	227		230		234		14
17	227		231	2.363612	234		13
18	227		231		234		12
19	227		231		235	2.371068	11
20	227		231		235		10
21	227		231		235		9
22	228	2.357935	231		235		8
23	228		231		235		7
24	228		231		235		6
25	228		232	2.365488	235		5
26	228		232		235		4
27	228		232		336	2.372912	3
28	228		232		236		2
29	228		232		236		1
30	228		232		236		0
	Sign 8		Sign 7		Sign 6		

8. *To find the Third Equation of the Moon.*

THis Equation depends upon the Diſtance of the Sun from the Moon's Nodes, and is greateſt in the Octants, and is then 47″, but in the Syzigias and Quadratures nothing: Therefore from the Sun's true Place, ſubtract the Place of the Node firſt Equated, and ſay, As Radius, to the Sine of the double Diſtance of the Sun from the next Syzigia, or Quadrature, ſo is 47″, to the Equation required.

Operation.	ſ. ° ′ ″
Sun's true Place. — —	9 22 23 46
Node firſt Equated ſubt. —	10 25 43 30
Diſt. Sun from the Node,	10 26 40 16
Double, — —	9 23 20 32
Complement, — —	2 6 39 28

Now ſay,

	° ′ ″	
As Radius — —	90 0 0	10.000000
To S. double Diſt of ☉ à ☊	66 39 28	9.962917
So is the greateſt Equation —	— 47	1.672098
To the preſent Equation —	— 43	1.635015

This Equation is added to the Moon's Place Equated the ſecond Time, whilſt the Nodes paſs from the Sun's Conjunction to the Quadratures of the ſame; and is ſubtracted in the Tranſit from the Quadratures to Conjunction. And, according to the Theory, I have framed the following Table, which gives this Equation by Inſpection.

A Table of the third Equation of the Moon.

Enter this Table with the Diſtance of the Sun from the Node, and you have the Equation to be apply'd according to its Title.

☉ a ☊	Signs $\frac{0}{6}$ Add ′	″	Signs $\frac{1}{7}$ Add ′	″	Signs $\frac{2}{8}$ Add ′	″	☉ a ☊
0	0	0	0	41	0	41	30
1	0	1	0	41	0	40	29
2	0	3	0	42	0	39	28
3	0	5	0	43	0	38	27
4	0	6	0	43	0	37	26
5	0	8	0	44	0	36	25
6	0	10	0	44	0	35	24
7	0	11	0	45	0	34	23
8	0	13	0	45	0	32	22
9	0	14	0	46	0	31	21
10	0	16	0	46	0	30	20
11	0	17	0	46	0	29	19
12	0	19	0	47	0	27	18
13	0	20	0	47	0	26	17
14	0	22	0	47	0	25	16
15	0	23	0	47	0	23	15
16	0	25	0	47	0	22	14
17	0	26	0	47	0	20	13
18	0	27	0	47	0	19	12
19	0	29	0	46	0	17	11
20	0	30	0	46	0	16	10
21	0	31	0	46	0	14	9
22	0	32	0	45	0	13	8
23	0	34	0	45	0	11	7
24	0	35	0	44	0	10	6
25	0	36	0	44	0	8	5
26	0	37	0	43	0	6	4
27	0	38	0	43	0	5	3
28	0	39	0	42	0	3	2
29	0	40	0	41	0	1	1
30	0	41	0	41	0	0	0
	Signs $\frac{5}{11}$ Sub.		Signs $\frac{4}{10}$ Sub.		Signs $\frac{3}{9}$ Sub.		

9. *To find the Second Equation of the Moon's Apogee.*

FIrſt, (as in the ſeventh Article hereof) if from the Sun's Place, you ſubtract the Place of the Apog. firſt Equated, the Remainder is called the Annual Argument, and in this Example is 8 ſ. 14° 29′ 55″, which is demonſtrated from the Theory thus:

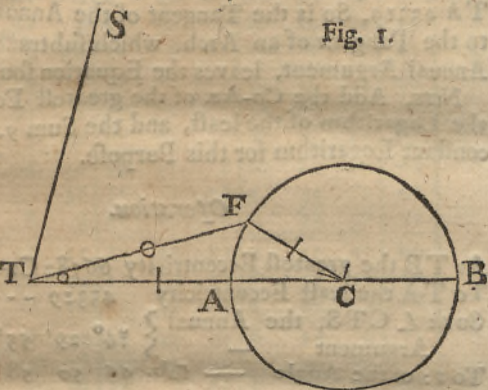


Fig. 1.

Let T repreſent the Earth, T S a right Line joining the Earth and ☉; T A C B, a right Line drawn from the Earth to the Place of the Moon's Apogee firſt Equated. The Angle S T A, the Annual Argument, of the ſaid Apogee = 74° 29′ 55″: T A the leaſt Eccentricity 43319 of the Lunar Orbit; T B the greateſt 66782. Biſſect A B in C, and on the Center C, and Semidiameter A C = C B, Deſcribe the Circle A F B; and make the Angle B C F equal to twice the Annual Argument 148° 59′ 50″, and draw T F, and C F, ſo ſhall T F be the Eccentricity at the time of the Queſtion, and the Angle C T F the Equation of the Apogee ſought. In which Triangle C T F are given T C, C F, and the Angle included, being the Compliment of twice the Annual Argument to a Semicircle = 31° 0′ 10″ to find the Angle C T F, and the Side T F.

Operation.

T B the greateſt Eccentricity	66782
T A the leaſt Eccentricity	43319
Difference = A B —	23463
Half = A C = C F — —	11731½ + T A = T C

I

Which

Which falls directly under the fecond Axiom of plain Trigonometry; for as the Sum of the Sides TC+CF, To their Difference = TA, So is the Tangent of half the Sum of the oppofite Angles, to the Tangent of half their Difference, which fubtracted from half the Sum of the Angles, gives the leffer Angle, *viz*. CTF the Equation fought. Which in fhort is, As the greateft Eccentricity TB 66782, Is to the leaft Eccentricity TA 43319, So is the Tangent of the Annual Argument, to the Tangent of an Arch, which fubtracted from the Annual Argument, leaves the Equation fought.

Note, Add the Co-Ar. of the greateft Eccentricity to the Logarithm of the leaft, and the Sum 9.812019 is a conftant Logarithm for this Purpofe.

Operation.

As TB the greateft Eccentricity	66782 Co-Ar.	5.175341
To TA the leaft Eccentricity	43319 ----	4.636678
So *t*: ∠ CTS, the Annual Argument —	74° 29′ 55″	10.556970
To *t*: of the Angle — fub.	66 50 58	10.368989
Rem: ∠CTF, the Equation	7 38 57	

This Equation is to be added if the Annual Argument be 0, 1, 2, 6, 7 8 Signs, but fubtracted if it be 3, 4, 5, 9, 10, 11, to or from the Place of the Apogee firft Equated, the Sum or Difference is the Place of the Apogee a fecond time Equated: which in this Example is 1 *f*. 15° 32′ 48″; according to which Theory I have calculated the following Table.

A Table of the ſecond Equation of the Moon's Apogee.

Ann. Argu.	Signs $\frac{0}{6}$ Add			Signs $\frac{1}{7}$ Add			Signs $\frac{2}{8}$ Add			Ann. Argu.
	°	′	″	°	′	″	°	′	″	
0	0	0	0	9	28	8	11	40	16	30
1	0	21	4	9	42	20	11	30	55	29
2	0	42	9	9	56	9	11	20	30	28
3	1	3	11	10	9	25	11	8	59	27
4	1	24	11	10	22	10	10	56	23	26
5	1	45	7	10	34	21	10	42	42	25
6	2	5	59	10	45	59	10	27	53	24
7	2	26	46	10	57	2	10	12	00	23
8	2	47	28	11	7	29	9	55	1	22
9	3	8	3	11	17	18	9	36	58	21
10	3	28	31	11	26	27	9	17	50	20
11	3	48	50	11	34	57	8	57	38	19
12	4	8	59	11	42	45	8	36	24	18
13	4	28	59	11	49	51	8	14	8	17
14	4	48	48	11	56	12	7	50	54	16
15	5	8	24	12	1	48	7	26	41	15
16	5	27	48	12	6	37	7	1	31	14
17	5	46	58	12	10	34	6	35	29	13
18	6	5	54	12	13	50	6	8	35	12
19	6	24	34	12	16	11	5	40	49	11
20	6	42	58	12	17	40	5	12	26	10
21	7	1	4	12	18	15	4	43	18	9
22	7	18	52	12	17	56	4	13	30	8
23	7	36	20	12	16	41	3	43	7	7
24	7	53	28	12	14	29	3	12	14	6
25	8	10	15	12	11	18	2	40	53	5
26	8	26	38	12	7	9	2	9	10	4
27	8	42	39	12	1	58	1	37	9	3
28	8	58	15	11	55	46	1	4	53	2
29	9	13	24	11	48	33	0	32	29	1
30	9	28	8	11	40	16	0	0	00	0
	Signs $\frac{5}{11}$ Sub.			Signs $\frac{4}{10}$ Sub.			Signs $\frac{3}{9}$ Sub.			

10. *To find the present Eccentricity of the Moon.*

THere are in the fame Triangle TCF, given as before, with the Angle CTF juft now found, to find the Side TF, the prefent Eccentricity. *Gregory Aftron.* pag. 546.

Operation.

As ſ. ∠ CTF, the Equa. Apog. —	7° 38′ 57″ Co-Ar.	0.875799
To the Side CF (always the fame) —	11731½ -------	4.069354
To ſ. ∠ TCF, Double Ano Ar —	31 00 10 ------	9.711874
To Side TF the Eccentricity —	45397 -------	4.657027

11. *To find the Mean Anomaly of the Moon.*

FRom the Moon's Place the third time Equated, fubtract the Place of the Moon's Apogee the fecond time Equated, and the Remainder is the Mean Anomaly of the Moon at that Time.

Operation.

	ſ.	°	′	″
From ☽ place the third time Equated	2	23	24	40
Subtract the Place Apogee fecond time Equ.	1	15	32	48
Remains ☽ Mean Anomaly —	1	7	51	52

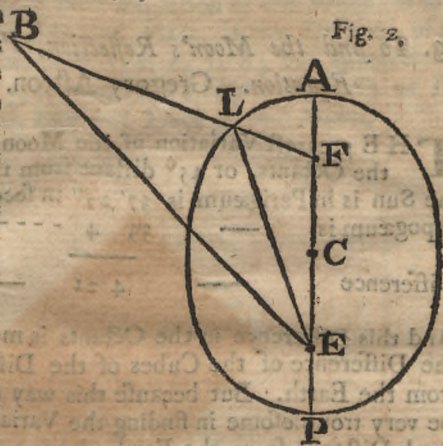
12. *To find the Elliptic, or fourth Equation of the Moon.*

IN the adjacent Figure make LB = LE, and join BE; then is FL + LE = AP. Make the Angle AFL equal to the Mean Anomaly 37° 51′ 52″; The Angle FEL the true Anomaly, and the Angle FLE the Elliptic Equation being the Double of the Angle FBE.

To

To A C the Mean Distance of the Moon from the Earth = 1000000 add C E = C F 45397 the present Eccentricity, the Sum is 1045397 = to A E the Apogeon Distance: again from A C 1000000 take C E = C F 45397 the remainder is 954603 = A F = E P the Perigeon Distance. *Gregory's Astron.* Vol. 1. pag. 389.

Fig. 2.



Now say,

As the Apogeon Distance, to the Perigeon Distance: so is the Tangent of half her Mean Anomaly, to the Tangent of half the true Anomaly; which subtracted from half the Mean Anomaly, and the Remainder doubled gives the Prosthaphæresis or Elliptic Equation sought*; which is to be subtracted from the third Equated Place of the Moon, if the Mean Anomaly be 0, 1, 2, 3, 4, 5 Signs; but added, if it be 6, 7, 8, 9, 10, 11, the Sum or Difference is the fourth Equated Place of the Moon.

Operation.

As AE — —	1045397 Co-Ar.			3.980719
To EP — —	954603 —			— 5.979822
	°	′	″	
So *t.* of half Mean Anomaly	18	55	56	- 9.535301
To *t.* of half the true Anomaly	17	23	37	- 9.495842
Remains the Angle F B E -	1	32	19	
Doubled is = ∠ F L E Equation	3	4	38	Subtract.

13. *To find the Moon's Reflection, Variation, or fifth Equation.* Gregory Aſtron. *pag.* 548.

THE greateſt Variation of the Moon is when ſhe is in the Octants, or 45° diſtant from the Sun, and when

the Sun is in Perigæum is	37′ 25″	in ſeconds	2245″
Apogæum is	33 4		1984
Difference	4 21		261

And this Difference in the Octants is made reciprocally as the Difference of the Cubes of the Diſtances of the Sun from the Earth. But becauſe this way of reaſoning would be very troubleſome in finding the Variation anſwering the Sun's Diſtance from the Earth, I have calculated the following Table, which enter with the Sun's Mean Anomaly, and you have the Variation anſwering. Then from the fourth Equated Place of the Moon, ſubtract the true Place of the Sun, which double, and ſay, As Radius to Sine of the double Diſtance of the Moon from the Sun: ſo is this Variation in reſpect of the Sun's Diſtance from the Earth, to the Variation of the ☽ in reſpect of the ☉ at that Time.

Operation.

	ſ.	°	′	″
4 Eq. pl. ☽	2	20	20	2
☉ place	9	22	23	46
Diſt. ☽ à ☉	4	27	56	16
Double	9	25	52	32
Complement	2	4	7	28

Now ſay,

	° ′ ″	
As Radius	90 0 0	10.000000
To ſ. Double	64 7 28	9.954119
So ☉ Vari.	2225	3.347330
To ☽ Vari.	2002	3.301449

′ ″
60) 2002 (33-22

This

This Variation, or fifth Equation of the Moon, is to be added to the 4th Equated Place, if the Diſtance of the Moon from the Sun be 0, 1, 2, 6, 7, 8; but ſubtracted if the Diſtance be 3, 4, 5, 9, 10, 11 Signs, the Sum or Difference is the fifth Equated Place of the Moon.

A Table of the proportional Part of the 5th Equation, or Variation of the Moon.

Anom. ⊙	Sign 0			Sign 1			Sign 2			Anom. ⊙
	′	″	‴	′	″	‴	′	″	‴	
0	33	4	0	33	47	30	34	31	0	30
1	33	5	27	33	48	57	34	32	27	29
2	33	6	54	33	50	24	34	33	54	28
3	33	8	21	33	51	51	34	35	21	27
4	33	9	48	33	53	18	34	36	48	26
5	33	11	15	33	54	45	34	38	15	25
6	33	12	42	33	56	12	34	39	42	24
7	33	14	9	33	57	39	34	41	9	23
8	33	15	36	33	59	6	34	42	36	22
9	33	17	3	34	0	33	34	44	3	21
10	33	18	30	34	2	0	34	45	30	20
11	33	19	57	34	3	27	34	46	57	19
12	33	21	24	34	4	54	34	48	24	18
13	33	22	51	34	6	21	34	49	51	17
14	33	24	18	34	7	48	34	51	18	16
15	33	25	45	34	9	15	34	52	45	15
16	33	27	12	34	10	42	34	54	12	14
17	33	28	39	34	12	9	34	55	39	13
18	33	30	6	34	13	36	34	57	6	12
19	33	31	33	34	15	3	34	58	33	11
20	33	33	0	34	16	30	35	0	0	10
21	33	34	27	34	17	57	35	1	27	9
22	33	35	54	34	19	24	35	2	54	8
23	33	37	21	34	20	51	35	4	21	7
24	33	38	48	34	22	18	35	5	48	6
25	33	40	15	34	23	45	35	7	15	5
26	33	41	42	34	25	12	35	8	42	4
27	33	43	9	34	26	39	35	10	9	3
28	33	44	36	34	28	6	35	11	36	2
29	33	46	3	34	29	33	35	13	3	1
30	33	47	30	34	31	0	35	14	30	0
	Sign 11			Sign 10			Sign 9			

Table of the Proportional Part of the 5th Equation, or Variation of the Moon, continu'd.

⊙ Anom.	Sign 3 ′	″	‴	Sign 4 ′	″	‴	Sign 5 ′	″	‴	⊙ Anom.
0	35	14	30	35	58	0	36	41	30	30
1	35	15	57	35	59	27	36	42	57	29
2	35	17	24	36	0	54	36	44	24	28
3	35	18	51	36	2	21	36	45	51	27
4	35	20	18	36	3	48	36	47	18	26
5	35	21	45	36	5	15	36	48	45	25
6	35	23	12	36	6	42	36	50	12	24
7	35	24	39	36	8	9	36	51	39	23
8	35	26	6	36	9	36	36	53	6	22
9	35	27	35	36	11	3	36	54	33	21
10	35	29	0	36	12	30	36	56	0	20
11	35	30	27	36	13	57	36	57	27	19
12	35	31	54	36	15	24	36	58	54	18
13	35	33	21	36	16	51	37	0	21	17
14	35	34	48	36	18	18	37	1	48	16
15	35	36	15	36	19	45	37	3	15	15
16	35	37	42	36	21	12	37	4	42	14
17	35	39	9	36	22	39	37	6	9	13
18	35	40	36	36	24	6	37	7	36	12
19	35	42	3	36	25	33	37	9	3	11
20	35	43	30	36	27	0	37	10	30	10
21	35	44	57	36	28	27	37	11	57	9
22	35	46	24	36	29	54	37	13	24	8
23	35	47	51	36	31	21	37	14	51	7
24	35	49	18	36	32	48	37	16	18	6
25	35	50	45	36	34	15	37	17	45	5
26	35	52	12	36	35	42	37	19	12	4
27	35	53	39	36	37	9	37	20	39	3
28	35	55	6	36	38	36	37	22	6	2
29	35	56	33	36	40	3	37	23	33	1
30	35	58	0	36	41	30	37	25	0	0
	Sign 8			Sign 7			Sign 6			

Add to the Variation of the Moon.

☽ à ☉	ſ. $\frac{0}{6}$		ſ. $\frac{1}{7}$		ſ. $\frac{2}{8}$		☽ à ☉
	′	″	′	″	′	″	
0	0	0	2	54	2	54	30
1	0	6	3	0	2	48	29
2	0	12	3	6	2	42	28
3	0	17	3	11	2	37	27
4	0	23	3	17	2	31	26
5	0	29	3	23	2	25	25
6	0	35	3	29	2	19	24
7	0	41	3	35	2	13	23
8	0	46	3	40	2	8	22
9	0	52	3	46	2	2	21
10	0	58	3	52	1	56	20
11	1	4	3	58	1	50	19
12	1	10	4	4	1	44	18
13	1	15	4	9	1	39	17
14	1	21	4	15	1	33	16
15	1	27	4	21	1	27	15
16	1	33	4	15	1	21	14
17	1	39	4	9	1	15	13
18	1	44	4	4	1	10	12
19	1	50	3	58	1	4	11
20	1	56	3	52	0	58	10
21	2	2	3	46	0	52	9
22	2	8	3	40	0	46	8
23	2	13	3	35	0	41	7
24	2	19	3	29	0	35	6
25	2	25	3	23	0	29	5
26	2	31	3	17	0	23	4
27	2	37	3	11	0	17	3
28	2	42	3	6	0	12	2
29	2	48	3	0	0	6	1
30	2	54	2	54	0	0	0
	ſ. $\frac{5}{11}$		ſ. $\frac{4}{10}$		ſ. $\frac{3}{9}$		

A Table of the Variation or 5^{th} Equation.

☽ a ☉	ſ. $\frac{0}{6}$ Add.		$\frac{1}{7}$ Add.		$\frac{2}{8}$ Add.		☽ a ☉
	′	″	′	″	′	″	
0	0	0	28	38	28	38	30
1	1	12	29	11	28	2	29
2	2	21	29	43	27	25	28
3	3	29	30	12	26	45	27
4	4	37	30	39	26	4	26
5	5	46	31	4	25	20	25
6	6	53	31	27	24	34	24
7	7	59	31	47	23	47	23
8	9	7	32	5	22	58	22
9	10	13	32	20	22	7	21
10	11	19	32	34	21	15	20
11	12	24	32	45	20	22	19
12	13	27	32	53	19	26	18
13	14	30	32	58	18	29	17
14	15	32	33	3	17	32	16
15	16	32	33	4	16	32	15
16	17	32	33	3	15	32	14
17	18	29	32	58	14	30	13
18	19	26	32	53	13	27	12
19	20	22	32	45	12	24	11
20	21	15	32	34	11	19	10
21	22	7	32	20	10	13	9
22	22	58	32	5	9	7	8
23	23	47	31	47	7	59	7
24	24	34	31	27	6	53	6
25	25	20	31	4	5	46	5
26	26	4	30	39	4	37	4
27	26	45	30	12	3	29	3
28	27	25	29	43	2	21	2
29	28	2	29	11	1	12	1
30	28	38	28	38	0	0	0
	$\frac{5}{11}$ Sub.		$\frac{4}{10}$ Sub.		$\frac{3}{9}$ Sub.		

