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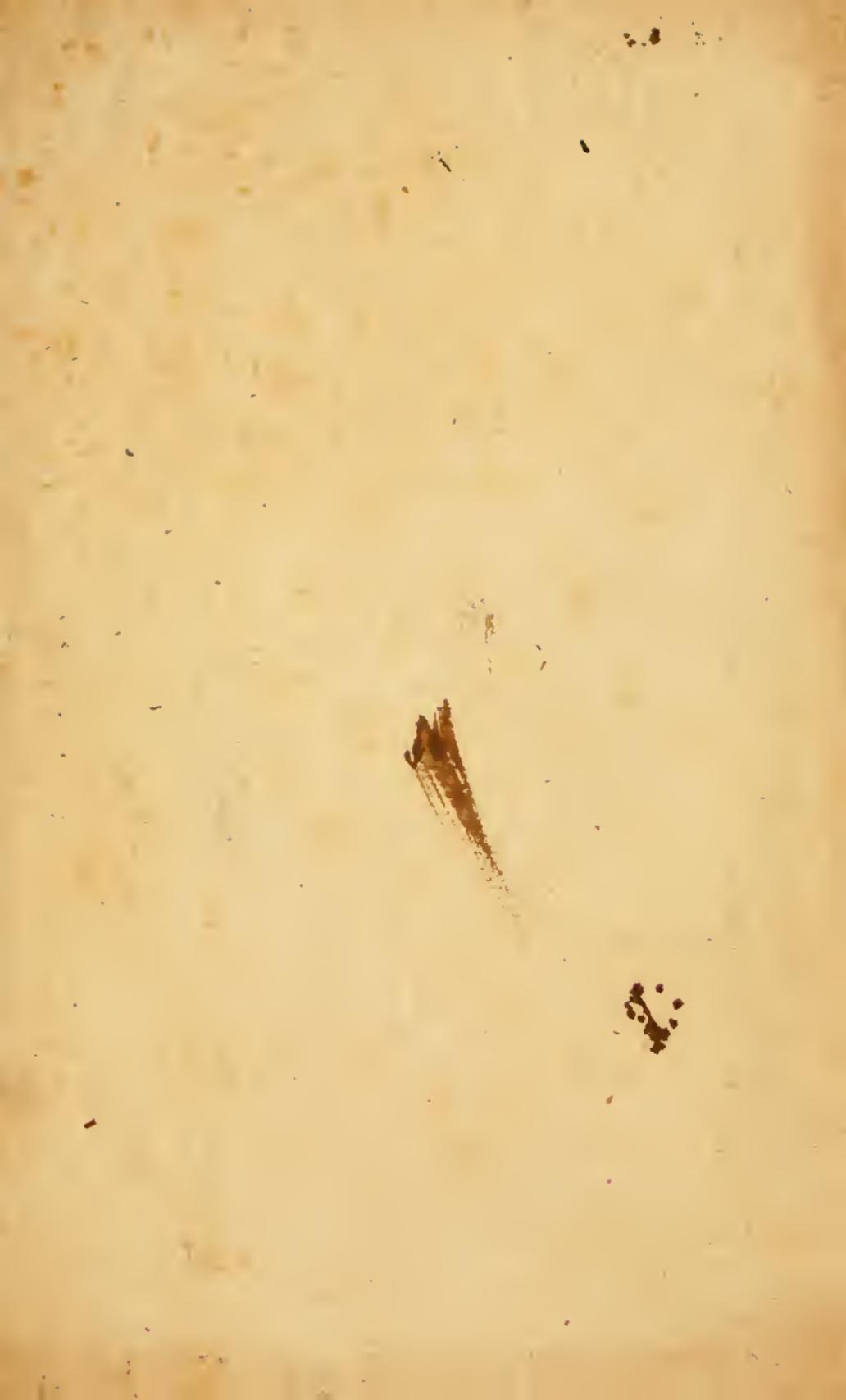
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A

Richard Peters

NEW METHOD  
OF  
STATING and EXPLAINING  
THE  
SCRIPTURE CHRONOLOGY,  
UPON

*Mosaic Astronomical Principles, Mediums and Data,*

As laid down in the PENTATEUCH.

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Ethnicis igitur nullum tempus propriè historicum audiat, nisi quod primam olympiadem sequitur. Nos autem qui *Mosaicis* gaudemus *Ratiociniis*, ab ipso primo homine, mundoque condito historias nostras exordiamur. Et idcirco totum temporis, quod *ab ipsis motuum cœlestium carceribus*, ad hanc usque Metam, sive *præsens tempus* effluxerit, historicum jure nominamus.

BEVERIDGE'S *Chronol. Inst.* l. I. c. 2.

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By JOHN KENNEDY, Rector 'of  
*Bradley* in the County of *Derby*.

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THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

RESEARCH REPORT

NO. 100

1950

BY

J. R. OPPENHEIMER

AND

H. S. GARDNER

CHICAGO, ILLINOIS

1950

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# P R E F A C E.

THE importance of the point, the settling of which is the attempt of the following sheets, fully appears from it's having employed the researches and pens of the most learned and inquisitive in all ages; and the *difficulties*, with which it's determination is attended, are no less apparent from all human calculations having been hitherto devoid of agreement; and their endeavours unable to bring it to any precise regulation. To ascertain then a branch of science no less difficult than *useful* to be adjusted, may be thought well to claim the divine interposition.

———— *Deus interfit.* ———— *Dignus vindice Nodus Incidit.* —————

I therefore present the reader with a system of chronology built upon *Mosaic* principles and data; and do request of him to lay aside, for a while, all preconceptions of difficulties and objections, 'till he has viewed my whole scheme, and considered it in all it's parts.

It has seldom or never happened, that a scheme of any kind, has been brought to perfection in the first attempt. But here it must be remembered, that the scheme of genuine sacred chronology, is of too refined and delicate a nature to admit of any *mean*; and the proof of it, like the source and fountain from whence it was derived, must be *perfect in it's origin*.

My calculations, founded on the terms, principles and data of the *Pentateuch*, lay a claim to a just exactness; and should they, upon a due examination, be found *liable to produce* erroneous conclusions in Sun and Moon astronomy, they *cannot be Mosaic*, and I must acknowledge myself to have been guilty of a very *high Misnomer*, in giving them such a sacred appellation. And therefore the conviction of *a single error in time* from the creation to this day, which, upon no-

tice given, cannot be corrected upon the principles laid down, must be admitted as a confutation of this whole performance, and there will be no plea left, but only,

*Quod si non tenuit magnis tamen excidit aufis.*

The more immediate view of this work is to evince, amongst others, the following propositions, which were drawn up by me nearly in the same form and published some time ago, when several subscriptions were taken in upon them; and sorry I am that I could not discharge my obligations sooner to those, who were so kind as to encourage my design, which I certainly would have done, had I not in this interval met with many unexpected interruptions.

I. The original position of the two great luminaries, the Sun and Moon, with respect to the Earth, on the fourth of the Hexaëmeron, deduced from the first chapter of *Genesis*, and ascertained in the Levitical law, by *Moses*, when he enjoins the observation of the feast of the In-gathering on the 15th day of the month, in the revolution, *i. e.* end of the year: here the number 15 (which is the Scripture full-moon day, and was its quality on the 4th of the Hexaëmeron) does really and in fact, with a true astronomical exactness, express the distance of the *Mosaic* cardinal, *i. e.* autumnal æquinoctial point, from the evening of the Moon's visibility, ———— ☽

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○

☾ 15.

II. An astronomical determination on what day of the week was the 4th of the Hexaëmeron, collected and stated from the *Mosaic* terms of computation, *viz.* days, weeks, and years; beginning his account of time, and his Chronology, from a cardinal point of the heavens, *viz.* the autumnal æquinox; and from a cardinal point of the day, *viz.* noon, with respect

to the *Mosaic* meridian, which is geographically described, *Gen. ch. 2. ver. 10. &c.*

III. *Moses* measures the lives of the patriarchs, by the course of the Sun, or tropical solar years; and records all historical transactions and events, by the months and days of the lunar year, computed from new Moon (☾) to new Moon (☾).

IV. In consequence of the preceding proposition, it will appear from *Gen. i. 14.* and *Moses's* account of the deluge, that *Noah* was in the ark, part of two distinct solar, and part of two distinct lunar, years.

*N. B.* (1st) The two distinct solar years are expressed by the numbers 600 and 601. *Gen. ch. 7. ver. 11.* and *ch. 8. ver. 13.*

The two distinct lunar years are thus pointed out: *Noah* entered into the ark, *Gen. ch. 7. ver. 11,* on the 17th day of the 2d month of that lunar year, which was concurrent with the solar year of his life 600; and he received the divine command to come out of the ark, *Gen. ch. 8. ver. 14, 15,* on the 27th day of the 2d month of that lunar year, which was concurrent with the solar year of his life, 601.

(2dly) In the year of *Noah* 600, in which the deluge began and ended, there was a co-incidence of the lunar year with the solar, the epact at the conclusion of that year being 11, and is plainly deducible from the *Mosaic* account, according to the *Hebrew* text.

(3dly) The *Mosaic* historical narration of the circumstances, process and conclusion of the deluge, is extremely curious, and will be found to be the key, whereby we may open many, if not most, of the secrets of the scripture computation, as, (1) not only the number of days in a month, but also the manner of computing and adjusting the months, both of the solar and of the lunar year. (2) The quality of the Moon which constitutes the head or beginning of the lunar year. (3) The

*N. B.* To render my astronomical calculations plain and easy to be understood, I have inserted and explained a concise astronomical table, both solar and lunar, constructed from the inverted position of the luminaries, A. M. 1. and A. M. 1656. [See Page 14.] And should the world continue any definite number of ages, the table founded on this inverted position will stand in need of no alteration or correction.

The purport of this undertaking, will not lead me to treat of the origin, or to settle the chronology, of the most antient kingdoms and nations, where the Scriptures are silent. Nor shall I attempt the connection of the Sacred History with the Profane: and indeed was I desirous to do it, I know not of one instance of that kind, which can be depended upon with certainty, (excepting the æra of the Olympiads, of the building of *Rome* according to *Varro*, and the æra of *Nabonassar*) before the expedition of *Nebuchadnezzar* into *Judæa*, &c. mentioned by the prophet *Daniel* *ch. 1, ver. 1*, and is confirmed by the much noted fragment of *Berosus*. Neither is it necessary to make a digression, in order to state and explain the most antient forms of year, which have been in use since the flood; but I shall entirely confine my enquiries to the *Mosaic* and *Scripture* year; and it will be my peculiar province to collect the principles and data, which lie dispersed thro' the *Pentateuch*, and to undertake to prove, by their assistance, that the whole of Sacred chronology, is built upon a most sure, and truly astronomical, foundation. These are some of the particulars which may be still reckoned amongst the necessary and essential *desiderata*, notwithstanding the many learned and elaborate volumes, which have been wrote and published upon the subject of the *Scripture* chronology.



I Month.			VI Month.		
Hebdom. Numerals.	Sol.	Luna.	Hebdom. Numerals.	Sol.	Luna.
4	1	1	7	1	1
5	2	2	1	2	2
6	3	3	2	3	3
7	4	4	3	4	4
1	5	5	4	5	5
2	6	6	5	6	6
3	7	7	6	7	7
4	8	8	7	8	8
5	9	9	1	9	9
6					



7  
1  
2  
3  
4  
5  
6  
7

I Month.			II Month.			III Month.			IV Month.			V Month.			VI Month.		
Hiddeum Numerals	Sol.	Luna.															
4	1	1	6	1	1	1	1	1	3	1	1	5	1	1	7	1	1
2	2	2	7	2	2	2	2	2	4	2	2	6	2	2	8	2	2
3	3	3	7	3	3	3	3	3	5	3	3	7	3	3	9	3	3
4	4	4	7	4	4	4	4	4	6	4	4	8	4	4	10	4	4
5	5	5	7	5	5	5	5	5	7	5	5	9	5	5	11	5	5
6	6	6	7	6	6	6	6	6	8	6	6	10	6	6	12	6	6
7	7	7	7	7	7	7	7	7	9	7	7	11	7	7	13	7	7
8	8	8	7	8	8	7	8	8	10	8	8	12	8	8	14	8	8
9	9	9	7	9	9	7	9	9	11	9	9	13	9	9	15	9	9
10	10	10	7	10	10	7	10	10	12	10	10	14	10	10	16	10	10
11	11	11	7	11	11	7	11	11	13	11	11	15	11	11	17	11	11
12	12	12	7	12	12	7	12	12	14	12	12	16	12	12	18	12	12
13	13	13	7	13	13	7	13	13	15	13	13	17	13	13	19	13	13
14	14	14	7	14	14	7	14	14	16	14	14	18	14	14	20	14	14
15	15	15	7	15	15	7	15	15	17	15	15	19	15	15	21	15	15
16	16	16	7	16	16	7	16	16	18	16	16	20	16	16	22	16	16
17	17	17	7	17	17	7	17	17	19	17	17	21	17	17	23	17	17
18	18	18	7	18	18	7	18	18	20	18	18	22	18	18	24	18	18
19	19	19	7	19	19	7	19	19	21	19	19	23	19	19	25	19	19
20	20	20	7	20	20	7	20	20	22	20	20	24	20	20	26	20	20
21	21	21	7	21	21	7	21	21	23	21	21	25	21	21	27	21	21
22	22	22	7	22	22	7	22	22	24	22	22	26	22	22	28	22	22
23	23	23	7	23	23	7	23	23	25	23	23	27	23	23	29	23	23
24	24	24	7	24	24	7	24	24	26	24	24	28	24	24	30	24	24
25	25	25	7	25	25	7	25	25	27	25	25	29	25	25			
26	26	26	7	26	26	7	26	26	28	26	26	30	26	26			
27	27	27	7	27	27	7	27	27	29	27	27						
28	28	28	7	28	28	7	28	28	30	28	28						
29	29	29	7	29	29	7	29	29									
30	30	30	7	30	30	7	30	30									

Gen. c. vii. v. 11.

Rain ceased. d vii. v. 2.

VII Month.			VIII Month.			IX Month.			X Month.			XI Month.			XII Month.		
Hiddeum Numerals	Sol.	Luna.															
2	1	1	4	1	1	6	1	1	1	1	1	3	1	1	5	1	1
3	2	2	7	2	2	7	2	2	2	2	2	4	2	2	6	2	2
4	3	3	7	3	3	7	3	3	3	3	3	5	3	3	7	3	3
5	4	4	7	4	4	7	4	4	4	4	4	6	4	4	8	4	4
6	5	5	7	5	5	7	5	5	5	5	5	7	5	5	9	5	5
7	6	6	7	6	6	7	6	6	6	6	6	8	6	6	10	6	6
8	7	7	7	7	7	7	7	7	7	7	7	9	7	7	11	7	7
9	8	8	7	8	8	7	8	8	8	8	8	10	8	8	12	8	8
10	9	9	7	9	9	7	9	9	9	9	9	11	9	9	13	9	9
11	10	10	7	10	10	7	10	10	10	10	10	12	10	10	14	10	10
12	11	11	7	11	11	7	11	11	11	11	11	13	11	11	15	11	11
13	12	12	7	12	12	7	12	12	12	12	12	14	12	12	16	12	12
14	13	13	7	13	13	7	13	13	13	13	13	15	13	13	17	13	13
15	14	14	7	14	14	7	14	14	14	14	14	16	14	14	18	14	14
16	15	15	7	15	15	7	15	15	15	15	15	17	15	15	19	15	15
17	16	16	7	16	16	7	16	16	16	16	16	18	16	16	20	16	16
18	17	17	7	17	17	7	17	17	17	17	17	19	17	17	21	17	17
19	18	18	7	18	18	7	18	18	18	18	18	20	18	18	22	18	18
20	19	19	7	19	19	7	19	19	19	19	19	21	19	19	23	19	19
21	20	20	7	20	20	7	20	20	20	20	20	22	20	20	24	20	20
22	21	21	7	21	21	7	21	21	21	21	21	23	21	21	25	21	21
23	22	22	7	22	22	7	22	22	22	22	22	24	22	22	26	22	22
24	23	23	7	23	23	7	23	23	23	23	23	25	23	23	27	23	23
25	24	24	7	24	24	7	24	24	24	24	24	26	24	24	28	24	24
26	25	25	7	25	25	7	25	25	25	25	25	27	25	25	29	25	25
27	26	26	7	26	26	7	26	26	26	26	26	28	26	26	30	26	26
28	27	27	7	27	27	7	27	27	27	27	27	29	27	27			
29	28	28	7	28	28	7	28	28	28	28	28	30	28	28			
30	29	29	7	29	29	7	29	29	29	29	29						
	30	30	7	30	30	7	30	30	30	30	30						

Ark refled. c viii. v. 4.

Tops of the Mountains feen. c viii.

Raven fent out. c viii. v. 7.

Dove fent out. c viii. v. 8.

Dove, d zime, v. 10.

Dove, v. 12.

Gen. c. viii. v. 13.

Hiddeum Numerals	Sol.	Luna.
7	31	7
8	32	8
9	33	9
10	34	10
11	35	11

Gen. c. viii. v. 13.

From Adam to  
are inserted.

100

Year of Promise	
After the Flood	
Joseph	
Jacob	
Joan	
Moyses	
Sarah	
Abraham	
Terah	
Nahor	
The of Po	
Intervals.	Adam





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# NEW METHOD

OF

STATING and EXPLAINING

THE

## SCRIPTURE CHRONOLOGY, &c.



According to the *Hebrew* (which is the only true) chronology, we are now in the sixth millenium of the world's past duration, *viz.* in the 5758th current year. And yet, even in these latter times, in a philosophical, astronomical, and mathematical age, neither the learned of our own, nor of any other, nation, (as experience testifies) have been able to teach us, how to accommodate by fixed and determinate rules, the *true measures* of the *annual periods* of the two great luminaries, either to civil or religious uses: I mean, not with that exactness and certainty, by plain, simple, and yet, unerring laws, which the primitive

A

primitive

mitive patriarchs were originally taught and practised ; as will demonstrably appear from the *Pentateuch* of *Moses*.

First then we are to state and determine the original position of the 3 orbs, the Sun, Moon, and Earth to one another ; which is the *fundamental datum* of the *Pentateuch*, and to us a necessary and important point of knowlege.

*Moses* concludes his historical account of the Hexaëmeron, with this remark, *And God saw all that he had made, and behold, it was very good, i. e.* every part of the universal system, whether inanimate, animate, or rational, was created in a state of *original perfection*.

As the two great luminaries are ever varying their mutual aspects to each other, their relations and distances ; was I to ask the astronomer, what we might infer from *nature*, to be their *first situation*, with respect to the Earth ? He would, it is probable, smile at my simplicity ; or, perhaps, give me some such serious answer as this, *viz.* In a circle there is no first point by *nature*, but only by *position*.

But was I to ask the same astronomer, what was the *most perfect*, and *therefore*, by just ratiocination and inference, the *original position*, I do not think he would look upon this question as absurd, or treat it with ridicule.

I will endeavour to deduce this point from some particular expressions made use of by *Moses* in the first chapter of *Genesis*, and afterwards confirm it by certain texts in the Levitical law.

Gen. ch. 1. ver. 14. *And God said, let there be lights* (Heb. and Gr. luminaries) *in the firmament* (Heb. expanse) *of the Heavens, to divide the day from the night* (Heb. between the day, and between the night) *and let them be for signs, and for seasons, and for days, and for years.*

Ver. 15. *And let them be for lights* (Heb. and Gr. luminaries) *in the firmament* (Heb. expanse) *of the Heavens, to give light upon the Earth,* (Heb. *lehair* (conjugat. hiphil) *gnal haaretz*, to cause to shine over the whole Earth, even to enlighten the whole extent of its surface, from the one pole to the other) *and it was so.*

Ver. 16. *And God made two great lights,* (Heb. and Gr. luminaries) *the greater light* (luminary) *to rule* (Heb. for the dominion of) *the day, and the lesser light* (luminary) *to rule* (Heb. for the dominion of) *the night. He made the stars also.* (Heb. and the stars.)

Ver. 17. *And God set them in the firmament* (Heb. expanse) *of the Heavens, to give light upon the Earth* (Heb. to cause the whole extent of the Earth to shine.)

Ver. 18. *And to rule over the day, and over the night, and to divide the light from the darkness.* (Heb. between the light and between the darkness.) *And God saw that it was good.*

Ver. 19. *And the evening and the morning was the fourth day.*

Should we enlarge our ideas of the universe into as many systems as modern philosophy suggests,

into a numberless host of suns, and an indefinite plurality of worlds, these words of *Moses* may be fairly extended to comprehend them all.—

Let there be luminaries in the expanse of the Heavens.—Upon a bare perusal of them, our thoughts immediately begin to range the whole circuit of the sky, and we raise our contemplations to the Sun, the Moon, the planets, the comets, the fixed stars, and all the hosts of Heaven: and we can scarce help indulging a pleasing hope, that *Moses* is about to draw the veil, and open to our intellectual view the secrets of the universal system. But the following words, in the beginning of the 16th verse—*And God made two great luminaries*—effectually restrain all such speculative excursions; the scene immediately closes, and we are in a moment convinced, that *Moses*, instead of multiplying systems, and enlarging our ideas of the universe, contracts his astronomy within narrow limits, and labours to fix our enquiries and contemplations upon the Sun, and the Earth's constant satellite the Moon.

Ver. 16. *And God made two great luminaries.*

*Moses*, it is manifest, takes no small pains to let the reader know, that he is not delivering to the world a systematical astronomy; and these words—*God made two great luminaries*—are evidently wrote, not in exclusion of, but in contradiction to, the fixed stars, and the planets, which are ranked amongst them. The numeral *two*, is set in direct opposition to their *multitude*; and

and the epithet *great* is set in direct opposition to their *apparent diminutive* magnitude.

First, to their *multitude*; when in a clear winter's evening, we lift up our eyes to the spherical concave, we see it bespangled with stars, innumerable as the sand upon the sea-shore; and the *Psalmist*, *Pf.* 147. ver. 4. spoke a literal truth when he said, It is God who telleth the number of the stars, and calleth them all by their names.

Secondly, to their *apparent diminutive magnitude*.

Though it should be admitted, that every fixed star, in itself considered, is a great luminary, and that it shines like our Sun, with its own native and inherent light; yet, with respect to the evidence of sense, they are *comparatively* very small. Take a star of the first magnitude, suppose *Sirius*; view it through a telescope, and it will be found to have no diameter, but appear only as a lucid point. This diminution of their magnitude arises from the immensity of their distance; nay, so immense is the distance of the fixed stars from the Earth, in the astronomer's account, that he assures us, the whole diameter of the great orbit, will not furnish him with an angle of observation. But God, says *Moses*, made *two great* luminaries.

Ver. 16. The greater luminary for the dominion of the day, and the lesser luminary for the dominion of the night.

*Moses* does not use these terms—the greater luminary, and the lesser luminary—for want of  
ap-

appellatives; since afterwards, *Deut. ch. 4. ver. 19.* he calls the one *Shemesh*, the Sun; and the other *Jareach*, the Moon. He was guided herein by a divine wisdom and direction. For had it been said—let the Sun and the Moon be in the expanse of the Heavens;—and God made the Sun for the dominion of the day, and the Moon for the dominion of the night;—this, with respect to us, would have been undoubtedly true: yet, might it not with some colour of reason have been objected, that God made all the hosts of Heaven, *Gen. ii. 1.* as well as the Sun and Moon? *Moses* therefore, has wisely evaded both the cavil and the objection, by writing, not in exclusion of, but only in contradistinction to, the more remote parts of the universe, with which we have not either an immediate or known connection.

In the former part of the 16th verse, the Sun and the Moon are set by *Moses*, in a state of comparison, with the fixed stars and planets; in the words immediately following, they are compared with each other; and in this last state of comparison, the Sun is the *greater*, and the Moon the *lesser* luminary, in respect of the different light they afford.

Ver. 16. *And the stars.* (Heb. *vecocabim.*)

Our *English* translators have inserted in this place the words—*he made also*—which is a mistake. And had there been any difficulty in understanding the sense of the words, as they lie in the *Hebrew* text, the comment of the *Psalmist* would have cleared it. *Pf. 136. ver. 8, 9.* who  
made

made the Sun for the dominion of the day, the Moon and the stars for the dominion of the night.

*Moses* includes both the superior and inferior planets, under the general denomination of (*cocabim*) stars. And, in truth and matter of fact, is not the planet *Venus*, for instance, our most bright, both morning and evening star? Do not the superior planets, *Saturn*, *Jupiter*, and *Mars*, regularly rise above the horizon, in the form and appearance of stars? Do not the fixed stars, with their united radiances and scintillations, share with the Moon in the dominion over the right?

And as it is plain that *Moses* ranks the planets with the stars, speaking from appearances and the evidence of sense, we have no grounds to expect a formal account of their magnitudes, densities, distances, periods, satellites, &c.—of all which there is a most profound silence.

Whatever worthy and exalted apprehensions of the author of nature, the infinite perfection of his attributes, or of the extent and magnificence of his works, reason and philosophy may dictate and discover to us; to whatever *important uses*, God, in his infinite wisdom and power, may have destinated the planets and the fixed stars (in the discovery of which, we have no other light to direct us, but bare *conjectures*, and arguments drawn from *congruities*) *Moses*, by divine direction, has withdrawn our thoughts and speculations from all such far distant objects; not only  
be-

because we have no visible relation to, nor perceptible connection with, them, but rather (as we may with certainty and confidence affirm) because they do not measure *our time*, either by their real or apparent revolutions. God has created and ordained two great luminaries, the Sun and Moon, to be *unto us*, for signs, and for seasons, for days and years; and to this motion only *Moses*, with great judgment and accuracy, confines his astronomy.

From the beginning of the 2d verse to the end of the first chapter of *Genesis*, the sacred historian treats not solely of creation; but evidently *περι της διακοσμησεως*, *de ordinatione*, of the orderly and regular disposition of the most eminent and conspicuous parts of the world, as they were fitted up and prepared by a most exquisite skill, wisdom, and contrivance for *our benefit*, and for *our accommodation*: hence the world in *Greek* is called *κοσμος*, ornament, order, beauty. And particularly in the 4th of the *Hexaëmeron*, the *Mosaic* historical narration treats not so much of the actual creation and production of the greater luminary, the lesser luminary, and the stars, as of their positions, uses, offices or ordinations, and final causes: the historian never fails indeed, as he proceeds in the narration, to point out the efficient cause, and is very careful, in every instance, to inform the reader, that every thing which exists was caused to exist by the power of God's word.

Ver. 15. *To give light upon the Earth.*

Should

Should a man, six feet high, stand upright upon an even extended plane, the radius of the circumference or circle of his observation, would not reach (as it is said) above 3 miles; within the limits of this horizon, the surface of the earth, and every object presented to his view, would be illumined by the rays of the Sun; and he would perceive that the Sun by day, and the Moon by night, did, in a literal sense, *give light upon the Earth*, as it is express'd in the *English* translation: But such a limited horizon, cannot convey to the mind a full, adequate, and sufficiently comprehensive idea of these words in the original. We must here abstract our thoughts, and to use the words of Mr. *Keil*. " We must rise in our imaginations in a line perpendicular to the ecliptic, as far above the Sun, as the Sun is distant from the earth; and from this celestial observatory, we should see the Earth describing the same great circle in the Heavens about the Sun, as the Sun seems to us now to describe about the Earth." And we should moreover perceive, that the words of *Moses*, *lehair gnal baaretz*, taken in the full extent of their signification, express thus much, *viz.* And God said, Let the great luminary in the expanse of the Heavens, cause the whole Earth to shine, and diffuse the light, warmth, and influence of its rays from pole to pole.

Having thus far prepared the way, and clearly hewed, that *Moses* confines his astronomy to the Sun and Moon; which he calls the *two great luminaries*, not in exclusion of, but only in con-

tradistinction to, the planetary system ; I shall now collect and consider the terms and expressions made use of by *Moses*, in his account of the 4th of the Hexaëmeron, which evidently and strongly infer (nor can it escape our diligent attention) the position of the two great luminaries, with respect to the Earth, at their creation ; and this, before I cite those particular texts, in the *Levitical* law, which directly ascertain it.

Had not the original position of the Sun and Moon (the subject of our present researches) been an *express datum* of the *Pentateuch* ; and could it not have been evidently and strongly inferred (as it certainly may) from the terms and historical narration in the first chapter of *Genesis* ; yet I cannot but think, that a competent knowledge of the doctrine of the sphere, and abstract ratiocination, must soon have discovered to us, that the *most perfect*, (as all things were constituted *in the beginning*, by the most consummate wisdom) must necessarily have been the *first, position* : and the only question to be discussed, would be, what is the *most perfect position* of the Sun and Moon, with respect to the globe of the Earth ?

Ver. 15. *Let them be for lights in the firmament of Heaven to give light upon the Earth.* (Heb. Let them be for luminaries in the expanse of the Heavens, to enlighten the whole globe of the Earth ; to spread the influence of their respective, though different, degrees of light, from the one pole to the other.) The words of *Moses* in the original

ginal do, I am persuaded, include the whole of this sense.

Now it is certain, from the doctrine of the sphere, that neither the one nor the other of the two great luminaries can perform this office; nor could they have discharged this *primary ordination* of their creator, directly and at once, but from the middle points of declination and of latitude; from the æquinoctial point, with respect to the Sun; and from the point of interfection, or near it, with respect to the Moon.

Ver. 14. And God said, Let there be (two great) luminaries in the expanse of the Heavens, to divide between the day, and between the night. Heb. *lehabdil ben haijom. uben ballaijelab.* Gr.

Διχαρίζειν ἀνὰ μέσον τῆς ἡμέρας ἢ ἀνὰ μέσον τῆς νυκτός.

Is it possible to read these words---to divide between the day, and between the night---and not perceive the Sun in the æquinox, and the Moon near the nodes? If these are not *æquinoctial* terms, we have no language to express them.

At the end of the 15th verse, *Moses* subjoins *vaijebi chen, and it was so.* These words are but few, but they are very emphatic, and may be said to conclude the argument. The Scriptures teach a first-cause philosophy, above the reach of human language: we learn from hence, that with God to *speak*, is to *act*; *amar vaijebi*, says the *Psalmist*. Ps. 33. 9. *He spake, and it was*; and that with God, *to will* is *to perform*; *zivvab vaijagnamod*, he commanded, and it (the world)

was established. When God says, *be it so, it is so*. We may therefore, upon just and solid grounds, expect to find all these points to be literally true, exactly as *Moses* has expressed and stated them; and they will most surely be proved to be so. *Vaijehi chen, and it was so.*

Here it may be proper to recollect the charter of dominion given by God to the Sun and Moon, immediately at their creation.

Ver 16. And God made two great luminaries,

The greater	}	luminary, for the dominion of the	} day.
'and			} night.
The lesser			

As there are 29 different epacts, the positions of the Moon to the Sun at the end, or in the revolution, of every year are various; and consequently must produce various degrees of illumination: but when the Sun is in the æquinoctial point, and the Moon near the nodes; in other words, when the Sun enters libra, on the 15th day, computed from the evening of the moon's visibility (which is the *Mosaic* and original full Moon)

*Then is the night commensurate to day,  
Then the two regents bear divided sway.*

This distich (no matter for the poetry) contains a fine astronomy; and it contains moreover the true astronomy of the *original position* of the Sun and Moon (with respect to the Earth) on the 4th of the

the

the Hexaëmeron, which was (as I shall shew hereafter) the autumnal æquinoctial day.

On the evening of this day, the moon arose upon the germinating and fruit-bearing earth (being recovered by the divine command, from the incumbent deep) in its original state of *decreasing perfection*.

By this means, the whole circumference and extent of the globe, and every point of it, was enlightened by the two luminaries; by the Sun in the one hemisphere, and by the full Moon in the other. And these words of *Moses*, *lehair gnal haaretz*, to enlighten the earth, were effectually made good in their utmost extent of latitude and signification.

This surely is the *most perfect*, and it was as surely the *original position* of the two great luminaries; and had I no other proof of it, I see not how it can be confuted.

The son of *Sirach* has given us a beautiful and elegant description of the Moon, which is thus expressed, *Ecclus. ch. 43. ver. 8.* η σελήνη — φως η μεινμενος επι συντελειας; αυζανομενος εθαυμασωσηεν αλλοιωσει. *i. e.* The Moon is a luminary, which decreaseth at its perfection, *viz.* after the full; encreasing wonderfully αλλοιωσει in its various phases, *viz.* after the change.

This description plainly refers to the two principal lunar phases, *viz.* the full Moon and the new.

In the *Pentateuch* we have both of them. In the beginning of the old world, or at the creation, the Sun began its course from the autumnal æquinoctial

noctial point, on the Scripture full-moon day, which is the 15th from the evening of the Moon's visibility, as has been already observed; and at the conclusion of the old world, A. M. 1655, the Sun finished its revolution at the same cardinal point, with a new Moon (☾) so that the *original position* was there inverted.

I will here set down, though by way of anticipation, the astronomical characters at the beginning and conclusion of the old world, that the reader may see what kind of astronomy he is to expect in the progress of this work.

	—	☾		☾	
<i>Adam</i>	—	☉	130	☉	
<i>Seth</i>	—		105		
<i>Enosh</i>	—		90		
<i>Cainan</i>	—		70		
<i>Mehalaleel</i>	—		65		
<i>Jared</i>	—		162		
<i>Enoch</i>	—		65		
<i>Methuselah</i>	—		187		
<i>Lamech</i>	—		182		
<i>Noah</i>	—		599		
	☾		A. M.	☾	
	☾	☉	1655	☉	☾
	☾ 15 ☉ 15 ☾			☉ 15 ☾ 15 ☉	

I will now present to the reader's view the whole astronomy of those two remarkable years of the creation, and of the universal deluge, A. M. 1. and A. M. 1656. *V. Noæ.* 600; in the same method, as he will find used by me all along, in the following calculations. The

The following is the position of the lunar year to the solar, A. M. 1. as computed from full Moon to full Moon, which is the sacred and ecclesiastical lunar year : and likewise, as computed from new Moon to new Moon ; by the months and days of which lunar year, all historical transactions and events are recorded throughout the Scripture history. I desire this observation may be remarked.

## I.

(1) A. M. 0 The Sun in the <i>Mosaic</i> cardinal point, or libra. —	☉	A. M. 1.	☉
(2) The full Moon arising upon the Earth. — — —	☉	354	☉ 11
(3) The chaotic new Moon epact	☾ 15	339	☾ 26

The position of the lunar year to the solar A. M. 1656. *V. Noæ* 600.

## II.

(1) The Sun in the <i>Mosaic</i> cardinal point, or libra. A. M. 1655, ending — — —	☉	A. M. 1656	☉
(2) The distance of the full Moon from the Sun —	☉	15339	☉ 26
(3) The new Moon epact 0.	☾	354	☾ 11

He that will examine, with some small degree of attention, these two short tables, must immediately perceive that the full Moons and new Moons have changed their places, and that different

rent symbols are, therefore, prefixed to similar



figures, viz.  $\odot$  11. A. M. I.  $\odot$  11. A. M. 1656.  
 &c.

The discovery of the inverted positions of the Sun and Moon, at the beginning and conclusion of the old world, and of the co-incidence of the lunar year with the solar, as computed from full Moon to full Moon, A. M. I. (see the table) and as computed from new Moon to new Moon, A. M. 1656, (see the table) is of too great use and importance to be expressed in a few words, as the sequel will fully shew, nor is this a proper place for it.

He that can convict either of these tables of error must necessarily overthrow my scheme, because the whole of the following demonstrations depend upon them, and proceed by them. If no one can, then it must stand its ground, as being built upon a true and sure foundation.

Having laid before the reader a specimen of that perfection of astronomy, which *Moses* explicitly teaches in his *Pentateuch* (as I hope clearly and fully to prove by degrees) I shall go on to consider the 17th and 18th verses of this chapter, which contain the remainder of *Moses's* account of the effect, which the two great luminaries were ordained immediately to produce, at their creation, upon the globe of the Earth.

Ver. 17, 18. And God set them in the expanse of the Heavens, (1) To enlighten the whole surface

face of the earth. (2) To rule over the *day* and over the *night*. (3) To divide between the *light* and between the *darkness*. And God saw that it was good.

Before I endeavour to account for these similar expressions, and seeming repetition of what was said before, I shall collect those terms, made use of by *Moses*, in the 14th, 15th, and 16th verses, and set them down in one column; and these last in another over against it, that in this view of them together, we may be able more readily to form a judgment about them.

## I.

Ver. 14. And God said, Let there be luminaries in the expanse of the Heavens.

(1) To divide between the *day* and between the *night*.

(2) For the dominion of the day, and for the dominion of the night.

(3) To enlighten the whole surface of the Earth.

(4) And it was so.

## II.

Ver. 17, 18. And God set them in the expanse of the Heavens.

(1) To divide between the *light* and between the *darkness*.

(2) To rule over the day and over the night.

(3) To enlighten the whole surface of the Earth.

(4) And God saw that it was good.

Some, perhaps, may think they have a right here to charge *Moses* with a vain tautology: and

indeed it must be acknowledged, that there is the appearance of a bare repetition, excepting principally and chiefly, that he substitutes the words—*light* and *darkness*—in the 18th verse, for those of—*night* and *day*—in the 14th.

When we examine the particulars of the two columns, we must observe, that this is the only considerable variation; and I will venture to say, that this one is of such importance, as must, I think, itself convince us, that *Moses* could not have made it, or have wrote in this manner, either without the assistance of a divine director, or being able to penetrate, by an extraordinary philosophic acumen, into the inmost depths and secrets of the sphere, as he lived before we have any account of the cultivation of science.

To evince this, I shall first shew, that these similar expressions, *viz.* (1) To enlighten the whole surface of the Earth. (2) To rule over the day and over the night, cannot, *if taken together*, be applied to the Sun in any point but the æquinoctial; nor to the Moon, but in or near the point of intersections of the 3 circles, of the æquinoctial, ecliptic, and the Moon's orbit.

Secondly, That the substitution of the terms—*light* and *darkness*, instead of—*day* and *night*—are to be looked upon as *Moses's* conclusive proof, of the consummate perfection of the *original position*.

First, I am to shew that these similar expressions, cannot, *if taken together*, and as *Moses* has connected them, be applied to the Sun in any point  
but

but the æquinoctial, &c. I am obliged to add, *if taken together*, because if taken separately, one of them may be truly applied, in any given degree of its oblique circulation ; as is obvious to apprehend, and may easily be made to appear.

Ver. 18. (2) *To rule over the day and over the night.*

Where there is no elevation or depression of the pole, there can be no variation in the length of the days. Hence it comes to pass, that those, and only those, who live under the æquator, constantly experience 12 hours night and 12 hours day. But in more distant climates, this uniformity will not hold : on the contrary, the day is ever lengthening or shortning, according to the Sun's more remote departure from, or nearer approach to, the æquator. But let the degree of declination be more or less, the Sun has as full a dominion over the longest, as over the shortest day ; whilst the Moon and stars govern equally the longest as the shortest night.

Between the poles and the polar circles, there is but one day and one night, throughout the year ; and each of them of six months continuance. But the Sun has an absolute dominion over the six-month day ; for during that space of time it never sets : whilst the Moon and the stars have the like sovereignty over the six-month night ; since, in that space of time, the Sun never rises. Consequently,

With respect to the six-month day, and the six-month night, between the poles and polar circles, these words of *Moses*—*limshol baijom ubal-laijelab*—are literally true.

Though all this be readily admitted, yet still it may be asked, where, in these intermediate states of declination, is the *equal* dominion of the Moon by night, and of the Sun by day; which was the original dominion, with which they were invested by the divine charter?

In order to understand the words of *Moses* (when he writes as an astronomer) we must ever have recourse to, and diligently examine, the establishment of nature; and without some previous knowledge of the one, we can never be qualified rightly to comment upon the other.

Ver. 17. *Lehair gnal haaretz.* (2) To enlighten the whole surface of the Earth.

When the Sun is in the greatest extreme of its declination, it shines beyond the pole; but then the opposite in the mean time, is equally involved in darkness. On the other hand, when the Moon is in its utmost extent of latitude, it shines also beyond the pole; but then that which is opposite to it, is at the same time deprived of the benefit in an equal degree.

Therefore, if these words be applied to them in these situations, they must be varied, without any authority from the text, in some such manner as this, *viz.*

When the Sun is in the solstices, and the Moon at its greatest distances from the ecliptic, they do  
not

not spread the influence of their respective, tho' different, degrees of light from the one pole to the other, but interchangeably or by turns. Not in the most perfect manner, from pole to pole, directly and at once, as—*in the beginning*.

From what has been said last, it is sufficiently clear, I think, that *Moses* in the 17th and 18th verses still refers to the Sun in *libra*, and to the Moon in *aries*, as we speak.

I am now to shew, secondly, that the substitution of the terms, *light* and *darkness*, ver. 18. instead of *night* and *day*, ver. 14. is to be looked upon as *Moses's* conclusive proof of the consummate perfection of the *original position*.

Ver. 18. (3) *To divide between the light and between the darkness.*

This equal division of *light* and *darkness* is the second circumstance recorded by *Moses*, in the original constitution of nature.

Ver. 3. *And God said, let there be light, and there was light.* (Heb. And God said, let light be, and light was.)

Ver. 4. *And God saw the light that it was good: and God divided the light from the darkness.* (Heb. between the light, and between the darkness.)

There is a visible difference in the introduction to these words, as they lie in the 4th verse, and in the 18th; in the first case, the effect is referred to the immediate act of God; God, says *Moses*, divided.----In the latter, the effect is referred to a secondary and instrumental cause, ordained

by

by God. Ver. 18. God placed them, says *Moses*, in the expanse of the Heavens, — *i. e.* so placed them under such determinate laws of motion, such peculiar circumstances of position, *lehabdil*, &c. to divide constantly and invariably, &c.

We must carefully bear in our minds that *Moses* restrains his astronomy to 3 orbs: to the orb of the Sun, and to the orb of the Moon, which are his two great luminaries; whilst he ever considers the orb of the Earth, as the whole and sole object of their distinct illuminations.

Ver. 3. God divided between the *light* and between the *darkness*.

Let us now, in the interpretation of this text, consult the settled state of nature, and *Moses's* narration of its primary constitution.

Here then I say, that *light* and *darkness* (so far as we are concerned) are relative terms; and the relation arose (and necessarily must do so) from the divine and primary application of the orb of the Earth to the first existing light. Suppose the Earth to be fixed (motionless) in any one point of its orbit whatever; this *light* though at ever so immense a distance from it, must needs illumine one hemisphere; whilst that which was turned from it, must as necessarily (by reason of the interception of the rays) lie in *darkness*. And there constantly is, and ever must be in nature, a darkened and an enlightened hemisphere with respect to the orb of the Earth; and in the now settled state of nature, to the orb of the Sun.

In this stage of our progress, we have, as yet, but two opposite terms, viz. *light*, on the one side; and *darkness*, on the other side of the globe.

But *Moses* thus proceeds in his narration: Ver. 5. *And God called the light, day; and the darkness, he called, night.*

Calling and being, in the idiom of the *Hebrew* language, are, as is well known, synonymous. God, says *Moses*, by the power of his word, commanded the *light* to become *day*; and, by the power of the same word, he commanded the *darkness* to become *night*; i. e. he impressed the *diurnal motion*. V V

We have now 4 distinct terms, viz. *darkness*, *night*, on the one side of the globe; and *light*, *day*, on the other.

And do we not often familiarly speak, of the *darkness* of the *night*, and of the *light* of the *day*, without considering in our minds, at the same time, in what a curious and divine manner (by antecedence and consequence) *Moses* has informed us, both of their origin (with respect to us and our habitation) and of their distinction, as founded in nature.

Here the comment of the *Psalmist* is this, *Pf.* 74. ver. 16. *The day is thine, and the night is thine. Attab hacchinotba hammaor vashemesb.*

The *day* is *thine*; that is, of thy ordination and appointment, for thou calledst the *light*, *day*; the *night* is *thine*; that is, of thy ordination and appointment; for thou calledst the *darkness*, *night*. Thou, O God, *in the beginning*, willedst the vicissi-

vicissitudes of *light* and *darkness*, the constant and agreeable successions of *night* and *day*.

The latter part of this verse has been, I perceive, a great stumbling block to translators and expositors. The *Greek* version renders it thus, *συκαταρτισω τον ηλιον η φαειν*. Thou hast prepared the *Sun* and the *light*. But the word which they have render'd (*τον ηλιον*) the *Sun*, in the original is---*hammaor*, the *luminary*: and the word, which they have render'd (*φαειν*) *light*, in the original is (*shemesh*) *Sun*.

On the contrary, our *English* translators have given it this construction.---Thou hast prepared the *light* and the *Sun*. But the word which they have render'd---*light*---in the original is---*the luminary*.

Might not the latter part of this verse, be interpreted in the following manner? *Attah baccchinotha hammaor vashemesh*, thou hast prepared the (great) luminary, even the Sun; the receptacle of light, and, by means of the diurnal motion, the parent of day.

Although *Moses* does not teach us to philosophize, after the manner of men; yet the *Pentateuch* conveys to the mind clear, distinct, and determinate ideas of his principles, data, and terms; and this, independent of the aids and assistances of technical language; without which support, invented science would become lame, and arts must keep silence.

There is an essential difference, in the establishment of nature, between *light*, *day*; *darkness*,

*ness, night.* For *day*, includes and infers the constant, regular rising and setting of the Sun; and *night*, *vice versa*.

Should the diurnal motion be entirely stopp'd, *night* would be lost in the *primitive darkness*; and *day* would resolve into the *primitive light*.