14. *To find the Sixth Equation of the Moon.*

OUR Author fixes this Equation at a mean Quantity 2′ 10″. This being known; from the Moon's Apogee the ſecond time Equated, ſubtract the Apogeon of the Sun, and Note the Remainder.

Alſo from the Place of the Moon the fifth time Equated, ſubtract the Sun's true Place, and Note this Remainder, add theſe two Remainders together, and work as below.

Operation.

Place Moon's Apogee ſecond time Equated	1	15	32	48
Place Sun's Apogee ſubtract ——	3	8	13	55
Remainder —— ——	10	7	18	53
Place of the ☽ the fifth time Equated	2	19	46	40
Sun's Place ſubtract ——	9	22	23	46
Remainder —— ——	4	27	22	54
Remainder add —— ——	10	7	18	53
Sum of theſe two Remainders ——	3	4	41	47
Complement —— ——	2	25	18	13

Now ſay,

	°	′	″	
As Radius —— ——	90	0	0	10.000000
To Sine Z Remainders ——	85	18	13	9.998539
So is 2′ 10″ in Seconds - - - - -			130	2.113943
To the Sixth Equation in Seconds -			129	2.112482

This Sixth Equation is to be ſubtracted from the 5th Equated Place of the Moon, if the aforeſaid Sum of the two Remainders (or its Exceſs above 12 Signs) be leſs than a Semicircle, or Six Signs; but if it is more, it muſt be added, the Sum or Difference is the Moon's Longitude the ſixth time Equated.

15. *To*

15. *To find the Seventh Equation of the Moon.*

THis Equation Sir *Isaac Newton* has expressed by this mean Quantity 2′ 20″, which, he says, is encreased and diminished, according to the Situation of the Lunar Apogæum 54″; that is, if the Lunar Apogee be join'd with the Sun's Apogæum, the Equation is then 2′ 20″ + 54″ = 3′ 14″, and also when it is in the Sun's Syzigias; but when it is in the Sun's Quadratures, the aforesaid Equation is to be diminished 50″, and he makes the least Quantity 1′ 26″, that is 2′ 20″—54″. But when the Moon's Apogee and Sun's are in Opposition, he cannot determine (for want of Observation) whether the said Equation is to be encreased or diminished.

Therefore, from the sixth Equated Place of the Moon, subtract the Sun's true Place, and the Remainder is the Distance of the Moon from the Sun. Then say,

As Radius, To the Sine of this Distance of the Moon from the Sun, So is 2′ 20″ in Seconds 140″, To the Seventh Equation of the Moon: which must be subtracted from the sixth Equated Place, if the Distance of the Moon from the Sun be less than 6 Signs, but added when more; the Sum or Difference is the Moon's true Place in her Orbit.

Operation.

	s.	°	′	″
Moon's Longitude the sixth time Equated	2	19	44	31
Sun's true Place subtract	9	22	23	46
Remains the Distance of the ☽ à ☉	4	27	20	45
Complement	1	2	39	15

Now say,

	°	′	″	
As Radius	90	0	0	10.000000
To s. Dist. ☽ à ☉	32	39	15	9.732045
So 2′ 20″ = Seconds			140	2.146128
To 1 15 the seventh Equation sub.			75	1.878173

16. *To*

16. *To find the Moon's Latitude, and the Reduction from her Orbit to the Ecliptic.*

FRom the Sun's true Place, ſubtract the Place of the Moon's North Node firſt Equated, the Remainder is called the Annual Argument of the Node.

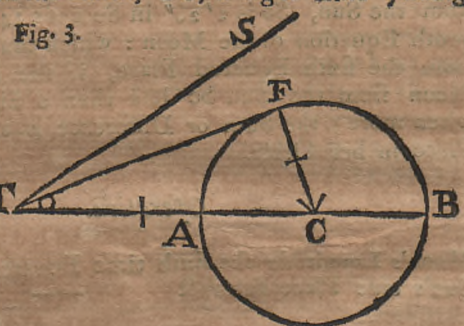
Operation.

	ſ.	°	′	″
Sun's true Place — —	9	22	23	46
North Node firſt Equated — —	10	25	43	30
Rem. Annual Argument of the Node	10	26	40	16
Doubled is — — —	9	23	20	32

From this Work, and from the adjacent Figure, the ſecond Equation of the Node is thus conſtructed.

Let T repreſent the Earth, T S, a right Line joining the Earth and Sun: Let T A C B repreſent a Line drawn to the Place of the Moon's aſcending Node Equated the firſt Time; and the Angle S T A the Annual Argument of the Node.

Fig. 3.



Let T A be taken in the ſame Ratio to A B as 56 to 3. Biſſect B A in C, and on the Center C and Radius A C = C B draw the Circle A F B, and let the Angle B C F be equal to Double the Annual Argument in this Example 133° 20′ 32″ as found above; Draw T F, then will the Angle C T F be the ſecond Equation of the Node Aſcending. Now in the Oblique-Angled Plain Triangle T F C, there are known, the Sides T C, and C F, with the included

cluded Angle FCT, to find the Angle CTF the preſent Equation of the Node. For if TA be 56, then AB (by the Theory) is 3, and conſequently AC = $1\frac{1}{2}$. Therefore TC 56 + AC $1\frac{1}{2}$ = TC $57\frac{1}{2}$; then becauſe all Lines drawn from the Center of a Circle to the Circumference thereof are equal, CF is alſo equal to AC = CB $1\frac{1}{2}$, and the Angle TCF is the Complement of the Double of the Annual Argument 66° 39′ 28″ of the Node. This being the ſecond Axiom of oblique-angled Plain Triangles. The firſt and ſecond Terms in the Analogy are always the ſame, *viz.* the Sum of the Sides is ever 59, and their Difference 56: ſo that as the Sum of the Sides 59 is to their Difference 56, ſo is the Tangent of half the Sum of their oppoſite Angles (which is ever equal to the Annual Argument of the Node) To the Tangent of half their Difference; which ſubtracted from half the Sum of the two unknown Angles, leaves the leſſer Angle CTF, which is the Equation of the Node.

Operation.

As the Sum of the Sides TC + CF	Co-Ar.	59—8.229148
To their Difference		56—1.748188
		° ′ ″
So *t.* of half Z oppoſite Angles		33 19 44—9.817961
To *t.* of half their Difference	—	31 58 15—9.795297
Remains Equation of the Node		1 21 29 Subtract.

This Equation is always to be added to the firſt Equated Place of the Node, if the Double of the Annual Argument be leſs than Six Signs; but ſubtracted, if more. Or with the Diſtance of the Sun from the Node enter the Table of its Equation (which I have made according to above Directions) and take out the Equation, which apply'd to the firſt Equated Place according to its Title gives the true Place of the Moon's Aſcending Node. Note, add the Co-Ar. of the Logarithm of the two Sides, to the Logarithm of their Difference, and that Sum ſhall be a conſtant Logarithm 9.977336.

17. *To find the Inclination of the Limit*, Gregory Aſtron. pag. 550.

THE Inclination of the Moon's Orb with the Ecliptic, when the Nodes are in the Sun's Quadratures, is 4° 59′ 35″. And when they are in the Syzigias 5° 17′ 20″: therefore the greateſt Inclination above the leaſt is 17′ 45″; and according to this Limitation I have made the Table of Inclination of the Limit, which enter with the Annual Argument of the Node, or Diſtance of the Sun from the Node, which in this Example is 10 *ſ*. 26° 40′ 16″, and take out the Inclination of the Limit, 12′ 26″.

18. From the true Place of the Moon in her Orbit, ſubtract the true Place of the Node laſt Equated, and the Remainder is the Argument of Latitude 3 *ſ*. 25° 21′ 15″.

19. With the Argument of Latitude take out of the Table the ſimple Latitude, as alſo the Increment or Parts to be added, and reſerve them till anon. *Greg.* 551.

20. Before we can find the Moon's true Latitude, we muſt find the proportional Part of the Increment thus. As the greateſt Inclination of the Moon's Orb and Ecliptic above the leaſt, *viz.* 17′ 45″.
To the preſent Increment as found by Precept 19.
So is the preſent Inclination of the Limit as found by the 17, To the proportional Part of the Increment, which added to the Simple Latitude, as found by the 19, and it gives the Moon's true Latitude.

21. With the Argument of Latitude enter the Table of Reduction, and take out the Reduction, and alſo the Exceſs; then, for the proportional Part of the Exceſs by the Logiſtical Logarithms, ſay,
As the greateſt Inclination of the Moon's Orb above the leaſt, *viz.* 17′ 45″,
Is to the preſent Exceſs:
So is the preſent Inclination of the Limit as found by the 17 above,

To

To the proportional Part of the Excess, which added to the simple Reduction, gives the true.

22. According to the Title of the Table of Reduction, apply the Reduction to the Moon's Orbit Place, and you will have the Moon's true Place in the Ecliptic: as you may the better perceive by tracing the following Examples.

The

The firſt Example of the Sun and Moon's Place.

Equal Time	Long. ☉	Anom. ☉		
	ſ. ° ′ ″	ſ. ° ′ ″		
Anno 1729	9 20 56 32	6 12 42 37		
January 1	59 8	59 8		
Mean Mot.	9 21 55 40	6 13 41 45	Anom.	
Equat. add	28 6	9 21 55 40	Long.	☉.
☉ true Plac.	9 22 23 46	3 8 13 55	Apog.	

Equal Time	Long. ☽.	Apog. ☽.	Node ☽.	
	ſ. ° ′ ″	ſ. ° ′ ″	ſ. ° ′ ″	
Anno 1729	2 10 19 39	1 7 42 20	10 25 48 59	
January 1	13 10 35	6 41	3 11	
Mean Mot.	2 23 30 14	1 7 49 1	10 25 45 48	
1 Equation	— 2 51	+ 4 50	— 2 18	
☽ Equated 1	2 23 27 23	1 7 53 51	10 25 43 30	Node Equat.
2 Equation ſ.	— 2 0	+ 7 38 57	9☉22 23 46	Sun's Place.
☽ Equated 2	2 23 25 23	1 15 32 48	10 26 40 16	☉ à ☊.
3 Equation ſ.	— 43	9☉22 23 46	9 23 20 32	Double.
☽ Equated 3	2 23 24 40	8 14 29 55	2 6 39 28	Complement
4 Equation ſ.	— 3 4 38	4 28 59 50	— 1 21 29	2d Equa. ſub.
☽ Equated 4	2 20 20 2	1 1 00 10	10 24 22 1	Nod. true Pl.
5 Equation ſ.	— 33 22	Eccentricity — — —	45397	
☽ Equated 5	2 29 46 40	Mean Anom. — —	1 ſ. 7° 51′ 52″	
6 Equation ſ.	— 2 9	Inclination of the Limit. — —	12 26	
☽ Equated 6	2 19 44 31	Simple Latitude — — —	4 30 37	
7 Equation ſ.	— 1 15	Increment — — — — —	16 1	
☽ in her Orb.	2 19 43 16	Exceſs — — — — — —	36	
NorthNod. ſ.	10 24 22 1	As the Greateſt 17′ 45″ Co-Ar.	4709	
Arg. Latitud.	3 25 21 15	To Increment 16 1 — —	5736	
Tr. Lat. N.D.	4 41 50	So Inclination 12 26 — —	6836	
Red. add	+ 5 29	To Increment 11 13 — —	7281	
Eclipt. Place	2 19 48 45			

Example 2.

Equal Time	Long. ☉.	Anom. ☉.		
	ſ. ° ′ ″	ſ. ° ′ ″		
Anno 1729	9 20 56 32	6 12 42 37		
January 2	1 58 17	1 58 17		
Mean Mot.	9 22 54 49	6 14 40 54	Anom. } ☉.	
Equat. add	30 5	9 22 54 49	Long. } ☉.	
☉ true Plac.	9 23 24 54	3 8 13 55	Apog. } ☉.	

Equal Time	Long. ☽.	Apog. ☽.	Node ☽.	
	ſ. ° ′ ″	ſ. ° ′ ″	ſ. ° ′ ″	
Anno 1729	2 10 19 39	1 7 42 20	10 25 48 59	
January 2	26 21 10	13 22	6 21	
Mean Mot.	3 6 40 49	1 7 55 42	10 25 42 38	
1 Equation	— 3 3	+ 5 10	— 2 27	
☽ Equated 1	3 6 37 46	1 8 0 52	10 25 40 11	Node Equat.
2 Equation ſ.	— 1 54	9☉23 24 54	9☉23 24 54	Sun's Place.
☽ Equated 2	3 6 35 52	8 15 24 2	10 27 44 43	☉ à ☊.
3 Equation ſ.	— 42	5 0 48 4	9 25 29 26	Double.
☽ Equated 3	3 6 35 10	0 29 11 56	2 4 30 34	Complement.
4 Equation ſ.	— 3 55 38	+ 7 16 43	— 1 20 1	2d Equa. ſub.
☽ Equated 4	3 2 39 32	1 15 17 35	10 24 20 10	Nod. true Pl.
5 Equation ſ.	— 24 34			
☽ Equated 5	3 2 14 58			
6 Equation ſ.	— 2 5			
☽ Equated 6	3 2 12 53			
7 Equation ſ.	— 51			
☽ in her Orb.	3 2 12 2			
NorthNod. ſ.	10 24 20 10			
Arg. Latitud.	4 7 51 52			
Tr. Lat. N.D.	4 6 22			
Reduct. add	+ 6 53			
Eclipt. Place	3 2 18 55			

Eccentricity — — —	45173
Mean Anom. — — —	1 21 17 35
Simple Lat. — — —	3 56 21
Inclination — — —	12 43
Increment — — — —	13 58
Exceſs — — —	0 46
As the Greateſt 17′ 45″ Co-Ar.	4709
To Exceſs — 0 46 — —	18935
So Inclinat. — 12 43 — —	6738
To Exceſs add 0 33 — —	20382

SECTION II.

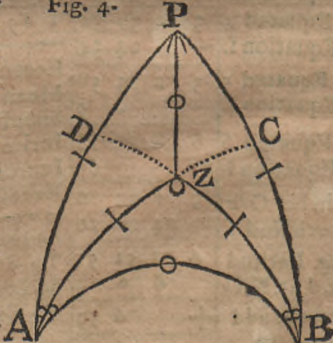
A Problem of the Sphere.

GIVEN, Two Altitudes of the Sun upon any Azimuth, with the Time between them, to find the Latitude of the Place.

Example, Suppose *July* 17, at 10½ in the Forenoon, I observe the Sun's Altitude 52° 59′; and at 2 in the Afternoon the same Day I observe it 49° 51′; What is the Latitude of the Place of Observation?

In the following Figure, A represents the Time and Place of the first Observation, B the second, P the North Pole, Z the Zenith, in which Triangles are given, A P 70° 58′ the Complement of the Sun's Declination, or its Distance from the North Pole, at the Time of the first Observation; B P 71° 1′ the Sun's Distance from the North Pole at the Time of the second Observation, with the included Angle at P, *viz.* A P B, 52° 30′ the Time between the two Observations: Also in the Triangle A Z B, there are given AZ 37° 1′ the Complement of the Sun's Altitude, or its Distance from the Zenith at the Time of the first Observation, and B Z 40° 9′ the Complement of the Sun's Altitude at the Time of the second Observation, to find Z P the Distance of the Zenith from the Pole equal to the Complement of the Latitude of the Place of Observation.

Fig. 4.



But before we can find Z P, we must find the Side A B, and the Angles at A and B. This may be effected two Ways; first, as I have shewed in Problem

blem 16 of my Doctrine of the Sphere. The other Way is wrought by the versed Sines, as I shall shew following. First in the Triangle A P B, to find the Side A B. This may be done by letting fall a Perpendicular from the Angle A upon B P, as A C; or else B D from the Angle B upon the Side A P, for both will produce the same Thing.

Operation.

	°	′	
As C *t.* P B ——	71	1 —	9.536561
To Radius ——	90	0 —	10.000000
So C *s.* ∠ D P B -	52	30 —	9.784447
To *t.* D P - - Sub.	60	32 —	10.247886
From A P ——	70	58	
Remains A D ——	10	26	
As C *s.* D P ——	60	32	Co-Ar. 0.308108
To C *s.* A D ——	10	26	- - - - 9.992759
To C *s.* B P ——	71	1	- - - - 9.512275
To C *s.* A B ——	49	26	- - - - 9.813142

Or by letting fall the Perpendicular A C.

	°	′	
As C *t.* A P ——	70	58	- - 9.537792
To Radius ——	90	0	- - 10.000000
So C *s.* ∠ A P C ——	52	30	- - 9.784447
To *t.* P C. Sub. ——	60	28	- - 10.246655
From P B ——	71	1	
Remains C B ——	10	33	
As C *s.* P C ——	60	28	Co-Ar. 0.307242
To C *s.* C B ——	10	33	- - - - 9.992596
So C *s.* A P ——	70	58	- - - - 9.513375
To C *s.* A B ——	49	26	- - - - 9.813213

Secondly, by the Tables of Versed Sines.

To solve this Case without the Help of the Perpendicular, has been long since hinted by *Gunter*, *Speidel*, *Gellibrand*, and *Collins*; (see *Collins*'s Sector on a Quadrant, Pag. 88.) and since them by Sir *Jonas Moore*, *Harris*, *&c.*

Rule.

As the Cube of the Radius, Is to the Rectangle of the Sines of the Comprehending Sides:
So is the Square of the Sine of half the Angle contain'd, To half the Difference of the versed Sines of the Third, and of the Ark of Difference between the two including Sides. Which is thus:

Double the Logarithm Sine of half the Angle given, and thereto add the Logarithm Sines of the contain'd Sides, and from the Left-hand of the Sum, dash out or reject 3, for the Cube of the Radius, so there rests the Logarithm of half the Difference of those two versed Sines, which half Difference doubled and added to the versed Sine of the Difference of the Logarithms of the containing Sides, gives the N. versed Sine of the Side sought.

Operation.

Given Angle A P B	52° 30′	half=26° 15′ Double Sine	19.291412
Given Sides A P	70 58	- Sine —	9.975583
Given Sides B P	71 1	- Sine ——	9.975713
Sum is ſ. of ——	10 4	——	9.242708
Natural Sine of -	10 4 is	——	1747939
Doubled is ——		——	3495878
Diff. of the Sides	0 3	Versed Sine is add. - - -	4
Sum is N. Versed ſ.	49 26	= Side A B -	3495882

Secondly, for the Angle A B P.

	° ′		
As ſ. A B - -	49 26	Co-Ar.	0.119387
To ſ. ∠ A P B	52 30	- - - -	9.899467
So ſ. A P —	70 58	- - - -	9.975583
To ſ. ∠ A B P	80 51	- - - -	9.994437

Or it may be found by the 9th Problem of my Doctrine of the Sphere, &c.

3. For the Angle B A P.

As ſ. A B	49° 26′	Co-Ar.	0.119387	}
To ſ. ∠ A P B	52 30	- - - -	9.899467	}
So ſ. P B —	71 1	- - - -	9.975715	}
To ſ. ∠ B A P	80 57	- - - -	9.994567	}

4. For the Angle Z A B. By Prob. 9. of my Aſtron.

Side ſubtend. the required ∠ Z B	40° 9′	A B	49° 26′
	½ 20 4½	A Z	37 1
	½ 6 12½		
		X	12 25
	Z 26 17	½	6 12½
	X 13 52		

ſ. A Z	37° 1′	Co-Ar.	0.220369	}
ſ. A B	49 26	Co-Ar.	0.119387	}
ſ. Z	26 17	- - - -	9.646218	}
ſ. X	13 52	- - - -	9.379601	}
Sum Logarithms		——	19.365575	}
Sine —	28 48	——	9.6827875	}
Double is	57 36	∠. Z A B ſub.		
B A P	80 57	from		
Z A P	23 21	Rem.		

5. For the Angle Z B A.

Side ſubtending the required Angle is A Z —— ——	37° 1′	B Z	40° 9′
	½ 18 30½	B A	49 26
	½ 4 38½		
		X	9 17
	Z 23 9	½	4 38½
	X 13 52		

ſ. B Z	40 9 Co-Ar. - - 0.190581	The three Angles at the Zenith are thus;	
ſ. B A	49 26 Co-Ar. - - 0.119387		
ſ. Z -	23 9 - - - - - - 9.594547		
ſ. X -	13 52 - - - - - - 9.379601	A Z P	143° 0′
Z of the Logarithms - -	19.284116	B Z P	132 56
Sine of	26 1 - - - - - - 9.642058	A Z B	84 4
			Z 360 00

Double 52 2 = ∠ Z B A. Proves the work right.
A B P 80 51

Z B P 28 49

6. Laſtly, for the Side Z P, being the Complement of the Latitude of the Place of Obſervation.

As ſ. ∠ Z P B	30° 0	Co Ar.	0.301029
To ſ. — Z B	40 9	- - - -	9.809419
So ſ. ∠ Z B P	28 49	- - - -	9.683055
To ſ. — Z P	38 26	- - - -	9.793503
From —	90 0		
Remains ——	51 34, the Latitude of the Place North.		