But notwithstanding the law of diurnal motion, and its advantageous effects, I mean the constant successions of night and day; *Moses* is careful to acquaint us, that the equal division of light and darkness, (which was a primary constitution of the creator, and is the same the astronomers call the circle of illumination) was far from being abrogated or cancelled. It was so, *in the beginning*, and it is so to this day. Suppose all motion to be this moment suspended; yet the Sun would be still in the center of the enlightned hemisphere; and a perpendicular drawn from the orb of the Sun to the orb of the Earth, would still fall in the center of the circle, which *bounds light and darkness*, which are the very words of *Moses*, used by the astronomers in the very same sense, and applied in the very same manner.

This equal division of *light and darkness*, arises invariably from the original divine cause mention'd above. But,

The equal division of night and day, arises from the Sun's ingress to the æquator. Therefore; when the Sun annually returns to the autumnal æquinoctial (*i. e.* the *Mosaic* cardinal) point, then the equal division of *light and darkness* becomes  
 D  
 exactly

exactly coincident with the equal division of *night* and *day*.

Thus I have illustrated those different expressions of *Moses*, ver. 14. and ver. 18.

Ver. 14. To divide between the *day* and between the *night*.

Ver. 18. To divide between the *light* and between the *darkness*. And

I have had the satisfaction to find them, in exact agreement and conformity, with the true doctrine of the sphere.

It is worthy of our remark, that *Moses* has judiciously reserved one of the most important particulars to the close of his account.

This is all I have to offer in relation to the fourth of the Hexaëmeron. And upon a review of the whole, may we not with reason, and upon just grounds say, That the *Mosaic* position of the Sun and Moon to each other, and to their divided dominions, the Earth, in their first goings forth, is too curious not to be admir'd; and too promising, in the whole and in every part, to be doubted or called into question; whilst the researches in philosophy, and the calculations in astronomy, claim not the privilege of *giving*, but labour to find out, from some fixed radix, the true position of the two luminaries to each other, in a *given time*, either real or imaginary?

I will now subjoin a synopsis of the contents of the first chapter of *Genesis*, in the light in which it appears to me; tho' I cannot help thinking there are some things, not only hard to be understood,  
but

but above the penetration of the acutest reason, and the most philosophic genius : and no wonder ; since *Moses* is entirely silent about the motives of creation, and only says, in general, that the Earth was---*tobu* and *bobu*. This confused congeries and fluid mass, is the subject and basis of his narration ; order, beauty, harmony, and perfection all arise from this ground, by the efficacy of the omnipotent *FIAT*. And the result is,---God saw all that he had made, and behold it was *very good*. In truth, it would have been the greatest miracle of all, if, in the historical account of a rising world, not one single circumstance had been found, which surpassed the human comprehension.

*A synopsis of the contents of the first chapter of Genesis.*

*Gen. ch. 1. ver. 1. c. 2. v. 1.* **T**HE creation of the Heavens and the Earth, and all the hosts of them, by the power of God's word. He spake, and it was ; he commanded, and they were created.

I. the Earth without *form* and *void*. II. Darkness upon the face (surface) of the *deep*. III. The spirit of God moved upon the face of the *waters*. IV. Light. V. The equal division of *light* and *darkness*. VI. The origin of the diurnal motion, and its effects, the successions of *night* and *day*. VII. *Form*. (1). The space of time which flows

D 2

from

from Sun-rising to Sun-setting, or, (at the æquinox) a semi-diurnal revolution.

The first compleat diurnal revolution, or *Jom* (2).

VIII. The expanse of the Heavens in the midst of the waters. IX. The division between the waters, which were above the expanse of the Heavens, and between the waters, which were below the expanse of the Heavens.

The second compleat diurnal revolution, or *Jom* (2).

X. The congregation of the waters into one place, and the constitution of the terraqueous globe. XI. The surface of the Earth (now become dry land) cloathed with grass, herbs, flowers, plants, shrubs, and fruit-trees, after their kind; bearing seed, whose seed is in themselves, upon the Earth.

The third compleat diurnal revolution, or *Jom* (2).

XII. Two great luminaries in the expanse of the Heavens. XIII. The equal division of day and night, or the (autumnal) æquinoctial day. XIV. The dominion of the greater luminary over the day. XV. The dominion of the lesser luminary and the stars over the night. XVI. The diffusion of light from pole to pole; by the Sun, from the æquinoctial; and by the full Moon, from the point of intersection---nearly. XVII. The equal division of light and darkness, the primary result of the Earth's fixed position to the Sun,

Sun, coincident with the equal division of night and day. XVIII. *Haju laotboth*, i. e. prædetermined future events, to be ascertained in their times by the periodical revolutions of the two great luminaries. XIX. *Haju lemognadim*, i. e. the appointment of the two great luminaries for the regulation and determination of the periodic returns of solemn assembly days, instituted *in the beginning*. XX. The commencement of the annual motion, and the radix of time, from whence to compute by days and by years. XXI. The distinction of years, or the solar and lunar.

The fourth compleat diurnal revolution, or *Jom* (2).

XXII. Fish, after their kind. XXIII. Winged fowl, after their kind. XXIV. The divine benediction of them.

The fifth compleat diurnal revolution, or *Jom* (2).

XXV. Animals, wild and domestic, reptiles, insects. XXVI. The creation of the first human pair (for God called *their* name *Adam*, in the day they were created, *ch. 5.*) in the image of God. XXVII. Male and female created he them; but man the first in order and dignity. XXVIII. The charter of dominion granted to man, the Lord of all. XXIX. The solemn divine benediction of the human pair. XXX. The appointment of food for all. XXXI. The original perfection of all things.

The sixth compleat diurnal revolution, or *Jom* (2).

*Gen. ch. 2. ver. 3.* And God blessed the *seventh* day, and sanctified it, because in it he rested from all his work.

Before any one be too solicitous to know, why God appointed six compleat successive days, for the creation and constitution of the universe and the system of 7 days; first, let him ask the most sagacious enquirer into nature, why the creator appointed six primary planets, together with the Sun (the center of their respective motions) to constitute likewise a septenary system.

The precept to observe the fourth commandment; is ushered in with this singularity of expression, *Zacor—remember* the sabbath day to keep it holy: why so? Because, had the antient *Israelites*, either through carelessness, or a total apostacy from the worship of the true God, the creator of Heaven and Earth, once suffered this *divinely instituted memorial* to have slipped out of their minds; they could not possibly have recovered it again, either by the light of nature, or the powers of reason, or the periodic motions of the luminaries. And we plainly see, that the deists, the zealous abettors of the light of nature, and the all-sufficient guidance and direction of unassisted reason, acknowledge no stated public memorials, either of creation or redemption. These works of the Lord, and the wonders he hath done, for the children of men, are neither the objects of *their* faith, nor *their* regard, nor contemplation. Here the light of nature becomes a most *profound darkness*, and discovers nothing.

I do not presume to grasp the extent, or penetrate the depths, of the *Mosaic* cosmogeny: I shall content myself, with being able to demonstrate, that *Moses* dates the *beginning of time*, and his chronology, from the fourth of the Hexaëmeron (when the annual motion commenced) and yet so, as to exclude it from the computation, in the collected number of days.

This remarkable circumstance, *viz.* of the exclusion of the fourth of the Hexaëmeron, from the collected number of days (though I am sensible that the peculiar meaning of it is not yet understood) is so far from being a precarious hypothesis, or a fanciful and groundless conceit, that it itself establishes a general rule, for the carrying on and aptly connecting a continued series of solar revolutions, without perplexing the account (as *Sosigenes* was forced to do) with an intercalary day, at the end of every fourth solar year; which is of no small use in the civil computations of time; and I may venture to say, is absolutely inscrutable upon any other principle. It never yet has been, nor possibly can be, obtained by all our most exact Observations of the phænomena of nature, and physical ratio of things.

The not apprehending, and in sure consequence of that, the not expecting to find, a close connected and demonstrable scheme of Sun and Moon astronomy, both in the *Pentateuch*, and throughout the *Hebrew* bible, has been the grand obstacle and impediment, why so many have entirely overlooked, and scarce any one has sufficiently attended

tended to, and considered the inherent astronomical sense and signification of the *Mosaic* and Scripture terms of computation, which would long e'er this have laid open and completed the sacred and important scheme.

From the *Mosaic* terms, *Gen. ch. 1. ver. 14, 15, 16, 17, and 18*, we inferred the Sun in the æquinox, and the Moon a little past the full, or at such a distance from the node, as not to fall into the Earth's shadow. But waving all advantages which might be taken from the precedent reasonings and deductions, I shall step a little further into the *Pentateuch*, and see what discoveries may be made from thence to ascertain the first position of the Sun and Moon to the Earth, as contended for above.

*Moses*, in the 23d chapter of *Leviticus*, recites, in an orderly manner, *mognadei Jehovab*, ver. 2. which I interpret the solemn assembly days, and set feasts of the Lord; *i. e.* which were instituted and ordained, (some of them, *in the beginning*) by the authority and command of *Elohim Jehovab*; the God of the *Patriarchs*, the God of the *Hebrews*, and the God of *Israel*.

Should a question and doubt arise, whether some of them were instituted—*in the beginning*, then I ask, whether *baju lemognadim*—*Gen. i. 14.* is not expressly found amongst the original ordinances, laws, statutes, and decrees of the supreme legislator? Can it be reasonably, and upon apparent just grounds disputed, whether the *Psalmist* refers to that original law, *Gen. i. 14.* when he says,

says, *Pf. civ. 19.* (*Jehovah*) *Gnashab Fareach lemognadim*; God has made and appointed the Moon, (*i. e.* as I shall hereafter prove) the *months* and *days* of the *lunar year*, for the regulation and determination of the periodic returns of solemn assembly days.

Levit. ch. 23. ver. 33, 34. *And the Lord spake unto Moses, saying, ver. 34. speak unto the children of Israel, saying, the 15th day of this seventh month shall be (chag hassuccoth) the feast of tabernacles.*

Ver. 39. *Also in the 15th day of the seventh month, when ye have gathered in the fruit of the land, ye shall keep (chag) a feast unto the Lord.*

The month and day of the month, specified by *Moses*, carry back our thoughts, through all the intermediate months, to the beginning of the year; but yet, whilst we only compare these two texts together, we cannot so much as form a probable conjecture, much less are we able to determine, of what kind of year this is the seventh month; *i. e.* whether of a solar, or of a lunar, or of a mere civil and political year: nor is there one circumstance, that can give us any farther information than this, *viz.* that we here read the 15th day of the seventh month of a year.

To these therefore let us add the following texts, and see what light may be gained from them.

Exod. ch. 23. ver. 16. *And thou shalt observe (chag haasiph) the feast of in-gathering, which is*

*in the end of the year.* Heb. *betzeeth haschanah,*  
*in exitu cujusque anni.*

Ch. 34. ver. 22. *And thou shalt observe* (chag haasiph) *the feast of in-gathering, at the year's end.* Marginal reading, *revolution of the year.* Heb. *Tekuphath haschanah, in revolutione cujusque anni.*

By comparing all these texts together, more than a single ray of light begin to break in upon us. We are now in possession of sufficient *data*, from whence we may argue, and from which, by laying *Moses's* fundamental principles together, we may readily, and with certainty, collect a distinction of years: for have we not the 15th day of the seventh month of the lunar year, and the last day or conclusion of the solar? Thou shalt keep, says *Moses*, the feast of the in-gathering, on the 15th day of the seventh month, in the going out of the year, or in the revolution of the year.

The preceding observations will receive a farther confirmation by considering the *Mosaic* computation of time, propof. 2d.

Time may be considered as a quantity of *determinate duration*; a duration successive, measured by motion: and the apparent revolutions of the greater luminary are the *appointed measures* of a determinate quantity of time; considered as divisible, by the *Pentateuch*, into days, weeks, and years.

These are the 3 astronomical *Mosaic* terms of computation.

*Days*

*Days and years* arise from the apparent diurnal and annual revolutions of the Sun; but the distribution of our time into weeks, or systems of 7 days, proceeds not, as is allowed, from the visible constitution of things, but immediately derives its origin from a positive divine institution. And since the number 7, or the *hebdomatic* measure, is an infallible medium of proof, throughout the Scripture chronology, and indeed the whole course of time, from the fourth of the Hexaëmeron, to this present day; therefore it is, that I have called, *days, weeks, and years*, the 3 astronomical *Mosaic* terms of computation.

*Moses*, Gen. i. 14. records, by divine authority, these fundamental principles of astronomy---  
*And God said, Let there be luminaries in the expanse of the Heavens*—and amongst other uses—*haju lesbanim*—let them be for (distinction of) years. He adds, ver. 16. *And God made two great luminaries*, viz. *Shemesh* and *Jareach*, Deut. ch. 4. ver. 19.

The verb *haju* being in the plural number manifestly relates, and hath an immediate respect to *both luminaries*, and these words—*haju lesbanim*—may be understood, as if it had been distinctly said,

*Jchi hammaor* } *haggadol* } *lesbanab.*  
 } *bakkaton* } *lesbanab.*

Let the greater } luminary be appointed } for a year.  
 lesser } } for a year.

Let the Sun and the Moon, by their annual revolutions, measure each its respective year.

We are plainly taught from hence, that solar years and lunar years have their distinct foundations in nature, and are equally of divine ordination and appointment—in *the beginning*. And we shall find, that the *Hebrew* word *shanab*, repetition, is applied in the *Pentateuch*, both to the solar and to the lunar year.

Now, may I not ask the question, Are not these amongst the principles of computing times, which are clearly and explicitly taught in the *Pentateuch*? And it would have been incongruous and absurd, as well as highly derogatory to the author of it, as a chronologist and legislator, not to have established his chronology, and to have ascertained invariably the appointed seasons of his set feasts, upon the principles and laws of astronomy, revealed to him by the author of nature himself. But we shall find no such defects in *Moses*, for he has done so: *Thou shalt observe* (says he) *chag haasiph*, on the 15th day of the seventh month, *tekuphath hashanab*.

And indeed if *Moses* had not made use both of the solar and the lunar year; or if we may suppose the primitive patriarchs and *Israelites* to have been ignorant of them, then they never yet answered the ends of their joint ordination, from the beginning till now. The old *Ægyptians*, *Chaldæans*, *Medes*, *Persians*, *Syrians*, *Phœnicians*, *Græcians*, *Romans*, used a year purely solar; which, in different ages, was more or less perfect.

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The *Europæans* continue in the use of the *Julian*: the *Turks* and *Arabians* have a year purely lunar, vague and erratic. And we must be at last obliged to *Mosaic* principles of astronomy, and to the *Hebrew* bible, for the due regulation, and just correction, both of our ecclesiastical and civil year.

The *Mosaic* term *tekupha* is of special note, and merits our careful examination. The present *Jews* call the four cardinal points of the ecliptic *tekuphoth*.

*Vox tekupha Hebraicé idem valet atq; Græca τεροται, viz. puncta cardinalia, duo æquinoctia, totidemq; solstitia.* Bp. Bever. Chron. Instit.

In the astronomical calculations of the *Jews*,—*Tekupha tisri* denotes the autumnal æquinox. *Tekupha tebeth* the winter solstice. *Tekupha nisan*, the vernal æquinox. *Tekupha tammuz*, the summer solstice.

*Tekupha* is used in the *Hebrew* Scriptures to express both the diurnal and annual revolutions.

*Shanah* signifies to repeat or double. *Quia sole ad punctum, unde digredi cæperat, redeunte, iteretur; & in se sua per vestigia semper volvatur ac redeat.* Buxt. Lex.

It is very surprising, that not one of the many Scripture chronologists should so much as think of applying the tropical year to the *Mosaic* and Scripture chronology; when it is evident, that we cannot define *shanah*, as it is applied to the Sun, without defining at the same time the tropical year.

If *Moses* was capable of laying down, in the introduction to his *Pentateuch*, the fundamental principles of Sun and Moon astronomy, why not of erecting a suitable chronology upon those principles? If he was qualified to inform us, that the God of nature—in the beginning—ordained the two great luminaries, to determine each its year, by their respective annual periods, though with an original distinction, which will in its place be stated and explained, what reasonable inducement have we to imagine, that he did not know them? The absurdity most surely lies, not in the apprehending that he did, but in hastily concluding, as most have done, that he did not. *Moses* nowhere betrays his ignorance, whilst his language and style imply some extraordinary degrees of knowledge. *Ex. g.*

*In the six hundredth (solar) year of Noah's life, in the second month, the seventeenth day of the month (of the lunar year) the same day the fountains of the great deep were broken up.*

I shall reduce my observations upon these several texts, which I have collected and laid together, into these following particulars.

(1) If it should be asked, and no doubt some one would be curious enough to ask, how may we certainly deduce, from the terms of these, or any other texts, the *tekupbah*, or cardinal point, of the *Mosaic (shanab)* tropical year?

In order to give a satisfactory answer to this question, we must have recourse to *Moses's* law; from

from whence we learn, that when the *Israelites* were to be settled in *Canaan*, they would have 3 successive harvests.

1. The barley harvest. 2. The wheat harvest. 3. The latter harvest, or the in-gathering of the olive-yards and vineyards. We say then, that the terms *chag haasiph* are equally a periphrasis of the autumnal æquinoctial season, as *chodesh abib*, are of the vernal. For *abib* is not the political name of a month; but an appellative; as much as to say, the month of ripening; (vide *Shuckford's* preface; vol. 2.) the month in which the barley was ripe for the harvest; in which they began to put the sickle to the corn: which, in the climates of *Palestine* and *Egypt*, and those more hot eastern countries, was at the vernal æquinox; (vid. *Prid.* preface, vol. 1.) or, in the *Mosaic* style, *beha chodesh abib*. Hence we conclude, that the autumnal æquinoctial day was the *tekuphah*; or cardinal point, of the *Mosaic* (*shanab*) tropical year.

(2) *Moses* enjoins (by the divine command) the observance of a double festival, viz. (*chag hassuc-zoth*) the feast of tabernacles; and (*chag haasiph*) the feast of the in-gathering, on the 15th day of the seventh month. And he explicitly declares to them the reasons for the observance of the former, viz. ver. 43. *That your generations may know, that I made the children of Israel to dwell in booths, when I brought them up out of the land of Egypt, saith the Lord.* But he is entirely silent as to the other. Why so? Because *chag haasiph*

was an *original festival*, well known to the *Israelites* at least traditionally, if not by an immemorial observance, and is to be carried back, quite through the patriarchal dispensation, up to the times of *Adam*; *Vaijomer Elobim—haju lemognadim*—Gen. i. 14.

(3) *Moses* denominates and distinguishes the months by *ordinal numbers*, which not only determine the situation of the months in the lunar year, and patriarchal calendar, (hereafter to be exhibited as preserved and transmitted by *Moses*) but also limit their precise distance, before the *Exodus*, from the autumnal æquinox; and, after the *Exodus*, from the vernal.

We have, for instance, *ver.* 39. the seventh month of the lunar year from the vernal æquinox; on the 15th day of which seventh month a feast was appointed to be observed: and thou shalt observe this feast (says *Moses*) in the revolution of the (solar) year.

(4) In these words—*tagnashab chag haasiph tekuphath hasbanah*—*Moses* ascertains the utmost astronomical limits and boundaries of the feast of in-gathering, and gives us to understand that it might fall upon the very day, on which the Sun finished and began its annual course; (For,

*Libra novi prima est, veterisq; novissima solis,  
Principium capiunt Phœbus & Annus idem.)*

tho' by the *original* and *immutable* law, it never did nor could come before it.

(5) From

(5) From *Adam* to *Moses* and the *Exodus*, the lunar year began at the autumnal æquinox, as did the primitive and patriarchal solar; which last continued the same under the law, after the beginning of the sacred year was transferred by the express command of God, *Exod. 12. ver. 1, 2.* to the opposite cardinal point, or vernal æquinox. Therefore, from 7 m. 15th day, subtract 6 m. and there will remain 1 m. 15th day. Now then, read the text thus: Thou shalt observe the feast of in-gathering (instituted originally) on the 15th day of the first month of the lunar year, and on the *tekupha*, or cardinal point of the solar. For *tekupha* is, in a strict and literal sense, cardinal; and *chag haasiph* being added to it, makes it to become autumnal.

The *Mosaic* integral number 15 is half 30; but 30 comprehends the number of days in the first month of a lunar year, and is bounded by nature, in both its extremes, by the lunar phases. 6. 30. 6. Divide therefore 30 into 15 and 15; then there will nothing more remain to complete the deduction, but only to translate the several terms of the collected *Hebrew* texts into astronomical symbols or characters, and we shall immediately have a sensible representation of the original position of the two great luminaries, on the 4th of the *Hexaëmeron*, exactly corresponding with the precedent interpretation of the terms there made use of by *Moses*.

Levit. c. 23. v. 39. *Tagnashah*, *chag haasiph*.

Thou shalt observe the feast of in-gathering. ☉

Exod. 23. 16. *Betzeeth* } *hashanah*. ☉

34. 22. *Tekuphath* }

In the end }  
revolution } of the year. ○

*Beba chamishah gnashar Jom lechodesh*. c. 15

On the 15th day of the month.

It is no mean or irrational entertainment to contemplate (with attention and admiration too) this *revealed astronomy*; and to be instructed, by intuitive evidence, how these important points stood in the very first rise and origin of nature.

It is possible that some may consider my interpretation and astronomical application of those few *Hebrew* texts, cited above, as an hypothesis only, though somewhat ingenious, and not at all unsuitable to the traditionary notions of a *Jew*. But when it shall appear, that demonstration gives its irrefragable sanction both to the interpretation, and astronomical application; what will be said then? Why, at least, as much as is contained in these few words following:

*Tempora quò vetustiora èò certiora.*

And will not this be a great deal to be said and admitted? For I am pretty certain, that neither the *Jews* nor the *Christians* have, at present, any the least apprehensions of seeing such a  
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(seeming) paradox verified by the genuine authenticity of the *Hebrew* text.

When we take a more close and intimate view of these original characters, we plainly perceive they determine, that *Bereschith* i. e. *in the first state of things*, the primæval festival *chag haasiph*, together with that of the first day of the seventh (which was, anciently, the first) month of the year, was appointed a settled *memorial*. Levit. ch. 23. ver. 24.

After the dissolution of the *Persian* monarchy by *Alexander*, the *Jews*, being dispersed through the *Grecian* colonies, became græcised or hellenised in their religion, their usages, and their computations; and so lost the knowlege of the *Mosaic* year. Yet it must be owned, that they have not so entirely lost all knowlege of it; but that they have still retained by immemorial tradition, some general traces and footsteps of it. For in the famous *Rabbi Hillel's* astronomical year, which was published about the middle of the 4th century, *Rosh haschanah*, or the beginning of the year, is that mean new Moon, whose full Moon either happens upon, or follows next after, the autumnal æquinox.

Hitherto I have been endeavouring to establish the literal truth of my first proposition; and I leave it to the reader to judge, how far I have contributed towards it, and what grounds he has to conclude,

Prop. I. That the reason why the 15th day of the month is characterised with so much solemnity in *Moses's* law, is, because the number 15 does really and in fact express the *original quality* and *position* of the Moon, on the 4th of the Hexæmeron.

It will be to little purpose to enter upon the calculations, and a direct proof, till we have settled the determinate sense and meaning of the distinguished terms of the *Pentateuch* relating to time and its measures. In order to this I shall return back and consider——

*Gen. ch. 1. ver. 5.* And God called the *light*, *day*; and the *darkness* he called *night*.

And the *evening* was, and the *morning* was the first *day*.

Was it possible for the Sun to be inhabited, its inhabitants would ever be in the center of its light, diffused all around to the utmost extremities of the circumference; and could they view the Earth from thence, they would only see its enlightened face without being sensible of the vicissitudes of *light* and *darkness*, much less, the successions of *night* and *day*. So that with regard to *us*, and our *native situation*, there is a great propriety, as well as conciseness, in speaking from appearances and the evidence of sense.

*Moses* inculcates first principles, and lays foundations with such a superior skill and judgment, as we must admire and esteem; for he pertinently and judiciously considers his reader as a fixed inhabitant of the Earth, to whom, as he well knew,  
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every phenomenon, arising from original position and diurnal motion, was merely optical; and that there was not, nor ever could be, *in nature*, any other than an *imaginary* and *supposed* spectator of *heliocentric motion*.

And yet, in this chapter of principles, his caution and wariness is not a little observable; for instead of openly mentioning the setting and rising of the Sun, he gives us the term *gnereb* to express the time of the one; and the term *boker*, to express the time of the other; and I shall not scruple to translate directly the one, Sun-setting; the other, Sun-rising. Whilst those who think it necessary to speak systematically, have equal authority from the *Mosaic* terms, *gnereb* and *boker*, to translate the one by the disappearing; and the other, by the appearing of the Sun; if they are persuaded, that, by such affected language, they preserve an important distinction, and convey to the reader's mind a more useful instruction. But to proceed.

*Moses* uniformly describes, through the whole Hexaëmeron, an æquinoctial day; and he terminates the boundaries of its equal divisions by *gnereb* (Sun-setting) and *boker* (Sun-rising).

That space of time which flows from *boker* (Sun-rising) to *gnereb* (Sun-setting) is (*Jom*) the artificial day, as some speak; for God called the *light, day*; *i. e.* he impressed the diurnal motion.

And that equal space of time which flows from *gnereb* (Sun-setting) to *boker* (Sun-rising)

is (*laijelab*) night ; for God called the *darkness*, *night* ; *i. e.* he caused, (by means of the diurnal motion) the Sun to set and to rise ; and *vice versa*.

But the darkned hemisphere and the enlightned hemisphere being added together, constitute (also *Jom. i. e.*) the natural day, or Nu $\text{\char"0000}$ themeron : for *gnereb* (Sun-setting) and *boker* (Sun-rising) were the first day.

We shall find the term *Jom*, used in both senses, *i. e.* as it denotes the *artificial* and the *natural* day, in *Moses's* account of the deluge, and the falling of the rains. *Gen. ch. 7. ver. 12. 17.* *And the rains was upon the Earth* (*arbagnim Jom vearbagnim laijelab*) *forty days and forty nights.* *Ver. 17. And the flood was upon the Earth,* (*arbagnim Jom*) *forty days, or Nu $\text{\char"0000}$ themérons.*

I shall now consult the fundamental text, *Gen. i. 14.* And God said—Let them be for *days* and *years*.

A distinction of days, not with respect to the natural measure, but to the law of computation, must be the necessary consequence of a distinction of years ; that is, there must be the days of the lunar year, as of the solar. And the not admitting this distinction into our reckonings and calendar, is evidently owing to our not being acquainted with, at least to our not making use of, the lunar year, together with, and distinct from, the solar.

The days then of the Scripture twofold year differ not in their measure, but in their epocha  
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or beginning: the solar year, and the solar day, ever begin together, and they have equally a variable epoch; whilst the days of the lunar year are fixed by nature, as well as by *Moses*, to an immutable cardinal point; and the æquinoctial day is the unchangeable standard of the computation. *Levit. ch. 23. ver. 32.* Ye shall celebrate your sabbaths, (says *Moses*) *megnereb gnad gnereb*, from evening to evening,—as on the æquinoctial day.

Thus far we have considered these terms as relating to both the luminaries, and their respective years; we shall now consider them as they are applied only to the Sun; and in this application of them *Moses* thus records the lives of the patriarchs—

*Gen. ch. 5. ver. 27.* All the *days* of *Methusalah* were 969 years.

*Moses* defines the longævity of his patriarchs, as an astronomer, by the diurnal and annual revolutions of the Sun; and none but an astronomer can ascertain the precise age of *Methusalah*, as stated by *Moses*. Nor can he be said to be a mean proficient, who is able to reduce solar years, and lunar years, to days, with the required exactness. This law of calculation so generally prevailed in primitive ages, and the patriarchs were so familiarized to it, that the terms became dialectical, and intermixed themselves with their common phraseology. *Gen. ch. 47. ver. 7, 8, 9.* And Pharoah said unto Jacob, how old art thou? And Jacob said unto Pharoah, the days of the years of my pilgrimage, are 130 years. Few and evil have  
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*the days of the years of my life been. And have not attained unto the days of the years of the life of my fathers, in the days of their pilgrimage.*

Although the diurnal and annual revolutions of the Sun are motions distinct from, and entirely independent of, each other; yet, in the settled ordination of nature, there is an obvious agreement and conformity between a *day* and a *year*. (In prophetic style, the one is, with great propriety, substituted to express a corresponding number of the other; I have appointed thee a *day* for a *year*, says God to the Prophet *Ezekiel*, ch. 4. ver. 6.) For as the Sun in its annual revolution passes over 4 cardinal points of the Heavens, so likewise in its diurnal it passes over 4 cardinal points of the day. The 4 cardinal points of the Heavens are by us distinguished into the autumnal æquinox; the winter solstice, the vernal æquinox, the summer solstice; and the 4 cardinal points of the day, into Sun-setting (0), Midnight (1), Sun-rising (2), Midday (3), — (4)

The space from Sun-setting to Sun-setting (*megnereb gnad gnereb*) is the invariable measure of the Nuethemeron at the æquinox, accommodated to the lunar phasis, established *in the beginning*, and ascertained by *Moses*.

Three complete quadrants measure from Sun-setting (0) to noon (3); here (with respect to the *Mosaic* meridian) we meet the Sun, and in the æquinoctial point; so that the 4th quadrant of the Nuethemeron was the first that was measured by the Sun.

We meet with no account, in the *Pentateuch*, of the artificial subdivision of the day into hours, &c. nay, there is not a word in the *Hebrew* language to denote the hours; for *shagnab*, *Dan.* iii. 15. is not *Hebrew*, but *Chaldee*. I can recollect but one single passage in the *Pentateuch*, where *Moses* undertakes to determine the precise time of the day between the cardinal points; and he there uses very elaborate terms, and such a peculiar *Hebrew* idiom, as will not admit of a literal translation into any other language. *Exod.* ch. 12. ver. 6. *And the whole assembly of the congregation of Israel shall kill it*, (*viz.* *Pesech*, the paschal lamb)—*bin hagnarbajim*. To understand this idiom rightly, we must remember, that there is a twofold declination of the Sun, *viz.* the annual and the diurnal. The former, I need not say, is reckoned from the æquator to the tropics, and so is both northward and southward. The latter is not reckoned two ways; when the Sun appears above the horizon, it is said to ascend; when it hath reached the meridian, it is said to descend, or to *decline*: now, says *Moses*, ye shall kill the paschal lamb—*bin hagnarbajim*—*i. e.* in the middle point of the Sun's diurnal declinations or tendencies to the western horizon. *Moses*, in this place, like a skilful mathematician, as well as expert astronomer, divides *Yom*, or the æquinoctial Nocthemeron, into octants, and orders the passover to be slain, at the end of the former half of the 4th quadrant; *i. e.* in the old *Roman* stile, which we read in the gospels, at

the ninth hour of the day ; and, according to us, at three o'clock in the afternoon. We have here an incontestible argument from the *Pentateuch*, that the method of computing by hours (however commodious it may be thought for civil use) was not used in the times of *Moses* ; though more than 2500 years of the world's age were completed at the *Exodus*.

The visible establishment of nature, and the *Hebrew* Scriptures, unanimously instruct us to divide *Yom*, or the æquinoctial Nuethemeron, into 4 equidistant quadrants ; and the corresponding cardinal points are explicitly mentioned in their appropriated terms.

(0)	(1)	(2)	(3)
Sun-setting.	Midnight.	Sun-rising.	Midday.
<i>Gnercb.</i>	<i>Chatzi laijelab.</i>	<i>Boker.</i>	<i>Zohoraim.</i>

In the evening, at midnight, in the morning, and at noon day, (in our stile, every hour and minute of the day) says the *Psalmist*, will I praise thee.

It may be proper in this place to remind the reader, that hitherto I have been stating first principles, and collecting proper materials to support the subsequent calculations ; and I would beg leave to suggest, that the subdivision of *Yom*, or the æquinoctial Nuethemeron, is of too great importance, in the course of this scheme, to be passed over, without some particular remarks and observations.

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When we take a review of the original characters which have been already expressed in the

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following manner—C 15.—it is evident, I may say, to sense, that the Sun began to measure the year from *libra* ; nor can the terms *chag haasiph*, without offering a manifest force and violence to their most obvious and natural sense, be applied to any other *tekuphab*, or cardinal point of the ecliptic.

It is also, as intuitively evident (without embarrassing the speculation with the subtilities of geometry, the operations of algebra, and the depths of science) that the æquinox fell upon the 15th day, computed from the evening of the Moon's visibility.

But here it must be particularly noted, that the integral number 15, with respect to the age of the Moon, on the 4th of the Hexaëmernn, is wholly chaotic and imaginary ; for the Moon arose, and enlightned with a full orb the new created Earth, after the setting of the Sun, or on the beginning of the 5th. But, with respect to the Sun, they are not entirely chaotic. The Sun began its course at noon, in the meridian of paradise. Therefore, from 15 days, subtract  $14\frac{3}{4}$ , there will remain  $\frac{1}{4}$ . This quadrant thus obtained was the first distinct portion of time, that was measured by the annual motion of the Sun, and the first solar year must be reckoned to have proceeded in this form, *viz.*  $\frac{1}{4} + 365$  days.

does the reader suspect, at present, the almost incredible importance of this quadrant, collected from the first point (both of the year and of the day) of the Sun's going forth on the 4th of the Hexaëmeron, and the autumnal æquinoctial day. And by way of farther explication, it is, (1) The original standard measure of equal time; for there was no sensible declination of the Sun, at his first setting, in the close of the 4th day. (2) It is the least astronomical and natural measure of time to us, the inhabitants of the Earth. (3) It is the only medium in our portion of the system, which, in union with the lunar year, can enable us to carry on a continued series of solar years (as was hinted before) without perplexing the account with an intercalary day, at the end of every fourth year. (4) This separate quadrant of the 4th of the Hexaëmeron, thus obtained, manifestly discovers to us the distinction founded in nature, between the (beginning of the) days of the solar year, and of the lunar.

As for instance, in the example before us; the first solar year, and the first solar day, began together at noon, or in the *Mosaic* meridian. But the days of the lunar year (by which the sacred writers, from *Moses* to *Nehemiah*, constantly reckoned) are to be computed (by an express command, *Levit. ch. 23. ver. 24.*) from evening to evening. Therefore the first solar year anticipated the beginning of the first lunar year (as measured from full Moon to full Moon) by one whole quadrant of the *Nucthemeron*.

As

As I have claimed the tropical, to be the *Mosaic*, solar year, I shall undertake in the calculations (which proceed upon *Mosaic* principles and data) to ascertain its quantity, from a medium in nature, suggested by the terms and stile of *Moses's* chronology.

*Gen. ch. v. ver. 27.* All the days of *Methuselah* were 969 years.

We are instructed by this text, and others of the like import, to compute the times by *days* and *years*; and although a *day* is not the aliquot part of a *year*, yet may they be reduced to an exact commensuration to each other; and from hence may be extracted the true quantity of the solar year. This commensuration of the diurnal and annual revolutions of the Sun has happened but three times since the creation, and the fourth will be completed, A. D. 1753, at the autumnal æquinox.

It is well known, that Pope *Gregory XIII.* reformed the calendar, A. D. 1582, when he threw off 10 days; ever since the beginning of A. D. 1700, we have reckoned 11 days difference between the old stile and new, or the *Gregorian* and *Julian* account; but though this is the 51st current year since this reckoning commenced, 11 days are not yet completed; now if the astronomer can shew, from his tables, by which he calculates the Sun's annual revolutions, when they will be *exactly* completed, he will be able, at the same time, and by the same means, to determine the true measure of the Sun's year.

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The revelations of the *Pentateuch* will evidence to us, that there are more secrets than one in our allotment in the system, which philosophy founded upon observation has not yet (fully) discovered to us.

*Felices animæ! quibus hos cognoscere motus,  
Non ars, non studium, sed deus ipse dedit.*

I shall now proceed to examine the grounds on which the later part of my second proposition is built; which some perhaps may look upon as an *arbitrary postulatam*, unwarranted by the *Pentateuch*, and so pass it by with a total disregard, *viz.*

II. That *Moses* dates the *beginning* of *time* and his chronology from a cardinal point of the Heavens, *viz.* the autumnal æquinox; and from a cardinal point of the day, *viz.* noon. And the *Mosaic meridian* is geographically described, *Gen. ch. 2. ver. 10, &c.*

The divine perfection of original astronomy will shine forth most conspicuously from the demonstrable truth and certainty of this peculiar (and may I not add, unexpected) proposition?

For can there be a nicer point, either stated or supposed, than the co-incidence of the *Mosaic tekupha* with *zohoraim*? Or the astronomical connection, and exact adjustment, of a cardinal point of the *year*, with a cardinal point of the day,

day, in a *given* and determinate *meridian*? And should it be found, in fact, an *express datum* of the *Pentateuch*, it must, I suppose, enhance its authority and its value; since we might tire ourselves by searching for it no purpose in any other records. The philosopher has never read it in the expanded volume of the material world, and if it is not legible in the book of *Revelation*, we must acknowledge it to be an inaccessible truth. But where the light of nature fails to aid and further the progress of our enquiries, there the light of *Revelation* seasonably interposes, as in theology so in astronomy, and graciously supplies its defects.

We have been sufficiently informed concerning the division of *Jom*, or the æquinoctial Nucthemeron, into 4 equidistant quadrants, and from hence we are able to exhibit to view every particular, in the following clear, perspicuous, and intelligible manner.

A. M. o. the Sun in the *Mosaic* }  
*tekupha* — — — } ☉

(0) (1) (2) (3) (4)  
*Gnereb. Chatzi laijela. Boker. Zoboraim. Gnereb.*  
 Sun-setting. Midnight. Sun-rising. Noon. Sun-setting.

The *meridian* of the garden of—*Eden*.

The full Moon ———— ○

The chaotic new Moon epact ☾ 15

This part of the 2d proposition offers to the astronomer's consideration as curious a speculation and

and disquisition, as can exercise his labours, and employ his skill. A discovery and proof of the *Mosaic meridian* (or that determinate point of Earth's surface, in respect to which the annual motion commenced, and from which both years and days are, by divine authority and command, to be jointly computed) must surely be attended with useful and important consequences. And although no public ample rewards have been proposed for its discovery and proof; yet is it, in itself considered, of sufficient weight to animate our endeavours, and to excite our most diligent pursuits.

It may possibly be enquired, why I have expressed myself in this singular manner, in the foregoing paragraph, *viz.* “ And from which both “ days and years are—to be *jointly* computed.” Was it ever known that their measures were separated or disjoined?

Here my answer is, it is plain from the *Mosaic* narration, *Gen. ch. 1. ver. 5.* That the diurnal motion was impressed 3 days, and 3 quadrants of a day, before the annual began; and that these 3 days, and three quadrants are not admitted into the computations of time, nor make a part of *Moses's* chronology. Now if the philosopher can prove, upon true principles of astronomy, that it is impossible in nature for the diurnal motion to exist prior to, distinct from, and independent of, the annual, he will effectually confute my interpretation; and if it will not stand the test of true philosophy, it must and it ought to fall.

It may be again objected, that *Moses* cannot be said to describe six successive *natural* days, because, though there was *light* for the 3 first days, there was no Sun till the 4th; to which I reply, that, with respect to the Earth, covered with the deep as with a garment, there was not only an equal division of *light* and *darkness*, but every one of these days had an *evening* and a *morning*, and *therefore motion*; and as there was motion, there must be a rising and setting, an appearing and disappearing of light, luminous body, luminary, Sun. Should any one be disposed to call, with *Milton*, this *original light*, “æthereal, first of things, quintessence pure,” this, or any other sentiments of this kind, will not any ways affect this antecedent diurnal motion, or natural measure.

I will here set down *Moses's* geographical description, and exact determination of his meridian.

Gen. ch. ii. ver. 8. *The Lord God had planted (Mikkedem, beforehand) a garden—and there he placed Adam.*

Ver. 10. *And a (single branch of a) river, went out of Eden to water the garden, and from thence (both northward and southward) it was parted, and became into 4 heads.*

Ver. 11. *The name of the first (river) is Pison—*  
 Ver. 13. *And the name of the second river is Gihon—*  
 Ver. 14. *And the name of the third river is Hiddekel (Grec. Tigris)—And the name of the fourth river is Perath, i. e. Euphrates.*

Now when we read this, are we to look upon it only as a map of the land of *Utopia*? As a mere visionary and romantic scene? Or admitting it (with all interpreters) to be real; are we to conclude, that *Moses* certainly intended no farther by it, than to point out that particular place of the Earth, where the first human pair paid their earliest adorations to their creator? Why then did not the pen of *Moses* describe, with the same exactness of geography, the land of (*Nod*) the wanderer *Cain*? Why did he not record the way of the ark, on the surface of the deep, and point out all its bearings? Why did he not settle the longitude and latitude of that place, in which *Noah* built and entered into the ark? Why did he not specify the very mountain on which it rested?

*Moses* never gratifies our vain curiosity; what he has recorded it would have been a detriment not to have known, and will sooner or later manifest its importance. Weigh every word of the *Pentateuch*, and you shall not find one of them light in the ballance.

If *Moses* was instructed, as a divine astronomer, *rightly to station* the two great luminaries at their *first goings forth*; why not also, as a divine mathematician and geographer, to fix and determine the meridian, according to which the original position was adjusted?—that very meridian which first passed through the center of the Sun?

A verbal explication of the original characters will be only a transcribing (as we shall presently see)

see) the nature, properties, and affections of a direct sphere. We are immediately directed by only casting our eye over them, to rectify the globe to the Sun's place in *libra*, and to bring it to the meridian, and then mentally correct our present application of the ecliptic to the terrestrial sphere. This being done, the Sun immediately appears in the midst of the prime vertical; from whence the division of the globe into the eastern and western semicircles of longitude, and into the northern and southern hemispheres, arises. The Sun is *due east*; it is *due west*; it is *due north*; and it is *due south*. I need not note its *right ascension*, for we cannot overlook it. Therefore,

Ascensional difference=0. Amplitude, ortive and occasive=0. North and south declination=0. Longitude=0.

Suppose now the Earth fixed immoveably in its orbit, and a right line to be drawn from the center of the Sun to the center of the Earth; it would

(1) Pass through the plane of the meridian of the garden of *Eden*.

(2) It would fall in the center of the enlightned hemisphere, or of the circle which bounds *light* and *darkness*. Gen. i. 4. *Vaijabdil Elohim bin haor ubin hachosbec*. Ver. 17. *Vaijitten otham Elohim, birkiang hashamajim, lehabdil bin aor bin hachosbec*.

(3) The circle which bounds *light* and *darkness* would pass through both the poles. Ver. 17. *Vaijitten otham Elohim, birkiang hashamajim, lehair gnal haaretz*.

(4) It would be co-incident with the rational horizon.

(5) It would cut the parallels of declination into two equal parts.—Gen. i. 14. *Vaijomer Elohim, jebi meoroth birkiang bashamajim, lehabdil bin hajjom ubin ballaijelab.*

(6) Being extended to the starry Heavens, it would meet that point where the ecliptic optically intersects the æquinoctial.

Now, I say, in this *perpendicular ray* we shall find what St. *Basil*, with great accuracy and just propriety, calls — Τῆς χρόνου τῆν πρώτην κίνησιν; the first *motion of time*: for *time* and (the annual) *motion* are coæval.

Thus then, from *revealed data*, I conclude the Sun began its course; or, if you had rather say, the (first computed) revolution of the æquator commenced from the æquinoctial point of the Heavens, and from the meridian of the garden of *Eden*; where we must remember the single river, which still remains as a directory.

Here I appeal to the *Pentateuch* for the meridian; and to astronomical calculation for the proof.

And yet the astronomer will never be able to calculate the Sun's going forth from the *Mosaic* meridian, unless he will take explicit directions and instructions from the sacred history. He must necessarily take into consideration, however reluctant his faith may be, that stupendous suspension of motion, recorded, *Josh. ch. 10. ver. 12, 13.*

Ver. 12. *Then spake Joshua to the Lord—and he said in the sight of all Israel—Shemesh dom—Sun be silent, or cease to speak thy wonted language.*

Ver. 13. *Vaijiddom bashemesh, and the Sun was silent.*

I would know from the astronomer himself, what is that universal language, which the Sun seems to speak, both to the cultivated and uncultivated nations of the world, in the interchangeable states of light and darkness, and the constant vicissitudes of night and day, with only one interruption since its first going forth; *for, ver. 14. there was no day like that before it nor after it?*

I would know what language, the *Ptolemaic* system supposes it to speak? From what ground arises the distinction, in the ephemerides, between heliocentric and geocentric motions? Whence comes the double language, in our astronomy, of *Apogee* and *Perigee*, of *Aphelion* and *Perihelion*? Do not the astronomers speak of the Sun's place in the ecliptic, fifty times for one of the Earth's in its orbit?

An astronomy, proceeding upon the evidence of sense, with a seeming disregard to philosophic realities, and the physical laws of motion, may be thought very unpromising to the penetration and acute discernment of a modern: but be that as it will; I shall offer to the reader this general remark, *viz.* That the astronomical language of  
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the *Pentateuch* is plain and simple, suited to appearances, and studiously accommodates itself to the ideas and apprehensions of the vulgar and illiterate.

The peculiar phrase or diction, in which *Moses* has recorded and transmitted to these latter ages, the astronomical characters of the world's æra, is very observable, and will serve as a pertinent illustration of the truth of my general remark with regard to simplicity.