And thus may the Latitude of the Place be found without the Meridian Altitude, by taking the Sun's Altitude twice in the Forenoon, or twice in the Afternoon; or by the Moon alone, or by the Moon and any Star, or elſe by the Altitude of two fixed Stars or Planets, for their Difference of right Aſcenſions ſhall be the Angle at the Pole; and then the Things given and required in the Triangle, are the ſame as above, which needs no Example.

SECT. III.

The Uſe of the Tables of the Satellites of Jupiter *and* Saturn.

THIS Part of Aſtronomy was entirely unknown to the Ancients, till about the Year 1610, when *Galilæus* in *Italy* firſt diſcover'd that *Jupiter* was inviron'd with four Moons or Satellites; and in *Germany* by *Simon Marius*, by Help of the Teleſcope, without which,

which, by Reaſon of *Jupiter*'s Splendor, and their ſmall Diſtance from him, they are not to be diſcerned. Thus, they being diſcovered, it put our Moderns upon examining their Motions, and framing a Theory, which is now ſufficiently done; and I can now (when *Jupiter* is not too near the Sun) ſhew them upon Demand to any one that is minded to be ſatisfied of the Truth hereof. The Circum-ſaturnials are in Number Five, which by reaſon of their great Diſtance from the Sun, and the Smallneſs of their Bodies, are not to be ſeen but by the Help of very long Teleſcopes; the diligent *Caſſini* was the firſt that ſaw the 1, 2, 3 and 5 Satellites, with a Teleſcope of 17 Feet, about the End of *October* in the Year 1671. But the 4th of *Saturn*'s Moons was firſt diſcover'd by Mr. *Hugens*, *Anno* 1655. Theſe Satellites of *Jupiter*, as well as of *Saturn*, are called *Secondary Planets*, *Moons*, or *Concomitants*; for they conſtantly keep cloſe to their reſpective Primarys, and always attend upon them in their Circulations round the Sun; and in the mean time each of them performs his proper Revolution round his proper Primary: The Earth indeed has only the Moon to keep her company, who never forſakes her in her annual Courſe round the Sun; and while ſhe attends upon us, ſhe performs proper Circulations of her own round the Earth, in the Space of near a Month. The Satellites of *Saturn* have alſo been ſeen in *England* by means of that Teleſcope which was given to the Royal Society by the *Dutch* Aſtronomer, Mr. *Hugens*, whoſe Length is 125 Feet, by which nearly a perfect Theory of their Motions are ſettled; and from thoſe Obſervations and Theory, I have formed theſe Tables of their Motions. To theſe Satellites belong peculiar Phænomena, which are theſe: 1. That they cannot be ſeen with the naked Eye. 2. That they cannot always be ſeen by them that look at them thro' a Teleſcope. 3. They always appear in a right Line with their Primary, ſome to the Right, and ſome to the Left-Hand.; at other times, all to the Right, or all to the Left-Hand. 4. That they are continually changing their apparent Diſtances from their Primaries, ſeeming at one time to be near, and at another time further removed. 5. That as they are viewed by us from the Earth, they ſeem to go ſometimes to the Eaſt, and at other times

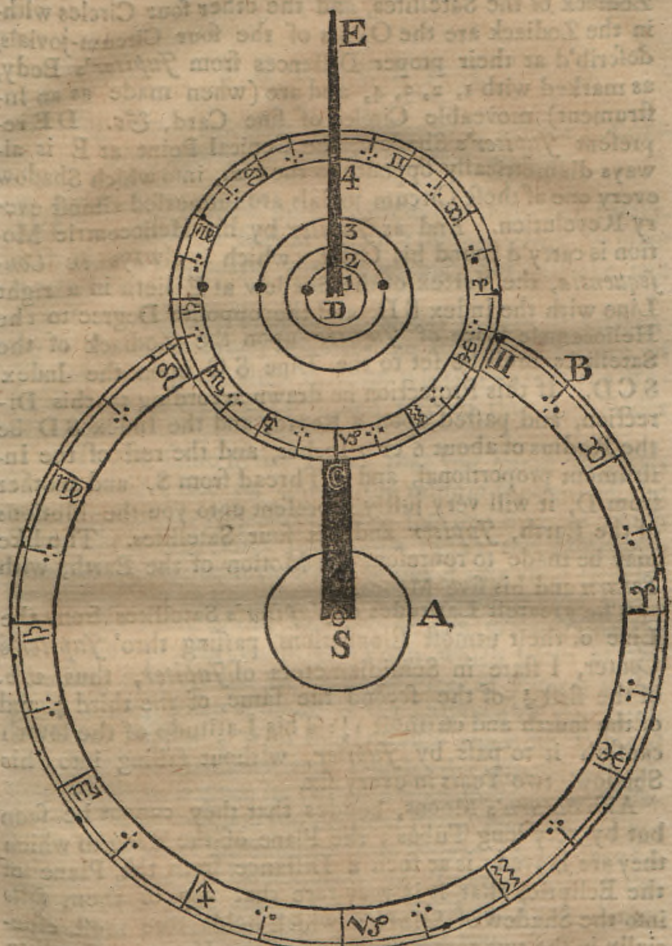
times to move to the West. 6. That when you look at them with two convex Glasses, they always appear on the contrary Side of their Primary to what they really are. 7. That Regard is to be had to the different Situation of the Earth, and the Place of the Observer, from these Phænomena of their Places; for such a Phænomenon is sooner seen when the Earth is nearer to it, than when it is removed from it. See the Theory of *Jupiter* in my System of the Planets, demonstrated Plate 10. Figure 4. 8. That when ♄ is in the Nodes of the Satellites ♍ ♓ 21°, the Sun is in the Plane of the Ring, from those Places; therefore the right Ascension and Declination is computed. 9. As far as can be discovered by us at so great a Distance, the Orbit of these Satellites appearing little or nothing eccentric; and by comparing the Periods of their Motions with the Periods of our Moon round the Earth, and the Periods of *Jupiter* and *Saturn* with the Period of the Earth round the Sun; the Inequalities in the Motions of these Satellites, may be deriv'd from the Inequalities in the Moon's Motion describ'd above in her Theory. These being their chief Phænomena.

We well know that the Motion of these Satellites are disturbed by the Sun acting upon them, and also by each other's Attraction, and by the Attraction of their Superiours or Primary Planets; but these Things being more physical than astronomical, I shall not trouble my Reader with them at this Time, but refer them to Sir *Isaac Newton*'s Philosophy, and *Gregory*'s Elements.

The third Satellite from *Jupiter* is of the first Magnitude, the first of that next to his Body is the second Magnitude, the second Satellite is of the third, and the fourth or outmost is of the fourth Magnitude. By these Directions it will not be difficult for an Observer to distinguish one Satellite from another. And the *Hugenean* or fourth of *Saturn's* Satellites, is the greatest of his Guards.

As the ☽ (the Earth's Satellite) is carry'd round the Sun along with the Earth in a Year, so are also the Satellites of *Jupiter* and *Saturn* carry'd round the Sun in the times of their respective Revolutions of their Primaries. And for a Demonstration hereof, I have framed the following Diagram after the Nature of my Lunar Instrument, which will make their Motions very plain and easy; in which

let



let S represent the Sun, A the Earth's Orb, B *Jupiter*'s Orb, divided into the 12 Signs of the Zodiack, the Index C is moveable, and lieth under the Orbs of the Satellites, and terminates at D, on which *Jupiter* at D moves round the Sun, and carries his four Satellites along with him; the outmost Circle from *Jupiter* at D represents the Zodiack marked with the 12 Signs thereof, which I call the Zo-

Zodiack of the Satellites, and the other four Circles within the Zodiack are the Orbits of the four Circum-jovials, defcrib'd at their proper Diftances from *Jupiter*'s Body, as marked with 1, 2, 3, 4, and are (when made as an Inftrument) moveable Circles of fine Card, *&c.* D E reprefent *Jupiter*'s Shadow, the Conical Point at E is always diametrically oppofite to the Sun, into which Shadow every one of thefe Circum jovials are immerfed almoft every Revolution. And as *Jupiter* by his Heliocentric Motion is carry'd round his Orbit, which is always *in Confequentia*, the Vertex of the Shadow at E lieth in a right Line with the Index S D, and the oppofite Degree to the Heliocentric Place of *Jupiter* upon the Zodiack of the Satellites muft be fet to the Line S C upon the Index S C D. If this Projection be drawn according to this Direction, and pafted upon a Board, and the Index S D be the Radius of about 6 or 7 Inches, and the reft of the Inftrument proportional, and a Thread from S, and another from D, it will very juftly reprefent unto you the Motions of the Earth, *Jupiter* and his four Satellites. The like may be made to reprefent the Motion of the Earth, with *Saturn* and his five Moons.

The greateft Latitudes of *Jupiter*'s Satellites from the Line of their utmoft Elongations, paffing thro' *Jupiter*'s Center, I ftate in Semidiameters of *Jupiter*, thus, *viz.* of the firft $\frac{1}{2}$, of the fecond the fame, of the third $\frac{3}{4}$, and of the fourth and outmoft $1\frac{1}{5}$: This Latitude of the fourth caufeth it to pafs by *Jupiter*, without falling into his Shadow, two Years in every fix.

Alfo *Saturn*'s Moons, befides that they cannot be feen but by very long Tubes; the Plane of the Ring in which they are moved, is at fuch a Diftance from the Plane of the Ecliptic, that it is very rare that any of them falls into the Shadow of *Saturn*: which holds true moft efpecially in the two remoteft, whereof the *Hugenian* Satellite is one, whofe Place I fhall fhew how to calculate by and by.

P R E-

PRECEPT I.

Shewing how to calculate the Distances of Jupiter's *Satellites, and to distinguish one from another.*

MY Design is here only to shew the ingenious Observer how to find at what Distance from *Jupiter* each Satellite appears, that so he may not mistake one from another.

1. From the Tables in my compleat System of Astronomy to the given Time, calculate the Heliocentric Place of *Jupiter*, as is there shew'd, from which subtract the Radical Place 5 *s.* 15° 22′ 57″, and reserve the Remainder till anon.

2. To the same given Time, that you found *Jupiter's* Heliocentric Place to, collect the middle Motions of the Satellite from its respective Table into one Sum, to which Sum, add always (after the Radix 1684) the Difference between the Heliocentric Place of the Radix, and the Heliocentric Place at the given Time just now reserv'd ; this Sum is the Place of the Satellite at the given Time, to answer our present Purpose. From which Place of the Satellite, subtract the Heliocentric Place of *Jupiter* at the given Time, what remains is the Distance of the Satellite from *Jupiter* ; with this Distance enter the Table of each Satellite's Distance from ♃ under the respective Satellite, and there is given its Distance from the Center of *Jupiter* in Semidiameters and decimal Parts. Here note, That if the Distance of the Satellite from *Jupiter* be less than six Signs, it is then in Consequence of *Jupiter*; but if the Distance be more than six Signs, it is in Antecedence, as the said Table will more fully direct you.

Example.

Anno 1728, *December* 16^{d} 9^{h} 1′ 48″, I observed with my 13½ Feet Tube, and two convex Glasses, the 2d, 3d, and 4th of *Jupiter's* Satellites (the first being at that time eclipsed) how were they by my Satellite Tables?

G Ope-

Operation.

Equal Time	Long ♃				Anom. ♃			
	ſ.	°	′	″	ſ.	°	′	″
1728	1	26	56	17	7	16	48	53
Dec. 16 Biſſ.		29	10	48		29	9	37
H. 9			1	52			1	52
′ ″								
1 48								
M. Mot.	2	26	8	57	8	16	00	22
Equat. add.		5	25	58				
♃ Helioc.	3	1	34	55				
Radix ſub.	5	13	22	57				
♃ á Radix	9	18	11	58				

Equal Time	Satellite 1.	Satellite 2.	Satellite 3.	Satellite 4.
	ſ. ° ′ ″	ſ. ′ ″	ſ. ° ′ ″	ſ. ° ′ ″
1728	11 2 39 1	2 8 15 54	6 27 46 57	3 24 19 14
Decemb.	8 17 32 1	11 21 22 34	7 8 19 29	11 26 57 38
Days 16 Biſſ.	7 7 53 54	9 11 57 23	4 13 59 12	5 17 40
Hours 9	2 16 16 38	1 7 59 3	18 50 16	8 3 29
Min. 1	8 29	4 13	2 6	54
Seconds 48	6 47	3 23	1 40	43
Sum —	5 14 36 50	0 19 42 30	7 8 59 40	4 4 39 38
♃ à Radix	9 18 11 58	9 18 11 58	9 18 11 58	9 18 11 58
Satellite	3 02 48 48	10 7 54 28	4 27 11 38	1 22 51 36
♃ Helioc.	3 1 34 55	3 1 34 55	3 1 34 55	3 1 34 55
Diſtance.	0 1 13 53	7 6 19 33	1 25 36 43	10 21 16 41

Hence, it appears by the Calculation, that the firſt Satellite was at the time of the Obſervation in the Shadow, becauſe its Diſtance from *Jupiter*'s Heliocentric Place was leſs than the Semiduration or Half-Stay in the Shadow 9°19′ 22″, and ſo of the other three.

The 2d and 4th were in Antecedence, and the third Satellite in Conſequence of *Jupiter* : But appear'd on the contrary Side of him, for the Reaſons above given.

2. The Satellites of *Saturn* may be found, as I have ſhewed in *Jupiter's*, with this Difference only, that as *Jupiter's* Satellites are immerſed into his Shadow, and *Saturn's* ſeldom are, that you work with *Saturn's* Geocentric Place, and you will have the Diſtance of his Moons from him, and alſo from each other; however, to ſatisfy the Curious and more Inquiſitive, I ſhall here ſhew the Method of *Hugens*, improv'd by Dr. *Halley*, in the *Philoſ. Tranſact.*

1. By the 8th Precept of my *Compleat Syſtem of Aſtronomy*, find the true Geocentric Place of *Saturn* to the time propoſed; from which ſubtract always the Place of the Apocronion (as they call it) 11 *ſ.* 20° 23′ 48″, the Remainder is the Diſtance of *Saturn* from the Equinox of the Ring. To which Place or Remainder, find the right Aſcenſion and Declination by the 2d and 3d Problems of my Book before cited; only here obſerve, that you make Uſe of 31° for the Obliquity or Inclination of this Satellite, inſtead of 23° 29′.

2. To the Right Aſcenſion thus found, add the Place of the Apocronion 11 *ſ.* 20° 23′ 48″, the Sum ſhall be the Longitude of the Satellites Apogeon; then ſay, As Radius, to the Sine of the Declination (found to the Obliquity 31°) So is 8, To the greateſt Latitude in Apogeon or Perigeon in the Parts of the Semidiameter of the Ring. Or ſo is 18, to the Parts of the Semidiameter of *Saturn's* Globe.

3. To the given Time collect the middle Motion of the Satellite, and from it ſubtract the Place of the Apocronion 11 20 23 48, the Remainder will be the mean Anomaly; with which, in the Table of the Moon's Equation in my *Compleat Syſtem of Aſtronomy*, take out the Equation anſwering thereto, and the Half thereof added or ſubtracted to or from the mean Motion, according to the Title of the ſaid Lunar Table, gives the true Motion of the Satellite, from which ſubtract the Apogeon as found in the laſt Precept, and if the Remainder be more than ſix Signs, the Satellite is Occidental; if leſs, Oriental: Then as Radius, to the Sine of the Remainder, ſo is 8, to the Semidiameter of the Ring; or 18 to the Semidiamiter of ♄ Globe, that the Satellite is to the Eaſtward or Weſtward of the Center of *Saturn* accordingly.

4. As Radius, to Co-Sine of the ſaid Remainder, ſo is the greateſt Latitude from the Line of the Anſæ, found by Precept 2. to the Latitude ſought. Example, *Anno* 1657, *May* 19, New Stile, about 10 at Night, Mr. *Hugens* obſerved the 4 Satellites very near to ♄ on the Weſtern Side, and very little above the Line of the Anſæ.

Operation.

Anno 1657, *May* 9ᵈ 9ʰ 40′ P. M. at *London.*

		ſ.	°	′	″
Saturn's Geocentric Place		5	28	53	8
Apocronion ſub.		11	20	23	48
♄ ab Equinox of the Ring		6	8	29	20
Right Aſcenſion anſwering		6	7	17	0
Place Apogeon		5	27	40	48
Declinat. South			4	21	0
Greateſt Latitude in Apog. $\frac{61}{100}$					
Radix	1681	1	0	48	56
Mot. for Years ſub.	24	8	29	35	15
Remains the Radix	1657	4	1	13	41
May		6	9	14	6

Days 9	6	23	11	33
Hours 9		8	27	59
Min. 40			37	38
M. Motion	5	12	44	57
Apocr. ſub.	11	20	23	48
Anom.	5	22	21	9
Equat. ſub.			18	23
Long. Satell.	5	12	26	34
Apog. ſub.	5	27	40	48
Rem.	11	14	45	46 Occident.
Comple.	0	15	14	14 Before the Apogee.

True Latitude North $\frac{18}{100}$ Parts of the Ring.

Here

Here follows a Catalogue of the Observations from which I constructed these Tables of the Satellites of Jupiter *and* Saturn.

ANno 1657, *May* 19, N. S. about 10 at Night, Monf. *Hugens*, with his long Glasses, observed the 4 Satellites of *Saturn* a little above the Line of the Ansæ, and very near to *Saturn* on the Western Side, that Planet was then in ♍ 28° 53′ 8″.

Anno 1658, *Mar.* 11, N. S. at 10 P. M. Monf. *Hugens* observed the same Satellite a little to the East of *Saturn*, and on the South-side of him.

Anno 1659, *March* 14, N. S. 12^h P. M. at the *Hague*, Monf. *Hugens* observed the 4th Satellite about one Diameter of the Ring under *Saturn*: but it was gone so far to the Westward, that he concluded, that about four Hours before, or 7^h 40′ at *London*, it had been in Perigæo.

Anno 1659, *March* 22^d 10^h 45′ P. M. this Satellite was a whole Diameter above the Line of the Ansæ, and the Perpendicular thereon fell nearly upon the Extremity of the Eastern Ansæ.

Anno 1682, *November* 13^d 13^h P. M. Dr. *Halley* observed *Saturn*'s 4th Satellite in Perigæo on the North Side of him; and a Perpendicular let fall from it on the transverse Diameter of the Ring, fell upon the Middle of the dark Spot of the following Ansæ.

Again, *November* 21^d 16^h 15′ P. M. this Satellite was on the South Side, the Perpendicular on the Line of the Ansæ fell on the Middle of the dark Spot of the Western Ansæ; and the same Night at 19^h, the Perpendicular fell precisely on the Center of *Saturn*; it was now in Apogæo.

Anno 1683, *Jan.* 24, at 8 at Night, he observed this Satellite in Apogæo, the Perpendicular on the Line of the Ansæ fell exactly on the Western Limb of ♄, and at 9^h 30′ the said Perpendicular fell within the Globe more than half Way to the Center, and distant from the Line of the Ansæ towards the South, about one Diameter of the Ring.

Anno 1683, *Feb.* 9^d 8^h 10′ P. M. this 4th Satellite was in Apogæo, and about one Diameter of *Saturn*'s Ring to the South.

Anno

Anno 1714, *April* 4^d 21^h 30′ N. S. Monſ. *Caſſini*, at the Royal Obſervatory in *France*, obſerved the innermoſt of ♄ Satellites in its inferiour Conjunction with *Saturn*, he was then in ♍ 5° 23′ 32″ by my Tables, and the ſame time the ſecond Satellite was in its ſuperiour Conjunction with *Saturn*.

Anno 1714, M. *Caſſini* obſerved the third Satellite of *Saturn*, *April* 4^d 10^h N. S. to have newly paſs'd its inferiour Conjunction with *Saturn*, and a Perpendicular from it fell on the Extremity of the Weſtern Anſæ, ſo that at about 5^h P. M. it was with the Center of *Saturn* then in ♍ 5° 27′ R, and conſequently the Satellite was in ♓ 5° 27′.

Anno 1715, *March* 25^d 11^h P. M. M. *Caſſini* obſerved the Hugenian or 4th Satellite in Apogæo, and did immerge behind the Body of *Saturn*, he was then in ♍ 20° 3′ 33″ R.

Anno 1714, *May* 6^d, 12^h P. M. *Caſſini* obſerved the 5th or outmoſt Satellite in its ſuperiour Conjunction with ♄ he being then Retrograde in ♍ 4° 32′ 45″.