*Moses*, for instance, does not enjoin his *Israelites* to observe the feast of in-gathering—*Tekuphath haaretz*---in the revolution of the orb of the Earth about the Sun ; nor—*Tekuphath hashemesh*—in the revolution of the orb of the Sun about the Earth ; the terms have no reference either to the one orb or to the other : but abstracting our thoughts, both from the *Ptolemaic* and the *Copernican* system, he only says, with a very surprising, and I verily believe, directed simplicity,—*Tekuphath habanah*—in the revolution of the year. Now, where there is a revolution, there must be motion, and a subject of that motion, but *Moses* appropriates it not. Nor can the terms and language of the *Pentateuch* be eluded or tormented into the confession or denial, either of the truth or falsity, of any philosophic system.

Let us recollect and contemplate the order and situation of the four quadrants, and their corresponding cardinal points, which we will now set  
down

down, with some small difference, in this manner,

Night.	}	<i>Gnereb.</i>	<i>Chatzi laijelab.</i>	<i>Boker.</i>
		Sun-setting.	Midnight.	Sun-rising.

Day.	}	<i>Boker.</i>	<i>Zoboraim.</i>	<i>Gnereb.</i>
		Sun-rising.	Midday.	Sun-setting.

*Moses*, in exact conformity to nature, divides the æquinoctial Nuethemeron, into two hemispheres; whilst *Gnereb* (Sun-setting) stands at the head or beginning of the night: and *Boker*, (Sun-rising) at the head or beginning of the equal day. Let us consider these three terms: *Boker*, *Zoboraim*, *Gnereb*.

The *Mosaic* position of these cardinal points fully informs us, how we are to conceive, and what judgment we are to frame of, the formal manner of diurnal motion.

The whole enlightned hemisphere was never designed to be the object of our senses; and we are obliged by the God of nature, whenever we take a view of the celestial phænomena, to argue, infer, and conclude, from geocentric motion. The *Mosaic* Term *Boker* conveys to the most rude and uncultivated mind the familiar sensible idea of the Sun's rising in the east; and *Gnereb* of his setting in the west; which space, at the æquinox, measures a semidiurnal revolution, the prior sense of *Jom*. Whilst the middle term *Zoboraim* constantly refers to the Sun in the meridian,

dian, to which he successively arrives by his apparent motion from east to west.

But here the philosopher interposes, and with ardor and zeal assures us, that all these phenomena, or appearances, are mere deceptions of sense; that we must learn to correct our senses by our judgments, and must rightly inform our judgments from the principles of true philosophy. If we ask how, with respect to the rising and setting of the Sun, we are immediately taught a contrary lesson; and now the whole enlightened hemisphere must be taken into the account, and the two extreme terms *Boker* and *Gnereb*, must be placed in this inverted order.

Center of Light.

(A) East. *Gnereb*.  $90^{\circ}$ .  $\odot$ .  $90^{\circ}$ . *Boker*. West. (B)  
Sun-setting. Sun-rising.

For the explanation of this scheme, and inverted position of the extreme terms, we are to suppose two spectators, A and B; the one (A) situated in the eastern, and the other (B) in the western verge of the enlightned hemisphere.

Now (A) being 90 degrees distant from the Sun immoveably fixed in the Heavens, it will appear to him in the edge of the horizon, and as setting in the West; consequently, this eastern point, with regard to the spectator (A) will be *Gnereb*, Sun-setting.

On the contrary, (B) being also 90 degrees distant from the Sun, it will be seen by him on the edge also of the horizon, and as rising in the east. Therefore, this western point of the enlightned hemisphere, with respect to the spectator B, will be *Boker*, Sun-rising.

As to *Zoboraim*, or the Sun in the meridian, the philosophic reality is this, *viz.* The Earth turns round its axis from west to east, and, meeting the Sun, passes under it, and revolves eastward.

These things are so generally known, that I have only hinted them without regard to minute exactness, and stating every circumstance; but it may be worth while to remark the tedious ambages of words, and laboured circumlocutions, we are forced to have recourse to, in order to express *philosophically* two of the most obvious and the most common phænomena of nature, the rising and the setting of the Sun.

But if we understand and apply the terms *Boker* and *Gnereb* in the order they are placed by *Moses*, and as corresponding with the evidence of sense (doubtless by the authority and suggestion of the Creator himself, who best understood the operations of his own hands, and must know what was the most proper, and the most instructive *mode* of human conception) all will be plain, and level to ordinary capacity and apprehension. Then the intricacies which attend philosophic stile immediately cease.

I would here beg leave to make *one observation*, and to propose *one question* to those who shall find themselves disposed to take notice of it.

The observation I would make is this—Sun and Moon astronomy were well understood; and, with respect to *use* and *application*; with greater *exactness*, and higher degrees of *certainty*, than arts and sciences have yet been able to *recover*; and this, several thousands of years, before *philosophic realities*, from aught that appears, were so much as apprehended or thought of; I am sure I may say, before they were digested into a regular system: this is the peculiar honour, I suppose, of the present age, and of our *British* philosopher.

The question I would propose is this.—What *physical reason* can be assigned, why the Creator of our solar system, infinitely wise throughout all his works, should have so *deeply secreted* from the evidence of our senses, both the *rotative* and *progressive* motions of the Earth, (though the *day* is measured by the one, and the *year* by the other) that almost 2000 years were passed, since the cultivation of science, or the times of *Hipparchus*, (not to mention the cycles of the *Greeks*) and between 5 and 6000 years of the world's age, before observation, calculation, and science, had taught us to demonstrate, with an absolute and infallible certainty, the truth of the *Copernican* system, to the entire confutation of the *Ptolemaic*? And lastly, to sum up the whole, what notable emolument or advantages, have accrued to Sun  
and

and Moon astronomy (I mean, with respect to the *recovery* of the *cœval* lunar year, its nice and curious adjustment to the revolutions of the true solar, and the *more exact measures of time*) by the *modern demonstration*?

Was it possible to establish a system of true philosophy upon the evidence of sense (which is impossible) the *Ptolemaic* must necessarily and universally prevail. And without controversy, this system (if any system may be supposed to be true, *i. e.* exactly conformable to the inward frame and real constitution of nature, which must be, one would think, rather a divine than human performance) derives an inconceivable honour and dignity upon this our Earth. For when we cast our eyes up to the Heavens, does not the Earth seem to be immoveably fixed, in the center of an immense concave sphere? And upon whatever point of its surface, we may chance to fix our feet, we are still in the center of our own observation. Does not universal nature, above, below, and all around us, seem to be created and ordained for our whole and sole use, and is pleased to militate in our service? The planets and the fixed stars shed the influence of their fainter beams on us by night, whilst the Sun warms, refreshes, and invigorates us by day. The stupendous circumvolution of the whole Heavens seems to be unwearied in the measuring of our days, and to roll in subserviency to the Lord of this important globe.

But say, that true philosophy both remonstrates and demonstrates against all this; that by its penetrating and enlightning powers it awakens us from these delusive, self-admiring dreams, and supercedes the hallucinations of sense. Be it so; yet surely, true philosophy never excites, much less will it justify, the petulancy of some modern astronomers; who, more arrogant and presumptuous than truly wise or knowing, defile whole pages with rhetorical flourishes and studied harangues, in degrading the place of their own habitation, this most dignified and distinguished planet. And all this, under the specious prætext of curbing its aspiring pretensions to any degrees of pre-eminence and superiority above the rest of its fellow-wanderers.

But I would ask such a systematical declaimer, whether he can produce an authentic historical account or memoir of any other known habitable world, besides this, from its *first formation* to this present day, from whence to trace the fundamental principles of his own profession, back to their very first spring and fountain head, and *there* fix them *a priori* on their own proper basis?

The masters of method have laid us down these two rules, (1) To shew what a thing is not. (2) To shew what it is.

As the antient and the modern astronomy are very different from each other in their calculus, extent, and terms; as widely different, I may say, as philosophy and no philosophy; as art and

no art ; as plain simplicity, and an ostentatious pomp and parade of technical language ; it is quite necessary to begin with the negative part of my rule, and to shew, with as much brevity as may be, what particulars do not appertain to the ancient and original knowlege.

First, *Saturn* with its ring and fatellites—*Jupiter* with its belts and fatellites—*Mars* and its retrogradations—the transits of *Venus*, like a black spot, over the disk of the Sun—the rare phænomena of *Mercury*—magnitudes, densities, distances—centripetal and centrifugal forces—the inclinations of the planes of the orbits—oppositions, conjunctions, trigons, quartiles, sextiles—In a word, every phænomenon, both of the superior and inferior planets, are entirely (and, indeed, by the very terms, necessarily must be) excluded from Sun and Moon astronomy.

Secondly, center of motion—universal principle of gravitation—elliptical orbits—focus—eccentricity—mean anomaly—prostaphæresis—regularity of solar days—ecliptic—æquator—horizon—constellations—signs—the ram, the crab, the ballance, and the goat's horn—degrees, minutes, seconds, &c.—hours, minutes, seconds, &c.—aphelion, perihelion—polar revolution, &c.—are all modern inventions and discoveries.

Thirdly, The Moon's anomalies—her accelerations and retardations in apogee, in perigee, in quadrature—The inclination of the plane of her orbit—angle of inclination—dragon's head—dragon's tail—The retrograde motion of the line of  
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the nodes—excursions beyond the ecliptic—commensuration of her diurnal and menstrual revolutions—librations in the perimeter of its orbit—periods, conjunctions, eclipses, &c. have no place, no denomination, are of no account, in the plain simple elements of original astronomy.

Let thus much suffice for the negative part of the rule; and to make a transition to the positive, I may justly observe, that in all this satrago of philosophy, astronomy, technical terms and scientific principles, there is no express mention, no note of reference, nor seemingly a remote thought or apprehension of the fundamental text of the *Pentateuch*, Gen. i. 14. And God said, *Let there be luminaries in the expanse of the Heavens, and let them be*—

(1) *Leathoth.* (2) *Emognadim.* (3) *Lejamim.*  
(4) *Vesbanim.*

The secrets and the depths of this theologico-astronomical text, neither human philosophy, nor all the improvements of modern science, have ever been able to unfold or penetrate; so purblind is human philosophy; so dark the light of nature.

It manifests not indeed the universal principle of gravitation; the center of motion, and physical law; yet it clearly reads, to the ear that is open to attention, a much more self-concerning and more instructive lesson.

It scientifically reveals the primary designation and the respective offices of the two great luminaries;

naries ; the sacred and the civil uses, the high importance and *final causes* of periodic motion.

Here the gracious œconomy and transactions of *Elohim Jehovah*, *ad extra*, with the whole race of mankind, are planned, if I may so speak, in the determinate divine counsel, and fore-knowledge, from the very foundations of the world.

And indeed, the *Mosaic* and Scripture astronomy is rather of a theological than philosophical nature ; for, in this divine dispensation, the Sun is not considered as the center of motion, light and heat, to a chorus of planets dancing round it ; nor is the Moon considered as a spherical opaque body, shining with borrowed and reflected rays ; but both the Sun and the Moon are here represented as the faithful witnesses in the Heavens ; ever regulating, in pursuance to the original law of the sovereign legislator, the periodic returns of solemn assembly days and divine institutions ; whilst they never fail to give their united and illustrious attestations to every awakening grand event, recorded throughout the Scripture history, with notations of time, *κατα τις προτεταγμενους χρονους & καιρους*, in exact agreement with *before appointed times and seasons*.

The learned and inquisitive Deist will not expect, and the Christian will rejoice to find, that the Sun and Moon in their courses shine in subserviency to the adorable mysteries of the Christian redemption, and gloriously plead the cause of revealed religion.

If

If our *British* philosopher has, in these latter ages, taught and demonstrated a geometrical philosophy; *Moses*, the *Jewish* legislator, above 3000 years before him, has clearly and explicitly revealed the original and *proportional* astronomy.

The patriarchs understood astronomy, so far as was necessary for mankind to know better than we; for what they knew, they knew to perfection, because they primarily received it from the Creator himself. The God of nature originally constructed the patriarchal year, no wonder that arts and sciences could never attain to it.

I who am but a novice, and just initiated into the perfections of the *Mosaic* calculus, cannot avoid perceiving the vast and inexpressible difference between the knowlege of a patriarch and of a modern philosopher, between the knowlege of one who lived near to the fountain and spring head of truth, and had imbibed, from his youth, the dogmata of our great and common progenitor, ultimately resolvable into immediate divine revelation, and that precarious uncertain knowlege, which was squeezed out, by the gradual and laborious deductions of reason and experiment, a drop or two in an age.

Astronomical history carries us back no farther than the times of *Hipparchus*, and in that interval of about 2000 years, we have, at last, made a shift by drudging at observation, and by invented rules of art, to discover and determine *nearly* the quantity of the Sun's annual course.

'Till the superior genius of Sir *I. Newton* arose, and instructed this western world, what was all

our philosophy, but the fluctuating opinions of the current age, the reveries of *Ren. des Cartes*?

But let us not imagine that we have exhausted science, for modern science is but in its dawn; and we are but just recovering some truths, which were well known to mankind (at first in general) above 5000 years ago. Take away the *Pentateuch* of *Moses*, together with the astronomical principles, mediums, and data, which are evidently, clearly, and perspicuously taught and inculcated there, for aught I can see, the sacred and ecclesiastical lunar year must be irretreivably lost; and that too, in this astronomical age. And yet—*haju lemognadim*—is a divine law, enacted *in the beginning*.

Should it be enquired, why the emperor and *Pontifex Maximus* entirely discarded the lunar (which was the ancient irregular *Roman*) year, need we scruple to assign for a reason, the utter inability of *Sosigenes* (his assistant and director) to teach him how to accommodate, by true astronomical laws, the one to the other, or the Moon's year to the Sun's? And will any *Europæan* astronomer kindly step in, to supply this evident want of skill in the *Ægyptian*? Strange and unexpected paradox! that, even in the age of science, we should be obliged to return back to the remotest ages of the antediluvian patriarchs, and to their superior skill in Sun and Moon astronomy, and to learn from the laws of primitive science how to restore the coæval lunar year, and how to recti-

fy our misapplications of the tropical solar to the *Julian*.

Six primary planets (says the modern astronomer) move in elliptical orbits about the Sun, the center of their motions. Why then 'tis as certain that there are six distinct species of planetary astronomy. And is it not highly reasonable, if not necessary, to be, first, well acquainted with our own, before we are so impatient to gratify an *useless curiosity*?

The diurnal and annual revolutions of *Jupiter*, for instance, measure not *my days*, nor *my years*, nor do the circumjovials preside over my *nights*.

After a general account of the several periods and distances of these solid moving orbs, together with their harmonious and truly divine proportional laws (I mean, that the squares of their periodic times are as the cubes of their distances) the astronomer has not recorded a phænomenon, which can merit the privilege of withdrawing our contemplations and studies from the *Mosaic* two great luminaries. I except not the altitude and diameter of *Saturn's* ring, whose immediate use and properties are beyond the reach of conjecture. Nor, the immerisions and emerisions of the satellites of *Jupiter*, a most enormous planet; and to us, (*cocab*) a star of about the first magnitude.

Had we employed our chiefest thoughts upon this one *Hebrew* text, *Gen. i. 16. Vaijagnash Elobim eth sbenci hammeoroth baggedolim* — rather than in wracking our brains, if haply we might be able to calculate and determine the diameter  
and

and circumference of the extreme orbit of *Saturn*, or solve (by geometrical schemes) the seeming retrogradations of *Mars*, we had long ago attained to that perfection in Sun and Moon astronomy, which the creator intended to be the object of our knowlege, and of which he has qualified us to receive the instruction.

Here I dare appeal to the greatest proficient in systematical science, whether the *civil* and the *sacred* uses, and the *final causes* of periodic motion, are not a more affecting, a more beneficial and concerning speculation, than precarious physical ratio, and physical law ?

The broad spheriodical figure of the Earth is *owing*, says Sir *I. Newton*, to the Earth's rotation about its axis; but surely, one would rather conclude, that it's form and motion were both impress'd by the creator of it; and, when impressed, could not be subject to any mutability or changes, without the divine interposition.

Astronomy, as the creator himself has revealed it to us in his written word, is useful, self-concerning, plain, easy, and obvious to common apprehension: whilst the learned professors have rendered it perplexed, intricate, and inaccessible to the bulk of mankind; as if they affected, like the old *Ægyptian* priests, to become sacred and venerable to the vulgar, by their esoteric dogmata, and their hieroglyphic grammata.

Arts and sciences have led us round-about ways; nay, thousands and millions of miles out of the

way; into paths, which God requires us not to traverse; into remote and distant regions, which we were never designed to reach or comprehend.

We, the Sun and Moon astronomers of this terraqueous globe, are no more concerned with the *British* catalogue of 3000 fixed stars, than with the parabola of a comet.

What account the (supposed) inhabitants of the superior and inferior orbs might be able to give of time and its measures, were it within our reach to examine them, I do not know, nor can a *Newton* inform my ignorance. It is sufficient for me, if I am able to render a satisfactory and true astronomical account of—my days, and—my years—from the *Pentateuch* of *Moses*, whose astronomical directory is express'd in the *Hebrew* text, *Gen. i. 14.* by a less number of words, than there are primary planets.

———*Haju lejamim vesbanim.*

This comprehensive scientific text points out to us a distinction of years, and a distinction of days; it confines our enquiries to solar and lunar years, and to the days of the solar year, and of the lunar. Add to this text,

*Gen. ch. 5. ver. 27.* All the *days* of *Methusalah* were 969 years.

In like manner, by the guidance of the *Mosaic* style, I say,

All

All the *days* of the world's past duration are 5757  
years, A. D. 1750  $\frac{2}{3}$

Now does it require any extraordinary genius, any uncommon degrees of penetration and sagacity, to discover, that we are positively directed, by the terms of *Moses's* chronology, to reduce solar years and lunar years to days? And from this simple (though very peculiar) law of reduction, in union with the *given radix*, and the terms of the *Pentateuch*, all founded in nature, we shall immediately discover the most useful, and the most necessary essentials of Sun and Moon astronomy.

It is now time to enter upon the proof of my 3d proposition, which sets forth, that *Moses* measures the lives of the patriarchs, &c.

In this proposition I must enter into a critical account of those two distinguished terms of the *Pentateuch*, *Chodesh* month, and *Shanah* year. I shall begin with the explanation of *Chodesh*, in doing which I will first set aside the *Jewish* notion of it: secondly, assign to it its true meaning: and lastly, shew the number of days it contains.

*Buxtorf* in his lexicon interprets *Chodesh* by the Latin — *Novilunium, mensis, ab innovatione Lunæ*. That *Chodesh* signifies *renovation*, or in a calendar sense, *repetition*, is easily allowed, though not of the Moon, but of a system of days, called month: that it should mean a renovation of the Moon's light is impossible to be true, because the months are equal, as will be proved in its place, which  
equality,

equality, a computation by the lunar periods and synods can never produce. And when *Moses* relates, *Exod. i. 2.* that his mother *Jochebed* hid him, *Shelofshe Jerachim*, these words were not to be understood to mean 3 *unequal lunar months*, but 3 *equal months* of the *lunar year*, between which two computations there is a wide difference.

*Chodesh* occurs above 150 times in the *Hebrew* text, yet in all those instances, I should say not in any one instance, does it ever refer to the new Moon any more than it does to the full, and equally to both.

Neither is the *Hebrew* word *Chodesh* more mistaken than the *Greek Neomenia* by which it is sometimes translated. There is a passage in *Philo*, contemporary with *Josephus*, which will clearly inform us of its precise determinate sense: great ambiguity and confusion has arisen from the *English* translation, which has rendered it, 2. *K. ch. 4. ver. 23, &c. New Moon, Moon* instead of *month*. But these few words of *Philo* will teach us where the error lies, and how to correct it: Μετα συνοδου, την κατα τινα Σεληνην νεαν. νεομηνια. Where *Philo* writes, μετα συνοδου, *Mr. Whiston*, in his *Harmony of the 4 gospels*, translates, p 195, l. 32, — *after the new Moon*. Now if this expression — *the new Moon*. — can with any propriety be applied to συνοδου, then the words — Σεληνην νεαν — being literally translated, will also signify — *new Moon*. — And I need not observe, that — *Νεομηνια* — is constantly translated *new Moon*.

But

But what inconsistency of interpretation is here? After the *new Moon*, which happens in every *new Moon*, is the *new Moon*. *Philo* was incapable of writing such unmeaning jargon, and what he means is clear, precise, and determinate.

There are 12 synodical lunations within the limits of a lunar year, according to the artificial calculations and invention of the *Greeks*. Now, says *Philo*, Νεομηνια, *i. e.* the first day of the month, begins in the evening *next after the synod*, and this in every successive month, throughout the lunar year. Κατα τινα Σελήνων νεαρ.

We have from the same antient writer and græcized *Jew* a farther explanation, and even the astronomical boundaries of the *Attic* term Νεομηνια. Astronomical, I mean, with respect to a calculation by the mean motion; which would sometimes fall on the right day, and sometimes would exceed it. Whenever this happened as it must when the Moon was in conjunction late in the day, they would begin their month on the evening the *next but one* after the synod, or when the Moon was visible; although this was not their law, and standing rule, nor did they intend it.

I was induced to remark thus much, because this very case fell out at the vernal æquinox, in the year of our Saviour's crucifixion, A. D. 33. and A. J. P. 4746. Mr. *Whiston*, in his *Harmony of the Gospels*, p. 196, has fixed this paschal new Moon to *March*, 19 d. 13 h. 30 m. or to half an hour past one in the afternoon; so that  
there

here wanted but  $4\frac{1}{2}$  hours to complete the day.  
And,

“ What is most material here (says Mr. *Whiston*, p. 197) is this: since the new Moon (so the astronomers express the synod) happened so near to the night on the 19th of *March* A. D. 33, as by no means to be visible till the evening of the 20th, it seems to follow— that not the 20th of *March*, but the 21st, should be the 1st day of the month of *Nisan*:”---and so it actually was. For whoever will give himself the trouble to make the calculation by *Ptolemy's* astronomy, which was publish'd A. D. 140, and adopted by Rabbi *Hillel* about A. D. 358, will find *Neomenia Nisan*, the 1st day of the 1st month of the *Jewish* year, to fall on the day after the conjunction, or on *March* 20, and on the 6th *Feria*. And consequently, the 14th day of the month,  $\text{ὅτε ἐθρον το παχα}$ , says *St. Mark*.  $\text{ἐν ἡ εδρα θυεσθαι το παχα}$ , says *St. Luke*, will fall on *April* 3d, and also on the 6th *Feria*, or  $\text{Προσαββατον}$ , in exact agreement with the gospel account.

*Mr. Whiston* seems not to have considered a material circumstance, *viz.* that he was able to calculate this paschal new Moon by the laws of true astronomy, whilst the *Jews*, who were taught by the *Greeks*, drew their conclusions from the mean motion only, which must, in other instances besides this, occasion the difference of a day, and ever when the conjunction happened in the afternoon, as this did.

The

The present *Jews* to this day, though they live in the astronomical age, and in the midst of astronomers, acquiesce in *Ptolemy's* definitions, and still calculate their *Νεομνιαι* by Rabbi *Hillel's* laws, and the mean motions of the Moon. To return to *Philo*:

The passage which I referred to last is this.

Νεμννια γαρ αρχεται φωτιζεν αισθητω φεγγι Σεληνην Ηλιος.  
*Idem apud Selden de anno judæorum, c. 20.*

“ In the end of the first day of the month  
 “ (which began the evening *next after* the synod)  
 “ the Sun begins to enlighten the Moon with a  
 “ *perceptible light*. And whenever they con-  
 “ cluded rightly this constantly happened.”

From the writings of *Philo Judæus*, and the concurrent testimony of *Josephus*, we may infer, that these expressions—a lunar month (κατα Σεληνην) and a month of the lunar year, is a characteristical difference between the computations of the ancient and of the latter *Jews*.

I shall now come closer to the point, and undertake to prove directly, that the latter *Jews* in their dispersions borrowed their unequal months, and the whole of their computations from the *Greeks*. They made use of no cycle, either that of 84 or of 19 years, as some have imagined; nor did they observe the *φαισ* of the Moon. The more we enquire into this, the more evidently its truth will appear from *Philo's* precise, exact, and determinate explication of the *Attic* term *Νεομννια*; whilst the ancient *Jews* shewed a total disregard

to lunar periods and synods throughout their year.

I shall fetch my argument from the table, and the several particulars of *Ptolemy's* calculation.

*Timocharis* observed, as *Ptolemy* has noted, l. 7. c. 3. p. 170. that the star called *spica virginis* exactly touched the north side of the Moon, as it was rising above the horizon, A. ær. *Nabonass.* 466, on the 7th of *Tboth*, and on the 6th of the *Attic* month *Pyanepsion*, decreasing.

This observation of *Timocharis* then was made in the beginning of the third year of the reign of *Ptolemy Philadelphus*, and in the 42d year from the death of *Alexander*, according to the law of the canon of kings.

*Neomenia Hecatombæonis*, or the first day of the first *Attic* month *Hecatombæon* (for *Pyanepsion* was the fifth) began the evening next after that synod, whose 15th day, from thence inclusive, fell either upon the summer solstice, or immediately after it. The summer solstitial days in that age, in the *Julian* calendar, were *June* 26, 27. We are therefore to ascertain the *Nucthemeron* of that synod, whose evening next after was nearest, according to mean motion, to *June* 27, A. ær. *Nabonass.* 465, and in the 2d year of the reign of *Ptolemy Philadelphus*.

Now, whether we calculate from the *Mosaic Molad Tobu*, or from *Rabbi Hillel's* (which are 13 decennial cycles distant from each other exactly) the *Nucthemeron* of that synod, which is nearest to *June* 27, will be determined by the mean  
motion

motion, (and the astronomer will confirm it) to June 19. Therefore,

(1) *Neomenia Hecatombæonis* began the evening of June 19, the next after the synod, according to mean motion, by which *Ptolemy* calculated. The same may be said of the *Jewish* month *Tamuz*, and of the *Macedonian* month *Panemus*, in the same parallel line, in tab. p. 89.

But we are informed by the hellenistical *Philo*, a latter *Jew*, that this law of computation, *i. e.* μετα σινουδου, holds equally true, κατα τινα Σελληνην νεαν, throughout the 12 synodical lunations. Therefore,

(2) *Neomenia Metagitnionis*, or the first day of the second *Attic* month *Metagitnion*, will fall, according to mean motion, and the calculation of *Ptolemy*, (as we shall see in the conclusion) on July 18. The same will hold equally true of the *Jewish* month *Ab*, and of the *Macedonian* month *Lous*, in the same parallel line.

(3) *Neomenia Boedromionis*, or the first day of the third *Attic* month *Boedromion*, will fall, by the same law, on August 17; and so will the first day of the *Jewish* month *Elul*, and of the *Macedonian* month *Gorpiæus*, in the same parallel line.

(4) *Neomenia Maimactericnis*, or the first day of the fourth *Attic* month *Maimacterion*, will fall, by the same rule, on September 15; and so also will the first day of the *Jewish* month *Tisri*, and of the *Macedonian* month *Hyperberetæus*, in the same parallel line.

(5) *Neomenia Pyanepfionis*, or the first day of fifth *Attic* month *Pyanepfion*, will fall, by the same rule, on *October 15*; and so likewise, will the first day of the *Jewish* month *Marchesvan*, and of the *Macedonian* month *Dius*, in the same parallel line.

(6) *Neomenia Thoth*, or the first day of the first month of the *Ægyptian* and *Chaldæan* year, from the æra of *Nabonassar 466*, falls on *November 2*, and the 7th of *Thoth* on *November 8*. But *September 8*,  $\div$  *October 31 =  $39$  — *October 15 =  $24$ . Therefore,**

The 7th of *Thoth* concurs with the 24th day of the *Jewish* month *Marchesvan*, of the *Macedonian* month *Dius*, and of the *Attic* month *Pyanepfion*. But the *Athenians* divided their month of 30 days into 3 decads; the 3d of which, or 10 last days, they reckoned in a retrograde manner, as the *Romans* did their calends, nones, and ides.

If the month consisted of 29 days only, then they computed the 9 last days from 20, in this manner.

ΕΝΝΑΤΗ ΘΗΙΟΥΝΤΟΣ, *Nona definentis*, or 21. ΟΥΔΩΝ ΘΗΙΟΥΝΤΟΣ, *Octava definentis*, or 22. ΕΒΔΩΜΗ ΘΗΙΟΥΝΤΟΣ, *Septima definentis*, or 23. ΕΞΤΗ ΘΗΙΟΥΝΤΟΣ, *Sexta definentis*, or 24; which is the day that *Ptolemy* has given, and calculated in this manner.

From the whole laid together, we may conclude, that there is more certainty in the computations of the latter *Jews*, than many have apprehended, or will readily believe.

We

We are as fully certified, for instance, that *Neomenia Nisan* fell on *March 20*, and on the 6th *Feria*, A. D. 33, as the astronomer can be by the tables, that the Moon was first visible on that evening. And Mr. *Whiston's* calculation of the true time of that synod; *Mar. 19 d. 13. h. 30. m.* has enabled me to discover the grounds of this certainty. Without the assistance of that calculation indeed, I could not have estimated the difference between the mean motion and the true; notwithstanding this, when the astronomer corrects the mean motion, he does not at the same time correct, much less can he be said to overthrow, or even to weaken, the conclusion of the *Jew*. That stands as it did, upon its own foundation.

Those who made the *Metonic* cycle the regulator of our ecclesiastical lunar year, whoever they were, they adopted, it is plain, the computation of the *Greeks* and of the latter *Jews*, who stand as distinguished from the *Rabbins* and *Talmudists* as they do from the ancient *Jews*. They have made some additions indeed, which have rendered the whole of the account very confused, and I may say, almost unintelligible. The proof is obvious and consists of the particulars ensuing.

- (1) The council of *Nice* was held, A. D. 325.
- (2d) *March 21* was considered as the fixed immoveable day of the vernal æquinox.
- (3) *March 8* is the day pointed out by the golden number as the first of the vernal Moon, which a latter *Jew* would call *Neomenia Nisan*.
- (4) *March 8* begins

gins on *March 7*, H. 6. P. M. for the evening next after the synod. (5) On the evening of *March 8* the Moon is supposed to be visible, according to the foregoing determination of *Philo*,

Νεμηνία γὰρ ἀρχεται φῶτιζεν αἰσθητῶ φεγγι Σελήνην Ἡλίου.

(6) *March 21*—*March 7*=14. Here we have what *Josephus* expressly calls τεσσαρεσκαί δεκατὴν κατὰ Σελήνην, i. e. the 14th day of the month according to the vernal Moon.

Thus far there is an exact conformity to the practice of the latter *Jews*, and to the language and style of *Philo* and *Josephus*; but if we proceed to examine more nicely these paschal canons, and the rule to find *Easter* for ever, we shall find a considerable deviation from both; nor has it been clearly and fully shewn (as I know of) from what antient testimonies and authorities the day of the full Moon was made coincident with the 14th day of the month, which *Eusebius*, as well as *Philo* and *Josephus*, has kept distinct. But as this discussion would lead me into too wide a digression, and answer no important end, I shall only observe in general, that this *Athenian Metonic* cycle has deluded the *Christian* church for 14 centuries and upwards; hanging out but a false light at first; and it has withdrawn even that above 1000 years ago. Although, had it not been antiquated and useless, its 19 corresponding numbers, which were formerly wrote in letters of gold, could have discharged no other office than that of directing us to the evening next after the synod, throughout the 12 lunations, according

ing to mean motion, and the calculation of the *Greeks*.

*Josephus*, in the whole course of his history, connects the months of the *Macedonian* year, with the months of the *Jewish*; and this he does so frequently, that it would be almost endless to produce instances. Now, should a question arise, whether we are to compute them as months of the *Macedonian* lunar, or of the *Macedonio-Julian* solar year, the following citation from *Josephus* must, one would be apt to imagine, decide it beyond all contradiction.

Τῷ δὲ μηνὶ τῷ Ξανθικῷ, ὅς νισσαν παρ ἡμῶν καλεῖται, καὶ τὴν ἐτὸς ἐστὶν ἀρχὴν, τεσσαρεσκαὶ δεκάτῃ κατὰ Σελήνην, ἐν κριῶν τῷ Ἡλίῳ καθεστώτος, δι' ἐτὸς ἑκάστου παρὰ θεοῦ ἐνομίσθη. *Antiq.* l. 3. c. 10. In the month *Xanthicus*, (which we call *Nisan*, and is the beginning of the year on the 14th day of the 1st month, according to the Moon) when the Sun is in aries, we annually kill the passover, according to the precept of the law.

Now, as both *Xanthicus* and *Nisan* are months, κατὰ Σελήνην according to the Moon, how is it possible that the 14th day of a lunar month, should fall uniformly on the 14th day of *April*, in the *Julian* calendar?

Notwithstanding this express declaration and attestation of *Josephus*, some learned writers have supposed *Josephus* to use the *Macedonio-Julian* months; so necessary is it to see and examine for ourselves. The opinion of every learned writer ought doubtless to have its due weight; but I see

no reason why, in every case, we should implicitly think it to be final and decisive: if, upon examination, it appears to be true, we should gladly embrace it as a truth; if a mistake, we should unite our endeavours to correct it.

The following is a table which exhibits to view the preceding observations on *Neomenia*; it includes the forms of years in use amongst 7 different nations and people, with their respective astronomical adjustments to the cardinal points; and it may be of use in the reading of *Josephus*, and *Greek* writers, (after *Alexander* had commanded the intercalary month, or *Artemisius* *Δωδεκα* to be introduced;) to those, I mean, who have not adopted an hypothesis, and are resolved implicitly to adhere to it.

The learned Bishop *Beverege* (*Chron. Instit.* l. 1. ch. 13. p. 170) with great judgment and accuracy concludes— *Novam quidem hanc mensium Macedonicorum dispositionem, inter alios, Josephus, antiquitatum judaicarum auctor, semper observat.*

The table annexed is completed (as we shall see presently) by an observation of *Timocharis*, recorded by *Ptolemy* in his *Almegist*; by the assistance of which, and those words of *Josephus*, *ὅτι κείνη τῆς ἡλίου καθέστωτος*, *the Sun being in aries*, the *Jewish*, the *Macedonian*, the *Attic* lunar; and also the *Nabonassarcan* 466, as fixed and ascertained by *Ptolemy*, together with the *Julian*, are reduced to the *Scripture* astronomical, both solar and lunar, year, as used and applied after the *Exodus*.

## A TABLE of astronomical reduction to the Scripture year.

									End of the lunar month.
The Julian solar.	April May June July August September October November December January February March								
The Nabonassa- rean solar 466, 5 first months.									
The months of the Attic lunar year.	Μενοχίαιον Θαργελλαιον Σκισφοροποιαιον Εκατομβαιαιον Μεταγερστιαιον Βονοβομιαιον Μαιμακτιαιαιον Ποαεφαιαιον Ποσιδιαιον Γαμηλιαιον Αρβυρειαιον Ελαφουβολιαιον								
The months of the Macedonian lunar year.	Ξαρθιαιος Αρτεμισιος Δαισιος Παμεμιος Λωος Γορπιαιος Υπερβερεταιος Διοσ Απελλατος Αυδουρατος Περγιαιος Δουστιος								
The months of the Jewish lunar year.	Nisan Iyar Sivan Tamuz Ab Elul Tisri Marchesvan Chisleu Tebeth Shebat Adar								
The adjustment of the months.	30 60 90 120 150 174 30 60 90 120 150 180								
Lunar year af- ter the Exodus	30 30 30 30 30 30 30 30 30 30 30 30								
Solar and lunar year.	I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII. XIII.								
	V D II 9 3 7 4 m 2 9 3 X XII								

We cannot sufficiently esteem the labours of *Ptolemy*. Had *C. Ptolemy*, the *Pelufian*, never wrote, profane chronology must still have lain in a state of confusion and ambiguity, uselefs and unintelligible: nor could we have afcertaincd the connection of facred chronology with the profane, in one fingle inftance, before the final difolution of the *Persian* monarchy by *Alexander the Great*, in the 4th year of the reign of *Darius Codomannus*. We could only have noted a few fynchronifms in the *Jewish* and *Chaldæan* hiftory, and in the times of the *Persian* monarchy.

The foregoing obfervations may be thought perhaps more than fufficient to correct the *Jewish* notion of the *Hebrew* word *Chodefb*, and the miftranslation of the *Greek* term *Neomenia*.

To proceed, fecondly, to the investigation of the true meaning of *Chodefb*. Whoever is defirous to underftand the *Mofaic* computations, muft firft endeavour by diligence, attention, and labour, to obtain clear, diftinct, and determinate ideas of the *Hebrew* terms upon which thofe computations are grounded.

It will be allowed that every author is, and neceffarily muft be, the beft interpreter of his own meaning. And without having recourfe to the grecized *Jews*, or the talmudically learned, we have from the *Hebrew* bible itfelf, 3 certain rules, in what determinate fenfe we are to interpret *Chodefb* or *Chodafhim*, either in the fingular or in the plural number.

Rule

## Rule I.

Whenever an ordinal number, as the 2d, the 7th, the 10th, or the like, goes before *Chodesh*, it then denotes one of the twelve months of the lunar year, and the ordinal number expresses the distance from the cardinal point ; before the *Exodus*, from the autumnal æquinox ; and at and after the *Exodus*, from the vernal.

## Example.

Gen. ch. 8. ver. 4. *And the ark rested in the 7th month (from the autumnal æquinox) on the 17th day of the month; upon the mountains of Ararat.*

Levit. ch. 23. ver. 24. *Speak unto the children of Israel, saying the 15th day of this 7th month (from the vernal æquinox) shall be the feast of tabernacles.*

## Rule II.

Whenever *Chodesh* stands by itself absolutely, without any ordinal number going before it, or without either the emphatic or demonstrative *Ha* prefixed ; in this situation it constantly denotes the beginning of a month, without the necessity of specifying any. Just in the same manner, as in the *Roman* stile, the *Calends* stand distinguished from the several months of the year, though included in them.

## Example.

Numb. ch. 28. ver. 11. *And in the beginnings of your months, (Heb. Beroshei chodsheicem) ye shall offer a burnt offering unto the Lord.*

Ver. 14. *This is the burnt offering of every month throughout the year. Heb. Zath gnolath—Chodesh, bechodsho, lechodshei hashanab.*

The force of Rule II. is entirely lost here in the *English* translation: but if we compare the words, ver. 11. with those in the latter part of the 14th verse in the *Hebrew* text together, we shall plainly perceive, that *Chodesh*, ver. 14. absolutely put, is synonymous with *Rosh Chodashim*, ver. 11. And the latter part of the 14th verse, being literally rendered, would run thus. This is the burnt offering, *Chodesh*, in the beginning of your months, *Bechodsho*, in its month, *i. e.* in every successive month, *Lechodshei hashanab*, throughout all the months of the year.

1 Sam. ch. 20. ver. 5. *And David said unto Jonathan, behold to-morrow is—Chodesh—the beginning of a month, and I should not fail to sit with the king at meat.—*

We assuredly know from this text, that *David* spake thus unto *Jonathan*, on the 30th day of some one month.

The *Greek* version interprets *Chodesh* in this place, by the *Attic* term *Νεομηνια*, and the *English* translation renders it new Moon.

2 K. ch. 4. ver. 23. *And he (the husband) said unto the Shunamite his wife, wherefore wilt thou*

*thou go unto the man of God to day? Lo a Chodesh,* it is not the beginning of a month, and so no festival. *Grec.* Νεομνία, *English* translation *new Moon.*

### Rule III.

When *Chodesh* occurs with the emphatic *Ha* prefixed, either explicitly or implicitly, with a præposition which excludes it, (as the initial letter **ח** *Cheth*, is indageshable) and without the ordinal, it then denotes *Rishon*, *i. e.* the 1st month of the ecclesiastical lunar year, as it was transferred by the divine authority and command, from *libra* to *aries*, from the autumnal to the vernal æquinox.

### Example.

Exod. ch. 12. ver. 2. *Ha Chodesh hazzeh, &c.* *This month* shall be, &c.—This is the standard emphatic text.

Exod. ch. 12. ver. 5. *And it shall be, when the Lord shall bring thee into the land of the Canaanites—*which he swear unto thy fathers to give thee,—*that thou shalt keep this service,—Be ha Chodesh hazzeh, i. e. in this very month,* emphatically.

*Psal.* 81. ver. 4. Blow up the trumpet *Be ha Chodesh, baceseh lejom chaggenu.*

After this third rule occurred to me, had I been required to translate this *Hebrew* text into *Greek*, without regard to elegance of phrase, I should, under its direction, have done it in the following manner.

Πσ. 81. υ. 4. Σαλπίζατε ἐν τῷ μηνὶ σάλπιγγι,

Ἐν ἀριθμημένῃ (ὠρισμένῃ) ἡμέρᾳ εορτῆς ἡμῶν.

*Clangite in illo ipso mense Buccinâ,*

*In numerato (statuto) die festi nostri.*

Blow up the trumpet in the month (*Abib*)

In the numbred (appointed) day of our feast.

In the first month of the altered lunar year (*Berishon*) on the 15th day of the month, (the numbred (appointed) day of the feast) on the 1st day of the feast of unleavened bread, on the self same day it came to pass, that all the hosts of the Lord went out of the land of *Egypt*.

Blow up the trumpet in the month (*Abib*) on the 15th day of the month, that memorable, that illustrious day, in which,—*ver* 7. *I eased his shoulder from the burden, and his hands were delivered* (by a miraculous passage through the red sea, *Heb. Tagnabornab*) from the *Egyptian* servile tasks, saith the Lord.

*Exod. ch. 13. ver. 3. And Moses said unto the people, Zacor haijom hazzeh, remember this day, in which ye came from Egypt, out of the house of bondage.—ver. 4. This day came ye out, in the month Abib, or of ripening, when the barley was ripe for the harvest; whereby Moses ascertains the vernal æquinoctial season, though not in technical, yet in terms equivalent to them.*

It is hardly possible not to perceive, that this is a memorial pathetic *Psalms*, comprising a great part

part of the history and of the chronology of the *Exodus*.

And yet, that hellenistical *Alexandrian Jew*, whoever he was, that translated the 4th verse of this *Psalms* into *Greek*, (though he was able to write ΕΛΛΗΝΗΣΙ with elegance enough) has betrayed a great ignorance of the history, and one of the most important and the most memorable transactions of the God of *Israel* with his people; and, through this mistaken translation, would for ever bar up all access to the sense of a most incomparable and divine *Psalms*: Nor is it at all to be wondered at, that the whole body of expositors, translators, and critics, who regarded it so far as to adhere to it, have, one after another, stumbled and fallen.

*Pf. 81. ver. 3. Greek version. Σαλπιστατε εν Νεομηνια σαλπιγγις  
εν ευσημω ημερα εορτης ημων.*

Blow up the trumpet on the 1st day of the month,

In the illustrious day of our feast.

Ver. 5. This day ordained he unto *Joseph* (and all *Israel*) for a testimony, Heb. *Betzeebo*, & Gr.

Εν τω εξελθειν αυτον εκ γης Αιγυπτου.

Here the *Alexandrian Jew*, without attending to the inconsistency and direct contradiction to the history, connects the first day of the month (*Νεομηνια*) with the day of the *Exodus*; whereas *Moses* expressly relates, that it came to pass on the

15th,

15th, and on the appointed day of the feast of unleavened bread.

*Junius* and *Tremellius* were no mean *Hebraicians*, yet they found this *Hebrew* text, a *Gordian* knot which they could not untie. For having rendered the former part, *Clangite in Novilunio Buccinâ*, by the misguidance of the *Attic* term *Νεομνία*, they were not able to proceed any farther; but after much hesitation and perplexity, they at last hammered out this laboured paraphrase, *Stativis quibusque feriis, diebus festis nostris*, which expresses the sense neither of the *Hebrew* nor of the *Greek*.

*Coverdale* was bewildered in the same labyrinth, and instead of a translation, gives us also a paraphrase: "Blow up the trumpet in the new Moon, even in the appointed time upon our solemn feast day."

Bishop *Patrick* seems to have framed both the argument of the *Psalms*, and his paraphrase of the 4th verse, upon the term *Νεομνία*, in conjunction with the *Hebrew* word *Shopher*, without considering that *David* had introduced into the service of the tabernacle a great variety of music, both vocal and instrumental. There are 3 musical instruments mentioned in the beginning of this *Psalms*, viz. *Toph*, *Cinnur*, and *Nebel*, before *Shopher* (a trumpet) which is but one out of four. Here I refer the reader to the comments themselves, and the argument of *Psal.* lxxxi. which is too prolix to transcribe.

*Buchanan's* poetical version is in the whole an excellent paraphrase; but the acuteness of his wit did not preserve him from splitting against the common rock.

If he himself drew up and prefixed the title or argument, there is this threefold inconsistency in the proceeding. 1. The title refers the feast spoken of, ver. 4. to the feast of tabernacles, which was always celebrated on the 15th day of the 7th month. 2. The interpretation of the 4th verse refers it to the *Calends*, or the 1st day of the month. 3. The subsequent paraphrase refers to the severe affliction of the *Ægyptian* bondage, and their deliverance out of it, which evidently happened (as we have seen) at the feast of unleavened bread.

I shall close these necessary remarks with part of a marginal note in the preface to vol. 3. of Mr. *Shuckford's* historical connection, p. 20. from whence it will farther appear what difficulties (occasioned by the mistranslation into *Greek*) have attended all attempts to unfold the sense of the 4th verse of the 81st *Psalms*.

Mr. *Shuckford* had been shewing from p. 16. (and has clearly shewn) that to an antient *Israelite*, month and Moon had no agreement with each other;—that in the *Hebrew*, *Jareach* or *Lebanah* are the words which signify the Moon, and *Chodesh* is the word for month;—that in the *Hebrew* bible, there is no one text, either in the books of *Moses*, or in any of the books of the Old Testament, which can intimate the *Israelites* to have observed the day of the new Moon, in any of

their festivals. To illustrate this, the *Psalmist*, says he, directs to blow up the trumpet, not as we render it *in the new Moon*, nor as the LXX. *Fr Neomunia*, but *Ba Chodesh, upon the month day*. Here he sets down the following marginal note.