Anno 1718, *April* 21^d 10^h 4′, Mr. *Pound* at *Wanſted*, by Help of the Royal Society's 125 Feet Glaſs, obſerved the 3d and 4th Satellites of ♄ in Apogæo, a little paſt their Conjunction with *Saturn*. The firſt was Northward of the Line of the Anſæ ; and therefore in the Apogeon Semicircle diſtant from the ſaid Line ¾ of *Saturn*'s Semidiameter, and about a Semidiameter of the Ring from the Weſtern Anſæ.

The 2d was a very little Southward of the Line of the Anſæ (and therefore in the Perigeon Semicircle) above a Semidiameter of the Ring from the Weſtern Anſæ. The 3d, 1ſt and 2d, were in a ſtreight Line.

And, *April* 22^d 11^h 5′ P. M. the four innermoſt Satellites were all Eaſtward of ♄, the 2d and 4th in the Apogeon, and the 1ſt and 3d in the Perigeon Semicircle: The 5th or outmoſt Satellite was at this time near its greateſt Elongation Eaſtward.

The Tables of the Satellites of *Jupiter* I have deduced from the Obſervations of Mr. *Flamſted*, confirmed with abundance of my own.

A

A Table of the Mean Motion of the Moon

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	ſ.	°	′	″	ſ.	°	′	″	ſ.	°	′	″
1681	6	1	45	55	8	4	29	45	5	24	13	35
1682	10	11	8	58	9	15	9	35	5	4	53	52
1683	2	20	32	1	10	25	49	26	4	15	34	9
1684	6	29	55	4	0	6	29	18	3	26	14	26
1685	11	22	28	42	1	17	15	49	3	6	51	32
1686	4	1	51	45	2	27	55	39	2	17	31	49
1687	8	11	14	48	4	8	35	29	1	28	12	6
1688	0	20	37	51	5	19	15	20	1	8	52	23
1689	5	13	11	30	7	0	1	51	0	19	29	29
1690	9	22	34	34	8	10	41	42	0	0	9	46
1691	2	1	57	38	9	21	21	32	11	10	50	3
1692	6	11	20	42	11	2	1	23	10	21	30	20
1693	11	3	54	21	0	12	47	54	10	2	7	26
1694	3	13	17	24	1	23	27	45	9	12	47	43
1695	7	22	40	27	3	4	7	35	8	23	28	0
1696	0	2	3	31	4	14	47	26	8	4	8	17
1697	4	24	37	34	5	25	33	57	7	14	45	23
1698	9	4	0	12	7	6	13	48	6	25	25	40
1699	1	13	23	17	8	16	53	38	6	6	5	57
1700	5	22	46	21	9	27	33	28	5	16	46	14
1701	10	15	20	0	11	8	20	0	4	27	23	20
1702	2	24	43	3	0	18	59	50	4	8	3	37
1703	7	4	6	6	1	29	39	40	3	18	43	54
1704	11	13	29	9	3	10	19	31	2	29	24	11
1705	4	6	2	47	4	21	6	2	2	10	1	17
1706	8	15	25	50	6	1	45	52	1	20	41	34
1707	0	24	48	53	7	12	25	42	1	1	21	51

A Table of the Mean Motion of the Moon

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	ſ.	°	′	″	ſ.	°	′	″	ſ.	°	′	″
1708	5	4	11	56	8	23	5	34	0	12	2	8
1709	9	26	45	34	10	3	52	5	11	22	39	14
1710	2	6	8	38	11	14	31	55	11	3	19	31
1711	6	15	31	40	0	25	11	45	10	13	59	48
1712	10	24	54	45	2	5	51	36	9	24	40	5
1713	3	17	28	24	3	16	38	8	9	5	17	11
1714	7	26	51	27	4	27	17	58	8	15	57	28
1715	0	6	14	31	6	7	57	49	7	26	37	45
1716	4	15	37	36	7	18	37	40	7	7	18	2
1717	9	8	11	15	8	29	24	12	6	27	55	8
1718	1	17	34	19	10	10	4	2	5	28	35	25
1719	5	26	57	23	11	20	43	52	5	9	15	42
1720	10	6	20	27	1	1	23	43	4	19	55	59
1721	2	28	54	5	2	12	10	15	4	0	33	5
1722	7	8	17	8	3	22	50	5	3	11	13	22
1723	11	17	40	11	5	3	29	56	2	21	53	39
1724	3	27	3	14	6	14	9	46	2	2	33	56
1725	8	19	36	52	7	24	56	18	1	13	11	2
1726	0	28	59	55	9	5	36	8	0	23	51	19
1727	5	8	22	58	10	16	15	59	0	4	31	36
1728	9	17	46	1	11	26	55	49	11	15	11	53
1729	2	10	19	39	1	7	42	20	10	25	48	59
1730	6	19	42	42	2	18	21	10	10	6	29	16
1731	10	29	5	46	3	29	2	1	9	17	9	33
1732	3	8	28	50	5	9	41	51	8	27	49	50
1733	8	1	2	29	6	20	28	23	8	8	26	56
1734	0	10	25	33	8	1	8	13	7	19	7	13

in Years Current.

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	ſ.	°	′	″	ſ.	°	′	″	ſ.	°	′	″
1735	4	19	48	37	9	11	48	4	6	29	47	30
1736	8	29	11	41	10	22	27	54	6	10	27	47
1737	1	21	45	20	0	3	14	26	5	21	4	53
1738	6	1	8	24	1	13	54	16	5	1	45	10
1739	10	10	21	28	2	24	34	7	4	12	25	27
1740	2	19	54	32	4	5	13	58	3	23	5	44
1741	7	12	28	10	5	16	0	30	3	3	42	50
1742	11	21	51	13	6	26	40	20	2	14	23	7
1743	4	1	14	17	8	7	20	11	1	25	3	24
1744	8	10	37	19	9	18	0	0	1	5	43	41
1745	1	3	10	58	10	28	46	32	0	16	20	47
1746	5	12	34	1	0	9	26	12	11	27	1	4
1747	9	21	57	5	1	20	6	13	11	7	41	21
1748	2	1	20	8	3	0	46	3	10	18	21	38
1749	6	23	53	47	4	11	32	34	9	28	58	44
1750	11	3	16	49	5	22	12	24	9	9	39	1
1751	3	12	39	54	7	2	52	15	8	20	19	18
1752	7	22	2	57	8	13	32	5	8	0	59	35
1753	0	14	36	36	9	24	18	38	7	11	36	41
1754	4	23	59	39	11	4	58	28	6	22	16	58
1755	9	3	22	42	0	15	38	19	6	2	57	15
1756	1	12	45	46	1	26	18	9	5	13	37	32
1757	6	5	19	26	3	7	4	41	4	24	14	38
1758	10	14	42	30	4	17	44	32	4	4	54	55
1759	2	24	5	34	5	28	24	22	3	15	35	12
1760	7	3	28	37	7	9	4	13	2	26	15	29
1761	11	26	2	15	8	19	50	45	2	6	52	35

A Table of the Mean Motion of the Moon

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	s.	°	′	″	s	°	′	″	s.	°	′	″
1762	4	5	25	18	10	0	30	35	1	17	32	52
1763	8	14	48	22	11	11	10	26	0	28	13	9
1764	0	24	11	25	0	21	50	16	0	8	53	26
1765	5	16	45	4	2	2	36	48	11	19	30	32
1766	9	26	8	8	3	13	16	38	11	0	10	49
1767	2	5	31	11	4	23	56	18	10	10	51	6
1768	6	14	54	15	6	4	36	19	9	21	31	23
1769	11	7	27	54	7	15	22	52	9	2	8	29
1770	3	16	50	57	8	26	2	42	8	12	48	46
1771	7	26	14	1	10	6	42	32	7	23	29	3
1772	0	5	37	4	11	17	22	23	7	4	9	20
1773	4	28	10	43	0	28	8	53	6	14	46	26
1774	9	7	33	46	2	8	48	43	5	25	26	43
1775	1	16	56	50	3	19	28	38	5	6	7	0
1776	5	26	19	53	5	0	8	26	4	16	47	17
1777	10	18	53	32	6	10	54	50	3	27	24	23
1778	2	28	16	35	7	21	34	47	3	8	4	40
1779	7	7	39	39	9	2	14	37	2	18	44	57
1780	11	17	2	42	10	12	54	28	1	29	25	14
1781	4	9	36	20	11	23	41	0	1	10	2	20
1782	8	18	59	23	1	4	20	51	0	20	42	37
1783	0	28	22	27	2	15	0	41	0	1	22	54
1784	5	7	45	30	3	25	40	32	11	12	3	11
1785	10	0	19	9	5	6	27	2	10	22	40	17
1786	2	9	42	12	6	17	6	53	10	3	20	34
1787	6	19	5	16	7	27	46	44	9	14	0	51
1788	10	28	28	19	9	8	26	35	8	24	41	8

in Years Current.

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	ſ.	°	′	″	ſ.	°	′	″	ſ.	°	′	″
1789	3	21	1	57	10	19	13	7	8	5	18	14
1790	8	0	25	1	11	29	52	57	7	15	58	31
1791	0	9	48	4	1	10	32	48	6	26	38	48
1792	4	19	11	8	2	21	12	38	6	7	19	5
1793	9	11	44	47	4	1	59	10	5	17	56	11
1794	1	21	7	50	5	12	39	0	4	28	36	28
1795	6	0	30	54	6	23	18	50	4	9	16	45
1796	10	9	53	57	8	3	58	41	3	19	57	2
1797	3	2	27	36	9	14	45	12	3	0	34	8
1798	7	11	50	59	10	25	25	2	2	11	14	25
1799	11	21	13	43	0	6	4	53	1	21	54	42
1800	4	0	36	46	1	16	44	43	1	2	34	59
1801	8	23	10	25	2	27	31	15	0	13	12	5
1802	1	2	33	28	4	8	11	5	11	23	52	22
1803	5	11	56	32	5	18	50	56	11	4	32	39
1804	9	21	19	35	6	29	30	46	10	15	12	56
1805	2	13	53	14	8	10	17	18	9	25	50	2
1806	6	23	16	17	9	20	57	8	9	6	30	19
1807	11	2	39	21	11	1	36	59	8	17	10	36
1808	3	12	2	24	0	12	16	49	7	27	50	53
1809	8	4	36	3	1	23	3	20	7	8	27	59
1810	0	13	59	6	3	3	43	11	6	19	8	16
1811	4	23	22	10	4	14	23	2	5	29	48	33
1812	9	2	45	13	5	25	2	52	5	10	28	50
1813	1	25	18	51	7	5	49	24	4	21	5	56
1814	6	4	41	55	8	16	29	13	4	1	46	13
1815	10	14	4	58	9	27	9	4	3	12	26	30

A Table of the Mean Motion of the Moon, &c.

Years	Long. ☽.				Apog. ☽.				Node ☽.			
	s.	°	′	″	*s.*	°	′	″	*s.*	°	′	″
1816	2	23	28	2	11	7	48	54	2	23	6	47
1817	7	16	1	41	0	18	35	26	2	3	43	53
1818	11	25	24	44	1	29	15	16	1	14	24	10
1819	4	4	47	48	3	9	55	6	0	25	4	27
1820	8	27	10	51	4	20	34	57	0	5	44	43
1821	1	6	44	30	6	1	21	30	11	16	21	50
1822	5	16	7	33	7	12	1	20	10	27	2	7
1823	9	25	30	37	8	22	41	10	10	7	42	24
1824	2	4	53	41	10	2	21	1	9	18	22	41
1825	6	27	27	19	11	14	7	32	8	28	59	47
1826	11	6	50	23	0	24	47	22	8	9	40	4
1827	3	16	13	26	2	5	27	12	7	20	20	21
1828	7	25	36	30	3	16	7	2	7	1	0	38
1829	0	18	10	9	4	26	53	34	6	11	37	44
1830	4	27	33	12	6	7	33	24	5	22	18	1
1831	9	6	56	15	7	18	13	15	5	2	58	18
1832	1	16	19	18	8	28	53	5	4	13	38	35
1833	6	8	52	57	10	9	39	37	3	24	15	41
1834	10	18	16	0	11	20	19	27	3	4	55	58
1835	2	27	39	4	1	0	59	18	2	15	36	15
1836	7	7	2	7	2	11	39	9	1	26	16	32
1837	11	29	35	46	3	22	25	41	1	6	53	38
1838	4	8	54	49	5	3	5	31	0	17	33	55
1839	8	18	21	53	6	13	45	21	11	28	14	12
1840	0	27	44	56	7	24	25	12	11	8	54	29
1841	5	20	18	34	9	5	11	45	10	19	31	36
1842	9	29	41	38	10	15	51	35	10	0	11	53

The Mean Motion of the Moon.

JANUARY.

Days	Long. ☽.				Apog. ☽.			Node ☽.		
	s.	°	′	″	°	′	″	°	′	″
1	0	13	10	35	0	6	41	0	3	11
2	0	26	21	10	0	13	22	0	6	21
3	1	9	31	45	0	20	3	0	9	32
4	1	22	42	20	0	26	44	0	12	43
5	2	5	52	55	0	33	25	0	15	53
6	2	19	3	30	0	40	6	0	19	4
7	3	2	14	5	0	46	48	0	22	14
8	3	15	24	40	0	53	29	0	25	25
9	3	28	35	15	1	0	10	0	28	36
10	4	11	45	50	1	6	51	0	31	46
11	4	24	56	25	1	13	32	0	34	57
12	5	8	7	0	1	20	13	0	38	8
13	5	21	17	35	1	26	54	0	41	18
14	6	4	28	10	1	33	35	0	44	29
15	6	17	38	45	1	40	16	0	47	40
16	7	0	49	20	1	46	57	0	50	50
17	7	13	59	55	1	53	38	0	54	1
18	7	27	10	30	2	0	19	0	57	11
19	8	10	21	5	2	7	0	1	0	22
20	8	23	31	40	2	13	41	1	3	33
21	9	6	42	15	2	20	23	1	6	43
22	9	19	52	50	2	27	4	1	9	54
23	10	3	3	25	2	33	45	1	13	5
24	10	16	14	0	2	40	26	1	16	15
25	10	29	24	35	2	47	7	1	19	26
26	11	12	35	10	2	53	48	1	22	37
27	11	25	45	45	3	0	29	1	25	47
28	0	8	56	20	3	7	10	1	28	58
29	0	22	6	55	3	13	51	1	32	9
30	1	5	17	31	3	20	32	1	35	19
31	1	18	28	6	3	27	13	1	38	30

The Mean Motion of the Moon

FEBRUARY.

Days	Long. ☽.				Agog. ☽.			Node ☽.		
	s.	°	'	"	°	'	"	°	'	"
1	2	1	38	41	3	33	54	1	41	40
2	2	14	49	16	3	40	35	1	44	50
3	2	27	59	51	3	47	16	1	48	1
4	3	11	10	26	3	53	57	1	51	12
5	3	24	21	1	4	0	38	1	54	23
6	4	7	31	36	4	7	19	1	57	33
7	4	20	42	11	4	14	0	2	0	44
8	5	3	52	46	4	20	41	2	3	54
9	5	17	3	21	4	27	22	2	7	6
10	6	0	13	56	4	34	4	2	10	16
11	6	13	24	31	4	40	45	2	13	27
12	6	26	35	6	4	47	26	2	16	37
13	7	9	45	41	4	54	7	2	19	48
14	7	22	56	15	5	0	48	2	22	59
15	8	6	6	50	5	7	29	2	26	9
16	8	19	17	26	5	10	10	2	29	20
17	9	2	28	1	5	20	51	2	32	30
18	9	15	38	36	5	27	32	2	35	41
19	9	28	49	11	5	34	13	2	38	52
20	10	11	59	46	5	40	54	2	42	2
21	10	25	10	21	5	47	36	2	45	13
22	11	8	20	56	5	54	17	2	48	23
23	11	21	31	31	6	0	58	2	51	34
24	0	4	42	6	6	7	39	2	54	45
25	0	17	52	41	6	14	20	2	57	55
26	1	1	3	16	6	21	1	3	1	6
27	1	14	13	51	6	27	42	3	4	16
28	1	27	24	26	6	34	23	3	7	27
29	2	10	35	1	6	41	4	3	10	38

MARCH.

Common	Long. ☽.				Apog. ☽.			Node ☽.			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	2	10	35	1	6	41	4	3	10	38	0
2	2	23	45	36	6	47	45	3	13	49	1
3	3	6	56	11	6	54	26	3	16	59	2
4	3	20	6	46	7	1	7	3	20	10	3
5	4	3	17	21	7	7	48	3	23	20	4
6	4	6	27	56	7	14	29	3	26	31	5
7	4	29	38	31	7	21	11	3	29	42	6
8	5	12	49	6	7	27	52	3	32	52	7
9	5	25	59	41	7	34	33	3	36	3	8
10	6	9	10	16	7	41	14	3	39	14	9
11	6	22	20	51	7	47	55	3	42	25	10
12	7	5	31	26	7	54	36	3	45	36	11
13	7	18	42	1	8	1	17	3	48	46	12
14	8	1	52	36	8	7	58	3	51	56	13
15	8	15	3	11	8	14	39	3	55	7	14
16	8	28	13	46	8	21	20	3	58	18	15
17	9	11	24	21	8	28	1	4	1	28	16
18	9	24	34	56	8	34	42	4	4	39	17
19	10	7	45	31	8	41	23	4	7	49	18
20	10	20	56	7	8	48	4	4	11	0	19
21	11	4	6	42	8	54	45	4	14	11	20
22	11	17	17	17	9	1	27	4	17	22	21
23	0	0	27	52	9	8	8	4	20	32	22
24	0	13	38	27	9	14	49	4	23	43	23
25	0	26	49	2	9	21	30	4	26	53	24
26	1	9	59	37	9	28	11	4	30	4	25
27	1	23	10	12	9	34	52	4	33	15	26
28	2	6	20	47	9	41	33	4	36	25	27
29	2	19	31	22	9	48	14	4	39	36	28
30	3	2	41	57	9	54	55	4	42	47	29
31	3	15	52	32	10	1	36	4	45	58	30

The Mean Motion of the Moon

APRIL.

Common	Long ☽.				Apog. ☽.			Node ☽.			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	3	29	3	7	10	8	17	4	49	8	0
2	4	12	13	42	10	14	58	4	52	11	1
3	4	25	24	17	10	21	39	4	55	29	2
4	5	8	34	52	10	28	20	4	58	40	3
5	5	21	45	27	10	35	2	5	1	51	4
6	6	4	56	2	10	41	43	5	5	1	5
7	6	18	6	38	10	48	24	5	8	12	6
8	7	1	17	12	10	55	5	5	11	22	7
9	7	14	27	47	11	1	46	5	14	33	8
10	7	27	38	22	11	8	27	5	17	44	9
11	8	10	48	57	11	15	8	5	20	54	10
12	8	23	59	32	11	21	49	5	24	5	11
13	9	7	10	7	11	28	30	5	27	16	12
14	9	20	20	42	11	35	11	5	30	26	13
15	10	3	31	17	11	41	52	5	33	37	14
16	10	16	41	52	11	48	33	5	36	48	15
17	10	29	52	27	11	55	14	5	39	58	16
18	11	13	3	2	12	1	55	5	43	9	17
19	11	26	13	37	12	8	36	5	46	15	18
20	0	9	24	12	12	15	18	5	49	31	19
21	0	22	34	47	12	21	59	5	52	41	20
22	1	5	45	22	12	28	40	5	55	52	21
23	1	18	55	47	12	35	21	5	59	2	22
24	2	2	6	32	12	42	2	6	2	13	23
25	2	15	17	7	12	48	43	6	5	54	24
26	2	28	27	42	12	55	24	6	8	34	25
27	3	11	38	17	13	2	5	6	11	45	26
28	3	24	48	52	13	8	46	6	14	56	27
29	4	7	59	27	13	15	27	6	18	6	28
30	4	21	10	3	13	22	8	6	21	17	29
31	5	4	20	37	13	28	49	6	24	27	30

MAY.

Common	Long. ☽				Apog. ☽			Node ☽			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	5	4	20	37	13	28	49	6	24	27	0
2	5	17	31	12	13	35	30	6	27	38	1
3	6	0	41	47	13	42	11	6	30	48	2
4	6	13	52	22	13	48	52	6	33	59	3
5	6	27	2	57	13	55	34	6	37	10	4
6	7	10	13	32	14	2	15	6	40	20	5
7	7	23	24	7	14	8	56	6	43	31	6
8	8	6	34	42	14	15	37	6	46	41	7
9	8	19	45	17	14	22	18	6	49	52	8
10	9	2	55	53	14	28	59	6	53	3	9
11	9	16	6	27	14	35	40	6	56	14	10
12	9	29	17	3	14	42	21	6	59	24	11
13	10	12	27	38	14	49	2	7	2	34	12
14	10	25	38	13	14	55	43	7	5	45	13
15	11	8	48	48	15	2	24	7	8	56	14
16	11	21	59	23	15	9	5	7	12	6	15
17	0	5	9	58	15	15	46	7	15	17	16
18	0	18	20	33	15	22	28	7	18	27	17
19	1	1	31	8	15	29	9	7	21	38	18
20	1	14	41	43	15	35	50	7	24	49	19
21	1	27	52	18	15	42	31	7	28	0	20
22	2	11	2	53	15	49	12	7	31	10	21
23	2	24	13	28	15	55	53	7	34	21	22
24	3	7	24	3	16	2	34	7	37	32	23
25	3	20	34	38	16	9	15	7	40	43	24
26	4	8	45	13	16	15	56	7	43	53	25
27	4	16	55	48	16	22	37	7	47	4	26
28	5	0	6	23	16	29	18	7	50	14	27
29	5	13	16	58	16	35	59	7	53	25	28
30	5	26	27	33	16	42	40	7	56	36	29
31	6	9	38	8	16	49	21	7	59	46	30

The Mean Motion of the Moon

JUNE.