“ The latter part of the verse is thought by  
 “ some writers to intimate something contrary to  
 “ what I am offering : blow up the trumpet, says  
 “ the *Psalmist*, on the *month day*, after which  
 “ follows, *Bacceseh lejom chaggenu*. The word  
 “ *Ceseh*, say they, is derived from the verb *Ca-*  
 “ *sab* to cover, so that *Bacceseh* may signify at  
 “ the covering, or when the Moon is in con-  
 “ junction with the Sun, covered as it were, so  
 “ as to give no light. Thus these writers think  
 “ this verse to intimate the new Moon to have  
 “ been a solemn festival.

“ But I would observe the expression thus taken  
 “ is so singular, unlike any thing to be met with  
 “ in any other place of Scripture, notwithstand-  
 “ ing the frequent mention of the *festival here*  
 “ *intended*, that I should think we cannot safely  
 “ build upon it.

“ Others derive the word *Ceseh* from *Casas*, to  
 “ number out : and accordingly render *Bacceseh*  
 “ upon the appointed day ; but were this the  
 “ sense of the place, the word would perhaps  
 “ have been written, not *Bacceseh*, but *Baccesea*.  
 “ See *Prov.* vii. 21.

“ The reader may see what has been offered  
 “ upon this text in *Scalig. de Emendat. Temp.*  
 “ l. 3. p. 153. *Cleric. comment. in loc.* and will  
 “ after

“ after all find the passage to be obscure, at most  
 “ but doubtfully explained by those who have  
 “ wrote upon it.”

I have laid down 3 distinct rules, all collected from the *Hebrew* bible, for the interpretation of *Chodesh*: I have confirmed the truth and propriety of each of them by examples. Now Mr. *Shuckford* has referred the former part of the 4th verse to rule II, whereas it falls under rule III. For *Ba Chodesh*, is *Be ha Chodesh*, not on the month day, but *in the month Abib*, emphatically; and the latter part of the verse, *Bacceseh lejom chaggenu*, points out the day.

A literal translation of these *Hebrew* words into *English* would run thus.—In the numeration or in the number of the day of our feast, *viz.* of unleavened bread. In the same kind of phrase, *Aristotle* calls time, *αριθμον κενουσεως*, the number of motion, *i. e.* a motion numbered. So here, in the numeration, or in the number of the day, is the same as in the numbered or appointed day; which intimates too, that they had a regular and well known calendar.

We will now shew the number of days in a month. We read, *Gen. xxix. 14.* that *Jacob* stayed with *Laban* (*Chodesh jamim*) a month of days, or a whole month; but we cannot collect from this text, how many days the *Mosaic Chodesh* contains. We can learn this only from *Moses's* account of the flood, *Gen. ch. 7.* and from hence learned writers have so frequently and so fully proved it to be a civil or political system of 30  
 N 2 days,

days, that I might have assumed it as an acknowledged and well known truth, if I had not thought it proper to observe (to those who may not have considered it) in what a very peculiar and singular manner, the author of the *Pentateuch* explains his terms, and instructs his readers.

It would be in vain for the most cultivated genius to emulate the accuracy, conciseness, and judgment of the *Mosaic* style. It demands and it merits the closest attention of our minds. We nowhere meet, for instance, with an express declaration, that a month contains 30 days; no, *Moses* interweaves this, and several other points, not necessary to be mentioned here, into the particulars of his historical narration, with a judgment vastly superior to an express declaration, or precise definition, which he altogether avoids.

*The waters, says Moses, ch. 7. ver. 24. prevailed upon the Earth, or continued to rise 150 days; and after the end of 150 days, the waters abated.*

Ch. 8. ver. 4. *And the ark rested in the 7th month, on the 17th day of the month, upon the mountains of Ararat.*

*Moses* had before related, *ch. 7. ver. 11.* that *Noah* went into the ark, and the flood began on the 17th day of the 2d month; he here describes the continuation of the rise of the waters, in a series of 150 expanded days, both as a circumstance of the deluge, and as a medium of proof in the calculation; and he immediately reduces these 150 expanded days to the state of a regular calen-

calendar, to give us to understand that we might expect one. But instead of defining the month, he gives us both a *divisor* and a *dividend*, so that we cannot possibly mistake the *quotient*: for from 7th m. 17th d. subtract 2d m. 17th d. the remainder shews that 5 months of the continuation of the deluge were completed on the day before the ark rested. So that 5 is the *divisor*, 150 the *dividend*, and 30 (the number of days in a month) the *quotient*.

5) 150 (30

We shall find as we proceed, this number 30 claiming a place amongst the 7 radicals, and to be of eminent and signal use in the integral calculations.

In this historical, and at the same time, argumentative manner, does *Moses* inform us by what kind of month he computes. I might proceed through the rest of the months, but the number of their days will appear in the consideration of *shanab*, year, whose form and astronomical quantity we proceed to examine.

I shall not begin my explication of that most distinguished term *shanab*, by amusing the reader with the various hypotheses, and discordant opinions, which, from time to time, have been offered to the public concerning it; every known form of year, excepting the true one, having been assigned for it: but shall endeavour, by gradual steps, to make it appear, that it is applied, by *Moses* in his chronology, to the year of the Sun, and to the year of the Moon; and that the essential distinction, between these two incom-

men-

mensurate years, was established by the Creator—*in the beginning.*

But here it must be noted, that although the Moon has a proper orbit of its own, and a proper motion in that orbit, to qualify it, *Lehair gnial haarez*, Gen. i. 15. yet the motions of the Moon were not appointed for, nor have they any share in the mensurations of time; no, not of its own year; no more than the librations of its orb, in the perimeter of its orbit. The days which constitute the quantity of its annual periods (which are sometimes 354, and sometimes 355, by a secret law, not obvious to be understood and explained) are, and necessarily must be, measured by the diurnal motion: and although the *stated sacra* of the antient people of God were constantly observed on the months and days of the lunar year; yet were those days to be computed, and their sabbaths celebrated, by a divine command, *Megnereb gnad Gnereb*, from evening to evening, or from the time of Sun-setting to the time of Sun-setting, as on the æquinoctial day.

The distinction of years was primarily constituted by the distance of the first appearance of the Moon's enlightned orb, from the *Mosaic Tekupha*; which distance is technically called the epact, and is still preserved, though not indeed immutably, by the original number 15, yet by limited variations returning in priodic times.

It may be required of me, perhaps, to shew by a particular illustration, what I would be understood to mean, “ By limited variations re-  
turn-

“ turning in periodic times.” The epacts, it is well known, are various and changeable: but though the same epact cannot form the difference between two successive years, yet it has a regular periodic return. To exemplify this, I have chose the first four years of the world, or the patriarchal *Tetraeteris* (which exhibits the most perfect Sun and Moon astronomy) and have subjoined a table of the returns of the same positions—*nearly*; which are characterized by the corresponding years of the reign of *Tiberius Cæsar*, at the distance from each other, of more than 4000 solar revolutions. My choice was directed to these latter, (for I was not confined to them) as being the 4 evangelical years; and if extended to the vernal æquinox following, they will comprehend the whole times of the gospel, from the first preaching of *John the Baptist*, to the crucifixion of our Saviour.

*The astronomical positions of the first 4 lunar years, to the first 4 solar.*

Table III.

A.M.0.	A.M. 1.	A. M. 2.	A. M. 3.	A.M. 4.
☽		☽	☽	☽ ☽
☉		☉	☉	☉ ☉
○	354 ○ 11	343 ○ 22	8 ○ 354 ○ 3	352 ○ 14
☾ 15	339 ☾ 26	4 ☾ 354 ☾ 7	347 ☾ 18	12 ☾ 354 ☾

A periodic return of the same positions—nearly; in the 15th, 16th, 17th, and 18th years of the reign of *Tiberius Cæsar*, reduced to the autumnal æquinôx; which is necessary to be observed; because that which becomes, by this astronomical reduction, the latter end of the 18th, is, in the canon of *Ptolemy*, the beginning of the 19th, A. D. 32. A. J. P. 4745.

Table IV.

14th year.	15th year.	16th year.	17th year.	18th year.
	☾		☾	☾
	☉		☉	☉
○ 354	○ 12	342 ○ 23	7○354○4	351 ○ 14
☾ 15	339 ☾ 27	3☾354☾8	346 ☾ 19	11☾354☾

Now I am to prove, that the contents of these two tables represent and express the true form of the *Mosaic*, which is an exact transcript of the celestial, year; primarily constructed by the Creator of the luminaries, and with divine wisdom adapted both to our civil and religious uses; as will be abundantly seen in its full explication.

These positions of the lunar years to the solar, the integral days of the one to the integral days of the other, and their exact commensuration to an individual point (still inviolably preserving the astronomical distinction of years) are as much above the reach of man's invention, as the Sun and the Moon are above the power of man's formation.

The

The double radix or epoch of the Moon's year, and its obvious effects, *viz.* a twofold computation, from full Moon (☉) to full Moon (☉), and from new Moon (☾) to new Moon (☾), (the one being the sacred and ecclesiastical, and the other the civil and historical; year, whilst the Sun by its diurnal and annual revolutions measures the duration of all things) cannot escape our notice, nor fail to engage a suitable attention. Has philosophy discovered it? Has science ever taught it? Can the invented rules of art attain to it? Without some previous knowledge of the original characters, and the partition of the æquinoctial Nuſthemeron into 4 equidistant quadrants, a more abſtrufe problem, and of more difficult ſolution, cannot be readily propoſed. It is certain, that ſcience has hitherto declined the attempt; discouraged it may be, by the intricate ratio of the epacts. This ſeeming intricacy proceeds from two cauſes, *viz.*

First, from the admitting *artificial fractions* into the calculus, and from the artificial diviſions of the ecliptic and the æquator. Hence it is infered, that the Sun meaſures by its mean diurnal motion, 59'. 8". ſo it does according to the *Rule of Three* appealed to in this caſe, upon a miſtaken hypotheſis, and a falſe foundation. For neither the book of nature, nor the book of revelation, inſtruct us to calculate by ſuch inadequate methods. What was it miſled men to cramp the Sun's annual courſe within ſuch unnatural limits, but the an-

tient imperfect year of 360 days? Why not divide the ecliptic and the æquator into 365 degrees, and one fourth; (with its due correction) according to *Moses* and nature?

Secondly, another manifest cause of this seeming intricate ratio of the epacts is owing to the stated method of calculating synods, dichotomies, and oppositions. These are constantly set down in our common almanacks, under the title and denomination of the 4 quarters of the Moon; and we are hereby given to understand; that the astronomers are now able to correct the mean motion, and to equate the anomalies of the Moon; an improvement in science, which the *Greeks*, their predecessors in astronomy, could never arrive to. Thus appears the depth of science in the ephemerides, and we cannot but admire the *speculative theory*, without any *possible application* either to civil or religious uses.

On the contrary, the original position and characters authorize me to say, and enable me to shew, that God placed the full Moon and (chaotic) new Moon, in the central points of two intersecting circles; to which centers they annually return, under the direction of proportional laws and determinate variations, a table of which will be given.

In fact therefore we have two models of Sun and Moon astronomy, transmitted to us; the one by *Moses*, and the other by the *Greeks*; and if we trace them to their respective origins, the one will terminate in divine revelation, and the other in an ambiguous

biguous response of the oracle of *Delphos*, concerning which we may speak hereafter.

As truth generates truth, and one genuine discovery readily opens the way to many more; so, if we argue (as we ought to do) from the fundamental principle,—*Haju leschanim*—we cannot overlook a distinction of years; and where must we reasonably search for this distinction of years, but in the terms and stile of sacred chronology?

*Moses* introduces and states the chronology of the beginning of the deluge in this peculiar ante-diluvian stile.

Gen. ch. 7. ver. 11. *In the six hundredth year of Noah's life, in the 2d month, on the 17th day of the month, on the same day, the fountains of the great deep were broken up, and the windows (Gr. cataracts) of Heaven were opened.*

It is a circumstance worthy of remark, that when *Moses* has laid down his principles, he never repeats them; but leaves it to the attention, understanding, and judgment of the reader, to collect, apply, and conclude from them.

Instead of an open declaration, for instance; that he measures by the solar years, and computes by the months and days of the lunar, he gives us *the year of a patriarch* to express the one, and *the month and day of the month* to denote the other.

Under the guidance of this *Mosaic principle*, we shall prove, that *Noah* was in the ark part of two solar, and part of two lunar, years.

The two solar years are distinguished by the numbers 600 and 601, *Gen. ch. 7. ver. 11.* and *ch. 8. ver. 13.*

The two lunar years are thus pointed out: *Noah* went into the ark on the 17th day of the 2d month of that lunar year, which was concurrent with the solar year of his life 600. And he received the divine command to come out of the ark, *Gen. ch. 8. ver. 14, 15,* on the 27th day of the 2d month of that lunar year, which was concurrent with the solar year of his life 601.

It will be granted without any considerable opposition, that here is a high degree of probability, and that the terms and stile made use of by *Moses* do plainly authorize and justify the application of the fundamental principle—*Haju lesbanim.*

For here is evidently, upon this principle, two solar years; following one another in immediate succession; and here is as evidently, upon the same principle, the 17th day of the 2d month of one lunar year, and the 27th day of the 2d month of another lunar year, following likewise in immediate succession; but the principal point of all, and which may be called conclusive, depends entirely upon the proof of that part of prop. 4. which sets forth,

That in the year of *Noah* 600, in which the deluge began and ended, there was a coincidence of the lunar year with the solar; and that the epact, in the conclusion of the year was 11, and is fairly deducible from the *Mosaic* account.

I am therefore to prove, not only that *Moses* measures the ages of the patriarchs by the years of the Sun, and computes by the months and days of the years of the Moon; but more particularly, that he has clearly ascertained in his historical narration the astronomy of the deluge, and with great accuracy and exactness determined the very position of the lunar year to the solar, which must necessarily be known from the epact.

If I do not make this appear in a clear, full, and satisfactory manner, all that may be advanced beside in this scheme will be of little or no avail. And the tables I. II. given above, must be said to owe their origin and existence in a great measure to the uncertainty of hypothesis.

There needs no additional proof to what has been already offered, that the *Mosaic* computations and chronology commence at the autumnal æquinox: and both the primitive solar and lunar year had but one and the same cardinal point, from the creation to the *Exodus*; when an alteration was made, in the beginning of the ecclesiastical and historical; the sacred and civil, lunar year, by the interposition and authority of the divine legislator: *Exod.* xii. 1, 2. But the beginning of measuring the solar, and the astronomy of the lunar, year, continued in their original state; as will be proved in its place.

I say then, that the year of *Noah's* life 600 begins and ends with the Sun's ingress to *libra*, and runs parallel with its corresponding solar revolution, A. M. 1656.

The

The first period of the *Mosaic* account extends from the beginning of the civil and historical lunar year (calculated from new Moon (C) to new Moon (C) to the beginning of the flood; and includes the space of 46 days, equal to one thirty-day month, and 16 days over, exclusive of the 17th day of the 2d month, in which *Noah* entered into the ark. p. 124-5, table. *see* *see* *see*

II. Ch. 7. ver. 4. *I will cause it to rain upon the Earth 40 days and 40 nights.*

Ver. 12. *And the rain was upon the Earth 40 days and 40 nights.*

Ch. 8. ver. 2. *And the rain from Heaven was restrained.*

Ch. 7. ver. 24. *And the waters prevailed upon the Earth 150 days.*

The impetuous violence of the falling rains, for 40 Nuethemerons inclusive, together with the breaking up of the fountains of (*Tebom*) the great deep, soon caused the ark to be lifted up above the Earth, (*ver. 17.*) and to float upon the surface of the waters; (*ver. 18.*) which prevailed, says *Moses*, *meod meod*, in an excessive degree, *until all the high hills which were under the whole Heaven were covered.*

Ver. 20. *Fifteen cubits upwards did the waters prevail, or were kept in a rising state, Vaijecussu haberim; when or after the mountains were covered. Postquam aperti fuerunt montes illi.—Jun. & Tremell.*

This

This 2d period of 150 days is divided into two parts, and has, agreeably thereto, two distinct terminations.

1. The uninterrupted 40 days rain; which, being added to the foregoing 46, make 86; so that *the rain from Heaven was restrained*, on the 26th day of the 3d equal month of the lunar year, in a continued reckoning from the beginning of it. p. 124-5, table.

2. The 110 days rising of the waters, after the ceasing of the rains; for the 40 days rain are included in the 150; (*ch. 7. ver. 24.*) and must be subtracted from them. These 110 days, being added to the foregoing 86, make 196; consequently the waters were abated, (*ch. 8. ver. 3.*) or ceased to rise any higher on the 16th day of the 7th equal month of the lunar year, exclusive of the day on which the ark rested, which was the 17th of the same month. *Ch. 8. ver. 4.* p. 124-5, table.

III. Ch. 8. ver. 5. *And the waters decreased continually until the 10th month: in the 10th month, on the first day of the month, were the tops of the mountains seen.*

This 3d period of the *Mosaic* account supplies us with 74 days; towards the completion of the lunar year, and leads us forward from the 16th day of the 7th to the 30th, or last day of the 9th equal

equal month. For  $74 \div 196 = 270$ , and  $9 \times 30 = 270$ . p. 124-5, table.

IV. Ch. 8. ver. 6. *And it came to pass at the end of 40 days, that Noah opened the window of the ark which he had made.*

Ver. 7. *And he sent forth a raven which went forth to and fro, until the waters were dried up from off the Earth.*

In this 4th period of his narration *Moses* changes his stile; from the chronological to the historical; perhaps, to notify to us the difference; for they each of them occur in the Scriptures; or perhaps, to avoid the frequent needless repetition of the month and day of the month.

We have gained from this period 40 days more towards the completion of the lunar year; these being added to 270, make 310 days; and they terminate on the 10th day of the 11th equal month; *Moses* therefore sent out the raven on the 11th day of the 11th month.

V. Ch. 8. ver. 8. *Also he sent forth a dove from him, to see if the waters were abated from off the face of the ground.*

Ver. 9. *But the dove found no rest for the sole of her foot, and she returned unto him into the ark: for the waters were on the face of the whole Earth. Then he put forth his hand and took her, and pulled her in unto him into the ark.*

Ver.

Ver. 10. *And he stayed yet other 7 days, and again he sent forth the dove out of the ark.*

Ver. 11. *And the dove came in to him in the evening, and, lo! in her mouth was an olive-leaf plucked off: so Noah knew that the waters were abated from off the Earth.*

Ver. 12. *And he stayed yet other 7 days, and sent forth the dove; which returned not again to him any more.*

It is evident from these words, in the beginning of the 10th verse—*he stayed yet other 7 days*—that Noah waited a whole week, *i. e.* from the 11th day of the 11th month inclusive, to the 17th day of the same month inclusive, for the return of the raven; but being disappointed in his expectations, *for the raven went forth to and fro, until the waters were dried up from off the Earth,* ver. 6. he sent out the dove the first time, on the 18th day of the 11th month; which, *finding no rest for the sole of her foot, returned to him into the ark,* on the same 18th day.

Another week being ended, immediately following that in which he waited for the return of the raven—*for he stayed yet other 7 days,* says the text, ver. 10. he sent out the dove the 2d time, on the 25th day of the 11th month. For  $18+7=25$ , and  $25-11=14=7+7$ .

On the evening of the 25th day of the 11th month, the dove came unto him, and *lo! in her mouth an olive-leaf plucked off.* *And he stayed yet other 7 days,* and sent out the dove the 3d

and last time (for she returned not again unto him any more) on the 2d day of the 12th month. For  $25 + 7 = 32 - 30 = 2$ .

We have now collected 11 equal months, and 2 days over, which amount in the whole to 332 days, and the last period of the account is clearly connected with the first, and that with the beginning of the year; but of what year, is a problem, which has never yet received (since the knowlege of it has been lost) a satisfactory solution.

*Moses* having brought us regularly down to the 2d day of the 12th month, we are presently perplexed with a seeming interruption of the calendar; and in this seeming interruption lies all the supposed difficulty; and it must be acknowledged, that this difficulty would have become insuperable, if *Moses* had not continued his narration to the 27th day of the 2d month (*Gen. ch. 8. ver. 14.*) of the next successive lunar year; and as *Noah* went into the ark on the 17th day of the 2d month of the lunar year, immediately preceding; had he been ordered to come out either one day sooner, or one day later, than is related by *Moses*; this difference of only one day, (such was the then position of the Sun and Moon in the Heavens) would have proved an effectual bar to our discovery of the epact, and together with it, of the astronomy of the year.

Before I apply myself to consider the remaining periods of the history and chronology, we may remember, that the last particular, mentioned by  
*Moses,*

*Moses*, was *Noah's* sending out the dove, on the 2d day of the 12th month, with this remark subjoined, *viz. which returned not again to him any more.* But do not these words imply *Noah's* expectations of its return? Here a nice and material question occurs, *viz.* Can we determine without any hypothesis, or arbitrary assumption, how many days precisely *Noah* waited for the return of the dove, after he had sent it out the 3d time? For in the answer to this question, we shall meet with the solution of the problem. Now, I say, if we steadily adhere to the principles laid down, the question may be easily answered, and the problem as readily solved. The principles laid down were, that *Moses* measures by the year of the Sun, which is of 365 days  $\frac{1}{4}$ ; and computes by the months and days of the year of the Moon, which is of 354 or 355 days. But here the *Mosaic* narration opportunely steps in to our aid, and determines the quantity of the then current lunar year, and consequently, the precise number of days *Noah* waited for the return of the dove, sent out the last time; as I shall make evident to the reader, if he will take along with him the following Axioms.

#### Axiom I.

When the lunar year is connected with the solar, and carried along together with it, by a true astronomical computation, amidst the various positions of the Moon to the Sun at the autumnal æquinox; it must needs happen sometimes, that

the last day of the lunar year will fall on the last day of the solar. This for want of a more proper term, I beg to call a commensuration ; *i. e.* ending together. When this happens, then of course the first day of the following lunar year will fall upon the first day of the solar. This I call a coincidence of the lunar year with the solar, *i. e.* a beginning together.

#### Axiom II.

Whenever there happens a co-incidence of the lunar year with the solar, and the quantity of the current lunar year is given, the epact at the end of the year is also given. For  $365 - 354 = 11$ , and  $365 - 355 = 10$ .

On the contrary, if the given epact be either 11 or 10, we may with certainty infer a co-incidence, and the quantity of the lunar year. For  $365 - 11 = 354$ , and  $365 - 10 = 355$ .

#### Axiom III.

The epact can never enter within the cardinal limits of that solar year, with which the current lunar year is connected ; but, being added to the conclusion of the preceding lunar year, measures astronomically the distance from thence to the beginning of the subsequent solar.

#### Axiom IV.

As *Moses* states the chronology of the deluge, in such an authoritative stile, we must conclude from thence, that those, to whom he primarily wrote, were

were well acquainted with the astronomical calendar, and fixed laws of computation; and, that they stood not in need of precise definitions, and more particular explications. And,

If we will carry along with us the principles of the *Pentateuch*, and argue and conclude from *them*, we can no more mistake the *distinction of years* than they could, nor the curious laws of their connection. And as we live in the astronomical age, we cannot be supposed to be ignorant, that the solar year contains at least 365 days, and the lunar year 354 and 355. By the assistance of this small degree of previous knowledge, we shall soon be convinced, that *Moses* has not left the calendar of the year of the deluge, in the state and condition of an imperfect fragment, but, on the contrary, that any additional circumstance would have been needless and superfluous.

Thus much may suffice as preparatory to the solution of the question, *viz.* How many days precisely *Noah* waited for the dove, sent out the 3d time?

We are certified from the accounts of *Moses*, that the whole space of *Noah's* abode in the ark is bounded by the 17th day of the 2d month of one year, and by the 27th day of the 2d month of the next year following; and as 1 m. 16 d. (p. 124-5, table) were lapsed before the entrance, so 1 m. 27 d. were reckoned before he received the command to go out. We have then 30+16 days on the one side, and 30+27 days on the other: throw off the 30 on both sides, and there

there will remain, 16 days and 27 days ; but  $27 - 16 = 11$ .

Now, I say, that this differential number 11, (though we shall shew a more proper deduction of it hereafter) cannot be proved to be the true astronomical epact, upon any other terms and conditions, than that of *Noah's* continuing in the ark 365 days, or a compleat solar year, neither one day more, nor one day less ; including the day he went in, and the day he was commanded to go out.

From 354 subtract 46, (the number of days which preceded the flood) (p. 124-5, table) remains 308. But  $308 + 57 = 365$ , and,  $365 - 11 = 354$ , the quantity (as may be proved) of the current lunar year.

Though the foregoing deduction of the epact 11 is true, yet I am obliged to take notice that it is not accurately made in all its circumstances : and I shall take occasion not only to enlarge, but to set it in a different light ; my chief design at present being only to shew, that since the epact was 11, (and it will clearly appear that this was the epact at the end of the year of *Noah's* life 600) we may with certainty infer (by Axiom II.) the co-incidence of the luminaries, and the quantity of that lunar year, by the months and days of which *Moses* has hitherto computed.

From these premises we are instructed to give a determinate answer to the question proposed in the following manner : *Noah* sent out the raven on the 11th day of the 11th month, each contain-

ing

ing 30 days; 310 days were therefore completed in a continued reckoning from the beginning of the year, or the autumnal æquinoctial new Moon evening. The complement of the year is 44 days; for  $354 - 310 = 44$ . These 44 days were divided by the narration into two equal partitions; for  $332 - 310 = 22$ , and  $354 - 332 = 22$ . Consequently, as 22 d. or 3 weeks and 1 day, exactly measure the distance from the 11th day of the 11th month, to the 2d day of the 12th; on the former of which, *Noah* sent out the raven, and on the latter the dove, the 3d and last time; so likewise, 22 d. or 3 weeks and 1 day exactly measure the distance from the 2d day of the 12th month (exclusive) to the end of the current lunar year, or the autumnal æquinoctial new Moon evening. But the dove not returning on that day, *Noah* gave over all farther expectations, and *Moses* thus proceeds in his narration.

VI. Gen. ch. 8. ver. 13. *And it came to pass, in the six hundredth and first year, in the first month, the first day of the month, the waters were dried up from off the Earth: and Noah removed the covering of the ark, and looked, and behold, the face of the ground was dry.*

*Moses*, in the unalterable stile of his chronology, first gives us the age of a patriarch to direct us to the year of the Sun; and then the month and day of the month, to direct us to the year of the Moon.

He

He that reads this important text in the original *Hebrew*, will soon perceive it to be a key of solution; and at least a strong confirmation, if not an undeniable proof; that I have rightly interpreted and properly applied that original divine law, let *them* be for years.

When *Moses* has occasion to describe any intermediate month; he constantly introduces an *ordinal* number to determine its situation in the calendar, and then specifies the day. *E. g.*

*In the 2d month, the 17th day of the month—  
in the 10th month, on the 1st day of the month.*

But when one lunar year had finished its revolution, and he was going to adjust his chronology to the beginning of another, we find a remarkable variation in his style, which neither the *Greek* version, nor the *English* translation convey to us.

*Gr.* Τὸ πρῶτον, ἐν πρῶτῃ τῷ μηνὸς.

*English* translation, “In the 1st month, on the 1st day of the month.”

In these versions, jointly considered, there is no visible difference between this and his usual method of determining any of the intermediate months, whilst in the *Hebrew* text, there is an evident distinction, and a very material peculiarity. For instead of saying, as in other instances, *Be ehad, Be ehad le Chodesh*—there is substituted in the room of the ordinal number, *Ehad*, the appropriated term *Rishon*, and he writes thus, *Be ba Rishon, Be ehad le Chodesh*.

*Berishon* differs little more than in termination from the first word of the *Pentateuch*, *Bereshith*.

And

And as that is rightly interpreted by St. *Basil*—  
 ΕΝ ΑΡΧΗ ΤΗ ΚΑΤΑ ΤΟΝ ΧΡΟΝΟΝ—in the beginning of time ;  
 so this latter may with equal propriety be inter-  
 preted—ΕΝ ΑΡΧΗ ΤΕ ΚΑΤΑ ΤΟΝ ΕΝΙΑΥΤΟΝ, in the head or  
 beginning of the lunar year. And in truth, if  
 we rightly weigh and take a more close view of  
 this *Mosaic* term *Rishon*, we shall find it to vary  
 more in *sound* than in *sense*, from the *Jewish* *Rosh*  
*hashanah*.

We shall have occasion to speak again of *Rishon*,  
 when we come to treat of the change of the be-  
 ginning of the lunar year, and of its being trans-  
 ferred from one cardinal point to another.

When we read these words, *Be ha Rishon*, *Be*  
*echad le chodesh*, can we only consider them as the  
 language of one transmitting to future ages, a *tra-*  
*ditional observation*, (“ *The best they were able to*  
*make,*”) of the Moon’s visibility?

I must not omit to observe in this place, that  
 when *Moses* is settling the chronology of the be-  
 ginning of the deluge, he expresses himself thus,  
*viz.* In the six hundredth year of *Noah*’s life—  
 But when that lunar year was ended, which was  
 concurrent with the solar year of *Noah*’s life 600,  
 and he is going to calculate the beginning of the  
 next, or of that lunar year which was connected  
 with the next succeeding solar year 601, (whose  
 epact, or limited number of days of its first month,  
 fell within the cardinal limits of the year 600)  
 he only says—In the six hundredth and first year—  
 and drops the following words—*of Noah’s life.*

I know it may be easily said, that this is only an ellipsis, which is frequently left to be supplied by the understanding of the reader. But I here beg leave to reply, that had *Moses* explicitly wrote, in the six hundredth and first year of *Noah's life*, these additional words would have created great difficulties in his chronology. For the solar year of *Noah's life* 601, is bounded on both sides by the cardinal points; and *Noah* could not be said to have entered into it, in any consistency with *Moses's* astronomical law of reduction, before all the days of the epact, which come before the æquinox, had been measured.

But here it may be urged perhaps, by way of objection, that this only changes one difficulty for another. For is it not equally improper and inconsistent to mention the six hundredth and first year, before it commenced; as the six hundredth and first year of *Noah's life*, before he had entered upon it?

But in answer to this, I beg the favour of the reader to return back to table III. and p. 103. A. M. 3. where he may perceive the new Moon epact to be 7; but although the 7 days of this epact are comprehended within the extreme points of A. M. 2. yet are they evidently a part of that lunar year, 347 days of which fall within the limits of A. M. 3. which is the solar year next following, and parallel with the 3d year of *Adam's* life.

Now if any event had fallen in the beginning of this lunar year of sufficient importance to have had

had its chronology fixed by the pen of *Moses*, he would not have wrote—in the 3<sup>d</sup> year of Adam's life, but thus—in the 3<sup>d</sup> year, in the 1<sup>st</sup> month, on the 1<sup>st</sup> day of the month.—And we should have been certified by this form of expression, that the lunar year which was concurrent with A. M. 2. was ended ; and that he was now calculating the beginning of another, or of that lunar year which was connected with A. M. 3. or the next solar year in immediate succession.

From hence we learn, that every solar year is to be looked upon in two different views. (1) As measuring the corresponding year of the life of a *Patriarch*. (2) As following another in immediate succession, without considering it as such a measure.

It is all one in point of chronology, if we substitute the year of the world 1657, instead of the year 601. *Moses* gives us the latter to inform us of his astronomical law of reduction ; and to let us know, that his tables are founded upon these two laws, *viz.*

I. That the years of the *Patriarchs* run parallel with the years of the world.

II. That every current year is the true solar.

The above observation, I apprehend, is no trivial criticism, or speculative refinement, but a necessary distinction which requires our attention.

VII. Gen. ch. 8. ver. 14, 15, 16. *In the 2d month, the 27th day of the month,—God spake unto Noah saying, go forth of the ark.—*

I shall only make this one short remark upon this last period, *viz.* *Moses* here closes the history of the deluge, its chronology, and its astronomy; which he has left in such a state of perfection, that no theories, tables, or calculations; that neither the depths of science, nor the most elaborate rules of art, can make any improvements upon it. This is much to say, but it is much more to prove it.

I shall now digest into order, and set in one entire view, all the particulars of *Moses's* narration, which we have hitherto been examining.

*The solar year of Noah's life, 600.*

M. D. months and days of the lunar year.

	M.	D.	Gen. ch. 7.
Period I.	I.	0	
	II.	16	46 days before the flood.
	II.	17	Ver. 11. <i>Noah</i> enters the ark.
II.	III.	26	40 ver 12. rains cease.
	VII.	16	110 The waters continue rising 40 + 110 = 150 days.
	VII.	17	Gen. ch. 8. ver. 4. The ark rests.

III.

	M.	D.	
		196	<i>Brought over.</i>
III.	{	IX. 30	74 The waters decrease.
		X. 1	<i>Ch. 8. v. 5.</i> The tops of the mountains seen
IV.	{	XI. 10	40 <i>Noah</i> waits before he sent the raven.
		XI. 11	1 <i>ver. 7.</i> The raven sent out.
		XI. 17	<i>Noah</i> waits for the return of the raven.
		XI. 18	7 The dove sent out the first time.
		XI. 25	7 <i>ver. 10.</i> The second time.
		XII. 2	7 <i>ver. 12.</i> The third and last time.
		*	
Sum Tot.		<u>332</u>	

*The solar year of Noah's life, 601.*

M. D. months and days of the lunar year.

M.	D.	<i>Gen. ch. 8.</i>
I.	30	<i>ver. 13.</i>
II.	27	<i>ver. 14.</i>
	*	

Sum Tot. 57

We have here the collected number of 332 days, under the year of *Noah's* life 600, and of

57 days, under the year of *Noah's* life 601. Should it be asked in what manner we are to reason upon them, how we are to apply them, and what to conclude from them, my answer is, that it hath been already determined upon the principles of the *Pentateuch*, that they are the months and days of two distinct lunar years; and that *Moses* measures by the solar, and instructs us rightly to compute by the lunar, year.

Was it possible, upon this occasion, to call in and consult an antient *Greek*, a *Jew*, and a *Turk*, all acquainted, in their way, with the lunar computation; as soon as they should be informed that a certain event was historically related to have come to pass on the 332d day of a lunar year, they would, without hesitation, assign for its complement 22 days, the space which *Noah* waited for the return of the dove, sent out the third and last time, But the *Turk* would endeavour to know whether it was of 354, or of 355 days; if the former, he would say, 22 days must be added; if the latter, 23; whilst the *Athenian* and the *Jew* would be silent in this particular. They would be equally surprized that the 332d day of a lunar year should be calculated to be the 2d day of the 12th month, and would jointly insist upon it that it must necessarily be the 7th, because  $7 + 22 = 29$ . They would unanimously agree, that *Moses* was certainly no astronomer, because he had betrayed such a gross and total ignorance of the *menstrual revolutions* of the Moon,  
and

and was an entire stranger to its *periods* and *synods*.

From these 332 days, and their complement 22, as *Moses* has brought down the account to the 2d day of the 12th month, we are clearly and fully informed, not only of the number of the days in a month, but also in what manner the *Antediluvians* computed and adjusted the months of the lunar year. For,

	M.	D.	D.	D.
To	11	+	2.	and to, 330
Add	22.			+
		22.		22.
	—————		—————	—————
We have,	11	+	24.	330
				+
				24.
				354.

From these several results, we assuredly know, that the patriarchal lunar year, digested into a calendar, was compounded of 11 thirty-day months, whilst the 12th consisted of 24 days, and sometimes of 25. For  $354 - 330 = 24$ , and  $355 - 330 = 25$ .

It is matter of some surprize, how it came to pass, that all, who have hitherto made the enquiry, should agree in concluding, that *Moses* has left the calendar of the deluge in a precarious, uncertain, and imperfect state. Should the reason be nicely examined into, it might be alleged, perhaps, that it is owing to this, *viz.* because *Moses* has not expressly related, that *Noah* sent out the dove, the 3d and last time, at the distance of 22 days precisely, from the autumnal æqui-

æquinoctial Moon's visibility. But should this be alleged as the ground of the uncertainty, must it not be immediately removed, as soon as we come to consider that *Moses* primarily addressed his chronology to those who are well versed in the astronomical calendar, and habitually exercised in the stated laws and rules of its calculations?

Suppose some *English* historian had related a very memorable event to have happened, A. D. 1656, *Feb.* 2d, would the *English* reader, who was familiarized to the *Julian* calendar, and constantly reckoned the times by its months and days, have stood in need of such a minute explicit remark as this, *viz.*

*N. B.* *February* is the 2d month in the *Julian* calendar, and in every common year has 28 days, but in a bissextile, or at the end of every 4th year of 366 days, it has 29?

Would not the *English* reader, I say, have justly looked upon such an explicit remark as this, rather as an affront to his understanding, than a necessary information; and have thought the historian an injudicious and circumstantial trifler?

It may not be allowed as yet perhaps, that these are parallel cases, but the farther we proceed the more we shall be convinced that they are.

We may reasonably imagine, that much of the primitive knowlege, and many antient traditional dogmata, subsisted amongst the *Hebrews* and the  
If-

*Israelites*, in the times when *Moses* wrote ; which are entirely lost to us. And consequently, we have no other light to guide our steps, and direct our pursuits after *original truths*, but the principles, data, and terms, &c. which are recorded in the *Pentateuch*. And indeed, if we rightly estimate their *number* and their *value*, we have no great cause to complain.

But here perhaps an opponent may arise, and zealously allege against all that has been offered in support of a distinction of years, the *contrary sentiment* of archbishop *Usher*. And it is possible that such an opponent might argue thus :

Have we not equal reason from *Moses's* account to complete these 332 days into a solar year (as the judgment of the learned archbishop of *Armagh* led him to conclude) as into a lunar year ?

To which I would reply :

Have we not equal reason from *Moses's* account to complete them into a lunar year, as into a solar ?

He would appeal to the authority of the archbishop, and I would appeal to *Moses's* fundamental principle—*Haju lesbanim*—Let them be for years.

Will any one engage to prove that I have misinterpreted the *Hebrew* text, and misapplied the principle ? If not,—then where shall we find an arbitrator ? And who will undertake to moderate the dispute between the authority of archbishop *Usher* and the writer of the *Pentateuch* ?

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But

But in order to shew a due difference and regard to the decision and judgment of the truly great and learned *Primate*, I will resolve these 332 days into their equal months, and digest them into two distinct columns, and then we shall see what advantage a defender of the solar hypothesis will be able to gain.

The months and days of the solar year.			The months and days of the lunar year.		
I.	30	30	I.	30	30
II.	30	60	II.	30	60
III.	30	90	III.	30	90
IV.	30	120	IV.	30	120
V.	30	150	V.	30	150
VI.	30	180	VI.	30	180
VII.	30	210	VII.	30	210
VIII.	30	240	VIII.	30	240
IX.	30	270	IX.	30	270
X.	30	300	X.	30	300
XI.	30	330	XI.	30	330
XII.	2	332	XII.	2	332
	*	*		*	*

Upon the first view of this distribution of the months it might be fairly said, is it not evident to sense, that 33 days (according to the prelate's determination) are the complement of the solar year?

True: but is it not as evident to sense, that 22 days (according to a contrary determination) are also the complement of the lunar year? We are

are still therefore upon an equality, nor is there any advantage gained.

Had this been a real and not an imaginary contest, it must, I think, have been entertaining; and perhaps, surprizing to those who could not see as yet beyond the veil.

But to put a stop to unnecessary amusements, I will be bold to say, it is impossible for the most subtile and the acutest reasoner, by any methods of arguing, to supersede the certainty of that fundamental principle of the *Pentateuch*, (by whose sole influence, as by a faithful polar star, I have all along directed my course) and that, for this special reason, because this equal distribution of months and days has a real foundation *in nature*; it is the immediate result of a true astronomical coincidence of the lunar year with the solar, at the time of the deluge. By virtue of this co-incidence, the months and days of the solar year (by which *Moses* only measures, but never computes) lie concealed under the months and days of the lunar: and as the months contain 30 days respectively, they must needs be exactly commensurate to each other. This is called by the mathematicians *Epharmosis* or adaptation, and we may see it exemplified in the 4th prop. of *Eucl.* elements.

Hence it comes to pass, and we cannot sufficiently admire it, that the 1st day of the 1st month of the lunar year was also the 1st day of the 1st month of the solar.

And the 17th day of the 2d month of the lunar year, (by which *Moses* computes *Noah's* entrance

trance into the ark) was also the 17th day of the 2d month of the solar. To pass by the intermediate co-incidences, I shall only add, that,

The 2d day of the 12th month of the lunar year (on which, as *Moses* relates, *Noah* sent out the dove, the 3d and last time) was also the 2d day of the 12th month of the solar.

Now we begin to draw near to a point; the scene is opening, and that seemingly inaccessible truth (*quæ a seculis in puteo latuit*) is ready to display itself, by a most easy and obvious calculation. For as 33 days are the complement of the solar year, and 22 of the lunar; these complementary days (by means of the co-incidence, which will be demonstrated to be true) must necessarily include the true astronomical epact, and it is the difference of the two additional numbers; so that the whole calculus is no more than simple subtraction, *viz.*  $33 - 22 = 11$ , the epact.

We may properly enlarge it thus,  $332 + 33 = 365$ , and  $332 + 22 = 354$ . And  $365 - 354 = 11$ , the epact as before.

Let it be carefully noted, that this last calculation, easy and simple as it is, not only gives the epact, but places it in its true natural situation, at the end of the year of *Noah's* life 600.

Again,  $365 - 11 = 354 - 354 = 0$ , the index of commensuration.

If these things are so; then surely it may be said, that those reasonings and decisions (ascribe them to whom you will) must be thought *somewhat deficient*; which, overlooking the lunar year,

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entirely lost the lunar epact, and, in sure consequence of that, the astronomy of the *Pentateuch*.

The following sentiment and resolution is as justifiable in chronology, as in natural philosophy.

*Nullius addictus jurare in verba magistri.*

The precise number of days which *Noah* stayed in the ark, are the most important circumstance of the chronology of the deluge, and the certainty of the deduction entirely depends upon them.

*Longinus* thought fit to characterize the *Jewish* legislator with this title—*ετυχων αυτης*, a no ordinary man; and cites these words of the *Pentateuch*, *γενεσθω φως κ̄ γενετο*, to illustrate the true sublime; and yet *Moses*, without any studied ornaments of speech, or affectation of language, in the most natural simplicity of a plain historical narration, transmits to these latter times, I will add, to the most remote and distant ages to come, not only the uniform, beautiful, and most admirable contexture, but also the most exact astronomy, of the antediluvian calendar and patriarchal year. Nay, he, with the same unaffected simplicity, records the laws of calculation in his principles, data, and terms.

For my own part, when I read and *consider* the secrets and the wonders of the narration, it seems to me impossible for any one, except the *Epicurean* deist, to doubt of the divine superintendence

tendence with respect to *Moses*; and a providential prædetermination with respect to *Noah*.

Had *Noah* abode in the ark one day more, or one day less, than as the time now stands punctually limited, we could not have recovered from the history of the deluge the original celestial year.

How far we may be able to philosophize upon *Noah's* flood, as to its natural causes, and its natural effects, I do not know; I can only tell, that from *Moses's* account, we have a plentuous promp-  
tuary and fund of useful knowlege and instruction.

If we will be at the pains to examine in what manner archbishop *Usher* reckoned the time of *Noah's* continuance in the ark, we shall soon perceive, that his mistake is not so entirely owing to the error of a principle as to a partial consideration.

The following extract from his *Chronologia sacra*, (ch. 3. p. 16.) will evidence his hypothesis, and the ground of the mistake.

“ *Illud igitur immotum maneat, quod spiritu*  
 “ *sancto tam luculenter habemus expressum, anno*  
 “ *600, vitæ Noæ, mense 2, die 17, diluvium*  
 “ *cœpisse: anno 601, mense 1, die 1, superficiem*  
 “ *terræ aquis liberatam, & mense 2, die 27, tellu-*  
 “ *rem planè arefactam esse: & consequenter inte-*  
 “ *grum annum (ut de excurrentibus diebus nihil*  
 “ *dicamus) Noam in arcâ exegisse.”*

The reader may be pleased to observe, that the following calculus proceeds upon the solar, *i. e.* archbishop *Usher's*, hypothesis.

$365 + 57$  (solar days)  $= 422 - 46$  (days, which lapsed before the flood)  $= 376 - 365 = 11$ . This remainder the archbishop calls *excurrent days*, or which exceeded the measure of the solar year. But in truth, they are the days of the epact, and, by a mistaken hypothesis, have been reckoned twice over; first in the additional number 33, (which includes them as the epact in its true place, at the end of the year 600, as was noted above) and again in the number 57; which are days of the lunar year, and not of the solar. From 57 lunar days subtract 11, the remainder 46 gives the corresponding month, and day of the month, of the solar year 601.

*Noah* then was ordered to come out of the ark, on the 16th day of the 2d month of the solar year 601; yet we expressly read, Gen. ch. 8. ver. 14. *In the 2d month, the 27th day of the month, God spake unto Noah, saying, Go forth of the ark.*

Therefore *Moses* measures by the years of the Sun, but computes by the months and days of the year of the Moon.

Should any doubts still remain upon the reader's mind, as to the certainty of this distinction of years (which I so strongly plead for, and aim to establish) I am in hopes, that what I am going farther to add will entirely dissipate them, and set every point in a clear, and in its proper light.

From

From the first day of the 1st month (inclusive) of the year of *Noah's* life 600, to the 27th day of the 2d month (inclusive) of the year of his life 601, in which he was commanded by God to go forth of the ark, there had passed one entire solar year, and part of another ; and also (through the coincidence) one entire lunar year had passed, with part of another, whether *Moses* computed by its months and days or not. But should it be concluded that he did not, then I ask, how will it be accounted for, if I am found capable of adjusting from the stile of *Moses's* chronology, and the circumstances of his narration, the very same position of this lunar year to the given solar, as the astronomer will find by a backward computation to that year ?

I will beg the favour of the candid reader's attention to the following part of the deduction, which will approve itself to be in the conclusion, one of the most perfect exemplars or astronomical chronology that was ever delivered to the world. When the God of nature, the creator of the luminaries, vouchsafes himself to determine (and incites his amanuensis to record) the times and seasons, can the divine computation fail to awaken our attention ?

My enquiries must still proceed upon the original principle of the twofold year, and the argument in its favour is obvious and concise. *Moses*, in the introduction to his *Pentateuch*, opens his history with the mutual offices and settled ordinations of the two great luminaries. Now here  
*Moses*

*Moses* either lays down a fundamental principle as a directory, or he does not. If he does not, all enquiries of this kind must needs be as vain as groundless. If he does, why may we not presume with confidence, upon his application of it?

Should any one object against my reading the text thus—In the six hundredth (solar) year of *Noah's* life, in the 2d month, the 17th day of the month, of the (lunar year)—what methods would he take to convict me of error? I will try to argue for him, and see what may be urged.

First, in one entire solar year which had passed, there are 365 days, and 57 given towards another, which may be set down thus,

A. 600.	A. 601.
D.	D.
365	57.

But I should reply, that in one entire lunar year which had also passed, there are 354 days, and 57 given towards another, which, according to my directory, I should set down in this distinct manner.

A. 600.	A. 601.
Solar year   365	—   46.
Lunar year   354	11   46.

Secondly,  $365 - 46 = 319$ , and  $319 + 57 = 376$ . From hence it may be inferred, that *Noah* was in the ark a whole solar year, and 11 days over.

But not to continue these arguings any farther, I think I may safely say, that they are not of sufficient

ficient force to overthrow, or so much as weaken those foundations on which I hope to raise a compact and firm superstructure.

As to the precise number of days, in which *Noah* was confined to the ark, my directory instructs me to collect, state, and determine them in a different manner, and the calculation must be framed to correspond with the distinction of years. But here we must remember the co-incidence and its effects. For,

As 46 days of the lunar year, so likewise an equal number of the solar, must needs have been measured before *Noah* entered into the ark. This suggestion being sufficient, I shall proceed to the calculation, and number the several steps.

(1)  $354 + 57 = 411$ . These 411 days measured the entire space from the beginning of the year 600, to the last day of *Noah's* continuance in the ark.

(2)  $57 - 11 = 46$ , and  $365 + 46 = 411$ . The solar days, by means of the co-incidence, must necessarily be equal to the lunar, and we see here that they are so.

(3)  $411$  (lunar days)  $- 46 = 365$ . These 365 days limit the time of *Noah's* confinement, without excess or defect.

(4)  $411$  (solar days)  $- 46 = 365$ , as before. Although *Noah* was in the ark 365 days, or the quantity of a solar year, yet was it not a distinct solar year, following in a regular succession, but is compounded of the parts of two solar, and of the

the parts of two lunar years. We must therefore separate and determine these parts respectively. I say then,

(5)  $354 - 46 = 308$ , and  $308 + 57 = 365$ , as before.

(6)  $365 - 46 = 319$ , and  $365 - 319 = 46$ . Then  $319 + 46 = 365$ , as before. Set the several parts orderly down in the following manner.

A. 600.    A. 601.

Solar year 319 | + 46 } = 365. The days of  
Lunar year 308 ( | + 57 } *Noah's* confinement.

From this disposition, even sense may judge, that *Noah* was confined to the ark, 319 days of the solar year of his life 600, and of the concurrent lunar year 308. To these we must add 46 days of the solar year of his life 601, and of the concurrent lunar year 57, and we have the whole space on both sides.

(7)  $319 - 308 = 11$ , the epact, in its proper place, at the end of the year.

Thus much may serve to introduce the principal points to be proved, which may be justly reckoned among the depths of genuine sacred chronology, and have lain hid for ages. Nor is it an ordinary satisfaction to be assured, that they are all capable of a proper solution.

I was sollicitous some pages past to make it seem probable, that *Noah* waited for the return of the dove sent out on the 2d day of the 12th month, 22 days precisely, or to the end of the

current lunar year : and I might have rendered it more probable by varying and enlarging the argument. For the recorded number of days of the first lunar year are 332, and the recorded number of days of *Noah's* confinement may be thus obtained ; *viz.*  $332 - 46 = 286 + 57 = 343$ , which is the number sought. Set these two numbers down together with the well known quantities of a common lunar and of a civil solar year, in one line.

332, 343, 354, 365.

From this situation of these numbers, we may readily perceive,

First, that 22 days are the complement of 332 into a lunar year, and of 343 into a solar, or the time of *Noah's* abode in the ark.

Secondly, that they follow one another in arithmetical progression, continually encreasing by 11, and that the last of them in order is the epact, in its natural situation, at the end of the year.

But having made a farther progress, and in some measure opened the scene, instead of calculating probabilities, and searching for arguments to confirm them, I shall now exert my endeavours to remove far off from the reader's mind, all thoughts and apprehensions of *uncertainty* and *interruption* ; and here I scruple not to assert, and shall apply myself to prove, that if *Moses* had not related any one circumstance of the deluge, besides the year, month, and day of *Noah's* entrance into the ark, and going out of it, he would by  
*this*

*this stile* alone have rendered both the calendar and the astronomy of the year, absolutely perfect and complete; excepting only the necessity of knowing the quantity of *Chodesh*: he would, by *this stile* alone, have accurately settled and determined these 3 things. (1) The co-incidence of the lunar year with the solar. (2) The limited number of days contained in the epact. And, (3) in consequence of that, the quantity of the lunar year, immediately preceding. Nay, I durst go a step farther, and say, that when God commanded *Noah* to go forth of the ark, in the six hundredth and first year, in the 2d month, the 27th day of the month, he, *at the same time*, expressly determined, and *Moses*, by the *same terms*, expressly recorded (as he had before stated the time of his entrance) the *then position* of the Sun and Moon in the Heavens.

In order to illustrate the truth, and evince the certainty of this unexpected and amazing proposition, I shall beg leave to borrow the stile and terms of *Moses's* chronology, (for historical circumstances and facts are not indispensibly necessary) and transfer them from the year of *Noah's* life 600 and 601, to the years of our Lord (according to the vulgar account) 1066 and 1067, which comprehend the first year of the reign of *William the conqueror*.

According to the *English* chronicle, *William the conqueror* began to reign *October 14*, A. D. 1066, and he reigned, by the accounts of history, 20 years, 10 months, and 26 days. These  
odd

odd months and odd days may be very pertinent, and have their use in a chronicle bound to historical verity; but they are so far from being essentially necessary, that they cannot be admitted into a canon, adapted to the purposes of astronomical chronology. Witness *Ptolemy's* cannon of kings, (whose infallibility depends upon calculated eclipses) but much more and above all, *Moses's* tables of the genealogies of the patriarchs, (which the more the reader examines, the more he will admire) both before and after the flood, ever consisting each of them of integral years.

Rejecting therefore *October 14, A. D. 1066*, we will carry back the beginning of his reign to the beginning of the year, and make the years of *his* reign, and of the reigns of *all the succeeding kings and queens since the conquest*, run parallel with their corresponding *Julian*; having received my chiefest instructions from the uniform astronomical law of *Moses's* canon of patriarchs.

To shew that we are not pinned down to this, the table of kings, &c. subjoined, may be considered, if we are so disposed, under a twofold reduction; *viz.* First, to the *Julian* calendar, as it is by its author extended from *January 1* to *December 31*. Secondly, to the same, as it may be calculated from the *Mosaic* cardinal point, to the same cardinal point again: of which reduction the characters of the Sun's ingress to *libra*, placed in each of the extremes of A. M.

☉5073☉, are a sensible indication.

A TABLE of the kings and queens since the conquest, the years of whose reigns are made to run parallel not with the *Julian*, as it lies extended from *January 1* to *December 31*, but, as it may be computed, from the Sun's ingress to *libra*, and its return to the same point again.

Names of kings and queens.	Years of reign	Anni Ær. Ang.	A. M.	A. D.
			5073	1066
William I.	21	21	5094	1087
William II.	13	34	5107	1100
Henry I.	35	69	5142	1135
Stephen	19	88	5161	1154
Henry II.	35	123	5196	1189
Richard I.	10	133	5206	1199
John.	17	150	5223	1216
Henry III.	56	206	5279	1272
Edward I.	35	241	5314	1307
Edward II.	20	261	5334	1327
Edward III.	50	311	5384	1377
Richard II.	22	333	5406	1399
Henry IV.	14	347	5420	1413
Henry V.	9	356	5429	1422
Henry VI.	39	395	5468	1461
Edward IV. V.	22	417	5490	1483
Richard III.	2	419	5492	1485
Henry VII.	24	443	5516	1509
Henry VIII.	38	481	5554	1547
Edward VI.	6	487	5560	1553
Mary I.	5	492	5565	1558
Elizabeth.	45	537	5610	1603
James I.	22	559	5632	1625
Charles I.	24	583	5656	1649
<i>Abasileutus</i> I.	11	594	5667	1660
Charles II.	25	619	5692	1685
James II.	4	623	5696	1689
Wil. III. M. II.	13	636	5709	1702
Ann	12	648	5722	1714
George I.	13	661	5734	1727
George II.	23	684	5757	1750
Current	24	685	5758	1751

Should

Should a proper authority give a sanction to this astronomical reduction, noted in the table by its symbols, and re-establish the antient original laws of measuring by the years of the Sun, and of computing by the months and days of the years of the Moon, we should soon be sensible of the benefit. Then our accounts would be no more perplexed with the *civil præcessions* of the æquinoxes, nor should we ever hear again of the *lunar anticipations*. For neither the one nor the other have a just foundation in nature; but owe their origin, and all their hypothetical and delusive powers to an erroneous computation: but this reduction being admitted, and these laws restored and applied, no possible mistake could arise, no after error be ever able to insinuate itself into our chronology; no, not in the multiplied successions of revolving ages.

Not to be too sollicitous about matters which fall not within my province, since the year of the Moon may be applied, *ad libitum*, to the year of the Sun, (to any of its cardinal points) I shall make choice of the former reduction of the first year of the reign of *William the conqueror*, to illustrate the truth, and evidence the certainty of my proposition. Because, by this reduction, we shall meet with the same position of the lunar year, with respect to the *Julian* solar, taken in its proper situation and extent, from *January 1* to *December 31*; as *Moses* has determined by his stile, and recorded in the year of *Noah's* life 600, with respect to the tropical solar, extended from *libra*

to

to *libra*. And I was the more inclined to chuse this reduction, because as these two distinct lunar years differ in their quantities, and their attending epacts; so this difference will occasion some variation in the stile of *Moses's* chronology, and enable me to express and manifest the quantities of each by that variation; which must make the illustration and the proof more clear and full.

In the close of the foregoing paragraph, I laboured under the difficulty (and it may often be my case) of finding out proper words, in order to prevent my meaning from being misapprehended, where so nice a point is depending, as that of the secret and almost imperceptible efficacy of *Moses's stile in chronology*, undeniably is.

I would not be thought to insinuate, that it is in the nature of a calculus to discover and fix the positions of the luminaries in general, or in a given year; this is so far from being the truth, that on the contrary, it is peculiarly adapted, (in his account of the deluge) nay I may say, it is entirely appropriated, to a year of co-incidence, and to the *then position*, which was but one, amongst many, of the Sun and Moon in the Heavens.

I hope it will not be thought a trouble to return to, and consider the 13th verse of the 8th chapter.

*And it came to pass in the six hundredth and first year, in the 1st month, the 1st day of the month, the waters were dried up from off the Earth: and Noah removed the covering of the*

T

ark,

*ark, and looked, and behold the face of the ground was dry.*

Now is it not natural to suppose, that *Noah*, and those who were in the ark with him, might be sufficiently tired with such a long and tedious confinement, and were all as impatient as a shipwrecked mariner, to set their feet again upon dry land? And admitting the surface of the Earth not to be quite so firm and solid, as in process of time it might and would be, yet they would have been gladly released from their prison, and enjoyed their much-wished liberty :—notwithstanding this, *Noah* did not conduct them out, *in the 1st month, on the 1st day of the month, when he looked, and behold the waters were dried up from off (the face of) the ground*; but he patiently continued in the ark, to the 57th day following, and waited for the command of God himself.

Ver. 14. *In the 2d month, the 27th day of the month, God spake unto Noah, saying, go forth of the ark.*

When God speaks, we have infinite reason to expect perfection.

This important text is the key which unlocks the whole secret, and whilst it displays the wonders, it conveys to the mind, at the same time, an affecting and lively sense of the universal benefit, of a divine revelation.

God inclined *Noah* to reside patiently in the ark until this day, *this very day*, for special reasons; *viz.* that by this means, *Moses*, his amanuensis, might transmit to future ages the astronomy of  
that

that destroying year, in which the Earth, miserably defaced and torn by an insupportable deluge, was almost if not altogether reduced to the original *Tobu* and *Bobu*. And this, first, as a heavenly attestation, as an undeniable because demonstrable proof of the reality and certainty of the fact: secondly, with a gracious intention to instruct ages to come, in the clear knowlege of the perfect, cœlestial year and of its unerring (tho' plain and simple) laws of calculation.

This point then is settled, that *Moses's* stile in chronology serves not as a calculus to discover and determine, but as a sure and faithful index to point out to us, *what was the position* of the luminaries at the beginning and end of that memorable year, of which he has given us such a large account, such a circumstantial historical narration.

There is no necessity at present for the multiplying of questions, or making a solicitous enquiry, how or in what manner, by what principles and laws, *Moses* might attain to the knowlege of such an exact astronomy: all that the proposition requires, or that lies upon me to make appear, in a satisfactory manner, is only this; *viz.* that by his very terms and stile, he has actually, expressly, and precisely stated and determined the true quantity of the epact, and of the finished lunar year, together with the co-incidence and the commensuration. Thus then I enter upon the illustration and the proof.

(1) In the beginning of A. M. 1655, or the year next before the flood, the lunar computa-

tion ended on the 11th day of the 1st month of the tropical year. But  $11 + 354 = 365$ , therefore, in the conclusion of the old world, A. M. 1655, the last day of the lunar year fell upon the last complete day of the tropical solar, which is, as I have called it, a commensuration.

(2) So likewise, in the same manner, in the beginning of A. D. 1065, the year next before the reign of *William I.* the lunar computation ended on the 11th day of the 1st month of the *Julian* year; but *January*  $11 + 354 = 365$ , therefore, A. D. 1065, the last day of the lunar year fell on *December* 31, or the last day of the *Julian*, and there was again a commensuration.

But as a co-incidence must necessarily follow a commensuration, therefore, in course, in the year of *Noah's* life 600, which runs parallel with A. M. 1656, the 1st day of the 1st month of the lunar year fell upon the 1st day of the 1st month of the tropical solar; the lunar year was of 354 days, and the epact 11—by the terms and stile of *Moses's* chronology, in his account of the deluge, as shewn, p. 137.

So likewise, in the same manner, in the 1st year of the reign of *William I.* which runs parallel with A. D. 1066, the 1st day of the lunar year fell upon the calends of *January*, the 1st day of the *Julian*; this lunar year was of 355 days, and the epact 10; which particulars are precisely stated and determined by a *suitable variation*, in the terms and stile made use of by *Moses*, in his account of the deluge.

These

These peculiar astronomical characters, arising from the application of the lunar year to the *Julian*, remarkably distinguish the first *Julian* year of the *English* æra; especially if we add the 1st day of the week, on which the calends of *January* happened that year.

We will now make tables of these several positions, in the same manner as above, and then subjoin the *Mosaic* terms and stile, and point out particularly how they express and record the astronomy.

A. M. 1655	A. M. 1656	A. M. 1657
A. N. 599	600	601
☽ 365	☽ 365	46
☉ II ☾ 354 ☾	☉ 354 ☾ II	46

A. D. 1065	A. D. 1066	A. D. 1067
Jan. 1. 365	365	46
II ☾ 354 ☾	355 ☾ IO	46

Under these tables we will recite

*The terms and stile of Moses's chronology.*

1. A. M. 1656. *Gen. ch. 7. ver. 11.* In the six hundredth year of *Noah's* life, in the 2d month, on the 17th day of the month:

2. A. M. 1657. *Gen. ch. 8. ver. 13.* In the six hundredth and first year of *Noah's* life, in the 2d month, on the 27th day of the month.

3. A. D. 1066. In the 1st year of the reign of *William I.* in the 2d month, on the 17th day of the month.

4. A. D. 1067. In the 2d year of the reign of *William I.* in the 2d month, on the 26th day of the month.

Some remarks here may be necessary, and will not be, I hope, unacceptable to the reader. When we take a view of these tables, we may perceive that the year of *Noah's* life 600 is connected with A. M. 1656.

(1) It is very observable, and all who have read the bible must needs have observed it, that the year of the world never once occurs, whether we consult the original *Hebrew*, or the *Greek* version, or the *Samaritan Pentateuch*, or *Josephus*; now this is no negligent omission, but was purposely designed to manifest to us the noble astronomical law of the sacred canon. 5757 revolutions of the Sun were completed at the last autumnal æquinox, A. D. 1750; of these 3471  $\frac{1}{2}$  were passed at the establishment of *Cyrus the Persian's* universal monarchy, including that space of time, in which the *Jews* returned from *Babylon* to *Jerusalem*. For every one of these, there is an assignable and corresponding year, either of a patriarch, or of a limited period, or of a judge, or of the reign of a king of *Judah*, or of *Israel*, or of the *Babylonish* captivity. And though all may not confidently acquiesce in this determination, upon the account of some imagined difficulties

ties

ties which have been raised ; yet, whatever prejudicate opinion may suggest, it will most surely be found, in the result, a demonstrable certainty.

(2) In the year of the world 1656, extended from *libra* to *libra*, the connected lunar year (as may be seen in the table) was of 354 days, and the epact of 11. In a just astronomical agreement here (as I shall presently shew) the terms and stile of *Moses's* chronology compute the 27th day of the 2d month ; for  $11 + 46 = 57 - 30 = 27$ .

(3) In the *Julian* year of our Lord 1066, which is extended from *January* 1 to *December* 31, the connected lunar year was of 355 days, and the subsequent epact of 10. In a just astronomical agreement hereto, the terms and stile of *Moses's* chronology compute, by a suitable variation, only the 26th day of the 2d month ; for  $10 + 46 = 56 - 30 = 26$ .

Thus far may be admitted as an illustration, but it may be asked, where is the proof?

I have alleged above, and am bound to support or retract it, that if *Moses* had related no one circumstance of the deluge, beside the year, month, and day of *Noah's* *ingress* and *egress*, he would have rendered thereby both the calendar, and the astronomy of the year absolutely perfect and complete, excepting only the previous knowledge how many days are contained in the *Hebrew Chodesh*.

How strange and how promising soever this allegation may be thought at the first view, as soon

as *Moses's* fundamental principles and data come to be rightly understood and considered, its truth will immediately shine as indisputably clear as the truth of an axiom.

The fundamental principle is this, *viz.*

Prop. 3d, That *Moses* measures by the years of the Sun, and computes by the months and days of the years of the Moon.

This principle is a sure directory to a right application of the data.

The data, in the present case, are the 17th day of the 2d month of one lunar year, and the 27th day of the 2d month of another, following it in immediate succession.

A lunar year must, in nature, consist either of 354 days, or of 355; never less than the one, never more than the other. The number of intervening days, which lie between the above *given limits*, must, by the fundamental principle and data, be just 365. They cannot possibly be one day more, nor can they possibly be one day less. These 365 days must necessarily include the quantities of both the lunar years, and both their epacts. The 1st month and 16 days, both of the solar and the lunar year, were lapsed before the entrance into the ark. A month has 30 days,  $30 + 16 = 46$ .

Before we offer the rule how to calculate the just quantity of the epact, and of the connected lunar year, A. M. 1656, and A. D. 1066, establishing at the same time the co-incidence and

com-

commensuration, first, divide the days of the solar year and of the lunar, as instructed by the given limits and data, in the following manner.

A. M. 1656.      A. D. 1066.

$$\begin{array}{l} \text{Solar year} \quad | 46 + 319 \quad | + 46 \quad | 46 + 319 \quad | + 46 \\ \text{Lunar year} \quad | 46 + 3080 \quad | + 57 \quad | 46 + 3090 \quad | + 56 \end{array}$$

This being done, the whole of the calculus, in both cases, will proceed readily; and may be easily understood with a small degree of attention.

A. M. 1656.

1.  $354 - 46 = 3080$  lunar days, or the number of days of the first lunar year, in which *Noah* continued in the ark.

2.  $3080 + 57$  lunar days = 365, the whole space of his confinement, including the day in which he was commanded to go out.

3.  $365 - 46 = 319$  solar days, or the number of days of the solar year of his life 600, in which *Noah* resided in the ark.

4.  $365 - 319 = 46$ , the number of days of the solar year 601.

5.  $319 + 46 = 365$ , the entire space, as before.

6.  $57 - 46 = 11$ , the quantity of the epact.

7.  $365 - 11 = 354$ , the quantity of the lunar year.

8.  $354 - 354 = 0$ , the index of commensuration.

A. D. 1066.

- (1)  $355 - 46 = 309\epsilon$ . (2)  $309\epsilon + 56 = 365$ .  
 (3)  $365 - 46 = 319$ . (4)  $365 - 319 = 46$ . (5)  
 $56 - 46 = 10$ , the quantity of the epact. (6)  
 $365 - 10 = 355$ , the quantity of the lunar year.  
 (7)  $355 - 355 = 0$ , index of commensuration.

But as I have applied the lunar year to the *Julian*, A. D. 1066, I may be more particular here; without running any hazard of being thought obscure or unintelligible. If we look into the lowermost table for A. D. 1067, (p. 149) we may perceive the lunar days to be placed thus— $\epsilon$  10 | 46. Now  $46 + 10 = 56$ . To 46 add *December* 31, and from the sum 77, subtract the compound 56, remains *December* 21. If we look for *December* 21 in the *Julian* calendar, we shall find over against it, in the column of collected days, reckoned from the calends of *January*, 355 days. These 355 are the days of the concurrent lunar year, and they constitute its true quantity; but they are also the collected days of the *Julian* year, which lie concealed under the days of the lunar, being co-incident with and commensurate to them. *Moses's* fundamental principle then—*Haju lesbanim*—is no delusive guide; it is far from being chargeable with an absurdity, nor can it be impeached as irreducible to practice.

Now should some one astronomer be disposed to make a calculation for the given year, A. D.  
 1066,

1066, (though I do not know that this calculation ever has been made by the tables) and not find *December 21* to be the day after the Moon's conjunction, (though it is necessary to note, that *December 19* past 6 in the evening, in the primitive account, is *December 20*) then it must be allowed, that I have not added any degree of proof to the illustration.

It is possible that the reader may by this time be in some measure reconciled to the truth and certainty of my 3d proposition—That *Moses* measures by the years of the Sun, but computes by the months and days of the years of the Moon.

And may I not be permitted to indulge a farther hope, that he finds himself somewhat inclined to admit,

That *Moses's* historical narration of the circumstances, process, and *conclusion* of the deluge, is extremely curious, and in fact, the key, whereby we may open many, if not most, of the secrets of the antient and original computation of times, *according to the Hebrew text*.

These last words---*according to the Hebrew text*---are here emphatical, since the Septuagint version reads, *cb. 7. ver. 11.* erroneously and corruptly, *Εβδομη και εικαδι τε μνηος*, *i. e.* the 27th instead of the 17th day of the month. Now I doubt not to say, against the most critical acumen, that had there been found no other difference, *but this one*, between the chronology of the Septuagint version, and that of the original *Hebrew*, this

*one difference alone* is of such importance, that it would have kept the astronomy of the *Pentateuch* in an irretrievable state. Should any one apprehend that this assertion may be confuted, I could wish to see the arguments.

The particular discoveries arising from the *Mosaic* history of the deluge are, (1) The number of days in a primitive month. (2) The manner of computing and adjusting the months of the lunar year. (3) The manner of computing and adjusting the months of the solar year. (4) The law of their connection, which our astronomers have not taught us. (5) The quality of the Moon (☾) which constitutes the head or beginning of the Scripture lunar year.

The two first of these have been considered and stated already: proceed we then to the 3d.

Bishop *Stillingfleet* in his *Origines sacræ*, (l. 1. ch. 6.) from an observation of *Diodorus Siculus*, resolves the confusion and ambiguity of heathen chronology, into two causes.

First, Their not having any certain *parapegmata* or *epochæ*, from whence to deduce a true account of times.

Secondly, The uncertain and various form of their years.

But is not this the present state of the case? Have either the *Jews* or the *Christians* (with the *Hebrew* bible in their hands) any allowed grounds

to boast of what *Diodorus Siculus* calls—Παραπηνυμα πιστευμενον? Is their *epocha* from the creation, or their *æra mundi*, such a one? Then, I ask, who has demonstrated its certainty? The *Christians*, we know, have rejected the *Jewish æra*, whilst the *Jews* continue to reckon the several periods of the world's age from it.

The *Jewish æra* from the creation terminates A. J. P. 953, whilst *Scaliger* chuses 764, archbishop *Usher* 710, Mr. *Bedford* 706. Upon which of these dissentient hypotheses may we infallibly depend?

*Quæ, quibus anteferam? Quæ prima exordia sumam?*

Secondly, The uncertain and various form of their years.

We may argue here, as we did before, with respect to the different and discordant opinions concerning the world's *æra*, or *epocha*, from the creation: since we shall scarcely find any two *Christian* writers agreeing in their sentiments about the Scripture years; nay, pages might be filled with a recital of the particulars of their disagreement.

Had the great *Stillingfleet*, when he wrote his *Origines sacræ*, been required to determine the quantity, and delineate the *form*, of the patriarchal year, there is reason to think, he would have referred the querist, for the solution of his quæry, to archbishop *Usher's* annals. And had the learning and judgment of the primate been consulted

on

on this head, would he not have referred him to the *Ægyptians* for its *form*, and to the *Romans* for its quantity? I am led to think he would, by the following passage, in the preface to his annals.

“ *Primorum patrum, veterumque Ægyptiorum*  
 “ *& Hebræorum annus, ejusdem cum Juliano*  
 “ *quantitatis fuisse reperitur, sed ex mensibus 12*  
 “ *equalibus, dierum 30 constans (Hebræos enim ante*  
 “ *Babylonicam captivitatem lunaribus mensibus*  
 “ *fuisse usos, probari non potest) dierum epagome-*  
 “ *non 5, & quarto quoque anno 6, ad 12 mensis*  
 “ *finem, adjētā appendicula.”*

I make no doubt but that archbishop *Usher*, following the thread of the *Mosaic* narration, traced out the primitive calendar to the 2d day of the 12th month; but when he had gone thus far, finding no more circumstances related, which might direct him to compleat it, yet however perceiving, that the collected number of 332 days evidently included 11 thirty-day months, and the *Ægypto-Julian* year, as it seems occurring to his thoughts; he to 332 added, (hypothetically) 28 days, which made them 360, or 12 equal months, of 30 days a-piece: to these 360 days, he added the 5 well known *Epagomenai*, which made them 365: to these he continued to add 6 hours, which made them  $365 \frac{1}{4}$ , and completed the *Julian* year. Thus finding himself in the end possessed of a civil solar year, the nearest to the true one, that ever was or possibly can be  
 ob-

obtained, he rested in the conclusion and enquired no farther.

These seem to me to have been the several steps of archbishop *Usher's* reasonings and determination, both of the *form* and of the quantity of the Scripture solar year, as may be plainly gathered from the above cited passage in his preface.

According to this determination then *Methuselah* lived 969 *Ægypto-Julian* years ; but the author of the *Pentateuch* died 1426 *Mosaic Shanim* or tropical years, before the first fixed *Ægyptian* year was reckoned.

The *Ægypto-Julian* year bears the same date with the *Alexandrian æra* of the *Ætiac* victory, An. *Ær. Nabonass.* 719, Aug. 29. Nor can it be proved from authentic testimony, that the solar year, in that *form* and in that *quantity*, was ever in civil use before that time, in any one nation.

But, deferring farther discourse concerning the *quantity* of the primitive solar year, how does it appear that *Moses* gives a sanction to the archbishop's determination of its *form*, or the manner of computing and adjusting its months? For where are the *Mosaic* principles and the *Mosaic* historical data to be seen in the several steps of the proceeding? These must still be collected from the limited time of *Noah's* continuance in the ark.

It has been made sufficiently plain and clear already, that *Noah* stayed in the ark 319 days of the solar

solar year of his life 600; and 46 days of the solar year of his life 601. Now then,

	M. D.	D.	
If to	10+19	300+19	319
We add	1+16	30+16	46
	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>
We shall have	11+35	330+35	365

Again, *Noah* was in the ark 308 days of one lunar year, and 57 days of another; therefore,

	M. D.	D.	
If to	10+8	300+8	308
We add,	1+27	30+27	57
	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>
We shall again have	11+35	330+35	365

We conclude then, from both deductions taken jointly (I refer here to that of the lunar year, as stated p. 127.) that the manner in which the antediluvians computed and adjusted the months, both of the solar and of the lunar year, was as follows.

	M. D.	D.			
The patriarchal	Solar	} year	11+35	330+35	365
	Lunar		11+24	330+24	354
			<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>	<hr style="width: 50%; margin: 0 auto;"/>
			11	11	11

The epoch at the end of the deluge.

I will now offer a calculation grounded upon *Mosaic* data, which will confirm archbishop *Usher's* conclusion, excepting the quadrants, which will be considered hereafter.

From the 1st day of the 1st month of the solar year of *Noah's* life 600, to the day in which he received the divine command to come out of the ark, there passed 411 days, both solar and lunar; therefore,

	M.	D.	D.	D.	
If from	13	+ 21	390	+ 21	411
We subtract	1	+ 16	30	+ 16	46
	<hr style="width: 50%; margin: 0 auto;"/>		<hr style="width: 50%; margin: 0 auto;"/>		<hr style="width: 50%; margin: 0 auto;"/>
We shall have	12	+ 5	360	+ 5	365

But this is much more antient than the *Ægypto-Julian* year.

We have now obtained from *Moses* these three numbers, 354, 360, 365. The first is the quantity of a lunar year, the 3d of the solar, exclusive of the quadrant, and the 2d is a mean proportion between the quantities of both.

To 365 add 1, or the autumnal æquinoctial day, then the 4 following cases will include all the variety of the epacts, in a year of co-incidence.

1. 354, 360, 366,  $6 + 6 = 12$ , } including the æquinoctial day.
2. 355, 360, 365,  $5 + 5 = 10$ , excluding.
3. 354, 360, 365,  $6 + 5 = 11$ , excluding.
4. 355, 360, 366,  $5 + 6 = 11$ , including.

The co-incidence of the lunar year with the solar, the exact commensuration of the days of the one to the days of the other, consequent thereupon; and the mean proportion 360, admit of the following partitions.

$$\begin{array}{l} \text{Solar} \\ \text{Days of the} \\ \text{Lunar} \end{array} \left. \vphantom{\begin{array}{l} \text{Solar} \\ \text{Days of the} \\ \text{Lunar} \end{array}} \right\} \text{year} \left\{ \begin{array}{l} 330 + 24 + 6 + 5 \\ 330 + 24 + 6 + 5 \end{array} \right.$$

It is evident to sight, that, in a year of coincidence, the 24th and last day of the 12th month of the lunar year falls upon the 24th day of the 12th month of the solar.  $330 + 24$  solar days = 354; borrow 6 days from the lunar epact, and add them to these 354 solar days, and we shall have 360, or the 12 equal months of the solar year. Now, I say, that the 5 remaining days are the complement of 365 solar days, and also of the epact.

I thought it the more necessary to make this observation, because it is evident in fact, that the sons of *Noah* in general, when they came to be dispersed, lost all knowledge of the astronomy of the year; and retained no more of the antient and original computation than these 360 days, or the 12 equal months of the solar year.

And when in after ages, they by some means recovered the 5 remaining days, they added them to the 360, as the complement of the solar year, (in which they were mistaken almost a whole quadrant) but they were not capable of considering

dering them as the complement also of the lunar epact; nor has its primitive application and use been restored by all the improvements and inventions of science. And yet the mythologic fable represents *Hermes* as playing at dice with *the Moon*, and winning from *her*, the 72d part of 360 days; which plainly implies, as it seems to me, some imperfect traditional notion of the lunar year. This proposition I offer, as an *hypothesis* of the origin of this very antient year of 360 days, which has been productive of so various and unsatisfying solutions.

There is no necessity to recapitulate the particulars, which have been hitherto stated, and in some measure explained; but it may be necessary to remember and carry along in our minds, that *Moses's* astronomy proceeds altogether upon a distinction of years, and that these two distinct years had at the time of the deluge (the coincidence proves this) one and the same common *epocha*, and that their respective annual periods commenced at the same cardinal point; and that this cardinal point was the autumnal æquinox. Thus, in the more remote and primitive ages, stood *Rishon* (*Gen. ch. 8. ver. 13.*) the 1st month, as it were, the head of the lunar year.

But when *Moses*, *Levit. ch. 23.* takes occasion to treat of, and is enumerating to the *Israelites*, all the solemn assembly days and appointed feasts of the Lord throughout the ecclesiastical lunar year, we then receive a different instruction: we are plainly and openly informed, that the *epochæ*

are become as distinct as the two years themselves; and are so disjoined the one from the other, that the 15th day of the 7th month of the lunar year might, and sometimes actually did, fall, *Tekuphath bashanah*, on the cardinal point of the solar. From 7 m. 15th day, subtract 15, the remaining six complete *Chodashim* measure the determinate distance of *Rifhon* from its antient original situation. And if that antient original situation was at the autumnal æquinox, it must have been transferred, the astronomer will say, to the vernal; *Εν κριῶ τῆ ἡλίου καθέστωτος*, the Sun being in aries, says *Josephus*. Hence the annual courses of the two great luminaries mutually interfect each other in the circle of the year. And



these numbers, thus placed to each other, 15, 180, 15, express the limited and invariable distance between the feast of tabernacles, and the 1st day of the feast of unleavened bread, from the times of *Moses* down to the times of *Nehemiah*.

Although it does not appear, that the *Patriarchs*, the *Hebrews*, the *Israelites*, or even *Jews*, before the times of *Alexander*, had any knowledge of the division of the ecliptic into two unequal segments, at the æquinoctial points, nor were able to ascertain the Sun's ingress to aries; yet such was the original astronomy, and such the construction, both of their altered and unaltered year (as we shall see from the following tables, and shall be more fully informed by the calculations) that

that the *Israelites* could not fail of keeping their passover on the 14th day of the month *Abib*, or at the vernal æquinox.

The alteration of the beginning of the sacred year, and the transferring of *Rishon* to the opposite cardinal point, is such a remarkable transaction, such an unusual proceeding, its like not being to be met with amongst the nations, that *Moses* has in a particular manner informed us, *when* it was done, by *whom*, and for what *ends* and *purposes*, *viz.* to be a permanent standing memorial of great blessings and very signal mercies at that time received; also, a prædiction and type of greater blessings and more signal mercies to come.

He introduces his relation with such an awful solemnity, that we in a moment perceive it was no constitution of the elders, no private institute of his own, but was commanded and immediately executed by the interposition of the supreme legislator himself, by the sole authority of the God of nature and framer of the cœlestial year.

*Exod. ch. 1. ver. 1.* The Lord spake unto *Moses* and *Aaron* in the land of *Ægypt*, saying,  
*Ver. 2. Ha Chodesh hazzeb Rosb Chodashim, Rishon hua lacem lachodshei hashanab.*

*Septuagint version.* Ο μὴν ἔτος ὑμῶν ἀρχὴ μηνῶν, πρῶτος ἐστὶν (ἐστί) ὑμῖν ἐν τοῖς μῆσιν τῶ ἐνιαυτοῦ.

This month shall be unto you the beginning of months, it shall be unto you (*Rishon*) the 1st month (*Hasshanab*) of the (lunar and sacred) year.

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The alteration of the beginning of the year took place from this day forward, and both *Moses* and the prophets punctually compute the times by it; and even the exiled dispersed *Jews* begin their sacred year to this day from the vernal æquinox: and should a reason be demanded of them, they are able to plead divine authority, and the exprefs command of God himself for the antient usage. For,

*Pfal.* 81. *ver.* 4. *This was a statute of the God of Israel, and a law of the God of Jacob.*

*Ver.* 5. *This he ordained unto Joseph, (and all the 12 tribes of Israel) for a testimony—throughout their generations, by an ordinance for ever.*

The history of the *Pentateuch* abounds in the recital of events and facts, extraordinary in their nature, important in their consequences, and demonstrably true.

The chronology of the *Exodus*, like the *Mosaic* year, was never yet, as I know of, collected and proved from the *Hebrew* text; and yet it is a demonstration worthy of the sacred records, and highly becoming the author of the *Pentateuch*. But I shall not anticipate it here.

The reader is now thoroughly prepared and qualified, not only to peruse, but to understand the following schemes, both of the altered and unaltered Scripture year; nor will he stand in need of an index to point out to him the singular importance of the appropriated term *Rishon—Berishon, be eckad lechôdesth.* *Gen.* viii. 13.

And

And perhaps, when he takes a review of the emphatic text above, and seriously weighs and considers it in its whole tendency and design, he may become sensible, that when God speaks, and *Moses* records, we are sure to be instructed in points, which not only concern more immediately the *Israelites*; but remotely in the before-appointed season, the *Gentiles* also, and the whole race of mankind.

I.

The astronomical position of the lunar year to the solar at the deluge, when they jointly began their annual periods from the autumnal æquinox; which *Moses* has left upon record, as a most perfect standard and exemplar of the *antediluvian calendar* and *patriarchal year*.

*Chodshei Haschanab.*

<i>Risbon</i> $\hat{=}$	I.	30	30	
$\odot$	II.	30	60	
	III.	30	90	
	IV.	30	120	
	V.	30	150	
	VI.	30	180	
<i>Abib</i> $\nabla$	VII.	30	210	<i>Ha Chodsheb hazzeh lacem Rofb chodaschim, Exod. xii. 2.</i>
$\odot$	VIII.	30	240	
	IX.	30	270	
	X.	30	300	
	XI.	30	330	
Lunar } year.	XII.	24	354	$\text{C}$ A. M. 1656.
Solar } year.	XII.	35	365	$\hat{=}$ V. N. 600.



## II.

*Chodshei Haschanab.*

$\hat{=}$	I.	30	30	VII.	30	30
$\odot$	II.	30	60	VIII.	30	60
	III.	30	90	IX.	30	90
	IV.	30	120	X.	30	120
	V.	30	150	XI.	30	150
	VI.	30	180	XII.	30	180
<i>Abib</i> $\nabla$	VII.	30	210	I.	30	30
$\odot$	VIII.	30	240	II.	30	60
	IX.	30	270	III.	30	90
	X.	30	300	IV.	30	120
	XI.	30	330	V.	30	150
Lunar } year.	XII.	24	354	$\text{C}$ VI.	24	174
Solar } year.	XII.	35	365	$\hat{=}$ A. M.		1656.



I will take it for granted that the curious and inquisitive reader has viewed with some attention these two schemes of the Scripture year in its different states, before and after the *Exodus*. If he has, it cannot have escaped his notice, that *Rishon* is placed at the autumnal æquinox in the first, and over against *Abib*, or at the vernal æquinox, in the second. Now if it be admitted, or can be proved, that these adjustments are true, then the astronomical situation of all the intermediate months must follow of course.

By the joint assistance of these schemes, and the 39th verse of *Levit. ch. 23*, and the 16th verse of *Exod. ch. 23*, and the 22d verse of *Exod. ch. 34*, I shall be able to establish that fundamental principle, from which I have hitherto argued, and upon which I have confidently proceeded, beyond all grounds of doubt, or even a suspicion of uncertainty. Take scheme II, in which the months of the unaltered solar, and the altered lunar year, are set down collaterally.

Now I say, that the autumnal æquinoctial point of the ecliptic is distant in nature from the winter solstitial, 89 d. some odd hours, and odd minutes; the epocha of the solar year, and also

≈

of the lunar, before the *Exodus* was ☉; consequently, the last day of the 3d month (the sum of whose days = 90) of both years, must necessarily fall in a year of co-incidence, upon the day of the winter solstice. Whilst the last day of the 9th collateral month of the altered lunar year,

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reckoned from *Abib*, or ☉, would be co-incident with the same solstitial point. Now let us consult the prophet *Jeremiah*, (who lived many hundred years after the *Exodus*) and see what account he gives of the altered year.

Jer. ch. 36. ver. 9. *And it came to pass, in the 5th year of Jehoiakim, the son of Josiah king of Judah, in the 9th month, that they proclaimed a fast unto the Lord.*

Ver. 10. *Then read Baruch in the book, the words of Jeremiah, in the house of the Lord.*

Ver. 16. *And all the princes said unto Baruch, we will surely tell the king of all these words.*

Ver. 22. *Now the King sat, in the winter house, in the 9th month, and there was a fire on the hearth burning before him.*

Here an opponent might plead, that the prophet might as justly be supposed (since nothing appears to the contrary) to compute by the 9th month of the solar year, reckoned from the vernal æquinox, as from the 9th month of the lunar, beginning from the same cardinal, which only infers a change in the epocha of both, and why should we not infer it?

My reply to the objection is this: The prophets are but commentators upon the law; *Moses* fixes the standard, and they constantly follow its directions. But it is undeniably certain, the legislator enjoins the *Israelites* to observe the feast of tabernacles, and the feast of in-gathering, upon the

the 15th day of the 7th month of the altered lunar year, *Tekupath hasbanah*, in the revolution of the solar. And if we cast but our eye over table II, we shall see the 7th month of the altered lunar year, over against the original cardinal point of the unaltered solar. This argument is clear and decretory; and I need not search for any more instances.

Therefore, *Moses* and the prophets, both before and after the *Exodus*, compute by the months and days of the lunar year; but never by the months and days of the solar.

Having now finished my account of *Chodesh* and *Schanah*, I shall proceed to shew that the antient people of God had not only a *regular* and *well known calendar* in the reigns of *David* and *Solomon*, but somewhat more than this, *viz.* that the same form of year, the same uniform stile of chronology, and the same invariable law of computation is continued without interruption, throughout the *Hebrew Scriptures*.

*Nebemiah* returned to the *Persian* court in the 32d year of *Artaxerxes Longimanus*; and in that very year the certainty of the old testament history ends; nor can it be determined, but by conjecture, in what year, either *Nebemiah*, the *Tirshatha*, or *Malachi*, who was the last of all in the succession of prophets, died. Lower down than these times then we cannot come.

It is a sentiment of Sir *J. Marsham's*, *alia chronologia fuit ante Babylonicam captivitatem, alia post reditum*—If by the Words, *post reditum*,

this learned writer would be understood to mean, *immediately after the return*, I am obliged to dissent from him, because I shall undertake to prove the contrary from the Scriptures. And what reason can there be to infer and conclude a different law of computation, where there is no essential difference in the terms and stile of the chronology, nor any variation from *Moses's* original standard?

It may be said perhaps, that *Exra* and *Nebe-miab*, both of them, annex political names, *viz.* *Nisan*, *Tisri*, *Adar*, &c. to their months, which they borrowed from the *Chaldeans* in their captivity; and doubtless, together with them, their method of computing times. But the reason alleged here can be of no weight, because, altho' in *Solomon's* reign, they had before this introduced political names to their months (3 only of which are transmitted to us, *viz.* *Zif*, *Ethanim*, *Bul*) yet are they never explained and determined in both cases by ordinal numbers, and by this means, reduced to the genuine *Mosaic* stile. The truth of this will plainly appear in the following examples; to which more might have been added, had not these been sufficient to evince, that one uniform and invariable stile of chronology, one well-known law of computation, runs thro' the *Hebrew* Scriptures, from the 600th year (and upwards) of *Noah's* life, to the 32d year of *Artaxerxes Longimanus* king of *Persia*.

Those who may chance to read the following proofs will think it no small matter of wonder, that

that this part of the Scripture account has not been more attentively considered and regarded.

*The Mosaic original standard.*

*Gen. ch. 7. ver. 11.* In the six hundredth (solar) year of *Noah's* life, in the 2d month (of the lunar year, from the autumnal æquinox) the same day, were all the fountains of the great deep broken up. —

*The stile of Moses's chronology continued.*

(1) *1 K. ch. 6. ver. 1.* In the 4th (solar) year of *Solomon's* reign over *Israel*, in (the month *Zif*, which is) the 2d month, on the 2d day of the month, (*2 Chr. ch. 3. ver. 2.*) (of the altered lunar year, from the vernal æquinox) he began to build the house of the Lord.

(2) *1 K. ch. 6. ver. 38.* In the 11th (solar) year of *Solomon's* reign, in (the month *Bul*, which is) the 8th month (of the altered lunar year, from the vernal æquinox) was the house finished.