Com-mon	Long ☽.				Apog. ☽.			Node ☽.			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	6	22	48	43	16	56	3	8	2	56	0
2	7	5	59	18	17	2	44	8	6	7	1
3	7	19	9	53	17	9	25	8	9	18	2
4	8	2	20	28	17	16	6	8	12	29	3
5	8	15	31	3	17	22	47	8	15	39	4
6	8	28	41	38	17	29	28	8	18	50	5
7	9	11	52	13	17	36	9	8	22	0	6
8	9	25	2	48	17	42	50	8	25	11	7
9	10	8	13	23	17	49	31	8	28	22	8
10	10	21	23	58	17	56	12	8	31	32	9
11	11	4	34	33	18	2	53	8	34	43	10
12	11	17	45	8	18	9	34	8	37	54	11
13	0	0	55	43	18	16	15	8	41	5	12
14	0	14	6	18	18	22	56	8	44	16	13
15	0	27	16	53	18	29	37	8	47	26	14
16	1	10	27	28	18	36	19	8	50	37	15
17	1	23	38	3	18	43	0	8	53	47	16
18	2	6	48	38	18	49	41	8	56	58	17
19	2	19	59	13	18	52	22	9	0	9	18
20	3	3	9	48	19	3	3	9	3	19	19
21	3	16	20	23	19	9	44	9	6	30	20
22	3	29	30	58	19	16	25	9	9	40	21
23	4	12	41	33	19	23	6	9	12	51	22
24	4	25	52	8	19	29	47	9	16	2	23
25	5	9	2	43	19	36	28	9	19	12	24
26	5	22	13	18	19	43	9	9	22	23	25
27	6	5	23	53	19	49	50	9	25	34	26
28	6	18	34	28	19	56	31	9	28	45	27
29	7	1	45	4	20	3	12	9	31	55	28
30	7	14	55	39	20	9	54	9	35	6	29
31	7	28	6	14	20	16	35	9	38	16	30

in Months and Days.

JULY.

Common	Long. ☽.				Apog. ☽.			Node ☽.			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	7	28	6	14	20	16	35	9	38	16	0
2	8	11	16	49	20	23	16	9	41	27	1
3	8	24	27	24	20	29	57	9	44	37	2
4	9	7	37	59	20	36	38	9	47	48	3
5	9	20	48	34	20	43	19	9	50	59	4
6	10	3	59	9	20	50	0	9	54	9	5
7	10	17	9	44	20	56	41	9	57	20	6
8	11	0	20	19	21	3	22	10	0	30	7
9	11	13	30	54	21	10	3	10	3	41	8
10	11	26	41	29	21	16	44	10	6	51	9
11	0	9	52	4	21	23	25	10	10	2	10
12	0	23	2	39	21	30	6	10	13	13	11
13	1	6	13	14	21	36	47	10	16	24	12
14	1	19	23	49	21	43	28	10	19	35	13
15	2	2	34	24	21	50	9	10	22	45	14
16	2	15	44	59	21	56	52	10	25	56	15
17	2	28	55	34	22	3	32	10	29	6	16
18	3	12	6	9	22	10	13	10	32	17	17
19	3	25	16	44	22	16	54	10	35	28	18
20	4	8	27	19	22	23	35	10	38	39	19
21	4	21	37	54	22	30	15	10	41	49	20
22	5	4	48	29	22	36	56	10	45	0	21
23	5	17	59	4	22	43	37	10	48	11	22
24	6	1	9	39	22	50	19	10	51	21	23
25	6	14	20	14	22	57	0	10	54	32	24
26	6	27	30	49	23	3	41	10	57	42	25
27	7	10	41	20	23	10	22	11	0	53	26
28	7	23	51	59	23	17	3	11	4	3	27
29	8	7	2	34	23	23	44	11	7	14	28
30	8	20	13	9	23	30	25	11	10	25	29
31	9	3	23	44	23	37	6	11	13	36	30

The Mean Motion of the Moon

AUGUST.

Common	Long. ☽.				Agog. ☽.			Node ☽.			Bissex
	s.	°	′	″	°	′	″	°	′	″	
1	9	16	34	19	23	43	47	11	16	47	0
2	9	29	44	54	23	50	28	11	19	58	1
3	10	12	55	29	23	57	9	11	23	8	2
4	10	26	6	4	24	3	51	11	26	19	3
5	11	9	16	39	24	10	32	11	29	29	4
6	11	22	27	14	24	17	30	11	32	40	5
7	0	5	37	49	24	23	54	11	35	51	6
8	0	18	48	24	24	30	35	11	39	2	7
9	1	1	58	59	24	37	16	11	42	12	8
10	1	15	9	34	24	43	57	11	45	23	9
11	1	28	20	9	24	50	38	11	48	33	10
12	2	11	30	44	24	57	19	11	51	44	11
13	2	24	41	19	25	4	0	11	54	54	12
14	3	7	51	54	25	10	42	11	58	5	13
15	3	21	2	29	25	17	23	12	1	15	14
16	4	4	13	4	25	24	4	12	4	26	15
17	4	17	23	40	25	30	45	12	7	36	16
18	5	0	34	15	25	37	26	12	10	47	17
19	5	13	44	50	25	44	7	12	13	58	18
20	5	26	55	25	25	50	48	12	17	8	19
21	6	10	6	0	25	57	29	12	20	19	20
22	6	23	16	35	26	4	10	12	23	29	21
23	7	6	27	10	26	10	51	12	26	40	22
24	7	19	37	45	26	17	32	12	29	51	23
25	8	2	48	20	26	24	13	12	33	1	24
26	8	15	58	55	26	30	55	12	36	12	25
27	8	29	9	30	26	37	36	12	39	23	26
28	9	12	20	5	26	44	17	12	42	34	27
29	9	25	30	40	26	50	58	12	45	44	28
30	10	8	41	15	26	57	39	12	48	55	29
31	10	21	51	50	27	4	20	12	52	5	30

in Months and Days.

SEPTEMBER.

Common	Long. ☽.				Apog. ☽.				Node ☽.			Bissex
	s.	°	′	″	s.	°	′	″	°	′	″	
1	11	5	2	25	0	27	11	1	12	55	16	0
2	11	18	13	0	0	27	17	42	12	58	27	1
3	0	1	23	35	0	27	24	23	13	1	37	2
4	0	14	34	10	0	27	31	4	13	4	48	3
5	0	27	44	45	0	27	37	45	13	7	58	4
6	1	10	55	20	0	27	44	26	13	11	9	5
7	1	24	5	55	0	27	51	7	13	14	20	6
8	2	7	16	30	0	27	57	48	13	17	31	7
9	2	20	27	5	0	28	4	29	13	20	41	8
10	3	3	37	40	0	28	11	11	13	23	52	9
11	3	16	48	15	0	28	17	52	13	27	3	10
12	3	29	58	50	0	28	24	33	13	30	14	11
13	4	13	9	25	0	28	31	14	13	33	24	12
14	4	26	20	0	0	28	37	55	13	36	35	13
15	5	9	30	35	0	28	44	36	13	39	45	14
16	5	22	41	10	0	28	51	17	13	42	56	15
17	6	5	51	45	0	28	57	58	13	46	7	16
18	6	19	2	20	0	29	4	39	13	49	17	17
19	7	2	12	55	0	29	11	20	13	52	28	18
20	7	15	23	30	0	29	18	1	13	55	38	19
21	7	28	34	5	0	29	24	42	13	58	49	20
22	8	11	44	40	0	29	31	23	14	2	0	21
23	8	28	55	15	0	29	38	4	14	5	10	22
24	9	8	5	50	0	29	44	45	14	8	21	23
25	9	21	16	25	0	29	51	27	14	11	31	24
26	10	4	27	0	0	29	58	8	14	14	42	25
27	10	17	37	35	1	0	4	49	14	17	53	26
28	11	0	48	10	1	0	11	30	14	21	3	27
29	11	13	58	45	1	0	18	11	14	24	14	28
30	11	27	9	20	1	0	24	52	14	27	24	29
31	0	10	19	55	1	0	31	33	14	30	35	30

The Mean Motion of the Moon

OCTOBER.

Common	Long. ☽.				Apog. ☽.				Node ☽.			Biffex
	s.	°	′	″	s.	°	′	″	°	′	″	
1	0	10	19	55	1	0	31	33	14	30	25	0
2	0	23	30	30	1	0	38	14	14	33	46	1
3	1	6	41	5	1	0	44	55	14	36	56	2
4	1	19	51	40	1	0	51	36	14	40	7	3
5	2	3	2	15	1	0	58	17	14	43	17	4
6	2	16	12	50	1	1	4	58	14	46	28	5
7	2	29	23	26	1	1	11	39	14	49	39	6
8	3	12	34	1	1	1	18	20	14	52	50	7
9	3	25	44	36	1	1	25	2	14	56	0	8
10	4	8	55	11	1	1	31	43	14	59	11	9
11	4	22	5	46	1	1	38	24	15	2	21	10
12	5	5	16	21	1	1	45	5	15	5	32	11
13	5	8	26	56	1	1	51	46	15	8	43	12
14	6	1	37	31	1	1	58	27	15	11	53	13
15	6	14	48	6	1	2	5	8	15	15	4	14
16	6	27	58	41	1	2	11	49	15	18	15	15
17	7	11	9	16	1	2	18	30	15	21	26	16
18	7	24	19	51	1	2	25	11	15	24	36	17
19	8	7	30	26	1	2	31	52	15	27	47	18
20	8	20	41	1	1	2	38	33	15	30	57	19
21	9	3	51	36	1	2	45	14	15	34	8	20
22	9	17	2	11	1	2	51	55	15	37	19	21
23	10	0	12	46	1	2	58	36	15	40	29	22
24	10	13	23	21	1	3	5	17	15	43	40	23
25	10	26	33	56	1	3	11	58	15	46	50	24
26	11	9	44	31	1	3	18	39	15	50	1	25
27	11	22	55	6	1	3	25	21	15	53	12	26
28	0	6	5	41	1	3	32	2	15	56	22	27
29	0	19	16	16	1	3	38	43	15	59	33	28
30	1	2	26	51	1	3	45	24	16	2	43	29
31	1	15	37	26	1	3	52	5	16	5	54	30

NOVEMBER.

Com-mon	Long. ☽.				Apog. ☽.				Node ☽.			Bissex
	s.	°	′	″	s.	°	′	″	°	′	″	
1	1	28	48	1	1	3	58	46	16	9	5	0
2	2	11	58	36	1	4	5	27	16	12	16	1
3	2	25	9	11	1	4	12	8	16	15	26	2
4	3	8	19	46	1	4	18	49	16	18	37	3
5	3	21	30	21	1	4	25	30	16	21	48	4
6	4	4	40	56	1	4	32	11	16	24	59	5
7	4	17	51	31	1	4	38	53	16	28	9	6
8	5	1	2	6	1	4	45	34	16	31	20	7
9	5	14	12	41	1	4	52	15	16	34	30	8
10	5	27	23	16	1	4	58	56	16	37	41	9
11	6	10	33	51	1	5	5	37	16	40	52	10
12	6	23	44	26	1	5	12	10	16	44	2	11
13	7	6	55	1	1	5	18	59	16	47	13	12
14	7	20	5	36	1	5	25	40	16	50	23	13
15	8	3	16	11	1	5	32	21	16	53	34	14
16	8	16	26	46	1	5	39	2	16	56	45	15
17	8	29	37	21	1	5	45	43	16	59	55	16
18	9	12	47	56	1	5	52	24	17	3	6	17
19	9	25	58	31	1	5	59	5	17	16	16	18
20	10	9	9	6	1	6	5	46	17	9	27	19
21	10	22	19	41	1	6	12	27	17	12	38	20
22	11	5	30	16	1	6	19	9	17	15	49	21
23	11	18	40	51	1	6	25	50	17	18	59	22
24	0	1	51	26	1	6	32	31	17	22	10	23
25	0	15	2	2	1	6	39	12	17	25	21	24
26	0	28	12	37	1	6	45	53	17	28	32	25
27	1	11	23	12	1	6	52	34	17	31	42	26
28	1	24	33	47	1	6	59	15	17	34	53	27
29	2	7	44	22	1	7	5	56	17	38	3	28
30	2	20	54	57	1	7	12	37	17	41	14	29
31	3	4	5	32	1	7	19	18	17	44	25	30

The Mean Motion of the Moon, &c.

DECEMBER.

Com-mon	Long. ☽.				Apog. ☽.				Node ☽.			Biffex
	s.	°	′	″	s.	°	′	″	°	′	″	
1	3	4	5	32	1	7	19	18	17	44	25	0
2	3	17	16	7	1	7	25	59	17	47	35	1
3	4	0	26	42	1	7	32	40	17	50	46	2
4	4	13	37	17	1	7	39	21	17	53	56	3
5	4	26	47	52	1	7	46	2	17	57	7	4
6	5	9	58	27	1	7	52	43	18	0	18	5
7	5	23	9	2	1	7	59	24	18	3	28	6
8	6	6	19	37	1	8	6	6	18	6	39	7
9	6	19	30	12	1	8	12	47	18	9	49	8
10	7	2	40	47	1	8	19	28	18	13	0	9
11	7	15	51	22	1	8	26	9	18	16	11	10
12	7	29	1	57	1	8	32	50	18	19	21	11
13	8	12	12	32	1	8	39	31	18	22	32	12
14	8	25	23	7	1	8	46	12	18	25	42	13
15	9	8	33	42	1	8	52	53	18	28	53	14
16	9	21	44	17	1	8	59	34	18	32	4	15
17	10	4	54	52	1	9	6	15	18	35	15	16
18	10	18	5	27	1	9	12	56	18	38	25	17
19	11	1	16	2	1	9	19	38	18	41	36	18
20	11	14	26	37	1	9	26	19	18	44	47	19
21	11	27	37	12	1	9	33	0	18	47	58	20
22	0	10	47	47	1	9	39	41	18	51	9	21
23	0	23	58	22	1	9	46	22	18	54	19	22
24	1	7	8	57	1	9	53	3	18	57	30	23
25	1	20	19	32	1	9	59	44	19	0	41	24
26	2	3	30	7	1	10	6	25	19	3	51	25
27	2	16	40	42	1	10	13	6	19	7	2	26
28	2	29	51	17	1	10	19	47	19	10	12	27
29	3	13	1	52	1	10	26	28	19	13	23	28
30	3	26	12	27	1	10	33	9	19	16	33	29
31	4	9	23	2	1	10	39	50	19	19	43	30

The Moon's mean Motion in Hours, Minutes and Seconds.

H	Long. ☽.			Apog. ☽.		Node ☽.	
	°	′	″	′	″	′	″
′	′	″	‴	″	‴	″	‴
″	″	‴	⁗	‴	⁗	‴	⁗
1	0	32	56	0	17	0	8
2	1	5	53	0	33	0	16
3	1	38	49	0	50	0	24
4	2	11	46	1	7	0	32
5	2	44	42	1	24	0	40
6	3	17	39	1	40	0	48
7	3	50	35	1	57	0	56
8	4	23	32	2	14	1	4
9	4	56	28	2	30	1	12
10	5	29	25	2	47	1	19
11	6	2	21	3	4	1	27
12	6	35	18	3	21	1	35
13	7	8	14	3	37	1	43
14	7	41	10	3	54	1	51
15	8	14	7	4	11	1	59
16	8	47	3	4	27	2	7
17	9	20	0	4	44	2	15
18	9	52	56	5	1	2	23
19	10	25	53	5	18	2	31
20	10	58	49	5	34	2	39
21	11	31	46	5	51	2	47
22	12	4	42	6	8	2	55
23	12	37	39	6	24	3	3
24	13	10	35	6	41	3	11
25	13	43	32	6	58	3	19
26	14	16	28	7	15	3	27
27	14	49	24	7	31	3	34
28	15	22	21	7	48	3	42
29	15	55	17	8	5	3	50
30	16	28	14	8	21	3	58

The Moon's mean Motion in Hours, Minutes and Seconds, continu'd.

H ′ ″	Long. ☽. ° ′ ″	 ′ ″ ‴	 ″ ‴ ⁗	Apog. ☽. ′ ″ ‴	 ″ ‴ ⁗	Node ☽. ′ ″ ‴	 ″ ‴ ⁗
31	17	28	14	8	38	4	6
32	17	34	7	8	54	4	14
33	18	7	3	9	11	4	22
34	18	39	59	9	28	4	30
35	19	12	55	9	45	4	38
36	19	45	52	10	2	4	46
37	20	18	48	10	19	4	54
38	20	51	45	10	36	5	2
39	21	24	41	10	52	5	10
40	21	27	38	11	8	5	18
41	22	30	34	11	25	5	26
42	23	3	31	11	42	5	34
43	23	36	27	11	59	5	42
44	24	9	24	12	16	5	50
45	24	42	20	12	32	5	58
46	25	15	17	12	48	6	6
47	25	48	13	13	5	6	14
48	26	21	10	13	22	6	22
49	26	54	6	13	39	6	30
50	27	27	3	13	56	6	38
51	27	59	59	14	13	6	46
52	28	32	56	14	30	6	54
53	29	5	52	14	46	7	1
54	29	38	49	15	2	7	8
55	30	11	45	15	19	7	16
56	30	44	42	15	36	7	24
57	31	17	38	15	53	7	32
58	31	50	34	16	10	7	40
59	32	23	31	16	26	7	48
60	32	56	27	16	43	7	56

A Table of the 2d Equation of the Node, and Inclination of the Limit above 4° 59′ 35″.

☉ a ☊	Signs 0 & 6. Eq.Add.	Incli.	Signs 1 & 7. Eq.Add.	Incli.	Signs 2 & 8. Eq.Add.	Incli.	☉ a ☊
	° ′ ″	′ ″	° ′ ″	′ ″	° ′ ″	′ ″	
0	0 0 0	17 45	1 16 40	13 22	1 18 41	4 27	30
1	0 3 3	17 45	1 18 13	13 6	1 17 6	4 11	29
2	0 6 6	17 44	1 19 41	12 49	1 15 26	3 55	28
3	0 9 8	17 44	1 21 3	12 32	1 13 41	3 40	27
4	0 12 10	17 42	1 22 20	12 15	1 11 49	3 25	26
5	0 15 11	17 40	1 23 31	11 58	1 9 52	3 11	25
6	0 18 11	17 37	1 24 36	11 41	1 7 50	2 57	24
7	0 21 11	17 33	1 25 34	11 24	1 5 42	2 43	23
8	0 24 7	17 28	1 26 27	11 7	1 3 29	2 29	22
9	0 27 3	17 22	1 27 14	10 49	1 1 11	2 16	21
10	0 29 57	17 15	1 27 54	10 31	0 58 49	2 4	20
11	0 32 48	17 8	1 28 28	10 13	0 56 22	1 53	19
12	0 35 38	17 0	1 28 56	9 55	0 53 51	1 42	18
13	0 38 25	16 52	1 29 17	9 37	0 51 15	1 31	17
14	0 41 10	16 44	1 29 32	9 18	0 48 36	1 21	16
15	0 43 51	16 35	1 29 40	8 59	0 45 53	1 11	15
16	0 46 30	16 26	1 29 40	8 40	0 43 6	1 2	14
17	0 49 5	16 17	1 29 37	8 20	0 40 16	0 53	13
18	0 51 37	16 7	1 29 25	8 0	0 37 22	0 45	12
19	0 54 6	15 56	1 29 7	7 40	0 34 26	0 38	11
20	0 56 31	15 44	1 28 42	7 21	0 31 27	0 32	10
21	0 58 52	15 32	1 28 11	7 2	0 28 25	0 26	9
22	1 1 9	15 19	1 27 33	6 44	0 25 22	0 21	8
23	1 3 22	15 6	1 26 49	6 26	0 22 16	0 16	7
24	1 5 30	14 52	1 25 58	6 8	0 19 8	0 12	6
25	1 7 34	14 38	1 25 0	5 50	0 15 59	0 8	5
26	1 9 32	14 24	1 23 57	5 33	0 12 49	0 5	4
27	1 11 27	14 9	1 22 47	5 16	0 9 38	0 3	3
28	1 13 16	13 54	1 21 31	4 59	0 6 26	0 1	2
29	1 15 1	13 38	1 20 9	4 43	0 3 13	0 0	1
30	1 16 40	13 22	1 18 41	4 27	0 0 0	0 0	0
	Signs 5, 11 } Subt.		Signs 4, 10 } Subt.		Signs 3, 9 } Subt.		

A Table of the Simple Latitude of the Moon fitted to the leaſt Inclination of its Orbit, with the Increments to the greateſt Inclination.

Arg. L.	Latit. 0 N. A. 6 S. A.	Increment Add.	Latit. 1 N. A. 7 S. A.	Increment Add.	Latitude 2 N. A. 8 S. A.	Increment Add.	Arg. L.
	° ′ ″	′ ″	° ′ ″	′ ″	° ′ ″	′ ″	
0	0 0 0	0 0	2 29 39	8 45	4 19 22	15 21	30
1	0 5 14	0 11	2 34 9	9 1	4 21 58	15 30	29
2	0 10 27	0 22	2 38 37	9 17	4 24 26	15 39	28
3	0 15 40	0 41	2 43 1	9 33	4 26 52	15 47	27
4	0 20 52	1 0	2 47 22	9 58	4 29 12	15 56	26
5	0 26 4	1 19	2 51 41	10 4	4 31 27	16 4	25
6	0 31 17	1 38	2 55 56	10 19	4 33 37	16 12	24
7	0 36 28	1 56	3 00 8	10 34	4 35 43	16 19	23
8	0 41 38	2 15	3 4 18	10 49	4 37 43	16 27	22
9	0 46 48	2 34	3 8 23	11 4	4 39 38	16 34	21
10	0 51 57	2 53	3 12 25	11 19	4 41 28	16 40	20
11	0 57 5	3 11	3 16 24	11 33	4 43 13	16 46	19
12	1 2 13	3 30	3 20 19	11 47	4 44 53	16 52	18
13	1 7 18	3 48	3 24 11	12 1	4 46 27	16 57	17
14	1 12 23	4 6	3 27 58	12 15	4 47 57	17 3	16
15	1 17 27	4 24	3 31 42	12 29	4 49 21	17 8	15
16	1 22 29	4 42	3 35 22	12 41	4 50 39	17 13	14
17	1 27 29	5 0	3 38 58	12 54	4 51 53	17 18	13
18	1 32 28	5 18	3 42 30	13 7	4 53 1	17 22	12
19	1 37 26	5 36	3 45 58	13 20	4 54 4	17 25	11
20	1 42 21	5 54	3 49 22	13 32	4 55 1	17 29	10
21	1 47 14	6 12	3 52 42	13 44	4 55 53	17 32	9
22	1 52 6	6 30	3 55 58	13 56	4 56 39	17 35	8
23	1 56 56	6 57	3 59 9	14 8	4 57 20	17 37	7
24	2 1 43	7 4	4 2 16	14 19	4 57 56	17 39	6
25	2 6 28	7 21	4 5 18	14 30	4 58 26	17 41	5
26	2 11 11	7 38	4 8 16	14 41	4 58 51	17 43	4
27	2 15 52	7 54	4 11 9	14 51	4 59 10	17 44	3
28	2 20 30	8 11	4 13 58	15 2	4 59 24	17 44	2
29	2 25 7	8 28	4 16 42	15 11	4 59 32	17 45	1
30	2 29 39	8 45	4 19 22	15 21	4 59 35	17 45	0
	5 N. 11 S. Deſcen.		4 N. 10 S. Deſcen.		3 N. 9 S. Deſcen.		

A Table of Reduction, with the Excess above the least Inclination 4° 59′ 35″.

Arg. L.	Signs 0 / 6 Reduct. sub.		Exc.	Signs 1 / 7 Reduct. sub.		Exc.	Signs 2 / 8 Reduct. sub.		Exc.	Arg. L.
	′	″	″	′	″	″	′	″	″	
0	0	0	0	5	40	42	5	40	42	30
1	0	14	2	5	47	43	5	33	41	29
2	0	27	4	5	53	44	5	25	40	28
3	0	41	6	5	59	45	5	17	39	27
4	0	55	8	6	4	46	5	10	38	26
5	1	8	9	6	8	46	5	1	37	25
6	1	22	11	6	13	46	4	52	36	24
7	1	35	12	6	17	47	4	42	35	23
8	1	48	13	6	20	47	4	33	34	22
9	2	1	15	6	23	47	4	23	33	21
10	2	14	17	6	26	47	4	13	31	20
11	2	27	19	6	28	47	4	2	30	19
12	2	40	20	6	30	48	3	51	29	18
13	2	52	22	6	31	48	3	40	28	17
14	3	4	23	6	32	48	3	29	26	16
15	3	16	24	6	32	48	3	17	24	15
16	3	28	26	6	32	48	3	5	23	14
17	3	40	28	6	31	48	2	53	22	13
18	3	51	29	6	30	48	2	40	20	12
19	4	2	30	6	29	47	2	28	19	11
20	4	12	31	6	26	47	2	15	17	10
21	4	23	33	6	23	47	2	2	15	9
22	4	33	34	6	20	47	1	49	13	8
23	4	44	35	6	17	47	1	35	12	7
24	4	52	36	6	12	46	1	22	11	6
25	5	1	37	6	8	46	1	8	9	5
26	5	9	38	6	3	46	0	55	8	4
27	5	18	39	5	58	45	0	41	6	3
28	5	26	40	5	52	44	0	27	4	2
29	5	33	41	5	46	43	0	14	2	1
30	5	40	42	5	40	42	0	0	0	0
	Signs 5 / 11 Add.			Signs 4 / 10 Add.			Signs 3 / 9 Add.			

A Table of the Hourly Motions, Semi-diameters, and Horizontal Parallaxes of the Sun and Moon; the Sun's Horizontal Parallax being always 10″.

Mean Anom of ☉& ☽.		Hourly Motion ☉.		Hourly Motion ☽.		Mean Anom. of ☉& ☽.	
s.	°	′	″	′	″	*s.*	°
0	0	2	23	29	37	12	0
0	6	2	23	29	38	11	24
0	12	2	23	29	41	11	18
0	18	2	23	29	47	11	12
0	24	2	23	29	55	11	6
1	0	2	24	30	7	11	0
1	6	2	24	30	21	10	24
1	12	2	24	30	35	10	18
1	18	2	24	30	51	10	12
1	24	2	25	31	10	10	6
2	0	2	25	31	31	10	0
2	6	2	26	31	54	9	24
2	12	2	26	32	18	9	18
2	18	2	27	32	43	9	12
2	24	2	27	33	7	9	6
3	0	2	28	33	33	9	0
3	6	2	28	33	59	8	24
3	12	2	29	34	26	8	18
3	18	2	29	34	54	8	12
3	24	2	30	35	21	8	6
4	0	2	30	35	46	8	0
4	6	2	31	36	9	7	24
4	12	2	31	36	30	7	18
4	18	2	32	36	50	7	12
4	24	2	32	37	9	7	6
5	0	2	32	37	27	7	0
5	6	2	33	37	42	6	24
5	12	2	33	37	55	6	18
5	18	2	33	38	4	6	12
5	24	2	33	38	9	6	6
6	0	2	33	38	10	6	0

A Table of the Hourly Motions, Semidiameters, and Horizontal Parallaxes of the Sun and Moon; the Sun's Horizontal Parallax being always 10″: continued.

Mean Anom. of ☉& ☽.		Apparen. Semedia. ☉.		Apparen. Semidia. ☽.		Horizont. Parallax. ☽.		Mean Anom. of ☉& ☽.	
ſ.	°	′	″	′	″	′	″	ſ.	°
0	0	15	51	14	55	54	29	12	0
0	6	15	51	14	55	54	30	11	24
0	12	15	51	14	57	54	34	11	18
0	18	15	51	14	58	54	40	11	12
0	24	15	52	15	0	54	47	11	6
1	0	15	53	15	3	54	56	11	0
1	6	15	54	15	5	55	6	10	24
1	12	15	55	15	8	55	17	10	18
1	18	15	56	15	12	55	29	10	12
1	24	15	57	15	15	55	42	10	6
2	0	15	59	15	19	55	56	10	0
2	6	16	0	15	23	56	12	9	24
2	12	16	2	15	28	56	29	9	18
2	18	16	3	15	33	56	48	9	12
2	24	16	5	15	39	57	8	9	6
3	0	16	7	15	45	57	30	9	0
3	6	16	8	15	51	57	52	8	24
3	12	16	10	15	56	58	12	8	18
3	18	16	12	16	2	58	31	8	12
3	24	16	14	16	6	58	49	8	6
4	0	16	16	16	11	59	6	8	0
4	6	16	18	16	15	59	21	7	24
4	12	16	19	16	19	59	35	7	18
4	18	16	20	16	23	59	48	7	12
4	24	16	21	16	26	60	0	7	6
5	0	16	21	16	29	60	11	7	0
5	6	16	22	16	32	60	21	6	24
5	12	16	23	16	34	60	30	6	18
5	18	16	23	16	36	60	38	6	12
5	24	16	24	16	38	60	45	6	6
6	0	16	24	16	40	60	51	6	0

Years Current-	Motion.				Years Com.	Motion.				Days.	Motion.			
	ſ.	°	′	″		ſ.	°	′	″		ſ.	°	′	″
1681	10	8	50	5	1	2	23	6	50	1	6	23	24	21
1701	3	18	8	28	2	5	16	13	40	2	1	16	48	42
1721	8	27	26	50	3	8	9	20	30	3	8	10	13	2
1722	11	20	33	40	4	5	25	51	40	4	3	3	37	23
1723	2	13	40	30	5	8	18	58	30	5	9	27	1	44
1724	5	6	47	20	6	11	12	5	20	6	4	20	26	5
1725	2	23	18	31	7	2	5	12	10	7	11	13	50	26
1726	5	16	25	21	8	11	21	43	21	8	6	7	14	47
1727	8	9	32	11	9	2	14	50	11	9	1	0	39	7
1728	11	2	39	1	10	5	7	57	1	10	7	24	3	28
1729	8	19	10	12	11	8	1	3	51	11	2	17	27	49
1730	11	2	17	2	12	5	17	35	1	12	9	10	52	10
1731	1	25	23	52	13	8	10	41	51	13	4	4	16	30
1732	4	18	30	41	14	11	3	48	41	14	10	27	40	52
1733	2	5	1	52	15	1	26	55	31	15	5	21	5	12
1734	4	28	8	42	16	11	13	26	42	16	0	14	29	33
1735	7	21	15	32	17	2	6	33	32	17	7	7	53	54
1736	10	14	22	22	18	4	29	40	22	18	2	1	18	15
1737	8	0	53	33	19	7	22	47	12	19	8	24	42	36
1738	10	24	0	23	20	5	9	18	23	20	3	18	6	57
1739	1	17	7	13	40	10	18	36	45	21	10	11	31	17
1740	4	10	14	3	60	3	27	55	8	22	5	4	55	38
1741	2	6	45	13	80	9	7	13	30	23	11	28	19	59
1742	11	23	16	24	100	2	16	31	53	24	6	21	44	20
1743	2	16	23	14	200	5	3	3	46	25	1	15	8	41
1744	5	9	30	4	300	7	19	35	39	26	8	8	33	2
1745	2	26	1	15	400	10	6	7	32	27	3	1	57	22
Jan.	0	0	0	0	500	0	22	39	25	28	9	25	21	43
Feb.	6	5	34	46	600	3	9	11	18	29	4	18	46	4
Mar.	4	0	56	30	700	5	25	43	12	30	11	12	10	25
Apr.	10	6	31	16	800	8	12	15	5	31	6	5	34	46
May	9	18	41	41	900	10	28	46	58					
June	3	24	16	27	1000	1	15	18	51					
July	3	6	26	52	2000	3	0	47	42					
Aug.	9	12	1	39	3000	4	15	56	33					
Sept.	3	17	36	25	4000	6	1	15	24					
Oct.	2	29	46	50	5000	7	16	34	15					
Nov.	9	5	21	36	6000	9	1	53	6					
Dec.	8	17	32	1	7000	10	17	11	57					

H.	Motion.				′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗
	ſ.	°	′	″								
1	0	8	28	31	1	0	8	29	31	4	22	45
2	0	16	57	2	2	0	16	57	32	4	31	13
3	0	25	25	33	3	0	25	26	33	4	39	41
4	1	3	54	3	4	0	33	54	34	4	48	10
5	1	12	22	34	5	0	42	23	35	4	56	38
6	1	20	51	5	6	0	50	51	36	5	5	7
7	1	29	19	36	7	0	59	20	37	5	13	35
8	2	7	48	7	8	1	7	48	38	5	22	4
9	2	16	16	38	9	1	16	17	39	5	30	32
10	2	24	45	9	10	1	24	45	40	5	39	1
11	3	3	13	40	11	1	33	14	41	5	47	29
12	3	11	42	10	12	1	41	42	42	5	55	58
13	3	20	10	41	13	1	50	11	43	6	4	26
14	3	28	39	12	14	1	58	39	44	6	12	55
15	4	7	7	43	15	2	7	8	45	6	21	23
16	4	15	36	14	16	2	15	36	46	6	29	52
17	4	24	4	45	17	2	24	5	47	6	38	20
18	5	2	33	16	18	2	32	33	48	6	46	49
19	5	11	1	46	19	2	41	2	49	6	55	17
20	5	19	30	17	20	2	49	30	50	7	3	46
21	5	27	58	48	21	2	57	59	51	7	12	14
22	6	6	27	19	22	3	6	27	52	7	20	43
23	6	14	55	50	23	3	14	56	53	7	29	11
24	6	23	24	21	24	3	23	24	54	7	37	40
					25	3	31	53	55	7	46	8
					26	3	40	21	56	7	54	37
					27	3	48	50	57	8	3	5
					28	3	57	18	58	8	11	34
					29	4	5	47	59	8	20	2
					30	4	14	15	60	8	28	31

In Leap-Year, after *February*, add the Motion of a Day more to the reſt. The Radix of this Satellite I have taken *December* 31 at Noon 1683. *Jupiter*'s Heliocentric Place was then 5 *ſ.* 13° 22′ 57″. And the Half-Stay in the Shadow is 1^h 6′. Mot. 9° 19′ 22″.

Years Current-	Motion.				Years Com.	Motion.				Days.	Motion.			
	s.	°	'	"		s.	°	'	"		s.	°	'	"
1681	3	7	35	50	1	8	11	24	51	1	3	11	17	30
1701	7	22	20	10	2	4	22	49	41	2	6	22	34	59
1721	0	7	4	30	3	1	4	14	31	3	10	3	52	29
1722	8	18	29	20	4	0	26	56	51	4	1	15	9	58
1723	4	29	54	11	5	9	8	21	41	5	4	26	27	28
1724	1	11	19	2	6	5	19	46	32	6	18	7	44	57
1725	1	4	1	22	7	2	1	11	22	7	11	19	2	27
1726	9	15	26	12	8	1	23	53	43	8	3	0	19	56
1727	5	26	51	3	9	10	5	18	33	9	6	11	37	26
1728	2	8	15	54	10	6	16	43	23	10	9	22	54	56
1729	2	0	58	14	11	2	28	8	14	11	1	4	12	25
1730	10	12	23	4	12	2	20	50	34	12	4	15	29	55
1731	6	23	47	55	13	11	2	15	25	13	7	26	47	24
1732	3	5	12	46	14	7	13	40	46	14	11	8	4	54
1733	2	27	55	6	15	3	25	5	6	15	2	19	22	23
1734	11	9	19	56	16	3	17	47	27	16	6	0	39	53
1735	7	20	44	47	17	11	29	12	17	17	9	11	57	23
1736	4	2	9	37	18	8	10	37	8	18	0	23	14	52
1737	3	24	51	58	19	4	22	1	59	19	4	4	32	22
1738	0	6	16	48	20	4	14	44	20	20	7	15	49	51
1739	8	17	41	39	40	8	29	28	40	21	10	27	7	21
1740	4	29	6	29	60	1	14	13	0	22	2	8	24	50
1741	4	21	48	50	80	5	28	57	20	23	5	19	42	20
1742	1	3	13	40	100	10	13	41	39	24	9	0	59	5[illegible]
1743	9	14	38	31	200	8	27	23	19	25	0	12	17	19
1744	5	26	3	21	300	7	11	4	58	26	3	23	34	49
1745	5	18	45	42	400	5	24	46	38	27	7	4	52	18
Jan.	0	0	0	0	500	4	8	28	17	28	10	16	9	48
Feb.	8	20	2	16	600	2	22	9	56	29	1	27	27	17
Mar.	7	6	12	4	700	1	5	31	36	30	5	8	44	47
Apr.	3	26	14	20	800	11	19	33	15	31	8	20	2	16
May	9	4	29	7	900	10	3	14	45					
June	5	25	1	23	1000	8	16	56	24					
July	11	3	46	10	2000	5	3	52	48					
Aug.	7	23	48	26	3000	1	20	49	12					
Sept.	4	13	50	42	4000	10	7	45	36					
Oct.	9	22	35	29	5000	6	24	42	0					
Nov.	6	12	37	45	6000	3	11	38	24					
Dec.	11	21	22	34	7000	11	28	34	48					

H	Motion.				′	°	′	″	′	°	′	″
					″	′	″	‴	″	′	″	‴
	ſ.	°	′	″	‴	″	‴	⁗	‴	″	‴	⁗
1	0	4	13	14	1	0	4	13	31	2	10	50
2	0	8	26	27	2	0	8	26	32	2	15	3
3	0	12	39	41	3	0	12	40	33	2	19	17
4	0	16	52	55	4	0	16	53	34	2	23	30
5	0	21	6	9	5	0	21	6	35	2	27	43
6	0	25	19	22	6	0	25	19	36	2	31	56
7	0	29	32	36	7	0	29	33	37	2	36	10
8	1	3	45	50	8	0	33	46	38	2	40	23
9	1	7	59	3	9	0	37	59	39	2	44	36
10	1	12	12	17	10	0	42	12	40	2	48	49
11	1	16	25	31	11	0	46	26	41	2	53	3
12	1	20	38	45	12	0	50	39	42	2	57	16
13	1	24	51	58	13	0	54	52	43	3	1	29
14	1	29	5	12	14	0	59	5	44	3	5	42
15	2	3	18	26	15	1	3	18	45	3	9	55
16	2	7	31	39	16	1	7	32	46	3	14	9
17	2	11	44	53	17	1	11	45	47	3	18	22
18	2	15	58	7	18	1	15	58	48	3	22	35
19	2	20	11	21	19	1	20	11	49	3	26	48
20	2	24	24	34	20	1	24	25	50	3	31	2
21	2	28	37	48	21	1	28	38	51	3	35	15
22	3	2	51	2	22	1	32	51	52	3	39	28
23	3	7	4	15	23	1	37	4	53	3	43	41
24	3	11	17	30	24	1	41	18	54	3	47	55
					25	1	45	31	55	3	52	8
					26	1	49	44	56	3	56	21
					27	1	53	57	57	4	0	34
					28	1	58	11	58	4	4	48
					29	2	2	24	59	4	9	1
					30	2	6	37	60	4	13	14

In Leap-Year, after *February*, add the Motion of a Day more to the reſt. And the Radix of this Satellite I have taken *December* 31 at Noon, 1683. *Jupiter*'s Heliocentrick Place was then 5 ſ. 13° 22′ 57″. Its Half-Stay in the Shadow is 1^h 25′ Mot. 5° 58′ 45″.