(3) *1 K. ch. 8. ver. 2. \** In the 12th (solar) year of *Solomon's* reign, all the men of *Israel* assembled themselves unto king *Solomon*, at the feast (of tabernacles) in (the month *Ethanim*, which is) the 7th month, \* on the 15th day of the month, (of the altered lunar year, from the vernal æquinox) *Levit. ch. 23. ver. 34.*

(4) *2 K. ch. 25. ver. 8, 9.* In the 11th (solar) year of king *Zedekiah*, (which is the 19th year

year of *Nebuchadnezzar* king of *Babylon*) in the 5th month, the 7th day of the month, (of the altered lunar year, from the vernal æquinox) came *Nebuzaradan* captain of the guards, a servant of the king of *Babylon*, unto *Jerusalem*.

(5) *Jer. ch. 52, ver. 13.* \* In the 11th (solar) year of king *Zedekiah*, in the 5th month, the 10th day of the month, (of the altered lunar year, from the vernal æquinox) he (*Nebuzaradan*) burnt the house of the Lord, and the king's house, and all the houses of *Jerusalem*, and all the houses of the great men burnt he with fire.

(6) 2 *K. ch. 25, ver. 27.* And it came to pass, in the 37th (solar) year of the captivity of *Jehoiachin*, king of *Judah*, in the 12th month, the 27th day of the month, (of the altered lunar year, from the vernal æquinox) that *Evil-Merodac*, king of *Babylon*, in the year that he began to reign, did lift up the head of *Jehoiachin*, king of *Judah*, out of prison.

(7) *Ezek. ch. 24, ver. 12.* In the 9th (solar) year of king *Jehoiachin's* captivity, in the 10th month, the 10th day of the month, (of the altered lunar year, from the vernal æquinox) the word of the Lord came unto me, saying, *ver. 2.* Son of man, write thee the name of the day, even of *this same day*, the king of *Babylon* set himself against *Jerusalem*, *this same day*.

(8) *Haggai, ch. 1, ver. 1.* In the 2d (solar) year of *Darius* (*Hystaspes* king of *Persia*) in the 6th month, the 1st day of the month, (of the altered

altered lunar year, from the vernal æquinox) came the word of the Lord, by *Haggai* the prophet, unto *Zerubbabel*.

(9) *Zechar. ch. 1. ver. 7.* In the 2d (solar) year of *Darius* (*Hystaspes* king of *Persia*) in (the month *Shebat*, which is) the 11th month, the 24th day of the month, (of the altered lunar year, from the vernal æquinox) came the word of the Lord unto *Zechariah*.

(10) *Zechar. ch. 7. ver. 1.* And it came to pass, in the 4th (solar) year of *Darius* (*Hystaspes* king of *Persia*) in (the month *Chisleu*, which is) the 9th month, the 4th day of the month, (of the altered lunar year, from the vernal æquinox) that the word of the Lord came unto *Zechariah*.

(11) *Esther, ch. 3. ver. 7.* In the 12th (solar) year of king *Abasuerus* (*i. e.* *Artaxerxes Longimanus*) in (the month *Nisan*, which is) the 1st month (*Berishon*) they cast *pur*, that is, the lot, before *Haman*, from day to day, and from month to month, to the 12th month, that is the month *Adar*.

(12) *Ezra, ch. 6. ver. 15.* In the 6th (solar) year of the reign of *Darius* (*Hystaspes* king of *Persia*) in the month *Adar*, (which is the 12th month) *Esther, ch. 3. ver. 13.* On the 3d day of the month, (of the altered lunar year, from the vernal æquinox) the house of the Lord was finished.

(13) *Ezra, ch. 7. ver. 8, 9.* In the 7th (solar) year (of *Artaxerxes Longimanus* king of *Persia*)

*sia*) in the 5th month, on the 1st day of the month, of the altered lunar year, from the vernal æquinox) *Ezra* the scribe, came unto *Jerusalem*, according to the good hand of his God upon him.

(14) *Ezra*, *ch.* 10. *ver.* 16, 17. They sat down, in the 1st day of the 10th month, (of the altered lunar year, from the vernal æquinox) to examine the matter; *ver.* 17. And they made an end with all the men that had taken strange wives,

on the 1st day of the 1st month (*Berishon*, ☉).

(5) *Nehem.* *ch.* 8. *ver.* 2. \* In the 21st (solar) year (of *Artaxerxes Longimanus* king of *Persia* \*)—in the 7th month, on the 1st day of the month, (of the altered lunar year, from the vernal æquinox) *Ezra* the priest brought the law before the congregation—and, *ver.* 13. He read therein.

Can any one carefully peruse and weigh all these texts, to which many more might have been added, collected from the *Hebrew* bible, and entertain a doubt, whether the stile of *Moses's* chronology, and determinate law of computing times, be continued without any essential alteration down to the age in which *Nehemiab* lived, and to the 2d great monarchy, or not? It is possible indeed, that *some seeming difficulties* may occur to the mind in the reading of them; but this is not at all to be wondered at, nor will it be misinterpreted to my prejudice, should I freely say, that the whole scheme

scheme of sacred chronology has not hitherto been rightly explained, or thoroughly understood.

There is one seeming difficulty (amongst others perhaps) which may probably perplex the reader's apprehension, and rise up, as an objection, in some such form as this, *viz.*

How can we reconcile to the writings of the prophets, what has been advanced and asserted concerning the *altered* lunar year, and the *unaltered* solar, seeing it must needs be admitted, from the whole tenour of the above-cited texts, either that the epochæ of both years was transferred to the opposite cardinal point at one and the same time; or that the sacred writers, one and all, who have given any characters and notations of time after the *Exodus*, measure as well as compute by the months and days of the lunar year, exclusive of the solar; and since it is undeniably certain, that, in all the collected instances, they still reckon the years of the reigns of the kings of *Judah*, of the *Babylonish* captivity, of the reigns of the kings of *Persia*, (the same may be said of the years of the judges, of the 40 years in the wilderness, and also of the lives of *Moses* and *Aaron*) from the vernal æquinox, and never once from the autumnal?

My reply to the *apprehended difficulty* is this: The miraculous deliverance of the children of *Israel* from their *Ægyptian* bondage and slavery, by the mighty hand and stretched-out arm of the God of their fathers, was an event and transaction of sufficient importance to be the foundation of a

new æra ; and this too, the æra of the *Jewish* polity, which from hence dates its rise, and derives its origin. This polity subsisted 1565 solar revolutions, before it was finally subverted by the *Romans*. It began and it ended at the vernal æquinox, and at the feast of the passover ; though the temple indeed was not reduced to ashes till some time after, *i. e.* on the 10th day of the *Macedonian* month *Lous*, as *Josephus* relates, l. 5. ch. 11. *De Bell. Jud.*

From this miraculous establishment of the *Jewish* polity, and the commencement of its corresponding æra, we infer a twofold application of the solar year ; the one historical, adapted to the æra ; the other in strict propriety, astronomical, both as to calculation and measure.

My reasons for the certainty of this distinction, or twofold application of the solar year, are these two ; although one has been mentioned, and the other hinted at already.

(1) After the *Exodus*, God, by the hand of *Moses*, commands the children of *Israel* to observe the feast of tabernacles on the 15th day of the 7th month of the sacred and ecclesiastical lunar year, commencing at the vernal æquinox, *Tekuphath hasbanah*, in the revolution of the (solar) year. Therefore the autumnal æquinox, or the original *Mosaic* cardinal point, was still the astronomical epocha of the fixed and unaltered solar year.

(2) The

(2) The *Hebrews, Israelites, and antient Jews*, were acquainted with no astronomical characters at the vernal æquinox.

They could not determine the Sun's ingress to *aries* (as we speak) with that exactness and certainty they could into *libra*.

Nor is it any-where commanded, thou shalt observe the feast of unleavened bread on the 15th day of the 1st month, *Tekuphath haschanah*, in the revolution of the year. Again, farther, they have no calculations, much less did they make any observations of the Moon's visibility at the passover in the beginning of the month.

If we deliberately view scheme II. of the altered lunar year, we can reckon no more than 174 days from *aries* to *libra*, in the first six months of it: at this cardinal point only, we find the astronomical character of the Moon's phasis. In 174 days there are included 5 equal months;  $5 \div 30 = 150$ . But in every primitive lunar year there are contained 11 equal months, which amount to 330 days. But  $330 - 150 = 180$ . And just so many days intervene between the autumnal æquinox and *Risbon* invariably.

My Scripture directory, in this adjustment of the months, is taken from N<sup>o</sup>. 6. 2 *K. ch. 25. ver. 27.* where we are informed, that *Evil-Merodach*, king of *Babylon*, in the year he began to reign, lifted up the head of *Jehoiachin*, the captive king of *Judah*, out of prison, in the 12th

Z 2

month.

month, on the 27th day of the month, of the altered lunar year, from the vernal æquinox.

Now if, from the quantity of a primitive lunar year, we subtract 11 equal months, or 330 days, there can remain no more than 24 or 25 days at the most for the 12th month, but here are 27. Consequently, the 12th month of the altered lunar year must necessarily consist of 30 days, and by scheme II. so it does.

I have been labouring to prove, that the *Patriarchs*, the *Hebrews*, the *Israelites*, and the antient *Jews*, observed one and the same method of computation.

*Antiqui & recentiores Judæi*—is a distinction to be met with in the writings of the learned. And this distinction is well grounded, and necessary to be kept up. But the question is, in what point of time are we to search for its epocha? It is to be wished, that those who made the observation and admitted it, had fixed the historical date of its commencement. But as I do not find this to have been done, my own private judgment leads me to refer it to the times of *Alexander*, about the year *ante A. D.* 331; because the *Jews*, being then dispersed through the *Grecian Colonies*, and living under the government of the *Ægypto-Macedonian*, and *Syro-Macedonian* kings, soon became græcized or hellenized in their language, manners, and usages; and learned from their conquerors to compute by unequal months, to which the very construction of the primitive astronomical calendar must needs have

have kept them, as it might seem, entire strangers.

The son of *Sirach*, *Josephus*, and *Philo-Judeus*, are all of them antient writers ; and yet they must all be reckoned amongst the latter *Jews*.

We cannot but take notice of the sensible difference between the interpretation of the *Psalmist* and the son of *Sirach*, of *Gen. i. 14.* *Haju laothoth ulemognadim.* They both have respect to this text ; the one in the genuine stile of an antient *Hebrew*, the other in the exotic language of a latter *Jew*.

The *Psalmist* writes, *Pf. 104. 19.* God has appointed the Moon---*Lemognadim* (*i. e.* for the regulation and determination of the periodic returns of solemn assembly days, which were ever observed on the months and days of the sacred and ecclesiastical lunar year) without referring to, or including, the sense of the preceding words---*Laothoth*.

But the author of *Ecclesiasticus*, versed in the *Greek* translation, plainly refers to, and includes this mistaken interpretation of *Laothoth*—*Απο Σελήνης σημειον εορτης.* From the Moon is the *sign* of the feast. Then it follows, *Ecclus. 43. ver. 7.* *The month is called after her name.* But neither was the Moon a *sign* of the feast (of the passover) to an antient *Jew* ; nor is *Chodesh* denominated from *Jareach* or *Lebanah* ; nor is there a *Hebrew* text to parallel this.

As to the son of *Sirach*, it may be justly remarked, that though he has retained and recorded

ed much of the œconomical, political, and religious wisdom of the old *Jewish* church, yet has he no where discovered any the least knowlege of the old *Hebrew* method of computing times.

It does not fall within the compass of my present design to enlarge upon this subject; but from what has been offered, I may venture to appeal to any impartial and candid enquirer, whether the above citations from *Philo*, (who was contemporary with *Josephus*) together with the calculation of *Ptolemy*, be not a clear and sufficient proof, that the *Jews*, before, at, and after the burning of the 2d temple (how long after I cannot say) began their sacred year, *Μετα συνουδου*, the evening *next* after the Moon's conjunction with the Sun, according to mean motion, and as instructed by the *Greeks*: nor can it be collected from the aforementioned authors, nor from *Eusebius*, who wrote in the former part of the 4th century, nor from Rabbi *Hillel's* astronomical year, which was published about the middle of it, A. D. 358, that the *Jews* made any observations of the Moon's visibility.

Whether this conclusion be admitted or not by those who are qualified to criticize, and to sit as judges upon antient and different accounts; yet still it is necessary to preserve a distinction of periods and intervals, and to have due regard to the respective usages and customs which are related in each of them.

The 1st period then or interval, which merits our notice, commences with the primitive ages  
and

and origin of time : and if we terminate it in the 3<sup>d</sup> year of *Artaxerxes Longimanus*, where the old testament history ends, it will contain at least an uninterrupted series of 3575 years ; but I would rather extend it to the conclusion of the *Persian* monarchy, which subsisted after this 101 years. The principal scope and intention of my scheme limits my researches to this interval.

The 2<sup>d</sup> period or interval I suppose to extend from the conquests of *Alexander*, when the *Jews* were first dispersed amongst the *Greeks*, down to the end of the 4<sup>th</sup> century ; how much farther downwards I cannot say ; nor do I undertake to fix the beginning or ending of the 3<sup>d</sup> period : I can only observe, that the *Babylonish Talmud*, which informs us of the practice, made its first appearance in the beginning of the 6<sup>th</sup> century.

But now to make some application of all this : I say then, as 12 months of the lunar year and 12 synodic lunar months are amongst the characteristic differences between the computations of the antient, and of the latter *Jews*, which has been observed before ; so is the beginning of the month on the evening next after the synod, calculated by the mean motion, *more græcorum* ; and the method of settling it from the evening of the Moon's first appearance after its conjunction with the Sun, determined by observation, together with the numeral denomination of a 13<sup>th</sup> month (no trace or footstep of which is to be found either in the Scriptures, or in *Josephus*, or in *Philo*, though their computation was lunar) to  
which

which we may add, the superstitious translation of *Feriæ*: these, I say, are amongst the characteristic differences between the computations of the latter *Jews*, and of those whom, for distinction sake, I call *Rabbins* and *Talmudists*.

Consequently, as the *Julian* year cannot be reckoned backwards beyond the times of its first institution by *Julius Cæsar*, without being considered as proleptical; so neither can that method of settling the beginning of the lunar months, which obtained amongst the *Jews* in the 2d period, be reckoned backwards as a *Jewish* computation beyond the times of *Alexander*, without being considered likewise as proleptical. Nor lastly, can we extend the talmudical year backwards to the times of the 2d temple, without entirely superseding or shewing a total disregard to the testimony of the most approved writers of that age, who treat of these points.

It must be thought strange and unaccountable, that the *Talmud* and *Maimonides* should so confidently refer the whole affair of adjusting the beginning of the sacred year, and of determining its quantity, to the *Sanhedrim* or great consistory at *Jerusalem*; that they should so punctually relate their sitting the whole 30th day of the month, in a room called *Bethjazeck*, belonging to the great or outward court of the temple, to take evidence of the Moon's first appearance, and strictly examine the witnesses about the circumstances of it, when *Josephus*, who lived whilst the 2d temple was standing, was an eye-witness of its destruction,

struction, and wrote not long after it, should record nothing like it, or give the least intimation of any such custom; nay, *Pbilo* his contemporary attests the direct contrary, and refers the whole to calculation, after the manner of the *Greeks*. These things are too difficult for me either to reconcile or to comprehend.

Mr. *Whiston*, in his short view of the harmony of the 4 gospels, p. 196, inserts a Scholium, the former part of which I shall here transcribe, and leave the reader to judge, how far it may be thought to confirm the above distinction of ages and customs.

Scholium. “ It must here be observed, that  
 “ I say nothing of the delaying the month *Nisan*  
 “ upon the lateness of the spring, and several  
 “ other occasions which the *Jewish* writers speak  
 “ of in aftertimes, no more than I do of the  
 “ translation of their feasts from one day in the  
 “ week to another, upon some trifling reasons  
 “ alleged by them also. And I take no notice  
 “ of these things, because they all appear to me  
 “ to be of a *later date*, and not to have been  
 “ used in the times of our Saviour. The rules  
 “ I here go by are the very same that we find  
 “ in *Pbilo*, in *Josephus*, and in the other certain  
 “ remains of that and the foregoing ages; while  
 “ the other, which we meet with in the *later*  
 “ *Jewish authors*, can by no means prove any  
 “ *such antiquity*.”

If there are any who can implicitly credit the farrago of the *Mishnah*, and the tales of its volu-

minous *Gemara*, I am under no necessity to make myself an opponent ; since there is no room to make it a question, whether the authority of the *Pentateuch*, and the authority of the *Talmud*, are built upon distinct foundations. For my own part, I profess myself to give the preference to the writings of *Moses* and the prophets before all the *Tannaim* and *Mishnical* doctors, collectively taken.

I am sorry I cannot conclude this argument, or even lay the foundations of my scheme, without discovering a very wide disagreement in sentiment, from several authors of considerable note.

I meet with the following extract from the writings of the learned Sir *J. Marsham*.—*Mibi nondum est compertum quis fuerit intercalationis secundi Adar auctor, quo tempore cæperit.*—It is plain from this passage, that Sir *J. Marsham*, after all his enquiries, found himself incapable of fixing the beginning of the 3d period.

— *Ludunt operam chronologi qui veterum Hebræorum tempora ad cyclicas rationes reducunt. Veteres (viz. Hebræi) non ex scripto, non ex computo, sed ex observatione Neomenias suas notabant. Tempora quo vetustiora eo incertiora. Nullum extat in S. literis intercalationis vestigium ; neque constat chronologiam technicam stante primo templo Judæis fuisse cognitam.*

Sir *J. Marsham* has delivered it as his sentiment, that the antient *Hebrews*—*Ex observatione Neomenias suas notabant*—But he says this wholly  
and

and solely upon the authority of the *Talmud* and *Maimonides*; for as to Scripture, express testimony there is none.

Dr. *Prideaux* has entertained the same notions, and has fallen, I shall not scruple to say, into the same mistake, as appears from the following passages in the preface to his historical connection, vol. I.

*Antiently the form of the year, which they (the Hebrews and Israelites) made use of, was wholly inartificial. For it was not settled by any astronomical rules or calculations, but was made up of lunar months, set out by the phasis or appearance of the Moon. When they saw the new Moon, then they began their months, which sometimes consisted of 29 days, and sometimes of 30, according as the new Moon did sooner or later appear. p. 5.*

P. 8.—*In their intercalated years there was another month after Adar, which they called Ve-adar, or the 2d Adar; and then their year consisted of 13 months.—*

P. 10. *These having been the forms of the Jewish year, that is, the inartificial form, used by the antients in the land of Canaan, and the artificial and astronomical form now in use among the moderns.—&c.*

The Reverend Mr. *Bedford* must be allowed to have employed much time and pains on the subject of the Scripture chronology, and he asserts, without the least doubt or hesitation about its truth and certainty, that “ *The computation of lunar*

“ months began from the creation.” page 24. sect. 5.

“ It is evident, says he in the beginning of the same section, that the computation of months at first was made by lunar months, which began upon the evening, when the new Moon did first appear.” p. 24. sect. 5.

“ And thus, from the beginning, the month in Hebrew was called (Jareach) the Moon, or (Chodesh) the renovation of light. And the accent, which somewhat resemble a semicircle is called Jareach ben jomo. The Moon a day old, or the Moon newly begun.” Sect. 5. p. 24.

Sect. 15. p. 27. “ The Method therefore observed by the antient Patriarchs was this: they began their year with a new Moon——For this purpose they took the best observations they were capable of.”——

Sect. 6. p. 24. It is evident, that for the determining the beginnings of some months a due care was taken in the respective evenings to observe, whether the Moon was visible or not, and report the same to such who had a power to fix the months. This was done in Greece to the *Ἡεροι*, or magistrates at Athens, and in the land of Canaan, to the Sanhedrim at Jerusalem.

This method was certainly used in the old world until the time of Moses—at the autumnal æquinox; and after that, by the Jews, at the vernal. P. 24.

This was their method until their famous astronomical year was settled by Rabbi Hillel.——

This

This method *which they*, (*viz.* the *Patriarchs, Hebrews, Israelites, antient Jews, and latter Jews*) *used is exactly described by the Talmud and Maimonides. p. 24.*

It would be needless to transcribe any more, because it is already too evident to be either denied or concealed, that when Mr. *Bedford* wrote this, he might be justly said to have set at the feet of *Maimonides*, and not at the feet of *Moses*.

It were to be wished that,

## Chap. II.

Of the antient method of computing years and months, p. 23. had not been admitted into a learned and elaborate treatise of *the Scripture chronology*. But here I must except Sect. 19. p. 29. which contains an useful and demonstrable truth; which will prove, in the issue, an infallible test and criterion of the genuineness and authenticity of the *Hebrew* text, and of the absolute certainty of its chronological notations, its distinct epochs, and period.

Mr. *Marshal*, in his chronological treatise upon *Daniel's 70 weeks*, chap. V. has given a summary, chiefly from Mr. *Selden*, of all that may seem necessary to be said further concerning that form of year, which is described in the *Talmud*; which Mr. *Marshal* allows to be a *Jewish* year, but by no means the antient Scripture year, made use of all along by the sacred writers; much less that,

that, by which the years of *Daniel's* prophecy of the 70 weeks are to be reckoned. This is the main and sole point, which the whole scope and force of his argument is intended to prove, as may be plainly seen from the ensuing account, which I shall give in his own words.

P. 243, 244, 245. “ That the form of year, “ made use of by the *Jewish Sanhedrin* for the “ regulating of their festivals, should have been “ the year of reckoning intended in this prophe- “ cy, it is in no wise likely for the following “ reasons.

“ First, it is *no Scripture year*. For it con- “ sisted variously sometimes of 12 months, some- “ times of 13 months by the intercalation of the “ *Jewish Veadar*, or 2d *Adar*. But of this *Veadar*, or 2d *Adar*, in the *Jewish* year we have “ not throughout the Scriptures so much as one “ single mention of it, either by name, or as a “ 13th month. Whereas we have 12 months “ by name, and 12 months also in order of num- “ ber, as the 1st, and 2d, and 3d, and so on to “ the 12th, but never beyond that to the bring- “ ing in of a 13th, any where in the Scrip- “ tures.

“ Secondly, It was ever of most uncertain ac- “ count, as being merely artificial and arbitrary, “ as it depended purely upon the determination “ of the *Sanhedrin*. The people knew nothing “ at all about the year current, whether it would “ be a year consisting only of 12 months, or “ otherwise of 13 months, till they of the *San-*

“ *hedrin*

“ *bedrin* had made public declaration of it. And  
 “ this we are told was not usually done till to-  
 “ wards the end of the year. It was,

“ Thirdly, A year very uncertain also as to its  
 “ rise and origin. For who can tell how, or  
 “ *when*, it was first invented? Nor is it less uncer-  
 “ tain,

“ Fourthly, As to its continuation. For who  
 “ can tell us of a certainty, how long it was in  
 “ use among the *Jews*?

“ Fifthly, 'Tis so as in itself, so also as to any  
 “ real use that it could be of to the people, how-  
 “ ever we are told by the learned Mr. *Selden*, that  
 “ it was the year in civil use among the *Jews*.  
 “ He hath told us this indeed upon the testimony  
 “ of both the *Talmuds*, and upon the testimony  
 “ also of *Maimonides* from them: and yet he  
 “ himself has made this most improbable by his  
 “ own most just observation of the manifest diffi-  
 “ culties and uncertainty necessarily arising from  
 “ accounting by such a form of year.

“ But however setting aside this, methinks  
 “ had it been a year commonly known and in or-  
 “ dinary use among the *Jews*, it should have  
 “ been so in Scripture times; if not in all, at  
 “ least in some or other of them. And then con-  
 “ sequently in an intercalary year, we should  
 “ have there read of an additional month, known  
 “ by the name either of the month *Veadar*, or  
 “ the 2d *Adar*, or otherwise by a numeral deno-  
 “ mination of a 13th month.

“ For

“ For it is much that whereas, as I before ob-  
 “ served, in the holy Scriptures we have men-  
 “ tion made ever and anon of 12 months by their  
 “ respective names, or in numeral order so many  
 “ months spoken of with their historical events  
 “ for which they are remarked, that however no-  
 “ thing at all should have happened, through the  
 “ whole course of sacred history, to the making  
 “ famous also a month *Veadar*, or a 13th month,  
 “ as well as those other 12, of which there is  
 “ mention made under a twofold denomination  
 “ as above.”

I can readily agree with the very learned chro-  
 nologist, Mr. *Marshal*, that the *Jewish* talmudical  
 year is not an exact exemplar of that, by  
 which *Moses* and the prophets measured the times  
 and regulated the festivals; yet I cannot admit  
 his inference and conclusion, which he so strongly  
 urges, and so zealously insists upon in the pages  
 immediately following, 245, 246, 247.

“ And so far as *Scripture* is *our light* here, not  
 “ this, but the antient *Jewish* year, or the *Scip-*  
 “ *ture* year of 360 days, must have been the civil  
 “ year, or the year in ordinary use among God’s  
 “ people.

“ For, it is in no wise probable, that in the re-  
 “ gulating of king *Solomon*’s officers (1 *K.* iv. 7.)  
 “ who made provision for the king’s household,  
 “ each man his month in the year, or of those 12  
 “ captains (1 *Chron.* xxvii. 1.) which went in  
 “ and out before the king, month by month,  
 “ throughout *all* the months in the year, any  
 “ regard

" gard should have been had to that irregular  
 " form of *Jewish* year, as it differently consisted  
 " now of 12, now of 13 months: for had a  
 " *Veader* been here to be provided for, as in an  
 " intercalary year, it must have been then in the  
 " cases before us. 12 officers of the household,  
 " and 12 captains, each man his month, had  
 " not been sufficient for the number of months  
 " in such intercalary year.

" — But upon the foundation of *Scripture*  
 " months, of 30 days to a month, and of 12  
 " such months constituting the *Jewish* ordinary,  
 " or common year, the regulation was most rea-  
 " dily adjusted, the monthly succession of offi-  
 " cers doubtless had their respective salaries by the  
 " same known and ordinary *Scripture* year, con-  
 " sisting now in *Solomon's* time, as *antiently* and  
 " *from the beginning*, among God's people, of  
 " 12 equal months of 30 days, and of 12 times  
 " 30, or 360 days.

" — Upon the whole then, as thus before  
 " and after the captivity, we have evident foot-  
 " steps of a year of 360 days, as a known and  
 " common form of year among the *Jews*, what  
 " hinders in the prophecy before us given to that  
 " people, that the year of reckoning intended in  
 " it should not have been this very *Jewish* year,  
 " even as a *Jewish* form of year, as the same  
 " was, as I have shewn, *undoubtedly their an-*  
 " *tient Scripture year.*"

Mr. *Marshal* has laboured hard to prevent the  
 reader from mistaking the *Jewish* 13-month

year for the true antient Scripture year ; he contends that it was an irregular form of year, and could not be in ordinary and common use, as it was so difficult and uncertain in its application ; yet it must be said, that he has mended the matter but very little, and is likely to make a very insufficient compensation, whilst he aims to substitute in its stead the imperfect mutilated solar year of 360 days : for 360 days can never be made to measure the *Mosaic Shanah*, or a true solar revolution.

Mr. *Marshal's* hypothesis, and my 3d proposition are here set in an irreconcilable state of opposition to each other ; and my whole scheme seems to stand as yet unsupported by any concurring testimony. It must make its way and establish itself, as it can, amidst an endless variety of hypotheses and opinions.

However, notwithstanding this great contrariety and uncertainty of conjectures (for nothing more than conjecture has been hitherto offered as I know of) some eminent writers of this age have by their just and pertinent reasonings, descants, and observations, brought us to the verge of truth. But as soon as they have made the least efforts to reduce this theory and speculation to practice, then *ignotum nescio quid*, some secret and insurmountable difficulties have immediately interposed themselves, and put a stop to all further progress.

Mr. *Shuckford*, when he first entered upon the difficult undertaking of connecting sacred and profane

fane history, adopted a notion advanced by Mr. *Whiston* in his theory of the Earth, and is the basis of his anti-mosaical hypothesis, *viz.* That the antediluvian civil year was both solar and lunar (so far he is in the right, and will be countenanced by the *Pentateuch*) and that each of them contained just 360 days, and were exactly commensurate to each other; that at the flood the heavens underwent some change (by the descent and impulse of a comet, says Mr. *Whiston*) and *thereby* the solar and the lunar year were lengthened in the same proportion to each other, as we now find them to have; that long after the deluge, neither the *Jews* nor any other nation had any notion of the years containing any more than 360 days: but when he came to treat of the institutions of *Moses's* law, and to consider the *set seasons* for the constant and regular observance of its feasts, his judgment led him to correct, and his ingenuity to retract the error.

Mr. *Shuckford* is the only author I can find, that ever attempted to frame a scheme or draught of the *Mosaic* year, and he attempts it by the annual circulation of the sabbaths. But as he proceeded upon a mistaken hypothesis (being misled by *Josephus's* wrong interpretation of the *Hebrew* text) the result was, as he candidly acknowledges, that he could not satisfy himself. However, it being almost impossible for a person of his discernment and penetration to overlook the theory, so he reasons extremely well upon it, as will appear

from the following passages in his preface to vol. III.

“ If the *Israelites*, when they came into *Canaan*, had not been instructed to compute such a number of days to a year, as might come very nigh to the true measure of it, they could not long have continued to keep their *set feasts* in their *proper seasons*. The *beathen nations* had as yet no notion of the year’s containing more than 360 days. But such a year falling short 5 days, and almost a quarter of a day, of a true solar revolution, it must be evident, that the *stated feasts* of *Moses’s law*, if they had been observed in a course of such years, would have returned 5 days, and almost a quarter of a day, sooner than the *true season of the year*, for observing them, could have returned with them; and this in a very few years must have brought them into a great confusion.—p. 2.

“ *Moses* lived almost 40 years after his giving the *Israelites* these institutions; and if all this while 360 days had been computed to be a year, it is evident that the feasts of the law would by this time have gone backwards almost 210 days from what was *the real season of the year*, at which they were at first appointed. But we find, that when the *Israelites* came into *Canaan*, and were to keep the passover there on the 14th day of the month *Abib*, — The Corn was ripe in the fields—*Jordan* was in that flow over all its banks; which that  
“ river

“ river was annually remarkable for, all the time  
 “ of harvest—so that the passover, and conse-  
 “ quently the other feasts, fell *this year at* about  
 “ *the times* to which *Moses at first* stated them:  
 “ and *therefore* the *Israelites* must have had some  
 “ method to adjust the computed year to the true  
 “ *measures of a real one.*—p. 3.

“ But by *what particular method* the *antient*  
 “ *Israelites* regulated their year, may perhaps be  
 “ difficult to be ascertained.”—p. 4.

Mr. *Shuckford* concludes the whole of these reasonings (whether upon just and good grounds, or otherwise, may appear in time) with the same sentiment that Dr. *Prideaux* has expressed in his aforecited preface, *viz.* “ That antiently the  
 “ form of year, which the *Hebrews* and *Israelites*  
 “ made use of in the land of *Canaan*, was wholly  
 “ inartificial; for it was not settled by any astro-  
 “ nomical rules or calculations.” What is here suggested may be plainly and clearly collected from the 12th, 13th, and 14th pages of the same preface to Mr. *Shuckford's* 3d volume.

P. 12.—“ In order to fix their times right,  
 “ they were in the first place to observe the  
 “ month *Abib*, the harvest month, to appoint  
 “ the beginning of that to its *true season*; and  
 “ this they might do in the following manner.  
 “ When they found at the end of the year—that  
 “ the harvest was not so forward as to be fit to be  
 “ begun in about 16 days, they might then add  
 “ so many days to the end of their year, as might  
 “ be requisite. This, I think, might be the  
 “ me-

“ method in which the antient *Israelites* adjusted  
 “ their year to the seasons. We may observe of  
 “ this method of adjusting the year, that it is  
 “ easy and obvious; no depths of human science,  
 “ or skill in astronomy, are requisite for the pro-  
 “ ceeding according to it: the *Israelites* could  
 “ only want once in about 20 years to *lift up*  
 “ *their eyes*, and to *look* into their *fields*, and to  
 “ consider before they proclaimed the beginning  
 “ of their month *Abib*, whether, or how much  
 “ they wanted of being *white to harvest*; and this,  
 “ with the observing their sabbaths as above re-  
 “ lated, would furnish them with a year fully  
 “ answering all the purposes of their religion or  
 “ civil life: and this method being thus capable  
 “ of answering all purposes, without leading  
 “ them to a necessity of fixing æquinoxes, esti-  
 “ mating the motions of the heavenly bodies—I  
 “ am the more apt to think, that this was the  
 “ method which God was pleased by the hand of  
 “ *Moses* to suggest to them.”

There is a very near affinity between what is  
 here offered to the reader by Mr. *Shuckford*, and  
 the above-cited remark of Sir *J. Marsham*,  
 “ *Neque constat chronologiam Technicam stante*  
 “ *primo templo Judæis fuisse cognitam.*”

Although Dr. *Prideaux* has given such a parti-  
 cular account of the *Jewish* year from the *Talmud*,  
 and has mistakenly applied the practice of the  
 latest times, and in the 3d period, to the antient  
*Israelites* in the land of *Canaan*; yet no one mo-  
 dern writer has traced with a more just exactness  
 the

the out-lines of the *Mosaic* computation, than he has done, whilst he has made no attempt to fill them up, or to frame a calendar. In the 10th page of this same preface, speaking of an additional month in order to keep the beginning of the lunar year, as near to the cardinal limits of the solar, as such *intercalation* could effect it (speaking still rabbinically) he reasons in the following just manner upon the precise boundaries, and the punctually determined seasons of the sacred and ecclesiastical Scripture year.

“ They were forced, says he, to cast in another month, sometimes in the 3d year, and sometimes in the 2d, for the sake of their festivals. For their feast of the passover (the 1st day of which was always fixed to the middle of their month *Nisan*) being to be celebrated by their eating of the paschal lamb, and the offering up of the wave sheaf, as the *first fruits* of their *barley harvest*; and their feast of penitence, which was kept the 50th day after the 16th of *Nisan*,” — (says Dr. *Prideaux*, upon the authority of *Josephus*, but the *Hebrew* text expressly says, *Mimmochorath Hassabbat, e crastino ipsius sabbati*, on the morrow after the (seventh day) sabbath, in the passover week, which was the day in which the wave sheaf was offered) being to be celebrated by the offering of the two wave loaves, as the *first fruits* of their *wheat harvest*; and their feast of tabernacles, which was always begun on the 15th of *Tisri* being fixed to their time of their ingathering  
of

“ of all the fruits of the Earth. The passover  
 “ could not be observed till the lambs were grown  
 “ *fit* to be eaten, and the barley *fit* to be reaped ;  
 “ nor the pentecost till the wheat was *ripe* ; nor  
 “ the feast of tabernacles, ’till the *ingatherings* of  
 “ the vineyard and olive-yard *were over*. And  
 “ therefore these festivals being fixed to these *set*  
 “ *seasons* of the year,”—here I will beg leave to  
 subjoin—by the immediate appointment of God ;  
*Rishon*, the head, the beginning, the 1st month  
 of the sacred lunar year, must, and ever did fall  
 (under certain determinate variations) on the di-  
 vinely appointed seasons of the true solar.

Can we possibly read and lay together these  
 things, as stated in Dr. *Prideaux's* own words,  
 without making it a just matter of wonder and  
 surprize to find the whole of this evident astrono-  
 mical theory sunk and lost in a (supposed) rude,  
 uncertain, and inartificial adjustment of that very  
 year, which has the singular privilege of claiming  
 the creator himself for its author and institutor,  
 and is, we may be sure, as perfect as infinite wis-  
 dom thought fit to make it.

Mr. *Whiston*, from a remote distant view, and  
 a sort of apprehension of an astronomy in the  
*Hebrew bible*, expresses himself thus in his short  
 view, &c. p. 17. “ There is good reason to doubt,  
 “ whether in the days of *Jeroboam*, almost any  
 “ other nation but the *Jews*, who were therein guided  
 “ by divine revelation, knew and made use of a  
 “ fixed solar year or its equivalent.” When I com-  
 pare

“ pare this *favourable concession* and *splendid Infimuation*,” with several positions to be met with in this treatise, directly opposite to, and subversive of, it; I cannot but conclude that—he wrote an important truth, without attending to what he wrote, or knowing for a certainty that it was a truth.

That he did not know for a certainty that it was a truth, may be evidenced from his confused and perplexed interpretation of proposition II, which we find set down at large, p. 15.

II. “ That *Jewish* year, by which the sacred writers reckon the several intervals *since the deluge*, or at least *since the Exodus* out of *Ægypt*, was *either the true solar year, or a lunar one* so adjusted by proper *intercalations* to the solar, as to be in a manner equivalent to it.”

This proposition has two faces, one of which looks towards the *Pentateuch*, the other towards the *Talmud*; for *Moses* no where mentions, or gives the least hint of, an intercalary month in the lunar year; and we may from hence reasonably conclude, that there must be some secret, and as yet unknown, law in the *Mosaic* lunar computation, which the traditionary compiler of the *Mishna* and the *Talmudical* doctors were utter strangers to; and it is the office of the Scripture chronologist to and his endeavours to investigate and unfold it.

As Mr. *Whiston's* comment and scholium annexed to Prop. II. are very miscellaneous; and abound with hesitations, doubts, uncertainties,

and reverie, I shall not decline the trouble of drawing up and laying before the reader a synopsis of their contents.

*Comment I.* “ This (adjustment by proper intercalations) is evident, because their year by the express law of God was to be commensurate to the seasons.” II. It may be questioned, “ Whether the *Jews* used the lunar year before the *Babylonish* captivity, as they have done since ? ” (*viz.* the time of *Alexander*, by lunar months ?) Answered—“ It wants not its *probabilities*, yet is it *by no means* certain ; and is of *so small consequence either way*, we need not spend time in the enquiry about it.” III. “ The *Julian* year is so near to the *Jewish* year (whether it were solar or lunar) that it will supply its place, *well enough*, in the whole scheme of sacred chronology.”

*Scholium.* I. “ The *Julian* year measures the post-diluvian year only ; for the year *before* the deluge was of a *shorter duration*, and contained but 360 antediluvian days. Proved,

(1) “ From Mr. *Whiston*’s edition of his new theory of the Earth.

(2) “ From the *Mosaic* account of that year wherein the waters were upon the Earth.

(3) “ From the bishop of *Worcester*’s dissertation concerning *Daniel*’s weeks.

(4) “ From the antiquity of this year of 360  
“ days ; it being the *most antient* civil year, of  
“ which any footsteps remain in history, for a  
“ long time after the flood.

II. “ It is possible, and not at all absurd, to  
“ suppose, that the post-diluvian patriarchs be-  
“ fore the *Exodus used the same year* ; and that  
“ *Moses* also refers to the same, in the history of  
“ those times, till the divine law interposed.

“ But, III. It is necessary to speak with cau-  
“ tion in the present case, Because,

(1) “ We have *no positive evidence*, from the  
“ *Mosaic* stile, of the use of a different year since  
“ the flood. And,

(2) “ Because, if the *Patriarchs* did use the  
“ year of 360 days, yet *Moses* in his history might  
“ *reduce* those years to *that natural one*—which  
“ was used afterwards, and give us the whole  
“ period since the flood in the same method of  
“ computation.

(3) “ Because all chronologers have hitherto  
“ supposed the year in *Moses*, *before* and *after*  
“ the *Exodus*, to be the same. Therefore,

IV. “ It is not safe without more express evi-  
“ dence to disturb the *settled account* of those  
“ times, but we shall *suppose* the year since the  
“ deluge to be constantly the same. And,

V. “ Equivalent to the *Julian*.”

Thus being come to the bottom of the account by summing up the whole, we are given to understand, contrary to all our hopes and expectations, that Prop. II. both that part of it which is *Mosaic*, and that which is *Talmudic*, must be discarded, abrogated, and cancelled; whilst the learned and heterogencous scholium conveys just so much instruction and no more, than what archbishop *Usher* had long before left upon record in the preface to his annals, *viz.*

*Primorum patrum. veterumque Ægyptiorum & Hebræorum annus, ejusdem cum Juliano quantitatis fuisse reperitur.*

So when the mountain labour'd to produce  
Some huge gigantic birth—out pop'd a mouse.

It is a considerable objection against Mr. *Bedford's* proceedings, that, notwithstanding the promising title of his book, he no where supposes either any latent principles of astronomy in the *Pentateuch*, or any the least degree of knowlege of it in the *Patriarchs*. They only (according to his *Talmudic* hypothesis) settled the beginning of their year by an *observation* of the Moon's visibility (if not obstructed by clouds, and thereby rendered uncertain) about the time of the autumnal æquinox, as near as they could compute.

They were such proficients in the celestial science, that they could *as certainly* compute the  
num-

- number of years by summers, as the number of days by Sun-risings. And he very seriously suggests in this same chapter of principles, that the *Julian* or *Gregorian* year might serve (Mr. *Whiston* the astronomer adds *well enough*) for a just computation, without any sensible difference from the beginning of the world. May we not infer from hence, that had it not been for *Julius Cæsar* a heathen, and *Pope Gregory 13*, *Adam* and the rest of the primitive *Patriarchs* would have had no solar year at all? And yet, *Mr. Bedford* and *Mr. Whiston* both of them explain, as astronomers, the *Mosaic Shanah*; and having proceeded thus far, they unkindly palm upon us the civil *Julian* year in its stead.

*Adam*, in *Mr. Bedford's* scheme, is grossly ignorant; we are to suppose him making an observation from two trees, or setting up two sticks, directly opposite to each other, upon a horizontal plane, to learn from the projection of the shadow, whether the declination of the Sun was northward or southward.

I have no intention or desire to depreciate *Mr. Bedford's* labours, and I am, to my great satisfaction, assured, that he had a full view of one *Mosaic* principle, tho' in his calculation he takes no small pains to conceal it, for a reason hereafter to be explained. And I may take occasion to make it appear, that, by the assistance and direction of this one *Mosaic* principle, he was enabled to effect, what all his skill in modern astronomy, his too familiar acquaintance with  
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rabbinical learning, and the trash and trumpery of the *Talmud*, could not have enabled him to do.

It is a circumstance to be remarked, that archbishop *Usher* and Mr. *Bedford* have built upon principles quite the reverse of each other. The archbishop supposed that the antient *Israelites* had no acquaintance with the lunar year; Mr. *Bedford*, on the contrary, that they had no certain knowlege of the solar. Unite these contrariant hypotheses, and add the patriarchal law of connection; then from this union and composition will arise the true *Mosaic* twofold year.

I freely profess, that I should have thought it an extreme disappointment, had it been impossible to have discovered, I will not say the outlines only, but a well-concerted scheme of Sun and Moon astronomy in the *Pentateuch*, and throughout the *Hebrew* bible. I entered upon the subject and prosecuted the enquiry with no small degree of confidence, that it was possible to find, in the writings of the divine legislator, such principles, mediums, and data, as would be *in themselves* sufficient to establish and demonstrate an uniform and most perfect system of astronomical chronology.

And indeed the very stile of *Moses's* chronology must necessarily tend, I think, to create such a secret persuasion, at least, in the mind of every attentive reader. *E. g.*—After 430 years, (in the 1st month, on the 15th day of the month) on the self-same day it came to pass, that all the hosts of the Lord went out of the land of *Ægypt*, *Exod.* 12.

But

But when we add to this the strict precepts to observe every institution of the law in its *set* and *appointed* season, we are in the plainest and the strongest terms directed to conclude, that,

In what proportion soever we *suppose* the *Mosaic Shanab* to exceed the true measure of a solar revolution, in the same proportion exactly (multiplied by a considerable number of years) the set and appointed seasons must depart from the festivals.

On the other hand, in what proportion soever the *Mosaic Shanab* be supposed to *fall short* of the true measure of a solar revolution; in the same proportion exactly the festivals must depart from the *set* and *appointed* (solar) seasons.

And yet *Moses*, without making any allowance for a supposed excess on the one hand, or a supposed defect on the other, thus fixes the season, and thus enjoins the regular and constant observance of the institution of the passover, and of the feast of unleavened bread attending it.

Levit. xxiii. 5. *In the 14th day of the 1st month, at even, (Heb. bin bagnarbajim, i. e. in the middle distance between noon and Sun-setting at the vernal æquinox) is the Lord's passover.*

Ver. 6. *And on the 15th day of the same month is the feast of unleavened bread unto the Lord: seven days ye must eat unleavened bread.*

Exod. xiii. 4. *This day came ye out in the month Abib, i. e. of ripening, or at the vernal æquinox.*

Ver.

Ver. 10. *Thou shalt therefore keep this ordinance, Lcmognado, in its season, Mijamim Jemimah.*

Exod. xii. 14. *And this day shall be unto you for a memorial; and you shall keep it a feast unto the Lord throughout your generations: you shall keep it a feast by an ordinance for ever.*

Ver. 17. *And ye shall observe the feast of unleavened bread; for in this self-same day have I brought your armies out of the land of Ægypt: therefore shall ye observe this day in your generations, by an ordinance for ever, i. e. during the continuance of your temporary polity.*

Now, I say, if *Moses* had not delivered to the *Israelites*, together with these precepts, a true astronomical calendar (supposing them to have no traditionary or practical knowlege of such a one) instead of acting the part of a wise and divine legislator, he must necessarily have subjected himself to the just imputation of a rigid and severe taskmaster; not unlike those *Ægyptians* who enjoined the daily task, and exacted the constant tale, of bricks without affording any straw.

At the end of the calendar before our common prayer book, we have,

*A table to find Easter for ever.*

The principal decorations and embellishments of this table are the *golden numbers*, or primes, in the first column on the left hand. The title prefixed is a manifest indication, that the authors  
of

of these paschal (commonly called) *Nicene* canons aimed at a conformity to the precepts of *Moses*, enjoining the antient *Israelites* to observe *in its season* the feast of the passover; and they tacitly established these canons, as if they had been drawn up and expressed in the following authoritative stile, *viz.*

Ye shall observe the *Christian Pascha* always upon the 1st Sunday after the 1st (astronomical) full Moon, which happens either upon or next after the vernal æquinox, *viz.* the 21st of *March*. Ye shall observe the festival of *Easter* by *this rule*, and by *this table*, throughout your generations, by an ordinance for ever.