Years Current.	Motion.				Years Com.	Motion.				Days.	Motion.			
	s.	°	′	″		s.	°	′	″		s.	°	′	″
1681	2	22	15	57	1	11	5	35	40	1	1	20	14	4
1701	6	25	19	36	2	10	11	11	19	2	3	10	28	8
1721	10	28	23	14	3	9	16	46	59	3	5	0	42	13
1722	10	3	58	53	4	10	12	36	44	4	6	20	56	17
1723	9	9	34	33	5	9	18	12	23	5	8	11	10	21
1724	8	15	10	13	6	8	23	48	3	6	10	1	24	25
1725	9	10	59	57	7	7	29	23	42	7	11	21	38	30
1726	8	16	35	37	8	8	25	13	27	8	1	11	52	34
1727	7	22	11	17	9	8	0	49	7	9	3	2	6	38
1728	6	27	46	57	10	7	6	24	46	10	4	22	20	42
1729	7	23	36	41	11	6	12	0	26	11	6	12	34	46
1730	6	29	12	21	12	7	7	50	11	12	8	2	48	51
1731	6	4	48	1	13	6	13	25	50	13	9	23	2	55
1732	5	10	23	40	14	5	19	1	30	14	11	13	16	59
1733	6	6	13	24	15	4	24	37	9	15	1	3	31	3
1734	5	11	49	4	16	5	20	26	54	16	2	23	45	7
1735	4	17	24	44	17	4	26	2	34	17	4	13	59	12
1736	3	23	0	24	18	4	1	38	14	18	6	4	13	16
1737	4	18	50	8	19	3	7	13	53	19	7	24	27	20
1738	3	24	25	48	20	4	3	3	38	20	9	14	41	24
1739	3	0	1	28	40	8	6	7	16	21	11	4	55	29
1740	2	5	37	8	60	0	9	10	54	22	0	25	9	33
1741	3	1	26	52	80	4	12	14	32	23	2	15	23	37
1742	2	7	2	32	100	8	15	18	10	24	4	5	37	41
1743	1	12	38	11	200	5	0	36	21	25	5	25	51	45
1744	0	18	13	51	300	1	15	54	31	26	7	16	5	50
1745	1	4	3	35	400	10	1	12	42	27	9	6	19	54
Jan.	0	0	0	0	500	6	16	30	52	28	10	26	33	58
Feb.	3	27	16	11	600	3	1	49	3	29	0	16	48	2
Mar	2	23	50	9	700	11	17	7	13	30	2	7	2	7
Apr.	6	21	6	20	800	8	2	25	24	31	3	27	16	11
May.	8	28	8	26	900	4	17	43	34					
June	0	25	24	37	1000	1	3	1	45					
July	3	2	26	43	2000	2	6	3	30					
Aug.	6	29	42	54	3000	3	9	5	15					
Sept.	10	26	59	5	4000	4	12	7	0					
Oct.	1	4	1	12	5000	5	15	8	45					
Nov.	5	1	17	22	6000	6	18	10	30					
Dec.	7	8	19	29	7000	7	21	12	15					

H	Motion. s.	°	′	″	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗
1	0	2	5	35	1	0	2	6	31	1	4	53
2	0	4	11	10	2	0	4	11	32	1	6	59
3	0	6	16	45	3	0	6	17	33	1	9	4
4	0	8	22	21	4	0	8	22	34	1	11	10
5	0	10	27	56	5	0	10	28	35	1	13	15
6	0	12	33	31	6	0	12	33	36	1	15	21
7	0	14	39	6	7	0	14	39	37	1	17	27
8	0	16	44	41	8	0	16	45	38	1	19	32
9	0	18	50	16	9	0	18	50	39	1	21	38
10	0	20	55	52	10	0	20	56	40	1	23	43
11	0	23	1	27	11	0	23	1	41	1	25	49
12	0	23	7	2	12	0	25	7	42	1	27	54
13	0	27	12	37	13	0	27	13	43	1	30	0
14	0	29	18	12	14	0	29	18	44	1	32	6
15	1	1	23	47	15	0	31	24	45	1	34	11
16	1	3	29	23	16	0	33	29	46	1	36	17
17	1	5	34	58	17	0	35	35	47	1	38	22
18	1	7	40	33	18	0	37	40	48	1	40	28
19	1	9	46	8	19	0	39	46	49	1	42	33
20	1	11	51	43	20	0	41	52	50	1	44	39
21	1	13	57	18	21	0	43	57	51	1	46	46
22	1	16	2	54	22	0	46	3	52	1	48	50
23	1	18	8	29	23	0	48	8	53	1	50	57
24	1	20	14	4	24	0	50	14	54	1	53	1
					25	0	52	20	55	1	55	7
					26	0	54	25	56	1	57	14
					27	0	56	31	57	1	59	18
					28	0	58	36	58	2	1	25
					29	1	0	42	59	2	3	29
					30	1	2	47	60	2	5	35

In Leap-Year, after *February*, add the Motion of a Day more to the reſt. And the Radix of this Satellite I have taken *December* 31 at Noon, 1683. *Jupiter*'s Heliocentric Place was then 5 ſ. 13° 22′ 57″. Half-Stay in the Shadow 1^h 18′ Mot. 2° 43′ 15″.

Years Current	Motion.				Years Com.	Motion.				Days.	Motion.			
	s.	°	′	″		s.	°	′	″		s.	°	′	″
1681	8	12	56	51	1	9	13	5	7	1	0	21	29	16
1701	8	22	5	31	2	6	26	10	14	2	1	12	58	33
1721	9	1	14	10	3	4	9	15	21	3	2	4	27	49
1722	6	14	19	17	4	2	13	49	44	4	2	25	57	6
1723	3	27	24	24	5	11	26	54	51	5	3	17	26	22
1724	1	10	29	31	6	9	9	59	58	6	4	8	55	39
1725	11	15	3	54	7	6	23	5	4	7	5	0	24	55
1726	8	28	9	1	8	4	27	39	28	8	5	21	54	12
1727	6	11	14	8	9	2	10	44	35	9	6	13	23	28
1728	3	24	19	14	10	11	23	49	41	10	7	4	52	45
1729	1	28	53	38	11	9	6	54	48	11	7	26	22	1
1730	11	11	58	45	12	7	11	29	12	12	8	17	51	18
1731	8	25	3	51	13	4	24	34	18	13	9	9	20	34
1732	6	8	8	58	14	2	7	39	25	14	10	0	49	51
1733	4	12	43	32	15	11	20	44	32	15	10	22	19	7
1734	1	25	48	28	16	9	25	18	15	16	11	13	48	23
1735	11	8	53	35	17	7	8	24	2	17	0	5	17	40
1736	8	21	58	42	18	4	21	29	9	18	0	26	46	56
1737	6	26	33	5	19	2	4	34	16	19	1	18	16	13
1738	4	9	38	12	20	0	9	8	39	20	2	9	45	29
1739	1	22	43	19	40	0	18	17	19	21	3	1	14	46
1740	11	5	48	26	60	0	27	25	58	22	3	22	44	2
1741	9	10	22	50	80	1	6	34	38	23	4	14	13	19
1742	6	23	27	56	100	1	15	43	17	24	5	5	42	35
1743	4	6	23	3	200	3	1	26	35	25	5	27	11	52
1744	1	19	38	10	300	4	17	9	52	26	6	18	41	8
1745	11	24	12	34	400	6	2	53	9	27	7	10	10	25
Jan.	0	0	0	0	500	7	18	36	27	28	8	1	39	41
Feb.	10	6	7	30	600	9	4	19	44	29	8	23	8	58
Mar.	6	7	47	11	700	10	20	3	1	30	9	14	38	14
Apr.	4	13	54	41	800	0	5	46	19	31	10	6	7	30
May	1	28	32	55	900	1	21	29	36					
June	0	4	40	26	1000	3	7	12	53					
July	9	19	18	40	2000	6	14	25	46					
Aug.	7	25	26	10	3000	9	21	38	39					
Sept	6	1	33	40	4000	0	28	51	32					
Oct.	3	16	11	54	5000	4	6	4	25					
Nov.	1	22	19	24	6000	7	13	17	18					
Dec.	11	26	57	38	7000	10	20	30	11					

H	°	′	″	H	°	′	″
′	′	″	‴	′	′	″	‴
″	″	‴	⁗	″	″	‴	⁗
1	0	53	43	31	25	45	19
2	1	47	26	32	28	39	2
3	2	41	10	33	29	32	45
4	3	34	53	34	30	26	28
5	4	28	36	35	31	20	11
6	5	22	19	36	32	13	55
7	6	16	2	37	33	7	38
8	7	9	45	38	34	1	21
9	8	3	29	39	34	55	4
10	8	57	12	40	35	48	47
11	9	50	55	41	36	42	31
12	10	44	38	42	37	36	14
13	11	38	21	43	38	29	57
14	12	32	5	44	39	23	40
15	13	25	48	45	40	17	23
16	14	19	31	46	41	11	6
17	15	13	14	47	42	4	50
18	16	6	57	48	42	58	33
19	17	0	40	49	43	52	16
20	17	54	24	50	44	45	59
21	18	48	7	51	45	39	42
22	19	41	50	52	46	33	26
23	20	35	33	53	47	27	9
24	21	29	16	54	48	20	52
25	22	23	0	55	49	14	35
26	23	16	43	56	50	8	18
27	24	10	26	57	51	2	1
28	25	4	9	58	51	55	45
29	25	57	52	59	52	49	28
30	26	51	35	60	53	43	11

In Leap-Year, after *February*, add the Motion of a Day more to the rest. And the Radix of this Satellite I have taken *December* 31 at Noon, 1683. *Jupiter*'s Heliocentric Place was then 5 ſ 13° 22′ 57″. Half-Stay in the Shadow 1^h 35′. Mot. 1° 25′ 3″.

A Table of the Diſtances of the Satellites of *Jupiter* from his Body, in Semidiameters and Decimal Parts of *Jupiter*'s Globe.

°	0 Conſeq. 6 Antec.	1 Conſeq. 7 Antec.	2 Conſeq. 8 Antec.	°
	Satellite 1.			
0	0.	1.8592	3.7183	30
3	0.1859	2.0451	3.9042	27
6	0.3718	2.2310	4.0901	24
9	0.5577	2.4169	4.2760	21
12	0.7436	2.6028	4.4619	18
15	0.9300	2.7887	4.6478	15
18	1.1155	2.9746	4.8337	12
21	1.3014	3.1606	5.0196	9
24	1.4873	3.3465	5.2056	6
27	1.6732	3.5324	5.3915	3
30	1.8592	3.7183	5.5780	0
	Satellite 2.			
0	0.	2.9590	5.9180	30
3	0.2959	3.2549	6.2139	27
6	0.5918	3.5508	6.5098	24
9	0.8877	3.8467	6.8057	21
12	1.1836	4.1426	7.1016	18
15	1.4795	4.4385	7.3975	15
18	1.7754	4.7344	7.6934	12
21	2.0713	5.0303	7.9893	9
24	2.3672	5.3262	8.2852	6
27	2.6613	5 6221	8.5813	3
30	2.9590	5 0180	8.8760	0
	5 Conſeq. 11 Antec	4 Conſeq. 10 Antec.	3 Conſeq. 9 Antec.	

A Table of the Distances of the Satellites of *Jupiter* from his Body, in Semidiameters and Decimal Parts of *Jupiter*'s Globe.

Satellite 3.

°	0 Conseq. 6 Antec.	1 Conseq. 7 Antec.	2 Conseq. 8 Antec.	°
0	0.	4.72	9.44	30
3	0.472	5.192	9.912	27
6	0.944	5.664	10.384	24
9	1.416	6.136	10.856	21
12	1.888	6.608	11.328	18
15	2.36	7.08	11.8	15
18	2.832	7.552	12.272	12
21	3.304	8.024	12.744	9
24	3.776	8.496	13.216	6
27	4.248	8.968	13.688	3
30	4.72	9.44	14.159	0

Satellite 4.

°				°
0	0.	8.301	16.602	30
3	0.8301	9.1311	17.4321	27
6	1.6602	9.9612	18.2622	24
9	2.4903	10.7913	19.0923	21
12	3.3204	11.6214	19.9224	18
15	4.1505	12.4515	20.7525	15
18	4.9806	13.2816	21.5826	12
21	5.8107	14.1117	22.4127	9
24	6.6408	14.9418	23.2428	6
27	7.4709	15.7719	24.0729	3
30	8.301	16.602	24.903	0
	5 Conseq. 11 Antec.	4 Conseq. 10 Antec.	3 Conseq. 9 Antec.	

A Table of the Motion of the first Satellite of *Saturn*.

Years Current	Motion.				Years Com.	Motion.				Days.	Motion.			
	s.	°	′	″		s.	°	′	″		s.	°	′	″
1681	9	28	34	39	1	4	4	35	1	1	6	10	41	51
1701	4	23	43	6	2	8	9	10	1	2	0	21	23	42
1721	11	18	52	33	3	0	13	45	2	3	7	2	5	33
1722	3	23	27	34	4	10	29	1	53	4	1	12	47	24
1723	7	28	2	34	5	3	3	36	54	5	7	23	29	15
1724	0	2	37	35	6	7	8	11	55	6	2	4	11	6
1725	10	17	54	27	7	11	12	46	55	7	8	14	52	57
1726	2	22	29	27	8	9	28	3	47	8	2	25	34	48
1727	6	27	4	28	9	2	2	38	47	9	9	6	16	39
1728	11	1	39	28	10	6	7	13	48	10	3	16	58	29
1729	9	16	56	20	11	10	11	48	49	11	9	27	40	20
1730	1	21	31	21	12	8	27	5	40	12	4	8	22	11
1731	5	26	6	21	13	1	1	40	41	13	10	19	4	2
1732	10	0	41	22	14	5	6	15	41	14	4	29	45	53
1733	8	15	58	13	15	9	10	50	42	15	11	10	27	44
1734	0	20	33	14	16	7	26	7	34	16	5	21	9	35
1735	4	25	8	15	17	0	0	42	34	17	0	1	51	26
1736	8	29	43	15	18	4	5	17	35	18	6	12	33	17
1737	7	15	0	7	19	8	9	52	35	19	0	23	15	8
1738	11	19	35	7	20	6	25	9	27	20	7	3	56	59
1739	3	24	10	8	40	1	20	18	55	21	1	14	38	50
1740	7	28	45	9	60	8	15	28	22	22	7	25	20	41
1741	6	14	2	0	80	3	10	37	50	23	2	6	2	32
1742	10	18	37	1	100	10	5	47	17	24	8	16	44	23
1743	2	23	12	1	200	8	11	34	34	25	2	27	16	14
1744	6	27	47	2	300	6	17	21	51	26	9	8	8	5
1745	5	13	3	53	400	4	23	9	8	27	3	18	49	56
Jan.	0	0	0	0	500	2	28	56	25	28	9	29	31	47
Feb.	5	1	37	19	600	1	4	43	42	29	4	10	13	38
Mar.	3	1	9	6	700	11	10	30	59	30	10	20	55	28
Apr.	8	2	46	26	800	9	16	18	16	31	5	1	37	19
May	6	23	41	55	900	7	22	5	33					
June	11	25	19	14	1000	5	27	52	50					
July	10	16	14	53	2000	11	25	45	40					
Aug	3	17	52	13	3000	5	23	38	30					
Sept.	8	19	29	32	4000	11	21	31	20					
Oct.	7	10	24	51	5000	5	19	24	10					
Nov.	0	12	2	11	6000	11	17	17	0					
Dec.	11	2	57	39	7000	5	15	9	50					

H.	Motion. s.	°	′	″	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗
1	0	7	56	45	1	0	7	57	31	4	6	19
2	0	15	53	29	2	0	15	53	32	4	14	15
3	0	23	50	14	3	0	23	50	33	4	22	12
4	1	1	46	58	4	0	31	47	34	4	30	9
5	1	9	43	43	5	0	39	44	35	4	38	6
6	1	17	40	28	6	0	47	40	36	4	46	2
7	1	25	37	12	7	0	55	37	37	4	53	59
8	2	3	33	57	8	1	3	34	38	5	1	56
9	2	11	30	42	9	1	11	31	39	5	9	53
10	2	19	27	26	10	1	19	27	40	5	17	49
11	2	27	24	11	11	1	27	24	41	5	25	46
12	3	5	20	55	12	1	35	21	42	5	33	43
13	3	13	17	40	13	1	43	18	43	5	41	40
14	3	21	14	25	14	1	51	14	44	5	49	36
15	3	29	11	9	15	1	59	11	45	5	57	33
16	4	7	7	54	16	2	7	8	46	6	5	30
17	4	15	4	38	17	2	15	4	47	6	13	26
18	4	23	1	23	18	2	23	1	48	6	21	23
19	5	0	58	8	19	2	30	58	49	6	29	20
20	5	8	54	52	20	2	38	55	50	6	37	17
21	5	16	51	37	21	2	46	51	51	6	43	13
22	5	24	48	22	22	2	54	48	52	6	53	10
23	6	2	45	7	23	3	2	45	53	7	1	7
24	6	10	41	51	24	3	10	42	54	7	9	4
					25	3	18	38	55	7	17	0
					26	3	26	35	56	7	24	57
					27	3	34	32	57	7	32	54
					28	3	42	29	58	7	40	51
					29	3	50	25	59	7	48	57
					30	3	58	22	60	7	56	45

In Leap-Year, after *February*, add the Motion of a Day more to the reſt.

Its Nodes are in ♍ ♓ 21°. Inclination 31°.

The Epoche of this Satellite I have taken, *Anno* 1713, *December* 31 at Noon, ♄ Geocentric Place was then 5 ſ. 11° 6′ 9″.

Years Current.	Motion.				Years Com.	Motion.				Days.	Motion.			
	ſ.	°	′	″		ſ.	°	′	″		ſ.	°	′	″
1681	11	5	28	41	1	4	10	2	52	1	4	11	32	4
1701	11	24	6	19	2	8	20	5	44	2	8	23	4	7
1721	0	12	43	57	3	1	0	8	36	3	1	4	36	11
1722	4	22	46	49	4	9	21	43	32	4	5	16	8	15
1723	9	2	49	41	5	2	1	46	23	5	9	27	40	19
1724	1	12	52	33	6	6	11	49	15	6	2	9	12	22
1725	10	4	27	29	7	10	21	52	7	7	6	20	44	26
1726	2	14	30	21	8	7	13	27	3	8	11	2	16	30
1727	6	24	33	13	9	11	23	29	55	9	3	13	48	34
1728	11	4	36	5	10	4	3	32	47	10	7	25	20	37
1729	7	26	11	0	11	8	13	39	39	11	0	6	52	41
1730	0	6	13	52	12	5	5	10	35	12	4	18	24	45
1731	4	16	16	44	13	9	15	13	27	13	8	29	56	49
1732	8	26	19	36	14	1	25	16	19	14	1	11	28	52
1733	5	17	54	32	15	6	5	19	10	15	5	23	0	56
1734	9	27	57	24	16	2	26	54	6	16	10	4	33	0
1735	2	8	0	16	17	7	6	56	58	17	2	16	5	4
1736	6	18	3	8	18	11	16	59	50	18	6	27	37	7
1737	3	9	38	3	19	3	27	2	42	19	11	9	9	11
1738	7	19	40	55	20	0	18	37	38	20	3	20	41	15
1739	11	29	43	47	40	1	7	15	16	21	8	2	13	19
1740	4	9	46	39	60	1	25	52	54	22	0	13	45	22
1741	1	1	21	35	80	2	14	30	31	23	4	25	17	26
1742	5	11	24	27	100	3	3	8	9	24	9	6	49	30
1743	9	21	27	18	200	6	6	16	19	25	1	18	21	34
1744	2	1	30	10	300	9	9	24	28	26	5	29	53	37
1745	10	23	5	7	400	0	12	32	37	27	10	11	25	41
Jan.	0	0	0	0	500	3	15	40	47	28	2	22	57	45
Feb.	3	27	33	57	600	6	18	48	56	29	7	4	29	49
Mar.	6	20	31	42	700	9	21	57	5	30	11	16	1	52
Apr.	10	18	5	39	800	0	25	5	15	31	3	27	33	57
May.	10	4	7	31	900	3	28	13	24					
June	2	1	41	28	1000	7	1	21	33					
July	1	17	43	20	2000	2	2	43	6					
Aug.	5	15	17	17	3000	9	4	4	39					
Sept.	9	12	51	14	4000	4	5	26	12					
Oct.	8	28	53	6	5000	11	6	47	45					
Nov.	0	26	27	3	6000	6	8	9	18					
Dec.	0	12	28	55	7000	1	9	30	51					

H	Motion.				′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗
	ſ.	°	′	″								
1	0	5	28	50	1	0	5	29	31	2	49	55
2	0	10	57	40	2	0	10	58	32	2	55	24
3	0	16	26	30	3	0	16	26	33	3	0	52
4	0	21	55	21	4	0	21	55	34	3	6	20
5	0	27	24	11	5	0	27	24	35	3	11	49
6	1	2	53	1	6	0	32	53	36	3	17	18
7	1	8	21	51	7	0	38	22	37	3	22	47
8	1	13	50	41	8	0	43	51	38	3	28	16
9	1	19	19	31	9	0	49	19	39	3	33	44
10	1	24	48	21	10	0	54	48	40	3	39	14
11	2	0	17	12	11	1	0	17	41	3	44	43
12	2	5	46	2	12	1	5	46	42	3	50	12
13	2	11	14	52	13	1	11	15	43	3	55	41
14	2	16	43	42	14	1	16	44	44	4	1	9
15	2	22	12	32	15	1	22	12	45	4	6	36
16	2	27	41	22	16	1	27	41	46	4	12	5
17	3	3	10	13	17	1	33	10	47	4	17	34
18	3	8	39	3	18	1	38	39	48	4	23	3
19	3	14	7	53	19	1	44	8	49	4	28	32
20	3	19	36	43	20	1	49	38	50	4	34	1
21	3	25	5	33	21	1	55	7	51	4	39	29
22	4	0	34	23	22	2	0	35	52	4	44	58
23	4	6	3	13	23	2	6	4	53	4	50	27
24	4	11	32	4	24	2	11	33	54	4	55	56
					25	2	17	2	55	5	1	25
					26	2	22	31	56	5	6	54
					27	2	28	0	57	5	12	22
					28	2	33	28	58	5	17	51
					29	2	38	57	59	5	23	20
					30	2	44	26	60	5	28	50

In Leap-Year, after *February*, add the Motion of a Day more to the reſt.