And yet we find by experience, notwithstanding the *golden numbers*, that the two great luminaries have been so far from giving *their sanction* to these authoritative canons, that the Sun has departed about 11 days, and the Moon above 4, from the original paschal limits; from whence we assuredly know, that they are of mere *human appointment*, and not possibly of *divine institution*.

Now here comes the main question to be solved in the course of this enquiry, which is this; *viz.* what was that form of year, that sure and unerring rule of computation, which could enable the antient *Israelites* to observe the institutions of the law in their divinely appointed seasons? And this, throughout their generations, by an ordinance for ever?

And it may with good reason be made a question ; since the *Europæan* nations (however cultivated and improved by philosophy and science) are not, as yet, possessed of any such perfect civil year, nor have they just grounds to boast of any such indefectible rules of calculation ; the many different estimations of the tropical year are a sufficient proof of this.

“ And I think it was never pretended” (as are the words of Dr. *John Wallis*, professor of geometry at *Oxford*, in a letter to his grace the archbishop of *Canterbury*, dated *Oxford*, *June 13*, 1699) “ That the *civil year* must needs agree “ (exactly to a minute) with the *cælestial*, and if “ never so much affected *is impossible* to be had.” But, perhaps, this may be found a too hasty and precipitate conclusion.

The *Julian year* has measured, since its first institution, 1795 entire revolutions. And it remains to this day in the same state of imperfection as it was then in, when it came out of the hands of the *Ægyptian Sofigenes*. We still continue to reckon for three years successively, with the old *Ægyptians* and *Chaldeans*, 365 days precisely ; whilst the Sun annually measures almost one fourth part of a day more : consequently, at the end of every third *Julian year*, there is a manifest deficiency of near 18 hours from the Sun’s course. But in every 4th *Julian year* we compute 366 days, whilst the Sun equally measures as before. But the excess of the 4th year being equal to the defect of the 3 immediately preceding, by the un-  
natural

natural aid and assistance of a quadriennial intercalary day, the *Julian* and the tropical solar reckoning are brought to a *near equality*.

And how have the astronomers laboured from age to age since the cultivations of science to determine, if it might be, the *exact quantity* of their difference ?

Repeated *observations*, as experience has assured us, have been found *inadequate*.

Sir *Isaac Newton* has carried *the rules of art*, I will venture to say, as to this particular case, to their *Ne plus ultra*, and yet it is *uncertain*.

Science has hitherto been contented to submit to the determinations of art, and, in every calculation, assumes the *artificial conclusion*, as a first principle of nature.

But if external *nature* be *inaccessible*, and turns us over to artificial Rules ; if the *adequate correction* of the quadrant cannot be *absolutely ascertained* upon the principles of the *Pentateuch*, and the data of inspired *Moses* ; then a *due adjustment* of this primary ordination and original establishment of the creator *must still remain uncertain*.

To proceed ; as Mr. *Whiston* by his doubting comment and *Julian Scholium* has entirely set aside and rendered quite evanescent that specious proposition which he had laid down, as cited above, I shall here supply its place by the following one.

That *original antient year* (of the *Patriarchs*, *Hebrews*, *Israelites*, and *Jews*, who lived before the time of *Alexander*) by which the sacred

writers reckoned the several intervals from the first point of time to the 32d year of the reign of *Artaxerxes Longimanus* king of *Persia*, was the *true solar year* ; with which the twofold *lunar year* (both ecclesiastical and civil) was constantly *connected*, and carried all along together with it, by the laws of an extremely curious and *most exact* astronomy.

This is my account, in general, of the *Mosaic* twofold year.

Before I enter upon the direct proof of this proposition, and its several parts, I think it proper and necessary to take notice of *χρονοι* & *καιροι*, *times* and *seasons*, two very frequent and important distinctions in the terms of sacred chronology.

The word *season*, in our language, is equivocal; and without some particular remarks and observations may be apt to mislead the conceptions of a mere *English* reader.

*Χρονοι*, *times*, are measured by the annual revolutions of the Sun, which must necessarily include and distinguish the 4 seasons, *viz.* autumn, winter, spring, and summer. But those 4 seasons of the solar year are not called by the *Greeks*, *καιροι*, but *ωραι*.

The *Psalmist* compares a good man to a tree planted by the water-side, which shall bring forth its fruit in its *season*. Here one versed in the Scripture computation and careful application of its terms, if an *Hebraician*, would not expect to read in the original text, *Lemognado*, but *Begnitto* ;

*nitto*; which stand as distinguished from each other in the *Hebrew* language, as *καιροι* and *ωραι* in the *Greek*: and both of them more so, than times and seasons, according to the vulgar acceptation in the *English*.

In the 14th verse of the 1st chapter of *Genesis* we read in our translation, *and God said, let them be for signs and for seasons, and for days and years.* Here the original word *mognadim*, and the *Greek* version, *καιροι*, have no immediate reference in their primary signification to the 4 *solar seasons*, which are included in the following word *Shanim*; but in this, and other texts, they, in their scriptural use and application, express the sacred and ecclesiastical seasons, pinned down indeed to the solar; they principally, if not constantly, denote solemn assembly days—holy convocations—set conventions, or *stata sacra*; nor are they computed and adjusted by the annual revolutions of the Sun, but by the months and days of the year of the Moon.

God has appointed, says the *Psalmist*, the Moon, *Heb. Lemognadim, Gr. εις καιρους, i. e.* for sacred, solemn, ecclesiastical seasons, periodically returning.

St. *Paul* calls the year of *Christ's* Nativity, *πληρωμα τε χρονου*, the fullness of time, *Gal. iv. 4.* But, *ο καιρος*, the season of that time will be proved to be the 15th day of the 7th month, or the feast of tabernacles; which is the only feast of *Moses's* law, whose celebration was solemnized with an octave. The 1st, typifying and fore-  
shew-

shewing the day of his *birth*; the last, of his *circumcision*. And I doubt not to say, that the Scripture astronomical demonstration of the birth of the *Messiah*, both as to time and season, will merit an attentive examination. But before we attempt to raise a superstructure, we must lay sure foundations.

When our Saviour's disciples, after his resurrection, proposed this *Jewish* question to him; Lord, wilt thou at this time restore the kingdom to *Israel*? They received this answer, It is not for you to know, χρόνος ἢ καιρός, times and seasons, which the father has put in his own power.

There is a remarkable passage in the evangelical history, which will convey to the mind a very clear notion, I think, and a very affecting sense of this scriptural term, καιρός. When the passover day was come, in other words, in the beginning of the 14th day of the 1st month of the sacred year, which *Moses* calls *Abib* (vernal) and the Evangelists, one and all, describe by a periphrasis, still referring us to the *Mosaic* paschal canons in the 12th chapter of *Exodus* (which he that runneth, while he reads, cannot but perceive) *Jesus* sent before him two of his apostles, *Peter* and *John*, from *Bethany* to *Jerusalem*, saying unto them, Go into the city unto a certain man, and say unto him, the master saith, Ο καιρός με ἐγγύς ἐστι—*Mat.* xxvi. 18. Our *English* translators have rendered it, my time is at hand; but the word in the original is not χρόνος time; but καιρός season. As if it had been said, the before-appointed season of my being

being offered up as the true paschal lamb is at hand ; my predicted (*Exod. xii. 6.*) day (of the month) is come ; my predicted (*Exod. xii. 6.*) hour (of the day) is coming. Ο καιρος μὲς ἐγγυς ἐστὶ—Christ died, says St. *Paul, Rom. v. 6.* κατὰ καιρὸν.

Whether this distinction which I have here offered to the reader, has been observed and approved of by the commentators in general, I cannot say ; but I am strongly persuaded, that if parallel places be consulted and laid together, it will appear to have a just foundation.

Being now supplied with a sufficient stock of principles, data, and terms, to enable me to frame the integral calculation, I shall with pleasure enter upon the proof of my 6th, 7th, and 8th propositions, (the 5th will be considered, when we come to ascertain the astronomy, both in the beginning and in the end of the year of *Noah's* life 600, A. M. 1656) which no one, from what appears, has ever yet attempted.

I could wish that the intelligent reader would not think, that a bare transient and cursory perusal of the *Mosaic* table annexed would be sufficient to qualify him to pass a true judgment and determination concerning it ; but that he would examine it thoroughly, with as much care and attention as it really deserves. I have endeavoured to illustrate several particulars by observations and remarks, to which he will be able to add, I do not doubt, others that may have escaped me ; and as soon as he shall be convinced

vinced of its truth, certainty, and perfection; and shall have a clear view upon what an impregnable foundation it is built, and that, like the books of kings and chronicles, it is an uncommon test and criterion of chronological skill and acumen, he will not regret either the time or pains, that a due examination of it (for it must be studied) may have cost him.

It has been the most usual method to make two distinct tables of these genealogies; the one, of the *Patriarchs* who lived before the flood; and the other, of those who lived after it; and likewise to end the account at the birth of the eldest son of *Terah*, who was born to him, when he was 70 years old; but as in itself it is one continued table from *Adam* to *Joseph*, I have so represented it; and, doubtless, it ought to be so exhibited; for why a *division*? And I am sure there is very good reason to ask, why a *mutilation* of this incomparable canon?

Had I produced *Moses's* canon of *Patriarchs* (as Dr. *Overal* dean of *St. Paul's* produced *Ptolemy's* canon of kings) from some very antient MS. which had lain buried in obscurity and oblivion for ages, and published it together with the demonstration, need it be doubted, whether all the curious would have highly admired, and have proportionably rated the genuine antediluvian antique.

The intrinsic value and superior excellency of this *Mosaic* table arises from the perfection of its

its *inherent* astronomy, and the curiosity from its *high antiquity*.

The most antient ethnic epocha is that of the siege and the taking of *Troy*, which *Diodorus Siculus* and *Dionysius of Halicarnassus* agree to place in the 408th year before the *Olympiads*.

The first olympic game, after its restoration by *Iphitus*, was celebrated A. M. 3232, in the 33d year of *Uzziab* or *Azariab* king of *Judah*, at the summer solstice, according to this scheme of sacred chronology. From A. M. 3232 subtract 408 years, remains A. M. 2824, the 10th year of *Jair*. But this backward computation, from the 33d year of *Uzziab* king of *Judah*, A. M. 3232, to the 10th year of *Jair*, A. M. 2824, will not reach the death of *Joseph*, by 445 years: and when *Joseph* died, the *Patriarchs* had been in possession of an astronomical calendar and computation, 2369 years. This indeed must be acknowledged to be very extraordinary, and will not be implicitly credited, but upon such evidence and proof, as will amount, without exception or reserve, to a mathematical certainty.

When archbishop *Usher* contemplated the tables of the genealogies of the *Patriarchs*, both before and after the flood; the solidity of his judgment would not permit him to subscribe to the absurd traditional notions of the *Jews*, that the *Patriarchs* were all born and died at the autumnal æquinox, on the same month and day: yet it led him to adopt an hypothesis unwarranted by *Moses*, viz. that the lives of the *Patriarchs*

were (only) to be estimated like the reigns of the kings of *England*, in our chronicle; where the odd months and days collected and included measure the whole distance since the conquest; dating the beginning of the account, *OEt.* 14, A. D. 1066. And it is more than possible, that the learned prelate would have smiled at the simplicity of him, who should have suggested to him, that the years of the *Patriarchs* run parallel with those of the world, without any regard to the particular day, either of their birth, or of their death; just in like manner, as the years of the reigns of the kings in *Ptolemy's* canon run parallel with their corresponding *Nabonassar* years, without any regard to the month and day of the month, in which they began and ended their respective reigns, and as they were reckoned in the annals of the several kingdoms.

And further, that the only essential difference between *Moses's* canon of *Patriarchs* and *Ptolemy's* canon of kings was this, *viz.* that the first in itself considered is truly astronomical, because built upon an astronomical year; whilst the other is not, as being founded on a civil one.

As this *Mosaic* table is the very basis, and the main supporting pillar of the whole fabric of sacred chronology, we must carefully look to foundations; and be able and ready to prove, when called upon, that the whole and every part is rightly and duly constructed, according to the original plan of *Moses*, and in exact conformity to his explicit directions: for it may with some pretext

pretext of reason be alleged, that according to the table *Noah* was 502 years old at the birth of *Shem*; whereas, on the contrary, *Moses* expressly writes, *Gen.* v. 23. *Noah was 500 years old; and Noah begat Shem, Ham, and Japhet.*

It is certain that this text demands our special attention with respect to *Shem*, by placing him the first in order; and possibly a hasty, inconsiderate reader might be prompted to infer priority of birth from priority of order: but if he should, he would conclude erroneously, and in flat contradiction to the *Mosaic* data, and circumstances of the history, as may be plainly seen by collecting and duly comparing them.

*Ch.* vii. 6. *Noah was 600 years old when the flood of waters was upon the Earth, i. e.* he was in his 600th current year, *ver.* 11. For *Moses* constantly completes the current year, when he has occasion to mention the age of a living person. Thus, *Abram* was 75 years old when he departed out of *Haran*. Again, *Joseph* was 30 years old when he stood before *Pharaoh*. I need not produce any more examples.

*Gen.* xi. 10. *These are the generations of Shem; Shem was 100 years old, and begat Arphaxad, 2 years after the flood.*

Now from these circumstances of the history we may argue as closely and certainly as in the mathematics. For if *Noah* was 600 years old at the end of the year in which the deluge happened, then at the end of 2 years after it he must be 602; therefore from 602 subtract the 100 contem-

porary years of *Shem's* life, remains 502 for the age of *Noah* at the birth of *Shem*, as set down in the table.

*Shem* is placed in the first order, because, amongst other reasons, the chronology and the genealogies are continued in the line of *Shem*, and not in the line of *Japhet* or *Ham*.

It may likewise be urged by way of objection, just in the same manner as in the aforementioned case of *Shem*, that according to the table *Terah* was 130 years old at the birth of his son *Abram*; whereas, on the contrary, *Moses* expressly writes, *Gen. xi. 26. And Terah lived 70 years, and begat Abram, Nahor, and Haran.*

But should any one, by the sole guidance of this text, again infer priority of birth from priority of order, he would again conclude erroneously, and in direct contradiction to the circumstances of the history, as plainly related by *Moses*.

*Gen. xi. 32. And the days of Terah were 205 years.*

*Gen. xii. 4. Abram was 75 years old when he departed out of Haran.*

*Moses*, by these data, has clearly taught us to argue and conclude in this manner. From 205 years subtract the 75 contemporary years of *Abram's* life, the remainder 130 rightly determines the age of *Terah*, at the birth of *Abram*.

*Abram* is placed the first in order for the same reasons that *Shem* was, because the chronology and

and the genealogies are continued in the line of *Abram*, and not in the line of *Haran* or *Nabor*.

I am sensible but of one objection more of this nature which can be made, and it is this. According to the table, *Jacob* was 91 years old at the birth of his son *Joseph*. But here it may be asked, where does *Moses* specify the age of *Jacob* at the birth of *Joseph*? I answer very plainly and clearly in the circumstances of the history.

*Gen. xli. 46.* *Joseph* was 30 years old when he stood before *Pharaoh*, and was advanced to that high dignity. The 7 years of plenty immediately follow, at the end of which *Joseph* was 37 years old. Upon the return of his brethren into *Egypt* to buy corn, he told them, *Gen. xlv. 6.* *For these two years hath the famine been in the land: Joseph* was now 39 years old. In this year *Jacob* descended into *Egypt*, and stood before *Pharaoh*, *Gen. xlvii. 9.* *When the days of the years of his pilgrimage were 130 years.* Therefore from 130, subtract the 39 contemporary years of *Joseph*'s life, and the remainder 91 rightly determines the age of *Jacob* at the birth of *Joseph*, as in the table.

Here I shall offer a few remarks, (1) We cannot with certainty collect in what year of the life of *Jacob*, any one of his 12 sons was born, excepting only *Joseph*. (2) Not one of the 12 sons of *Jacob* is enrolled in the list of *Patriarchs*, or admitted into the canon, but only *Joseph*. (3) *Joseph* lived 110 years, the whole of which constitute a corresponding part of the world's chronology,

nology, which is peculiar to *Joseph*, for it cannot be said of any of the other *Patriarchs*. (4) As these 110 years close the canon, the chronology cannot be extended one year farther by the lives of the *Patriarchs*; it being no where intimated, nor can it be gathered from historical relation, in what year of the life of *Joseph*, either *Ephraim* or *Manasseh* was born. (5) From hence arises a very nice, and one of the most difficult demonstrations of the *Pentateuch*; which consists in the ascertaining in which of the 430 years of sojourning *Joseph* died; or, which amounts to the same, how many years precisely intervened between the death of *Joseph*, and the birth of *Moses*; who was 80 years old when he stood before *Pharaoh*, and demanded the dismissal of the *Israelites*.

Archbishop *Usher*'s hypothesis determines them to 64 years, but the certainty of this determination was never yet proved, nor can be, from the astronomical data of the *Pentateuch*; which cannot be treated of properly in this place. But to return;

There is no such table to be met with as the *Mosaic*, but in the *most ancient* sacred records. We may perceive, by a cursory view of it, that it divides itself into four distinct periods; in every one of which the ages of the *Patriarchs* decreased proportionally, or about one half. The 1st period contains 10 generations from *Adam* (who stands at the head of all epochs, periods, and computations) to *Noah* inclusive. It commences

on the 4th of the Hexaëmeron, at the autumnal æquinox, and it ends at the birth of *Shem* (who stands at the head of the 2d period) A. M. 1558, at the autumnal æquinox. During the 1st period, men generally lived between 900 and 1000 tropical years.

*A table of the ages of the Patriarchs of the 1st period.*

	1.	2.	3.
1 <i>Adam</i>	130	800	930
2 <i>Seth</i>	105	807	912
3 <i>Enosh</i>	90	815	905
4 <i>Cainan</i>	70	840	910
5 <i>Mehalaleel</i>	65	830	895
6 <i>Jared</i>	162	800	962
7 <i>Enoch</i>	65	300	365
8 <i>Methusalah</i>	187	782	969
9 <i>Lameeh</i>	182	595	777
10 <i>Noah</i>	502	448	950


  
 A. M. ☉1558☉*Shem* born.

The 2d period contains 4 generations, from *Shem* to *Heber* inclusive. It begins at the birth of *Shem*, A. M. 1558, at the autumnal æquinox; and it ends at the birth of *Peleg*, (who stands at the head of the 3d period) A. M. 1757, at the autumnal æquinox. During this 2d period, men generally lived between 400 and 500 years. No one

one person born after A. M. 1558 is recorded to have lived 500 years, excepting only *Shem*, who reached 600 years, 98 of which he passed in the old world, and 502 in the new. So that *Shem* lived just as many years in the new world, as *Noah* was old at his birth.

*A table of the ages of the Patriarchs of the 2d period.*

	I.	2.	3.
1 <i>Shem</i>	100	500	600
2 <i>Arphaxad</i>	35	403	438
3 <i>Salah</i>	30	403	433
4 <i>Heber</i>	34	430	464

199 *Peleg* born A. M. ☉ 1757 ☉

The 3d period contains 5 generations, from *Peleg* to *Terah* inclusive. It begins at the birth of *Peleg*, A. M. 1757, at the autumnal æquinox, and it ends at the birth of *Abram*, (who stands at the head of the 4th period) A. M. 2008, at the autumnal æquinox. During this 3d period, men generally lived between 200 and 300 years. No one person born after A. M. 1757 is recorded to have lived 300 years.

*A table of the ages of the Patriarchs of the 3d period.*

	1.	2.	3.
1 Peleg	30	209	239
2 Reu	32	207	239
3 Serug	30	200	230
4 Nabor	29	119	148
5 Terah	130	75	205

251 *Abram* born A. M. 2008 ☉.

The 4th period contains thirteen generations, from *Abram* to *David*, (who stands at the head of the 5th and last period) exclusive. During this 4th period, men generally lived between 100 and 200 years. It begins at the birth of *Abram*, A. M. 2008, at the autumnal æquinox; and it ends at the birth of *David*, A. M. 2918, at the vernal æquinox. No one person born after A. M. 2008, is recorded to have lived 200 years.

*David* lived 70 years, 2 *Sam.* v. 4. which has been the general standard of human life ever since, and is to this day; though many never attain to it, and a certain proportional number exceeds it. No one person, born after A. M. 2918, is recorded to have lived 180 years, which was the age of *Isaac*; or 175 years, which was the age of *Abraham* at his death.

*A table of the ages of the Patriarchs of the 4th period, as far as the canon extends, containing only 4 generations.*

	1.	2.	3.
1 <i>Abraham</i>	100	75	175
2 <i>Iaac</i>	60	120	180
3 <i>Jacob</i>	91	56	147
4 <i>Joseph</i>	39	71	110
	<hr/>		
	290		
	+71		
	<hr/>		

361 A. M. 2369  $\odot$  *Joseph* died.

The several tables of the respective ages of the *Patriarchs* in the 4 successive periods consist, each of them, of 3 columns; the 1st of which exhibits the ages of the *Patriarchs*, at the birth of their recorded sons, in whose line both the chronology and the genealogies are continued. These numbers, collectively taken, constitute a successive uninterrupted series of tropical years, and thereby ascertain astronomically the world's age, or determinate past duration. As for example, The 1st table comprehends 10 lineal descents in a continued succession, and the numbers of col. 1. being collected into one sum, produce and express 1558 solar revolutions; hence we infer, that *Shem* was born A. M. 1558, at the autumnal

tumnal æquinox. If we set them down in the following manner, we shall have a clear view of the whole.

## A.M.

Tab. 1. col. 1.	1558	<i>Shem</i> born, 2d period begins.
Tab. 2. col. 1. 199	1757	<i>Peleg</i> born, 3d period begins.
Tab. 3. col. 1. 251	2008	<i>Abram</i> born, 4th period beg.
Tab. 4. col. 1. 361	2369	<i>Joseph</i> died.

The respective numbers of the 2d column inform us how many years the *Patriarchs* lived after the birth of their recorded sons. These in conjunction with those of the 1st are a sure and useful directory for the drawing out a table at large, which will represent in one commodious view the astronomical parallelism of the corresponding years of the contemporary *Patriarchs*. To illustrate this by the table, we will take the year in which *Adam* died.

*Adam* lived 930 years; and as the year of his life 1 runs parallel with A. M. 1, so the year, in which he died, runs parallel with A. M. 930. From 930 (col. 3.) subtract 130 (col. 1.) the age of *Adam* at the birth of *Seth*, the remainder 800 (col. 2.) shews us how many years *Seth* lived contemporary with *Adam*. Again, from 800 subtract 105, the age of *Seth* at the birth of his son *Enosh*, the remainder 695 gives the contemporary years of *Enosh*. In like manner, the following numbers, 605, 535, 470, 308, 243, 56, denote the contemporary years of *Cainan*, *Mebalaleel*, *Jared*, *Enoch*, *Methusalah*, and *Lamech*.

All these years begin and end together at the autumnal æquinox ; they are all astronomically commensurate to each other, and they all run parallel with A. M. 930, in which year *Adam* died, See the table.

*Methusalah* lived 243 years with *Adam*, and died in the beginning of the year of the deluge, in the 969th current year of his life, and in the 726th year from the death of *Adam* ; for  $969 - 243 = 726$ . If to 725 we add 930, the life of *Adam*, the sum 1655 shews the duration of the old world, measured by the lives of two antediluvian *Patriarchs*: which seems incredible to us, who live in the 5th period, in which the term of human life is contracted into the narrow span of 70 or 80 years. And if *Moses* had not recorded and transmitted to us the astronomy of the primitive world, together with the precise time of its continuance, and the longævity of the *Patriarchs*, his plain historical account, however true in itself, would not have gained credit with some, whilst unsupported by demonstration. But the certainty and perfection of primæval astronomy may possibly extort an assent to the truth of *Moses's* narration, from those who are far from paying an implicit regard to his authority, as an inspired historian.

*Moses* has recorded the ages of *Methusalah* and of *Aaron*, under such peculiar circumstances, as plainly direct our thoughts to some uniform and established law of reduction.

*Me-*

*Methusalab* was 369 years old at the birth of his grandson *Noah*; the flood happened in the 600th current year of *Noah*'s life, and consequently, in the 969th of *Methusalab*. And as *Methusalab* was not involved in the deluge, if we suppose him to have died the day before it began, or a week before it, according to the opinion of the *Jews*, he could not have lived more than 968 complete years, one month, and odd days, reckoning from the autumnal æquinox: yet, says *Moses*, *Gen. v. 27.*

*All the days of Methusalab were 969 (complete) years.*

*Aaron* was 83 years old at the vernal æquinox, about the time of the *Exodus*. *Exod. vii. 7.* He died on mount *Hor*, (*Numb. xxxiii. 38.*) in the 40th year after the children of *Israel* were come out of the land of *Egypt*, on the 1st day of the 5th month, *viz.* from the vernal æquinox. And yet, says *Moses*, *ver. 39,*

*Aaron was 123 (complete) years old, when he died on mount Hor.*

It is undeniably certain, that *Moses* completes the last current year, both of *Methusalab* and of *Aaron*'s life, by a well-known and determinate law; the question is, by what law? Here the answer, I think, is obvious, *viz.* The indispensable obligation, that the antient *Israelites* were under to observe their festivals in their set and appointed seasons, throughout their generations, by an ordinance for ever, fully instructs us to conclude, that *Moses*'s law of reduction was a  
true

true astronomical law. And thus I endeavour to convey to the reader's mind a clear, easy, and familiar conception of it.

The flood began and ended in the 600th year of *Noah's* life, A. M. 1656. These 600 years of *Noah* (computed each of them from the autumnal æquinox, to the autumnal æquinox following) carry us back to the conclusion of the year of *Lamech's* life 182. For so many years old was *Lamech*, by *Moses's* astronomical law of reduction, at the birth of his son *Noah*, A. M.

1056, ⊙

These 182 years of *Lamech* carry us back to the conclusion of the year of *Methusalab's* life 187. For so many years old was *Methusalab* by *Moses's* astronomical law of reduction, at the birth of his

son *Lamech*, A. M. 874, ⊙

These 187 years of *Methusalab* carry us back to the conclusion of the year of *Enoch's* life 65. For so many years old was *Enoch*, by *Moses's* astronomical law of reduction, at the birth of his

son *Methusalab*, A. M. 687, ⊙.

These 65 years of *Enoch* carry us back to the conclusion of the year of *Jared's* life 162. For so many years old was *Jared*, by *Moses's* astronomical law of reduction, at the birth of his son *Enoch*,

A. M. 622, ⊙.

These

These 162 years of *Jared* carry us back to the conclusion of the year of *Mehalaleel*'s life 65. For so many years old was *Mehalaleel*, by *Moses*'s astronomical law of reduction, at the birth of his son

*Jared*, A. M. 460, ⊙

These 65 years of *Mehalaleel* carry us back to the conclusion of the year of *Cainan*'s life 70. For so many year's old was *Cainan*, by *Moses*'s astronomical law of reduction, at the birth of his son

*Mehalaleel*, A. M. 395, ⊙

These 70 years of *Cainan* carry us back to the conclusion of the year of *Enosh*'s life 90. For so many years old was *Enosh*, by *Moses*'s astronomical law of reduction, at the birth of his son *Cainan*,

A. M. 325, ⊙.

These 90 years of *Enosh* carry us back to the conclusion of the year of *Seth*'s life 105. For so many years old was *Seth*, by *Moses*'s astronomical law of reduction, at the birth of his son *Enoch*, A. M.

235, ⊙.

These 105 years of *Seth* carry us back to the conclusion of the year of *Adam*'s life 130. For so many years old was *Adam*, by *Moses*'s astronomical law of reduction, at the birth of his son *Seth*,

A. M. 130, ⊙

*Adam*, 130—130=0, ⊙. Therefore, these 130 years of *Adam*'s life carry us back to the

4th of the Hexaëmeron, and to the autumnal æquinoctial day; from which, and the 15th of the thirty-day month of the lunar year (established from the *beginning*) the divine chronologist dates his computations.

From this plain account, and familiar representation (antecedent to proof) we learn with some degree of satisfaction, in what a curious, exact, and skilful manner, the genealogies of the *Patriarchs*, both before and after the flood, from the 4th of the Hexaëmeron, to the end of the year in which *Joseph* died, are reduced to constitute an uninterrupted successive chronology, and the astronomical age of the world.

Hence also it comes to pass, that all the chronologists, who derive their computations from the authentic *Hebrew* text, have ever collected 1656 years, from the creation to the deluge inclusive; though they have been much divided in their sentiments and conjectures, concerning the form and quantity of these antediluvian years; they have been so far from undertaking to prove, that not one has met with sufficient ground and encouragement, to suppose them to be tropical solar.

The subject of this treatise is, I well know, at a very low ebb, and in such a settled disesteem, notwithstanding all the learned and elaborate dissertations and volumes which have been wrote upon it, and published in one age after another, that should any one assert in public conversation, that no one part of practical mathematics was more demonstrably certain than the Scripture chro-

chronology, not only in the general, but in every distinct branch and period, the person that should make the assertion would be looked upon as a fanciful dogmatist, or as not knowing what he said. But how paradoxical soever it may be found, and how strongly soever prejudicate opinion may oppose the reception, we shall find it in the result, after so many controversial wranglings, to be real matter of fact.

The two most distinguished and the most important years in the astronomical canon of *Patriarchs* are the year of the creation, or A. M. 1, and the year of the deluge, or A. M. 1656: in the 1st, the *Mosaic* history recites the origin and rise; in the 2d, the total subversion and most terrible devastation of this terraqueous globe; and he reduces his circumstantial narration and account under these five heads. 1. Its *impulsive* cause. 2. Its *efficient* cause. 3. Its *instrumental* cause. 4. Its *chronology*. 5. Its *astronomy*.

First, the *impulsive* cause of the deluge is related by *Moses* in very *affecting*, but the *efficient* cause in very *emphatic*, terms. We will consider all of them distinctly and briefly.

First, the *impulsive* cause of the deluge is thus recorded by *Moses*, *Gen.* vi. 5, 6. 11. 12.

Ver. 5. *And God saw that the wickedness of man was great in the Earth, and that every imagination of the thoughts of his heart was only evil continually.*

Ver. 6. *And it repented the Lord that he had made man on the Earth, and it grieved him at his heart.*

Ver. 11. *The Earth was also corrupt before God, and the Earth was filled with violence.*

Ver. 12. *And God looked upon the Earth, and behold! it was corrupt: for all flesh had corrupted his way upon the Earth.*

2dly, The *efficient* cause of the deluge was vindictive Justice armed with omnipotence, and is thus related by *Moses*. Gen. vi. 7. 13. 17.

Ver. 7. *And the Lord said, I will destroy man whom I have created from the face of the Earth, both man and beast, and the creeping things, and the fowls of the air, for it repenteth me that I have made them.*

Ver. 13. *And God said unto Noah, the end of all flesh is come before me, for the Earth is filled with violence through them: and behold! I will destroy them with the Earth.*

Ver. 17. *And behold! I, even I, do bring a flood of waters upon the Earth to destroy all flesh, wherein is the breath of life, from under Heaven: and every thing that is in the Earth shall die.*

3dly, The *instrumental* cause of the deluge in the hand of divine providence, was, the waters which are above, and the waters which are under the Earth.

Gen. vii. 11. *All the fountains of the great deep were broken up, and the windows (Gr. cataracts) of Heaven were opened.*

4thly, Its *chronology*, or exact time when it began, is thus determined and stated. Gen. vii. 11.

Ver. 11. *In the six hundredth year of Noah's life, in the 2d month, on the 17th day of the month, on the same day.*

We have in this determination, year, month, day, the name of a *Patriarch*, and his age; when we read this, can we reasonably imagine, that *Moses* implicitly took up with a mere political computation? We meet with nothing like it amongst the most antient nations, or in any other historical records.

*Berosus*, a priest of *Belus*, by birth a *Babylonian*, wrote the *Chaldaic* history; and we find in the fragments of *Abydenus* and *Apollodorus*, taken out of *Berosus*, and preserved by *Eusebius* in his *Greek* chronicon, that the *Chaldæans* had preserved in their traditions several circumstances of the deluge, exactly as they are recorded by *Moses* in his history; especially that of sending out a bird 3 times successively to see if the waters were abated, and its returning no more after the 3d time. But omitting the similar circumstances of the history, which have been so often noted, I shall only compare the chronology of the priest of *Belus*, with that of the *Jewish* legislator.

And, 1st, As there are 10 generations from *Adam* to *Noah*, according to *Moses*; so also, there are 10 generations from *Alorus* to *Xisuthrus*, according to *Berosus*.

2dly, As God revealed to *Noah* his intentions to drown the world by a flood, in the 600th year of his life, in the 2d month, on the 10th day of the month; and that it should begin on the 17th day of the same month, at the distance of 7 days, or a complete week from thence, according to *Moses*: so likewise, God revealed unto *Xisuthrus* his intentions to destroy the world by a flood, in some one year of his life, and that it should begin on the 15th day of the *Macedonian* month *Dæsius*, according to *Berosus*.

3dly, *Moses* gives us an ordinal number, viz. the 2d month; *Berosus*, a political month, viz. *Dæsius*.

4thly, The ordinal number of *Moses* directs us to an astronomical epoch of the year; the political month of *Berosus* pins us down to a civil one.

5thly, *Noah* lived 950 years according to *Moses*; *Xisuthrus* lived or reigned 43200 years, according to *Berosus*.

6thly, The years of *Noah*'s life may be ascertained by the astronomer, because exactly commensurate to an equal number of solar revolutions: but the years of the life or reign of *Xisuthrus*, are not to be estimated by the motions of the heavenly bodies, but by *Chaldæan Sari*, *Niri*, and *Sofi*. And,

If we admit the hypothesis of the learned *Monks*, *Anianus* and *Panadorus*, each *Chaldæan Sarus* will be equal to 3600 day-years; which contain 10 *Chaldæan* years, of 360 days each. A *Nirus* will be equal to 600 day-years, equal to the 6th part of 10 *Chaldæan* years, of 360 days each. And a *Sofus* will be equal to 60 day-years, equal to the 6th part of a *Chaldæan* year of 360 days.

*Berosus* wrote his annals in the reign, and by the command, it is said, of *Ptolemy Philadelphus*, not long after the *Hebrew* Scriptures had been translated into *Greek*; his place of residence was the isle of *Cos*, amongst the *Grecians*, so that he might be well acquainted with the *Macedonian* stile: but what! is the *Macedonian* month *Dæsius* to be extended back to the year of the deluge, to the days of *Noah*? And to an age, in which the remotest ancestors of the *Greeks* had no being or existence, but only in the loins of *Japhet*? This is too absurd to be supposed, and too extravagant to be granted.

And now let the reader judge from this comparison, which of these two chronologies is the most likely to gratify his enquiries, and to settle rightly the year of the deluge, that of *Moses*, or of *Berosus*?

And no wonder that *Moses* so far excelled, may some say,—For he was educated (*Gr.* *Επαιδεύθη*) in all the wisdom of the *Egyptians*, as the *Proto-Martyr*, *St. Stephen* has long since attested. *Acts* vii. 22. And did the *Ægyptian Sophoi* indeed instruct *Moses*, in the laws of true astronomy?

Then

Then have we not just grounds highly to esteem these splendid fragments of the *Pentateuch*, which have alone transmitted to us, the genuine remains and authentic monuments of the old *Egyptian* learning? But nothing is more remote from the truth than this; for alas! had not *Hermes* played at dice with the Moon (so relates the truly ancient mythologic fable) and won from her the 72d part of 360 days, the *Egyptians*, it is possible, might never have recovered the *quinque Epagomenæ*, from the reign of *Thoth*, to the death of *Cleopatra*.

The correction of the old *Egyptian* year from 360 to 365 days (for they knew nothing of the tetarton or quadrant many hundred years after) was made, as we are told by *Georgius* the *Syn-cellus* of the Patriarch *Taracosius*, in the reign of *Aseth*: but in what age this king *Aseth* reigned, whether *before* or *after* the time of *Moses*,

*Perdocti certant, & adhuc sub iudice lis est.*

Let thus much suffice in general for *Moses's* account of the *chronology* of the deluge, which leads me,

5thly, To its *astronomy*. The sacred historian has let latest posterity know, that as *chronology* is the life and soul of history, so *astronomy* is the life and soul of *chronology*. And should any one be prompted, by a weak incredulity, to doubt or call in question, the reality and certainty of the

*much*

*much characterized* year of the universal deluge, he must first put out the Sun and the Moon from the expanse of the heavens ; which give their united and irrefragable testimonies to the very times of this stupendous revolution, and most dreadful catastrophe.

As A. M. 1. the year of the creation, and A. M. 1656, the year of the old world's dissolution, stand very distinguished by their history, we might be induced to expect, that they would be as distinguished by their astronomy ; and so we shall find that they are ; we shall find, I say, that the astronomy of that year in which the world was created, and of that year in which it was destroyed by a flood, may be collected and stated with such a minute exactness, from the principles, data, and terms laid down and given in the *Hebrew* text of the *Pentateuch*, as will plainly and clearly lead us to a full and perfect knowledge of all the fundamental laws of Sun and Moon astronomy, and to all the necessary rules of calculation.

I will take the freedom to suppose, that the reader has already perused, and with some attention considered, Tab. I. II. p. 15. which exhibit the astronomy of these two remarkable years : if he has, he will be the better prepared for the more ready apprehension of the following illustration of them. But since these tables are very concise, and must needs be thoroughly understood by those who are desirous to acquaint themselves with this scheme, and the calculations which support

port it, I shall not scruple to set them down again in this place.

*The positions of the Sun and Moon, both in the beginning, and in the end of the year of the creation, and of the year of the deluge, compared together.*

Here we must carefully remember, that the primary position A. M. o. is the fundamental datum of the *Hebrew Pentateuch*.

Tab. I.		Tab. II.	
☽	A. M. I.	☽	A. M. 1656.
☉		☉	
○	354 ○ 11	☾	354 ☾ 11
A. M. o. ☾ 15	339 ☾ 26	○	15 339 ○ 26
<i>Zohoraim</i>		<i>Boker</i>	

Although the circumstances of the *inverted position* of the two great luminaries, in the beginning and conclusion of the old world, are too obvious not to be perceived; yet it may not be superfluous to note the particulars.

1. A. M. o. On the 4th of the Hexaëmeron, which was the autumnal æquinoctial day, the last day of the (chaotic) lunar year, supposed to be computed from full Moon (○) to full Moon (○), fell upon the last day of the (chaotic) solar.

1. A. M. 1655, ending the last day of the lunar year, computed from new Moon (☾) to  
new

new Moon ( $\tau$ ) fell upon the last day of the solar.

2. A. M. 1. A compleat lunar year of 354 days, computed from full Moon ( $\circ$ ) to full Moon ( $\circ$ ), fell within the cardinal limits of the solar.

2. A. M. 1656. A compleat lunar year of 354 days, computed from new Moon ( $\epsilon$ ) to new Moon ( $\epsilon$ ), fell within the cardinal limits of the solar.

3. A. M. 1. 339 days of the new Moon ( $\epsilon$ ) lunar year fell within the cardinal limits of the solar.

3. A. M. 1656. 339 days of the full Moon ( $\circ$ ) lunar year fell within the cardinal limits of the solar.

4. A. M. 1. The full Moon epact, or the distance of the full Moon ( $\circ$ ) evening from the autumnal æquinox, was  $\circ$ . 11. days.

4. A. M. 1656. The new Moon epact, or the distance of the new Moon ( $\epsilon$ ) evening from the autumnal æquinox, was  $\epsilon$  11. days.

5. A. M. 1. The new Moon epact, or the distance of the new Moon ( $\epsilon$ ) evening from the autumnal æquinox, was  $\epsilon$  26 days, including a full Moon evening; for  $\epsilon$  26—15= $\circ$  11.

A. M. 1656. The full Moon epact, or distance of the full Moon ( $\circ$ ) evening from the autumnal æquinox, was  $\circ$  26 days, including a new Moon evening; for  $\circ$  26—15= $\epsilon$  11.

Now no one will suspect me of *inventing* this astronomy; no one will offer to charge me with

*forging* these characters at so large an interval from each other; much less will any one ascribe to me the power of commanding the Heavens to *set their seal* to the truth, at the distance given.

It will be without doubt concluded, that I owe them to the aids and assistances of astronomical tables and calculations. But I can with truth reply, that I never consulted them; nor has philosophy and science ever yet discovered, or so much as suggested the double epoch or radix of the Moon's year, and of the twofold computation arising from it, the one sacred and ecclesiastical, the other civil and historical, as has been already observed. Nor am I as yet at all sensible of any just grounds and reasons, which might either oblige or incline me to retract what has been asserted under Proposition X. *viz.*

That the form of the patriarchal twofold, *i. e.* both solar and lunar year, is no where to be found, but (only) in the patriarchal line.

Upon the joint astronomy then of these 2 important years (which stand characteriz'd in such a peculiar manner) I lay the foundations of my proof. And he that can undermine this foundation, must necessarily overthrow the superstructure together with it: they must both stand and fall together. But I am under no apprehension at present, of any such consequence; I am rather in hopes, that what has been hitherto offer'd, tho' destitute of its proof, will tend to conciliate a favourable opinion

nion of my undertaking, to excite a due attention to the proofs, and to awaken the mind of the intelligent reader to a serious consideration and enquiry, whether there may not be, at last, very good grounds to expect somewhat *very extraordinary*, and even in a state of *perfection*, from the scheme of genuine sacred chronology, from the principles, data, and terms of the *Hebrew Pentateuch*.

I shall now return to the solution of the question proposed, *p.* 209, *viz.* What was the particular *form*, and the determinate *quantity* of that year, and likewise, what were those unerring rules of computation which could enable the ancient *Israelites* to observe the three great anniversary feasts of the law, in their divinely appointed seasons, and this too, throughout their generations, by an ordinance for ever?

This one precept is alone sufficient to assure and convince us, that the *Hebrew* term *Sshanab* must necessarily infer and express a true solar revolution; and we may with equal reason conclude, from the fundamental principle of the *Pentateuch*, and *God said — hajv leskanim, let them be for years*, that it must also denote and include the annual period of the Moon.

These truths have been the subject of much and long enquiry amongst the learned, tho' hitherto attended with little or no success.

The compilers of the universal history were learned and judicious persons, and we may presume, that in the prosecution of their design they

omitted no endeavours to furnish themselves with all the necessary lights and assistances they were able to procure: and yet, in the preface to Vol. 1. p. 54. they implicitly admit, that the antediluvian year consisted of just 360 days, and are of opinion that this is *sufficiently proved* in that discourse of Mr. *Allen*, formerly fellow of *Sidney college*, which Mr. *Whiston* has inserted (by Mr. *Allen's* permission, as he himself tells us) in his *theory of the Earth*.

Had those gentlemen consulted the *Pentateuch* only, and had they diligently examined, and carefully considered it's principles and data, they could not have patronized a notion so contrary to nature, so derogatory to *Moses*, and so intirely subversive of the astronomical chronology of the antediluvian world, as stated and determined in the original *Hebrew* text.

The following sheets then undertake, upon the sole authority of the *Pentateuch*, to render it undeniably, because demonstrably certain, that *Moses's* table of the genealogies of the patriarchs, both before and after the flood, is a most accurate astronomical table; and that the original, patriarchal year was the *true solar*; with which the lunar year was constantly connected, and carried all along together with it, by the laws of an *extremely curious*, and *most exact* astronomy.

Here the reader's attention, especially if he be an astronomer, will begin to be awakened; and no wonder if it should, for

*Nova, tamen antiqua, loquimur.*

The

The *Hebrew* chronology reckons from the creation to the end of the year of the deluge, 1656 *Mosaic Shanim*, or solar tropical years. Now should some eminent astronomer be required to determine the position of the Moon to the Sun, in the beginning and conclusion, in the first and the last year of this interval, or in any assigned intermediate one, without being allowed the privilege of ranging amongst the fixed stars, of calculating the Sun's place in the ecliptic, or the Moon's in it's orbit, and the stations of both in the *Julian* calendar, and all this, in a retrograde method, from some known fixed radix; he would think it no reproach to his skill in science to decline the impossible task; nor would he be naturally led to conclude, that the principles, data, and terms of the *Hebrew Pentateuch*, were *in themselves* a sufficient astronomical directory, as I am now going to prove that they are.

In the interval from the 4th of the *Hexaemeron* to the end of the year of *Noah's* life 600, we have three express *Mosaic* astronomical data.

First, the characters of the original position; or, the Sun's beginning it's course, from the autumnal æquinoctial point, on the 15th day from the new Moon (☾) evening. Secondly, 1656 true solar revolutions, all connected with each other, and beginning and ending at the autumnal æquinox. Thirdly, the termination of the last 12-month lunar year on the new Moon (☾) evening, at the distance of 11 days, from the original cardinal point.

$15 - 11 = 4$ . We have here 3 epacts, 1 real, *viz.* 11, and 2 chaotic or imaginary, *viz.* 15. 4. For if we compute backwards one whole year from *Moses's* account of the origin of time, or the epact 15, the Sun will be calculated to enter *Libra*, on the 4th day inclusive, from the new Moon (☾) evening. We have now obtained 3 *Mosaic* radical numbers (so I beg to call them) *viz.* 4. 11. 15.

$11 - 4 = 7$ . The number 7 is an express *Mosaic* datum, *God blessed the 7th day, says Moses, Gen. 2. and hallowed it.* We have now 4 *Mosaic* radical numbers, *viz.* 4. 11. 7. 15.