Its Nodes are in ♍ ♓ 21°. Inclination 31°.

The Epoche of this Satellite I have taken, *Anno* 1713, *December* 31 at Noon, ♄ Geocentric Place was then 5 ſ. 11° 6′ 9″.

Years Current	Motion.				Years Com.	Motion.				Days.	Motion.			
	ſ.	°	′	″		ſ.	°	′	″		ſ.	°	′	″
1681	5	4	23	10	1	9	17	2	0	1	2	19	41	26
1701	5	23	30	23	2	7	4	4	0	2	5	9	22	52
1721	6	12	37	36	3	4	21	6	0	3	7	29	4	17
1722	3	29	39	36	4	4	27	49	26	4	10	18	45	43
1723	1	16	41	36	5	2	14	51	27	5	1	8	27	9
1724	11	3	43	36	6	0	1	53	27	6	3	28	8	35
1725	11	10	27	2	7	9	18	55	27	7	6	17	50	1
1726	8	27	29	2	8	9	25	38	53	8	9	7	31	26
1727	6	14	32	3	9	7	12	40	53	9	11	27	12	52
1728	4	1	33	3	10	4	29	42	53	10	2	16	54	18
1729	4	8	16	29	11	2	16	44	53	11	5	6	35	44
1730	1	25	18	29	12	2	23	28	19	12	7	26	17	10
1731	11	12	20	29	13	0	10	30	20	13	10	15	58	35
1732	8	29	22	29	14	9	27	32	20	14	1	5	40	1
1733	9	6	5	55	15	7	14	34	20	15	3	25	21	27
1734	6	23	7	55	16	7	21	17	46	16	6	15	2	53
1735	4	10	9	55	17	5	8	19	46	17	9	4	44	19
1736	1	27	11	56	18	2	25	21	46	18	11	24	25	44
1737	2	3	55	22	19	0	12	23	46	19	2	14	7	10
1738	11	20	57	22	20	0	19	7	13	20	5	3	48	36
1739	9	7	59	22	40	1	8	14	25	21	7	23	30	2
1740	6	25	1	22	60	1	27	21	38	22	10	13	11	28
1741	7	1	44	48	80	2	16	28	51	23	1	2	52	53
1742	4	18	46	48	100	3	5	36	3	24	3	22	34	19
1743	2	5	48	48	200	6	11	12	7	25	6	12	15	45
1744	11	22	50	49	300	9	16	48	10	26	9	1	57	11
1745	11	29	34	15	400	0	22	24	13	27	11	21	38	37
Jan.	0	0	0	0	500	3	28	0	17	28	2	11	20	2
Feb.	10	10	24	20	600	7	3	36	20	29	5	1	1	28
Mar.	0	21	44	22	700	10	9	12	23	30	7	20	42	54
Apr.	11	2	8	43	800	1	14	48	27	31	10	10	24	20
May	6	22	51	37	900	4	20	24	30					
June	5	3	15	57	1000	7	26	0	23					
July	0	23	58	51	2000	3	22	1	6					
Aug.	11	4	23	11	3000	7	14	2	12					
Sept	9	14	47	31	4000	3	10	2	45					
Oct.	5	5	30	25	5000	11	6	3	18					
Nov.	3	15	54	45	6000	7	2	3	51					
Dec.	11	6	37	39	7000	2	28	4	24					

A Table of the Motion of the third Satellite of *Saturn*.

H.	Motion. s.	°	′	″	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗	′ ″ ‴	° ′ ″	′ ″ ‴	″ ‴ ⁗
1	0	3	19	14	1	0	3	19	31	1	42	56
2	0	6	38	27	2	0	6	38	32	1	46	15
3	0	9	57	41	3	0	9	58	33	1	49	34
4	0	13	16	54	4	0	13	17	34	1	52	53
5	0	16	36	8	5	0	16	36	35	1	56	13
6	0	19	55	21	6	0	19	55	36	1	59	32
7	0	23	14	35	7	0	23	15	37	2	2	51
8	0	26	33	49	8	0	26	34	38	2	6	10
9	0	29	53	2	9	0	29	53	39	2	9	29
10	1	3	12	16	10	0	33	12	40	2	12	49
11	1	6	31	29	11	0	36	31	41	2	16	8
12	1	9	50	43	12	0	39	51	42	2	19	27
13	1	13	9	56	13	0	43	10	43	2	22	46
14	1	16	29	10	14	0	46	29	44	2	26	6
15	1	19	48	23	15	0	49	48	45	2	29	25
16	1	23	7	37	16	0	53	7	46	2	32	44
17	1	26	26	51	17	0	56	27	47	2	36	3
18	1	29	46	4	18	0	59	46	48	2	39	22
19	2	3	5	18	19	1	3	5	49	2	42	42
20	2	6	24	31	20	1	6	24	50	2	46	1
21	2	9	43	45	21	1	9	44	51	2	49	20
22	2	13	2	58	22	1	13	3	52	2	52	39
23	2	16	22	12	23	1	16	22	53	2	55	58
24	2	19	41	26	24	1	19	41	54	2	59	18
					25	1	23	0	55	3	2	37
					26	1	26	20	56	3	5	56
					27	1	29	39	57	3	9	15
					28	1	32	58	58	3	12	35
					29	1	36	17	59	3	15	54
					30	1	39	36	60	3	19	14

In Leap-Year, after *February*, add the Motion of a Day more to the reſt.

Its Nodes are in ♍ ♓ 21°. Inclination 31.

The Epoche of this Satellite I have taken, *Anno* 1713, *December* 31 at Noon, ♄ Geocentric Place was then 5 ſ. 11° 6′ 9″.

Years Current.	Motion.				Years Com.	Motion.				Days.	Motion.			
	ſ.	°	′	″		ſ.	°	′	″		ſ.	°	′	″
1681	1	0	48	56	1	10	20	35	19	1	0	22	34	37
1701	2	15	28	19	2	9	11	10	37	2	1	15	9	14
1721	4	0	7	42	3	8	1	45	56	3	2	7	43	51
1722	2	20	43	1	4	7	14	55	52	4	3	0	18	28
1723	1	11	18	20	5	6	5	31	11	5	3	22	53	5
1724	0	1	53	39	6	4	26	6	30	6	4	15	27	42
1725	11	15	3	35	7	3	16	41	49	7	5	8	2	19
1726	10	5	38	54	8	2	29	51	45	8	6	0	36	56
1727	8	26	14	13	9	1	20	27	4	9	6	23	11	33
1728	7	16	49	31	10	0	11	2	23	10	7	15	46	10
1729	6	29	59	27	11	11	1	37	42	11	8	8	20	47
1730	5	20	34	46	12	10	14	47	38	12	9	0	55	24
1731	4	11	10	5	13	9	5	22	57	13	9	23	30	1
1732	3	1	45	24	14	7	25	58	15	14	10	16	4	38
1733	2	14	55	20	15	6	16	33	34	15	11	8	39	15
1734	1	5	30	39	16	5	29	43	30	16	0	1	13	52
1735	11	26	5	58	17	4	20	18	49	17	0	23	48	29
1736	10	16	41	17	18	3	10	54	8	18	1	16	23	6
1737	10	29	51	13	19	2	1	29	27	19	2	8	57	43
1738	9	20	26	31	20	1	14	39	23	20	3	1	32	20
1739	8	11	1	50	40	2	29	18	46	21	3	24	6	57
1740	7	1	37	9	60	4	13	58	9	22	4	16	41	34
1741	5	14	47	5	80	5	28	37	32	23	5	9	16	11
1742	4	5	22	24	100	7	13	16	55	24	6	1	50	48
1743	2	25	57	43	200	2	26	33	50	25	6	24	25	25
1744	1	16	33	2	300	10	9	50	44	26	7	17	0	2
1745	0	29	42	58	400	5	23	7	39	27	8	9	34	39
Jan.	0	0	0	0	500	1	6	24	34	28	9	2	9	16
Feb.	11	9	53	8	600	8	19	44	29	29	9	24	43	53
Mar.	8	12	2	26	700	4	2	58	24	30	10	17	18	32
Apr.	7	21	55	34	800	11	16	15	19	31	11	9	53	8
May	6	9	14	6	900	6	29	32	13					
June	5	19	7	14	1000	2	12	49	8					
July	4	6	25	40	2000	4	25	38	16					
Aug.	3	16	18	54	3000	7	8	27	24					
Sept.	2	26	12	2	4000	9	21	16	32					
Oct.	1	13	30	34	5000	0	4	5	40					
Nov.	0	23	23	42	6000	2	16	54	48					
Dec.	11	10	42	14	7000	4	29	43	56					

H.	°	'	"	H.	°	'	"
'	'	"	'''	'	'	"	'''
"	"	'''	''''	"	"	'''	''''
1	0	56	27	31	29	9	43
2	1	52	53	32	30	6	9
3	2	49	20	33	31	2	36
4	3	45	46	34	31	59	2
5	4	42	13	35	32	55	29
6	5	38	39	36	33	51	55
7	6	35	6	37	34	48	22
8	7	31	32	38	35	44	48
9	8	27	59	39	36	41	15
10	9	24	25	40	37	37	41
11	10	20	52	41	38	34	8
12	11	17	18	42	39	30	34
13	12	13	45	43	40	27	1
14	13	10	11	44	41	23	27
15	14	6	38	45	42	19	54
16	15	3	5	46	43	16	21
17	15	59	31	47	44	12	47
18	16	55	58	48	45	9	14
19	17	52	24	49	46	5	40
20	18	48	51	50	47	2	7
21	19	45	17	51	47	58	33
22	20	41	44	52	48	55	0
23	21	38	10	53	49	51	26
24	22	34	37	54	50	47	53
25	23	31	3	55	51	44	19
26	24	27	30	56	52	40	46
27	25	23	56	57	53	37	12
28	26	20	23	58	54	33	39
29	27	16	49	59	55	30	5
30	28	13	16	60	56	26	32

In Leap-Year, after *February*, add the Motion of a Day more to the rest.

Its Nodes are in ♍ ♓ 21°. Inclination 31.°

The Epoche of this Satellite I have taken, *Anno* 1713, *December* 31 at Noon. ♄ Geocentric Place was then 5 *ſ*. 11° 6' 9".

Years Current	Motion.				Years Com.	Motion.				Days.	Motion.			
	s.	°	'	"		s.	°	'	"		s.	°	'	"
1681	0	9	20	39	1	7	6	30	20	1	0	4	32	18
1701	1	12	8	47	2	2	13	0	40	2	0	9	4	36
1721	2	14	56	55	3	9	19	31	0	3	0	13	36	54
1722	9	21	27	15	4	5	0	33	38	4	0	18	9	13
1723	4	27	57	35	5	0	7	3	58	5	0	22	41	31
1724	0	4	27	55	6	7	13	34	17	6	0	27	13	49
1725	7	15	30	33	7	2	20	4	37	7	1	1	46	7
1726	2	22	0	53	8	10	1	7	15	8	1	6	18	25
1727	9	28	31	13	9	5	7	37	35	9	1	10	50	43
1728	5	5	1	33	10	0	14	7	55	10	1	15	23	1
1729	0	16	4	11	11	7	20	38	15	11	1	19	55	19
1730	7	22	34	31	12	3	1	40	53	12	1	24	27	38
1731	2	29	4	51	13	10	8	11	13	13	1	28	59	56
1732	10	5	35	11	14	5	14	41	33	14	2	3	32	14
1733	5	16	37	49	15	0	21	11	53	15	2	8	4	32
1734	0	23	8	8	16	8	2	14	31	16	2	12	36	50
1735	7	29	38	28	17	3	8	44	51	17	2	17	9	8
1736	3	6	8	48	18	10	15	15	10	18	2	21	41	26
1737	10	17	11	26	19	5	21	45	30	19	2	26	13	45
1738	5	23	41	46	20	1	2	48	8	20	3	0	46	3
1739	1	0	12	6	40	2	5	36	17	21	3	5	18	21
1740	8	6	42	26	60	3	8	24	25	22	3	9	50	39
1741	3	17	45	4	80	4	11	12	34	23	3	14	22	57
1742	10	24	15	24	100	5	14	0	42	24	3	18	55	15
1743	6	0	45	44	200	10	28	1	24	25	3	23	27	33
1744	1	7	16	4	300	4	12	2	6	26	3	27	59	51
1745	8	18	18	42	400	9	26	2	48	27	4	2	32	10
Jan.	0	0	0	0	500	3	10	3	30	28	4	7	4	28
Feb.	4	20	41	22	600	8	24	4	12	29	4	11	36	46
Mar.	8	27	45	50	700	2	8	4	55	30	4	16	9	4
Apr.	1	18	27	12	800	7	22	5	37	31	4	20	41	22
May	6	4	36	16	900	1	6	6	19					
June	10	25	17	38	1000	6	20	7	1					
July	3	11	26	42	2000	1	10	14	2					
Aug.	8	2	8	5	3000	8	0	21	3					
Sept.	0	22	49	27	4000	2	20	28	4					
Oct.	5	8	58	31	5000	9	10	35	5					
Nov.	9	29	39	53	6000	4	0	42	6					
Dec.	2	15	48	57	7000	10	20	49	7					

H. ′ ″	° ′ ″	′ ″ ‴	″ ‴ ⁗	H. ′ ″	° ′ ″	′ ″ ‴	″ ‴ ⁗
1	0	11	21	31	5	51	43
2	0	22	41	32	6	3	4
3	0	34	2	33	6	14	25
4	0	45	23	34	6	25	45
5	0	56	44	35	6	37	6
6	1	8	4	36	6	48	27
7	1	19	25	37	6	59	48
8	1	30	46	38	7	11	8
9	1	42	7	39	7	22	29
10	1	53	27	40	7	33	50
11	2	4	48	41	7	45	11
12	2	16	9	42	7	56	31
13	2	27	30	43	8	7	52
14	2	38	50	44	8	19	13
15	2	50	11	45	8	30	34
16	3	1	32	46	8	41	54
17	3	12	53	47	8	53	15
18	3	24	13	48	9	4	36
19	3	35	34	49	9	15	57
20	3	46	55	50	9	27	17
21	3	58	16	51	9	38	38
22	4	9	36	52	9	49	59
23	4	20	57	53	10	1	20
24	4	32	18	54	10	12	40
25	4	43	39	55	10	24	1
26	4	54	59	56	10	35	22
27	5	6	20	57	10	46	43
28	5	17	41	58	10	53	3
29	5	29	2	59	11	9	24
30	5	40	22	60	11	20	45

In Leap-Year, after *February*, add the Motion of a Day more to the reſt.

Its Nodes are in ♍ ♓ 4°. Inclination 16°.

The Epoche of this Satellite I have taken, *Anno* 1713, *December* 31 at Noon. ♄ Geocentric Place was then 5 ſ. 11° 6′ 9″.

A Table of the Diſtances of *Saturn*'s Satellites, from his Body in Semidiameters and Decimal Parts of his Globe.

Satellite 1.

°	0 Con. 6 Ant.	1 Con. 7 Ant	2 Con. 8 Ant.	°
0	0.0000	1.446	2.892	30
3	0.1446	1.5906	3.0366	27
6	0.2892	1.7352	3.1812	24
9	0.4338	1.8798	3.3258	21
12	0.5784	2.0244	3.4704	18
15	0.723	2.169	3.615	15
18	0.8676	2.3136	3.7596	12
21	1.0122	2.4582	3.9042	9
24	1.1568	2.6028	4.0488	6
27	1.3014	2.7474	4.1934	3
30	1.446	2.892	4.34	0
	5 Con. 11 Ant.	4 Con. 10 Ant.	3 Con. 9 Ant.	

Satellite 2.

°	0 Con. 6 Ant.	1 Con. 7 Ant.	2 Con. 8 Ant.	°
0	0.0000	1.853	3.706	30
3	0.1853	2.0383	3.8913	27
6	0.3706	2.2236	4.0766	24
9	0.5559	2.4089	4.2619	21
12	0.7412	2.5942	4.4472	18
15	0.9265	2.7795	4.6325	15
18	1.1118	2.9648	4.8178	12
21	1.2971	3.1501	5.0031	9
24	1.4824	3.3354	5.1184	6
27	1.6677	3.5207	5.3737	3
30	1.853	3.706	5.5593	0
	5 Con. 11 Ant.	4 Con. 10 Ant.	3 Con. 9 Ant.	

Satellite 3.

°	0 Con. 6 Ant.	1 Con. 7 Ant.	2 Con 8 Ant.	°
0	0.0000	2.5881	5.1762	30
3	0.2588	2.847	5.435	27
6	0.5176	3.1057	5.6938	24
9	0.7764	3.3645	5.9526	21
12	1.0352	3.6233	6.2114	18
15	1.2940	3.8821	6.4702	15
18	1.5529	4.141	6.7291	12
21	1.8117	4.3998	6.9879	9
24	2.0705	4.6586	7.2467	6
27	2.3293	4.9174	7.5955	3
30	2.5881	4.1762	7.7643	0
	5 Con 11 Ant.	4 Con. 10 Ant.	3 Con. 9 Ant.	

A Table of the Diſtances of the Satellites of *Saturn* from his Body, in Semidiameters and Decimal Parts of his Globe.

°	0 Conſeq. 6 Antec.	1 Conſeq. 7 Antec.	2 Conſeq. 8 Antec.	°
		Satellite 4.		
0	0.0000	6.	12.	30
3	0.6	6.6	12.6	27
6	1.2	7.2	13.2	24
9	1.8	7.8	13.8	21
12	2.4	8.4	14.4	18
15	3.	9.	15.	15
18	3.6	9.6	15.6	12
21	4.2	10.2	16.2	9
24	4.8	10.8	16.8	6
27	5.4	11.4	17.4	3
30	6.	12.	18.	0
		Satellite 5.		
0	0.0000	17.4859	34.9719	30
3	1.7486	19.2345	36.7205	27
6	3.4972	20.9831	38.469	24
9	5.2458	22.7317	40.2176	21
12	6.9944	24.4803	41.9662	18
15	8.743	26.2289	43.7148	15
18	10.4916	27.9775	45.4634	12
21	12.2402	29.7261	47.212	9
24	13.9887	31.4747	48.9606	6
27	15.7373	33.2233	50.7092	3
30	17.4859	34.9719	52.4578	0
	5 Conſeq 11 Antec	4 Conſeq. 10 Antec.	3 Conſeq. 9 Antec.	

A Table of the Number of Days from the first of *January* to any Day in the Year.

Days.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29	—	88	119	149	180	210	241	272	302	333	363
30	30	—	89	120	150	181	211	242	273	303	334	364
31	31	—	90	——	151	——	212	243	——	304	——	365

IN Page 70, I have given you a Table of the Hourly Motions, Apparent Semidiameter, and Horizontal Parallaxes of the Sun and Moon; but you are to obſerve, that that Table is computed to the middle State of the Lunar Orbit, not having regard to the Change of her Eccentricity: But that you may have theſe things true at all times, obſerve the following Method.

To find the Horizontal Parallax and Apparent Semidiameter of the Moon, according to the Theory.

Example. To the Place of the Moon *Jan.* 1, 1729, I would know her Horizontal Parallax, and Apparent Semidiameter, which are obtain'd from Figure 2. as follows

Operation.

As ſ. △ E L F, the Ellip. Equat.	3° 4′ 38″ Co-Ar.	1.270174
To E F the Double Eccentricity	90794 - - - -	4.958057
So ſ. ∠ L F E, Mean Anomaly	37 51 52 - - -	9.787897
To E L, Diſt. ☽ from the Earth	1037834 - - -	6.016128

Now ſay,

As preſent Diſt. ☽ à ⊙	— — —	6.016128
To her mean Diſtance	— —	6.000000
So ſ. mean Horizontal Parallax ☽	57′ 30″ - -	8.223357
To ſ. preſent Horizontal Parallax	55 24 - -	8.207229

2. For the Apparent Semidiameter ☽ at the ſame time, ſay by the Logiſtical Logarithms,

As the mean Horizont. Parall.	57′ 30″ LL Co-Ar.	815
To mean Semidiameter	— 15 45 — —	5809
So is the preſent Horiz. Paral.	55 24 — — —	346
To the preſent Apparent Semid.	15 11 —	5970

And after the ſame manner may you find the Moon's Horizontal Parallax to the ſecond Example, *January* 2. at Noon 1729, to be 56 14″, and the Apparent Semidiameter 15′ 24″.

For

For the true hourly Motions of the Sun and Moon in Eclipſes, &c. calculate their Places to half an Hour before, and to half an Hour after the equal Time of the true Conjunction or Oppoſition, and ſo you will gain their true hourly Motions at that time.

N. B. The Table in Page 94, is to be uſed when you find the Day of the Retrogradation of any Planet by the 11th Precept of my *Compleat Syſtem of Aſtronomy.*

FINIS.