The *Hebrew Chodesh* contains 30 days, and is another express datum of the *Pentateuch*; we have now 5 *Mosaic* radical numbers, *viz.* 4. 11. 7. 30. 15.

The number 360 is the arithmetical mean between the quantities of the solar and the lunar year; and it is evidently compounded (of which more hereafter) of 15, and it's quadruple 60. From hence I collect 6 *Mosaic* radical numbers, *viz.* 4. 11. 7. 60. 30. 15.

He must be a very negligent and disqualified searcher after first principles, and especially the fundamental principles of Sun and Moon astronomy, who could overlook the perfection of unity.

A small degree of abstract reasoning will make us sensible, that the whole flux of time, or of successive duration, is measured by a continued series of units, in this manner,  $1 + 1 + 1 + 1 + 1$ , &c. every unite denoting a compleat diurnal revolution, not of the æquator, but of the Sun from a given cardinal

cardinal point of the day, to the same cardinal point of the day again; and is, in nature, an absolutely perfect measure of time.

By these several steps we have collected 7 *Mosaic* radical numbers, which are the astronomical mediums and instruments of the following integral calculations. We shall range them in this order, tho' it is arbitrary.

The arithmetical mean proportion — 360 —

The 7 *Mosaic* radical numbers, *viz.* 1. 4. 11, 7. 60. 30. 15.

As a previous knowlege of these radicals is of indispensable importance throughout the calculations, I shall here subjoin a recapitulation of them, with some additional necessary remarks, of most of which the reader, if he thinks it worth his while, may easily frame in his mind clear and distinct ideas.

1 denotes a complete diurnal revolution of the Sun, computed *megnercb gnad gnereb*, from the time of it's setting to the time of it's setting, on the æquinoctial day. This is necessary to be noted and remembred.

4 is the root, origin, and foundation of the epacts, and it arises from the simple subtraction of 11 from 15. Or, it may be obtained in this manner: The 12th month of the *Patriarchal* solar year is of 35 days, and of the common lunar year of 24 days. Then  $35 - 15 = 20$ . Again,

$$\begin{array}{r} \hline 24 \\ \hline \textcircled{20} \\ \hline 24 - 20 = 4. \end{array}$$

11, This

11 is the 3d radical, and includes 3 distinct denominations. (1) It denotes the full Moon epact at the end of A. M. 1. (2) The new Moon epact at the end of A. M. 1656. (3) The inhering meridian epact, hereafter to be explained.

7 contains a system of days, called a week, and is of positive divine institution. This hebdomatic measure is infallibly an astronomical medium of proof, thro' the whole series of the world's chronology.

60. Every integer whatever, relating to time, may be supposed capable of being divided into sexagesimal parts; but the number 60 stands here as the quadruple of 15. For,  $1 : 4 :: 15 : 60$ .

30 contains the number of days in the primitive and patriarchal *Chodesh*; and it's *proportional divisions*, hereafter to be explained, will manifest the divine perfections of revealed astronomy. These divisions are collected from the *appendant proportions* of the original position of the two great luminaries.

15 is the original (chaotic) new Moon epact, and the fundamental datum of the *Pentateuch*.

*Additional necessary remarks.*

(1) We borrow, for brevity's sake, in the calculations these algebraic characters, + (more) the sign of addition, — (less) of subtraction, × (into) of multiplication, ÷ (divided by) of division, = (equal to) of equality.

(2) The 2d radical number 4, is the square of 2, the least assignable root. This square 4 is of such

such signal use in the arithmetical deduction and demonstration of the true quantity of the Sun's annual course, as may, in a high degree, merit our particular notice, attention, and consideration: For,

(3) *N. B.* The 3d radical number 11 is resolvable into 7. 4.

(4) 15 is resolvable into 11. 4. and, also, into 4. 7. 4. so that it is geometrically bounded, in it's two extremes, by a square. Let this be noted.

(5) 30 is resolvable into 4. 11. 4. 11. and, also, into 4. 7. 4. + 4. 7. 4.

(6)  $60 - 11 \div 15$ , remainder = 4.

(7)  $360 - 11 \div 15$ , the remainder = 4.

(8)  $\frac{15}{60} = \frac{1}{4}$ , or one quadrant.  $\frac{30}{60} = \frac{2}{4}$ , or

two quadrants.  $\frac{45}{60} = \frac{3}{4}$ , or three quadrants.

These *Mosaic* partitions are evidently establishments of nature, and we are, in a manner, sensibly directed to the observation of them.

(9) The quantity of the *Julian* year may be thus express'd,  $365 + \frac{15}{60}$ .

(10)  $365 + \frac{15}{60} \times 60 = 21915$  sexagesimal parts; and 60 is the 5th radical number.

(11)  $21915$  sexagesimal parts  $\div 15 = 1461$  quadrants, in a *Julian* year.

(12) If the quantity of the *Julian* year be reduced to sexagesimal parts, these being divided by 15, the remainder will be = 0.

(13) Here I lay down this axiom. If the true quantity of the solar tropical year, which we will now call  $x$ , be reduced to sexagesimal parts, these being divided by 15, the remainder must necessarily be 4, the square of 2. This I offer as a sure geometrical test and criterion of the just *αλεβηα* or exactness of that arithmetical calculus which undertakes to determine the quantity of the Sun's year.

(14) These symbols and numbers, thus placed

$$\frac{\textcircled{C}}{1. \frac{45}{60}}$$

to each other,  $\textcircled{C} 15.$ , represent and express the *Mosaic* root of time, the true foundations of Sun and Moon astronomy; and they may be thus translated into astronomical language, *viz.* on the 4th of the Hexaëmeron the Sun began it's course in the end of the third, or beginning of the fourth quadrant of the autumnal æquinoctial day, *i. e.* in a determinate meridian at noon, and on the 15th day from the evening of the Moon's (supposed) visibility.

Let these general remarks suffice for the present. We shall now again return to the solution of the question proposed, which includes these three useful, important, and fundamental particulars, *viz.* 1st, the form; 2dly, the quantity of the primitive two-fold year; 3dly, the primitive laws both of the solar and the lunar computations.

First, by the form is meant the manner of computing and adjusting the months, which has been already made sufficiently clear from *Moses's* account

account of the flood in the 7th and 8th chapters of *Genesis*; and it would be needless to repeat it here. Therefore, secondly, I shall proceed to investigate and determine it's quantity; which will lead me to the direct proof of my 8th proposition, which I shall here set down with some variation.

VIII. The quantity of the *Mosaic Shanab*, or solar tropical year, may be ascertained with the minutest exactness, to an indivisible point, from *Gen. v. 23. All the days of Enoch were 365 years*; in conjunction with the 384th year of *Noah's* life, which begins and ends at the autumnal æquinox with A. M. 1440, being the first year of commensuration.

The creator of the luminaries has clearly instructed us, by the hand of his servant *Moses*, *Gen. i. 14.* to reduce years to days, or to calculate both the diurnal and the annual revolutions; therefore, unless we are able to make the measure by days to correspond to a point with the measure by years, the calculus and the conclusion can never be said, in exact agreement with the constitution of nature, to be divinely true.

*All the Days of Enoch (says Moses) were 365 Years.*

It may be collected from this text, that the square of a true solar revolution, precisely measured the whole temporary duration of the translated

Patriarch, as reduced by *Moses* to an astronomical law. And no one can express the age of *Enoch*, when he was one year old complete, without being able, at the same time, to express the precise root of this square.

We are therefore to construct, by the direction of this text, an exact astronomical square of the Sun's annual period, whose extracted root shall be astronomically true to a point, independent of any previous knowledge either of the one or of the other. This may be judged indeed, at the first view, to be impracticable: But the candid reader will be prevailed upon to suspend his judgment awhile; because, possibly, he may not think himself, as yet, sufficiently acquainted with the inherent astronomical powers, and the latent proportional properties and affections of the 7 *Mosaic* radical numbers.

*Moses's style of chronology alone dictates the following Problem.*

It is required to reduce years to days, or to determine how many diurnal revolutions of the Sun correspond in nature with a given number of the annual, under these limitations and restrictions, *viz.*

First, without consulting the solar tables, or being supposed to know that there are any solar tables in being.

Secondly, without assuming any quantity of the solar tropical year, or being under the necessity of knowing it. I shall just remark,

Thirdly,

Thirdly, when the integral calculation is finished, the remainder, over and above complete days, will ever be either  $\frac{1}{4}$ , or  $\frac{2}{4}$ , or  $\frac{3}{4}$ , or 0. And in this constant preservation of the *integrality* of the *quadrant*, a conclusion, which the fractional calculations of the moderns cannot possibly attain to, lies secreted a very instructive lesson of practical astronomy, if a theory of determinate and equidistant meridians may be esteemed such.

The meridians are moveable circles in the Heavens, without number, without any perceptible distinction; yet passing thro' the center of the Sun in a constant, regular, and orderly succession, from West to East. And altho' we cannot indeed stop the career and mark these ever transient, ever variable circles, yet are we able to circumscribe a determinate number within determinate limits; then exactly calculate the successive approach of any one of these *determinates*, and arrest the *perpetual mover* in *it's moment* of time. This will be exemplified in the demonstration which we have now in hand.

The reason why I have taken occasion in this place to say thus much of meridians, is, because the solution of the problem entirely depends upon the being able to ascertain the computed meridian: by the *computed* is meant that meridian in which the Sun began it's course, on the autumnal æquinoctial day at noon. There is no necessity to controvert this epoch of the computation, because taking in all the meridians of the globe, it  
must

must be true *in nature*, whether we can rightly adjust the geography or not.

To be able to discover and settle the standard of the solar tropical year, and to prove it to be the standard, must surely be of prime use, and a necessary fundamental in practical astronomy. Science cannot offer a more curious, or a more subtle investigation; and it's evident importance may demand the notice and attentive regard of the most skilful astronomer.

*Euclid* has clearly demonstrated, *L. III. prop. 2.* that a sphere touches a plane but in *one point*, altho' matter is allow'd to be indefinitely divisible. Now quantity of time is as indefinitely divisible as quantity of matter, and yet, in the construction of an exact astronomical square of a solar revolution, we are required to discriminate and fix *one individual point*; that very intermediate point of a quadrant of the æquinoctial day, in which the Sun finishes it's 365th annual period (having first connected this given interval with the 4th of the Hexaëmeron, and the *Mosaic* radix) and in the same determinate point completes it's square, in a computed meridian; then from this point of a two-fold termination, to deduce and demonstrate the true quantity of the Sun's year; and all this, *à priori*, or without the precarious and exotic aid of any one postulatum.

To render every step of the process plain, easy, and intelligible, we may transfer the *Mosaic* radix from the 4th of the Hexaëmeron, and bring it  
down

down to our own times ; then the problem may be stated thus, *viz.*

Suppose the Sun to enter *Libra*, in any year, in the meridian of *London* at noon ; then, query, in what quadrant of the autumnal æquinoctial day? in what intermediate point of that quadrant? or, in our style, in what hour of the day, and in what minute of that hour (the reason why I do not ask, in what *second* of that minute, may appear as we proceed in the calculations) will the Sun again enter *Libra*, in the meridian of *London*, at the end of the 365th revolution from thence? for the conclusion must needs be the same, in both cases, by the uniform and immutable laws of astronomy.

Mr. *Keil*, in the preface to his astronomical lectures, with a secret exultation declares, “ That  
 “ among all the liberal sciences there are none in  
 “ which there remain fewer difficulties to be ex-  
 “ plained, objections to be answered, or scruples  
 “ to be removed, than there are in astronomy,  
 “ and no science has yet attained so great a degree  
 “ of perfection as it has.” If he means here Sun and Moon astronomy, as taught and explained in his lectures, I am extremely sorry I cannot implicitly allow *it's* perfection ; when we come to examine particulars, the reasons why I cannot, will appear.

It can be no impertinent digression to take occasion in this place to enquire into the proceedings of the astronomers, and the several methods they have had recourse to, in order to find out and determine

termine the quantity of the Sun's year, or in what space of time precisely the Sun passes from any one cardinal point of the ecliptic (suppose from *Libra*) to the same cardinal point of the ecliptic again. And it will appear in the issue, that their conclusions have been various, and, consequently, ambiguous and uncertain.

Bp. *Beverege* wrote his chronological institutions somewhat more than 80 years ago, *viz.* A. D. 1667, and, B. II. c. 2. p. 140. *de æquinoc-tiis & solstitiis*, he states the case, as it stood in that age, thus: “ *Quanta verò sit anni tropici*  
 “ *quantitas ac mensura; nondum inter ipsos con-*  
 “ *venit astronomos. Nos Longomontani, qui*  
 “ *eam exquisitissimè venatus est, amplectentes sen-*  
 “ *tentiam, annum hunc tropicum, diebus 365,*  
 “ *h. 5. 48.' 55'' definimus. Aufer h. 5. 48.' 55''*  
 “ *ex. h. 6. 0.' residuum est, h. 0. 11.' 5.''*

L. II. p. 145. we meet with the following account of *Tyco Brahe's* observations.

“ *Porrò nulla accuratius inventa sunt æquinoc-*  
 “ *tia, quam quæ Tyco Brahe anno æræ Christianæ*  
 “ *1584 et sequentibus Uraniburgi observavit.*

I will here subjoin a table of *Tyco's* most accurate observations of the Sun's entry into the æquinoctial and solstitial points, for 4 years successively, in the meridian of *Uraniburgh*.

*A Table of Tyco's Observations.*

Anni Christi.	Anni Periodi Julianæ.	Æquinoctia verna.	Solstitia æstiva.	Æquinoctia autumnalia.	Solstitia brumalia.
		D h '	D h '	D h '	D h '
Biff. 1584	6297	Mar. 10 9 30	Jun. 11 14 13	Sep. 13 4 c	Dec. 11 14 44
1. 1585	6298	Mar. 10 15 19	Jun. 11 20 1	Sep. 13 9 49	Dec. 11 20 33
2. 1586	6299	Mar. 10 21 8	Jun. 12 1 49	Sep. 13 15 38	Dec. 12 2 22
3. 1587	6300	Mar. 11 2 56	Jun. 12 7 37	Sep. 13 21 26	Dec. 12 8 11

From this table I gain the knowledge of these unequal divisions of the ecliptic :

	D	h	'
1. From the vernal æquinox to the summer solstice	93	4	43
2. From the summer solstice to the autumnal æquinox	93	13	47
3. From the autumnal æquinox to the winter solstice	89	10	44
4. From the winter solstice to the vernal æquinox	89	00	35

Whether later observations are supposed to come nearer to the truth than Tyco's has not fallen in my way to know, nor would it be of much moment to make the enquiry, as I judge from Keil's sentiments, *Lect.* XXII. p. 271.

— “ If again the next year, the Sun's entry into the æquator be observed in the same manner, the time elapsed between the two ingresses is the space of a tropical year, or time wherein the Sun (or rather the Earth) compleats his course in the ecliptic.

K k

— “ But

— “ But by observations that are made at  
 “ the distance of a year, we cannot safely rely  
 “ upon the true quantity of the year collected  
 “ from them; for a small error of one minute,  
 “ being constantly increased and multiplied by  
 “ the number of years, in process of time would  
 “ amount to a prodigious mistake in the place of  
 “ the Sun. Therefore the astronomers more ac-  
 “ curately determine the quantity of the year, by  
 “ taking the observations of two æquinocties, at  
 “ many years distance from one another; and di-  
 “ viding the time between the observations, by  
 “ the number of revolutions the Sun has made,  
 “ the quotient will shew the time of one revolu-  
 “ tion, or *nearly* the period of the Earth in her  
 “ orbit. For by this means, if there be any mi-  
 “ stake made in the observation, it will be divi-  
 “ ded into so many parts, according to the num-  
 “ ber of years, that it will be insensible for the  
 “ space of one year.

P. 272. “ The space of time belonging to the  
 “ tropical year is, *by this means*, found to con-  
 “ sist of 365 days, 5 hours, 48', and 57''.

We have now obtained 3 different quantities of  
 the tropical year, to which I shall add a 4th from  
 Dr. *Holder's* account of time, p. 55. where, to  
 use his own words, “ the true solar year is com-  
 “ puted to be constituted of 365 days, 5 hours,  
 “ 49', and 16'', so it falls short of the odd 6  
 “ hours, by 10' and 44''.

The tropical year then contains,		D	h	'	"	
according to	} 1. <i>Tyco's</i> observations 2. <i>Dr. Holder's</i> account 3. <i>Longomontanus's</i> } 4. <i>Sir I. Newton's</i> }	correction	365	5	$\frac{48}{49}$	0
			365	5	49	16
			365	5	48	55
			365	5	48	57

*Longomontanus* has corrected *Tyco's* observations by 5'' annually, and *Sir I. Newton* by 3''. But the annual difference of 2'' between these two corrections would create a difference in the Sun's place of 3 h. 11' 56'' in the space of 5758 years, and yet the error is insensible in the space of one year.

Now if we reduce 365 years to days, by tables made from the 3 last assigned quantities of the tropical year, these several reductions will produce, according to,

	D	h	'	"	Difference from the <i>Julian</i> re- duction.	d	h	'	"	Complements of the quadrant.
						d	h	'	"	
1. <i>Dr. Holder</i>	1333	13	12	42	20	2	17	17	40	
2. <i>Longomontanus</i>	1333	13	10	34	35	2	19	25	25	00 1 25 25
3. <i>Sir I. Newton</i>	1333	13	10	46	45	2	19	13	15	00 1 13 15

From this variety of conclusions, and two of them by the most approved, and the most able practitioners, we are led to conclude, that had there been no possible way of ascertaining the quantity of the solar tropical year, independent of observation, and all artificial rules, it must have remained an ambiguity to the end of time.

The solution of every problem is more or less difficult, according as the principles on which the solution depends are more or less evident and certain. Hence some, it is likely, may think that

the scripture chronologist is in a very unpromising state and condition, who aims to penetrate and explain the hidden secrets of Sun and Moon astronomy, under the direction, seemingly, of but a faint and glimmering light, supported but by very scanty instructions, *viz.* a very little more than the previous knowlege of the quantity of the *Julian* year, and the data of the *Pentateuch*; amongst which are reckoned the 7 radicals, with the arithmetical mean 360. Tho' slight as this foundation may seem, yet it is in fact amply sufficient for an uniform, proportional, and magnificent superstructure.

To proceed then to the *Mosaic* reduction of these 365 years to days, which will manifest the inherent astronomical powers, and, as we proceed farther, the latent proportional properties and affections of the arithmetical mean 360, and the 7 *Mosaic* radical numbers,

(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	4.	11.	7.	60.	30.	15.

which I here set down again for the sake of the indices, as they will help the reader immediately to perceive how and in what manner they are used and applied in the calculations.

The whole of this reduction of years to days, without the solar tables, may be comprehended under these very few plain and easy rules.

*The rules of reduction.*

Rule I. Divide the given number of years by the 7th radical number 15, rejecting the remainder if less than 15.

Rule

- Rule II. Multiply the precedent quotient by the 3d radical number 11, and reserve the product.
- Rule III. Divide the reserved product by the standing and unalterable divisor 24 (obtained by dividing the arithmetical mean 360 by 15) and the quotient will give the number of quadrants to be subtracted from the sum total of quadrants in the given number of years.
- Rule IV. As there are in a *Julian* year of  $365 \frac{1}{4}$ , 1461 quadrants, or 4th parts of a natural day, multiply the given number of years into 1461, and dividing the product or sum total of the quadrants by 4, the quotient will give the whole amount of *Julian* days, with the appendant quadrants.
- Rule V. From the sum total of *Julian* quadrants subtract the quotient obtained by Rule III, then dividing the remainder by 4, this last quotient will complete the reduction if a year of commensuration be given; of which we can reckon, as yet, no more than 3; but if it be not such a year, then the Rule how to proceed will be given, after the quantity of the tropical year is determined, and the meridian epact is known. At present the calculations proceed upon the radicals only, and assume nothing as known.

*The arithmetical operation for the given number  
of 365 years.*

	Years	
Rule I.		$365 \div 15 = 24$ , remainder 5, which reject.
Rule II.		$24 \times 11 = 264$ .
Rule III.		$264 \div 24 = 11$ quadrants to be subtracted.
	Years	D
Rule IV.		$365 \times 1461 = 533265$ quadrants, $\div 4 = 133316 + \frac{1}{4}$ Jul. reduction.
Rule V.	. . . .	- 11
	<hr style="width: 20%; margin: 0 auto;"/>	D
		$533254$ quadrants $\div 4 = 133313 + \frac{2}{4}$ solar reduction.
		<hr style="width: 20%; margin: 0 auto;"/>
		Difference from Julian $2 + \frac{1}{4}$ .

As Sir *I. Newton's* conclusion, p. 259, may be considered, in some sort, as a mean between that of Dr. *Holder's* on the one side, and that of *Longomontanus's* on the other, we will therefore reject both these (the one as a defect, the other as an excess) and compare the reduction by the radicals, with that of Sir *I. Newton's* only, and set down the less under the greater.

Days.

1. The integral calculation  $133313 + \frac{2}{4} \text{ } 00 \text{ } 00$   
D.                    h   '   ''
2. Sir *I. Newton's* reduction  $133313 + 10 \text{ } 46 \text{ } 45$

According to Sir *I. Newton's* reduction, the solution of the foregoing problem may be thus express'd in words at length.

If the Sun enters *Libra* in any year, in the meridian of *London*, at noon, then in the end of the 365th revolution from thence, it will again enter *Libra*, in the same meridian,  $46' \text{ } 45''$  past 10 at night.

night. Here are evidently very specious appearances of truth and exactness; for in this calculation we have not only the hour of the day, but the minutes of an hour; and let me add, — to the confutation of the whole — the seconds of a minute. I say, — to the confutation of the whole — for there are not wanting arguments to prove, that *second minutes* cannot be admitted into the solar computation, without a direct opposition and repugnancy to the standard of nature. And notwithstanding these specious appearances, I cannot think myself under any obligations to renounce my right of examining, whether these things are so?

As far as I can perceive at present, the only Prop which supports the whole, is but an assumption (for proof there is none) that

D  
365 5 h 48' 57'' exactly measure the solar tropical year. Invalidate this assumption, and the whole superstructure immediately falls to the ground; we have then neither an exact root, nor an exact square; all must be esteemed as an approximation only; but approximations in astronomy are by no means to be allow'd of, for they disconcert the harmony of the system.

The *British* philosopher laboured full 20 years in this one investigation; I think, from A. D. 1680 to the end of A. D. 1700. But what was there *in nature* to limit his researches to just 20 years? why not one year more? or why not one year less? It may be said, that just 20 years were sufficient

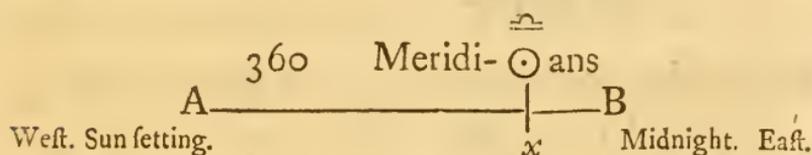
sufficient to answer the end he aim'd at; but this has never been yet proved, and, perhaps, never will be.

It is a mistake, which no authority can justify, first to labour out the quantity of the solar tropical year, by *observation* and *rules of art*, then to acquiesce in the determination as true, and frame the solar tables at a venture. It must be obvious to common apprehension, that such a procedure must almost necessarily be attended with *some adhering imperfection*, and will be ever liable to the demand of some further proof: for where indeed is the touchstone of the genuineness and authenticity of such a conclusion? where are the arguments founded upon *a medium in nature*?

If we take a view of the reduction by the radicals, and of that of Sir *I. Newton's*, as set down together, we may observe a very near agreement betwixt them; for they each of them collect 133313 complete days. And as the computation is dated from noon, the last of these days must also end at noon. Then there will remain, on the one side, 2 entire quadrants, which we will separate into  $\frac{1}{4} + \frac{1}{4}$ , and on the other side 10 h 46' 45'', which we will separate into 6 h + 4 h 46' 45''. This separated quadrant and these separated 6 hours respectively measure from noon to Sun setting in the computed meridian. Then the remaining intire quadrant will measure from Sun setting to midnight, which is the first of the autumnal æquinoc-tial day. In some one intermediate point of this intire quadrant, the Sun will finish it's 365th annual

nual revolution, and in the same individual moment complete it's square ; now the integral calculation undertakes to discriminate and fix the computed meridian which intersects the very point of this two-fold termination, and to express in sexagesimal parts (by the assistance and direction of the arithmetical mean 360, with the 1st and 5th radicals 1. 60.) it's precise distance from Sun-setting on the west, and from midnight on the east, which are the two astronomical extremes of the first quadrant of the autumnal æquinoctial nucthemeron.

We will at present represent the intermediate point sought by  $x$ , and help the reader's conception by the following Scheme.



Let the strait line A B denote the first quadrant of the autumnal æquinoctial day, bounded in it's western extreme by Sun-setting, and in it's eastern extreme by midnight.

Let this quadrant be divided into 360 distinct and equidistant meridians ; now the problem requires to determine which of these 360 meridians intersects the point of termination sought, and to express in sexagesimal parts it's distance from each of the extremes, both eastward and westward,

*The rules of the calculation.*

- Rule I. Multiply the collected number of days into 4, and to the sum add the remaining quadrants, if there be any; the product will be the sum total of the quadrants.
- Rule II. Multiply the sum total of the quadrants into the arithmetical mean 360, and the product will be the sum total of sexagesimal parts.
- Rule III. Divide the intire sum of sexagesimal parts by the given number of years, and the quotient will give the number of sexagesimal parts in one year, and the remainder will be the sexagesimal measure sought.

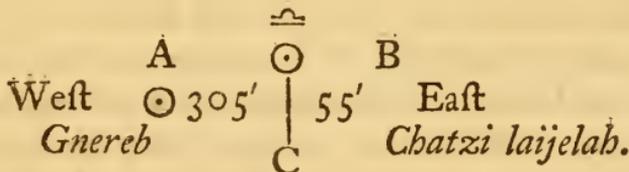
*The arithmetical operation for the given number of*  
D. 365 years.

- Rule I.  $133313 \times 4 = 533252 + 2 = 533254$  quadrants.
- Rule II.  $533254 \text{ quadrants} \times 360 = 191971440$  sexagesimal parts.
- Rule III.  $191971440 \text{ sexagesimal parts} \div 365 = 525949$  sexagesimal parts in a solar tropical year, remains  $\frac{2}{3}$  the measure sought.

The precedent calculation does not explicitly determine the quantity of the solar tropical year (that will be the office of a subsequent operation)  
it

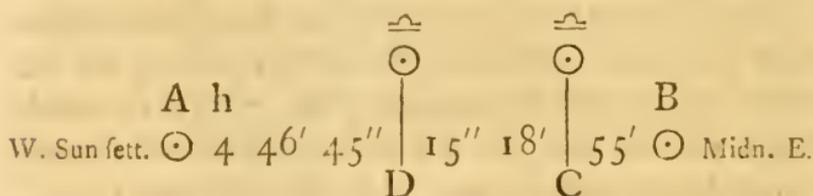
it only ascertains it's square in sexagesimal parts, which are here found to be 525949; we are at present more immediatly directed to the remainder  $\frac{55}{60}$ , which is the sexagesimal measure sought; for subtract 55 from 360, the remainder 305 discriminates and fixes the computed meridian which intersects the point of termination; and the problem may be solved in this language.

If the Sun enters *Libra* in any year, in the meridian of *London* at noon, then in the 365th revolution from thence it will again enter *Libra* in the same meridian, in the end of the 305th meridian or sexagesimal part (for  $\frac{1}{60}$  is the equable measure of these distances) from Sun setting on the west, and in the beginning of the 55th from midnight on the east, in the first quadrant of the autumnal æquinoctial day, as in this Scheme:



Thus are we able to circumscribe a determinate number of equidistant meridians, within determinate limits; then exactly calculate the successive approach of any one of these *determinates*, and arrest the *perpetual mover* in it's moment of time: and if we would reduce *this moment* to our method of computation by hours and minutes, we need only divide 305 by 60, then the quotient will give 5 hours, and the remainder 5 minutes.

The 6 subtracted hours, p. 264, measure from noon to Sun-setting; these being added we have 11 h 5', consequently, by this calculation, the Sun enters *Libra* in the computed meridian, and in the end of it's 365th revolution, not 46' 45'' past ten, but 5' past eleven at night precisely, which is 18' 15'' later. This difference of the times between these two ingresses in the same meridian (so that one of them must be erroneous) may be properly noted, within the limits of the same quadrant, in this manner :



Reduce 18' 15'' to seconds, and divide the product 1095'' by 365, the quotient will give 3'' for the difference of the 2 roots. The conclusion is evident, without the trouble of any farther calculations, for  $365 \text{ d } 5 \text{ h } 48' 57'' + 3'' = 365 \text{ d } 5 \text{ h } 49' 00''$ : which, as will be evident presently, is the quantity of the solar tropical year.

I must here beg the reader to take notice, that I am not undertaking to discover a truth unheard of before, but only to settle that for a certain truth, which the astronomers seem not to know for a certainty to be one: I am only undertaking to prove, both by calculation and by argument, that

that in the estimation of the solar tropical year, 365 d 5 h 49' 0" 1''' is too much ; or on the other hand, 365 d 5 h 48' 59" 59''' is too little. My meaning is, that 365 d 5 h 49' 00" is not an approximation, but adequately exact.

Some perhaps may imagine that the annual excess or defect of 3 seconds of time, in the case before us, can be of no great consequence either way. But I will say, that the annual excess or defect of a single particle of time cannot be dispensed with in the perfection of the solar system.

It may be thought (and indeed it is) very surprising, that the arithmetical mean 360 (concerning which I have some very particular and important remarks to offer) together with 7 almost uncompounded numbers, should be invested with such imperceptible and unsuspected powers. And it may justly excite our wonder and admiration to perceive, in the course of the calculations, that, in their right use and application, they, independent of known scientific principles, uniformly produce conclusions scientifically true. Yet farther ; it is more admirable still, that they lead us directly to nature, they conduct us immediately and at once into her *penetralia* and inmost recesses, without any *adhering imperfections*, any tedious and operose calculations. Scarce any one point in practical Sun and Moon astronomy can be proposed, whose solution may not be effected with a required exactness, by the incomprehensible efficacy of these *Mosaic* numerical data.

When

When I consider in what degrees of perfection the praxis of Sun and Moon astronomy was originally taught mankind, by the Creator himself; I can the more readily account for the inaccurate conclusions of the moderns; who build altogether upon observation and inadequate rules of art; who unweariedly consult the archives of the Stars, and meditate, day and night, on the book of nature: But altho' we allow it's characters to be ever so clear and legible, yet not being born with telescopic eyes, we are, at least, liable to mistake it's accents and it's points, which may give a different turn to the sense.

When I look into the writings of our astronomers, I am not fully taught; and I go away dissatisfied, because I find myself left in a state of doubt, hesitation, and uncertainty. I want to know, for instance, by what established law, and in what established proportion, a given point of the day annually varies from a given point of the year. — But before I proceed farther, it may be proper to consider these few

*Præcognita.*

(1) The Sun makes no stay in the æquinox; it only intersects a point, and passes obliquely on. And there are good reasons to think that *Tyco* observed the very article of time in which this intersection was made, *Sept. 13 d 4 h 0' A. D. 1584*, in the meridian of *Uraniburg*.

(2) The Sun ends and begins it's north and south declinations in an immutable point of the  
year,

year, but not in an immutable point of the day, which annually shifts and changes.

(3) That the point of the *day* annually shifts and changes is evidently manifest by observation: — As, for instance, had the Sun enter'd *Libra* this present year, A. D. 1751, on the 12th of *September*, 44 minutes past noon, in the meridian of *London*, at the end of the 4th year from hence it would have again enter'd *Libra*, in the same meridian, exactly at noon.

This being premised, I return to the question, by what established law, and in what established proportion, is this change in the point of the day with respect to a given place annually made?

When I make my appeal to the books of astronomers, concerning the former I find a most profound silence; concerning the latter, there are almost as many determinations as there are astronomers. *Longomontanus* informs me that I must express it thus,  $\frac{11'}{60} + \frac{5''}{60}$ . Sir *I. Newton* thus,  $\frac{11'}{60} + \frac{3''}{60}$ . Dr. *Holder* thus,  $\frac{10'}{60} + \frac{44''}{60}$ . Now which of these must we take for a directory?

In the exigence and strait of such evident ambiguity, I apply myself, in hopes of satisfaction, to *Tyco's* table of observations, p. 257, began A. D. 1584, and ended A. D. 1587, where, under *Brumalia Solstitia*, I meet with this quadriennial series,  $\frac{44'}{60} \frac{33'}{60} \frac{22'}{60} \frac{11'}{60} \frac{00''}{60}$ . Now I engage to support this determination, and to render it certain, that *Tyco's* index  $\frac{11'}{60}$  is the index of truth, and the very original proportion established by the Creator, whilst all the rest are artificial labour'd

labour'd anomalies, and a sad dislocation of proportional parts. So that *Tyco's* correctors may be justly said, in this case, to stand in need of correction.

Take then the 5th radical 60 for a denominator, and make the 3d radical 11 the numerator, and set them by each other.

*Tyco's* index  $\frac{11'}{60}$ . The 3d and 5th radicals  $\frac{11'}{60}$ . Now let the astronomers, one and all, declare, which of these two indices either exceed or fall short of the exact truth, and how much.

I shall assign my reasons in another place, why I call this index  $\frac{11'}{60}$  the meridian epact, and make use of it at present to complete the Vth rule laid down, p. 261.

Rule V. p. 261. — If the given year be not a year of commensuration, then multiply it into the meridian epact ( $= \frac{11'}{60}$ ) and dividing the product by the arithmetical mean 360, the quotient will give the number of quadrants to be subtracted from the sum total of the quadrants, and the remainder will be the true sexagesimal measure sought.

*The arithmetical operation.*

$$\begin{array}{r}
 365 \text{ years.} \\
 \times 11 \\
 \hline
 360) 4015' \text{ (11 quadrants to be subtracted.)} \\
 \hline
 \text{remains } 55 = \text{ to the sexagesimal measure sought.} \\
 \hline
 60'
 \end{array}$$

As this concise and easy calculation exactly agrees, both in the quotient and in the conclusion, with the two foregoing arithmetical operations, p. 262 and 266, they happily confirm and establish the truth of one another.

We must now go back to p. 266, and consider the quotient under Rule III, which exhibits, in 525949 sexagesimal parts, the exact astronomical square of a true solar revolution: but by

*Axiom, p. 250. (N<sup>o</sup> 13.)*

which we will here repeat with some additions; If the quotient contains the entire sum of sexagesimal parts by a reduction of the true quantity of a solar tropical year, these being divided by 15, the remainder (by argument; *à priori*, founded on the radical numbers) must necessarily be equal to 4, the square of 2:

On the other hand, If, after the division by 15, the remainder be less than 4, then the complement of the square will be ever equal to the sum of the annual defect, and *vice versa*.

Again: If the sum of the annual defect be multiplied by the given number of years, the product will be equal to the sum of the defect, and also equal to the complement of the square of the whole, and *vice versa*.

*The arithmetical operation.*

$$15 \overline{) 525949} ( 35063$$

The remainder = 4 the square of 2.

We must now undertake to ascertain the root of this square by the assistance of the numerical data, or their compounds; which will lead me to a discovery of the years of commensuration, and to the proof of their certainty.

First then, if we divide the sexagesimal quotient 525949 by the arithmetical mean 360, and the quotient arising from this division by 4, this last quotient being prefixed to the remainder will enable us to express the solar tropical year independent of hours, which (considered as the 24th part of a natural day) have no place in these calculations, but only by reduction.

*The arithmetical operation.*

$$525949 \div 360 = 1460, \text{ remains } 349.$$

Then,  $1460 \div 4 = 365 + \frac{3}{4} =$  the tropical year.

But  $360 - 349 = 11$  the meridian epact.

If we divide 349 by 60 the 5th radical number; the quotient, it will be said, will give 5 hours, according to our computation, and the remainder 49 minutes of an hour.

I would not have it thought that I superstitiously reject our method of computing hours; still I continue to say, that, notwithstanding the following reduction of 349 will produce the same numbers 5 and 49, yet we are under no necessity to denominate the former 5 hours, as used and understood by us, nor the latter 49 minutes of an hour.

ist,

1st, Divide 349 by 15, the quotient will give 23 quadrants of 60, and the remainder, 4 sexagesimal parts, which reserve.

2dly, Divide 23 quadrants of 60 by 4, the quotient will give 5 integers, and the remainder, 3 sexagesimal parts.

3dly, Multiply the remainder 3 by 15, and, to the product 45, add the first remainder 4, we shall then have  $\frac{5}{6}$  and  $\frac{4}{6}$ .

Here it will be insisted upon that this conclusion stands express'd in our style; for do not we divide the hour into 60 minutes, and are not 15 minutes a quarter of an hour? yes, undeniably; and it is allow'd, that thus far our computation falls in with the ratio of the radicals, and the originally established sexagesimal measure; but if we proceed one step farther, and consider the hour as  $\frac{1}{24}$ th of a natural day, then I must equally insist upon it, that the calculation, under this view, has no more immediate reference to the hour, than it has to sub-sexagesimal parts, or second minutes, which are utterly excluded from the quantity of the solar tropical year, by the appointed astronomical unit, or minimum  $\frac{1}{60}$ .

Thus we have, at length, by gradual advances obtained both the square and the root sought, in a method *à priori*, or without any supposed previous knowledge either of the one or of the other.

*Euclid's* doctrine of the section of strait lines is vastly curious; but here is the section of a quadrant (which may be represented by a strait line) propos'd, altogether as curious, and as truly geo-

metrical, I had almost said, as any in the second book of his elements. For what can be more mathematically exact than the discrimination, by a plain, easy, numerical calculus, of that very individual point, in a limited space of time, in which the Sun finished a given annual period, and in the same individual point completed it's square? such a conclusion in astronomy, without the aid of any known astronomical principles, was scarcely to be expected. And I am pretty certain, that if the whole process be judiciously examined, weighed, and considered, it will approve itself to the examiner.

Before I proceed to another argument, I beg here to remind the reader, that the principal end which I have in view is, to render it indisputably certain, that *Moses's* table of the genealogies both of the antediluvian and postdiluvian Patriarchs is, in itself considered, a most accurate astronomical table, and that it is founded upon these two laws, *viz.*

I. The years of the lives of the Patriarchs are made, by an astronomical reduction, to run parallel (*i. e.* to begin and end together at the autumnal æquinox) with the years of the world. And, consequently,

II. Every *Mosaic Shanab* is a true solar year.

Upon this account, order required me, in the first place, to ascertain the measure of the *Hebrew Shanab*; and I am, in the sequel, to demonstrate that I have ascertained it; that I have set the quantity of the tropical year in it's proper point of light,

light, and rendered it more certain than ever it was before, as being now by analysis reduced to it's original *Mosaic* principles.

Had I been obliged to have postulated the quantity of the solar tropical year, or could I not have immediately deduced it, by the assistance of the *Mosaic* data, the scheme of sacred chronology would have been deprived of the support of it's chief corner stone; and the astronomer, it is probable, might have hinted the justice of paying the small tribute of a grateful acknowledgement to *his labours*.

I will now make a table, by which any given number of solar tropical years, within the limits of 6000, may easily and readily be reduced to days.

*A table of reduction of solar tropical years to days.*

Year	Days	H	M
1	365	5	49
2	730	11	38
3	1095	17	27
4	1460	23	16
5	1826	5	5
6	2191	10	54
7	2556	16	43
8	2921	22	32
9	3287	4	21
10	3652	10	10
20	7304	20	20
30	10957	6	30
40	14609	16	40
50	18262	2	50
60	21914	13	00
70	25566	23	10
80	29219	9	20
90	32871	19	30
100	36524	5	40
200	73048	11	20
300	109572	17	00
400	146096	22	40
500	182621	4	20
600	219145	10	00
700	255669	15	40
800	292193	21	20
900	328718	3	00
1000	365242	8	40
2000	730484	17	20
3000	1095727	2	0
4000	1460969	10	40
5000	1826211	19	20
6000	2191454	4	0

We will now reduce, by this table, 365 years to days, in order to shew it's exact agreement with the precedent arithmetical calculus by the radicals, independent of all tables.

365 years separate themselves into this series, 300. 60. 5. set them down in this order, and the corresponding days, hours, and minutes in the same, over against them.

Years	D.	h.	'
300 } contain	109572	17	00
60 } contain	21914	13	00
5 } contain	1826	5	5
	□ 133313	11	5

*Coroll.* Should the Sun enter *Libra*, in the meridian of *London*, or elsewhere, in any year exactly at noon, then by this table, and the precedent calculation, it would again enter *Libra*, in the same meridian, 5 minutes past eleven at night precisely, by an invariable law, in the 365th revolution from thence.

	D.	h.	'	"
1. If to Sir <i>I. Newton's</i> reduction, we add the sum of the defect,	133313	10	46	45
			18	15 p. 268.
2. It will be equal, by <i>Axiom</i> , p. 273, to the complement of the square } □	133313	11	5	00

I could wish that the following question might be thought a proper thesis in astronomy to be put up and discuss'd in the schools, *viz.*

Whether

Whether the difference of 3'' in these two assigned roots ought to be estimated as an *annual defect*, or as an *annual excess*?

Now I undertake, against all opposition, to prove, that they ought to be estimated as an *annual defect*; and that the odd 57'' of Sir *I. Newton*'s determination of the quantity of the solar tropical year ought to be completed into a sexagesimal part.

Without any regard had to the foregoing calculations, and their result, I will still consider the measure of the solar tropical year as an unknown quantity; and I am to discover and settle it's exact measure from the first year of commensuration; not that I am confined to the first.

Was it a question put, and referred to the decision of our astronomers, whether the Creator has established a commensurability between the diurnal and the annual motions, or not? it must, upon their principles, be pass'd in the negative. And yet this established commensurability is the alone *medium in nature* which can enable us to ascertain, with the minutest exactness, to an indivisible point, the true measure of the Sun's year. I say, the alone *medium in nature*, for that it may be (at least, nearly) attained by the rules of vulgar arithmetic, Sir *I. Newton*, was he living, would not decline to testify.

It is a dream and a delusion to talk of the perfection of astronomy, in the present state of science, and the rules of it's determinations.

*Moses*

Moses, in the introduction to his *Pentateuch*, has happily taught us more in these few words; *God said, let them be for days and years*, than the moderns yet know, or have ever been able to find out. For they cannot make the measure by *days* to correspond exactly with the measure by *years*, and therefore their conclusions are *artificially imperfect*, instead of *divinely true*.

Our astronomers say, that the solar tropical year (whose quantity is not certainly known) gains a whole day of the *Julian*; in other words, that it's head goes backward in the *Julian* calendar, and so it begins a whole day sooner, in *about 130* years. If you demand *exactness of truth*, you will find the calculation perplexed and entangled with second minutes, to the utter exclusion of truth.

The astronomical effects and consequences of a commensurating year are attended with an appropriated singularity; for in this distinguished year only, the measure by *integral* days is the same, without excess or defect, with the measure by integral years. Both computations jointly begin and end in the same cardinal point of the year, in the same cardinal point of the day, and in one and the same meridian; all which particulars may be thus represented to the view:

$$\begin{array}{rcc}
 & & + \\
 \textcircled{\ominus} & 2103796 \text{ days} = 5760 \text{ years} & - \textcircled{\ominus} \\
 \text{Zoboraim,} & & \text{Zoboraim,} \\
 \text{Noon.} & & \text{Noon.} \\
 & & \text{Now}
 \end{array}$$

Now, I say, that the modern astronomer cannot, upon his avowed principles of calculation, and the *Newtonian* correction of *Tycho's* observations, either confirm or confute this conclusion. It may be true, or it may be false, for any thing he can prove to the contrary; for it entirely depends upon the doctrine of a commensurability: the question then that remains, is, whether this be matter of fact, or not? which is the subject of my present enquiry, and I thus introduce it.

From the beginning of A. D. 1700, we have reckoned 11 days difference between old style and new, or between the *Julian* and the *Gregorian* accounts; but altho' this is the 51st current year since this reckoning commenced, yet if we make a calculation by any of the solar tables now in use, they will give us to understand (so inaccurate have we been in the solar computation, as adapted to civil use) that these 11 days difference between the two accounts, are not yet completed. I ask then ———

In what year of the *Dionysian* vulgar æra will these 11 days difference be exactly completed?

Here our astronomers will find this plain, simple question, a difficulty as insuperable as that of squaring the Circle. And they will be reduced to the Dilemma either of giving up *Dr. Halley's* and *Sir I. Newton's* solar tables, or of attempting to prove, that the doctrine of a commensurability between the diurnal and the annual Motions is not founded in nature, and must be rejected as a fictitious and chimerical notion.

Now since the true measure of the Sun's year may still be considered (after so many diligent, skillful, and sollicitous researches, and endeavours to attain it) as, *quid indeterminatum*, or, as an uncertain quantity; and since *Longomontanus* has corrected *Tyco's* observations by 5'' seconds annually, and *Sir I. Newton* by 3'' seconds annually, we will assign *ex hypothesi* 5 different quantities of the tropical year, all terminating in second minutes, from 55'' to 59'', and then bring them all, if it may be, to some test and touchstone of their truth.

A TABLE of 5 assigned quantities of the solar tropical year, all terminating in second minutes.

The tropical	}	1	D h	365	5 48'	55''	<i>Longomontanus.</i>
year supposed		2		56''		A.	
to contain		3		57''		<i>Sir I. Newton.</i>	
		4		58''		B.	
		5		59''		C.	

The council of nice was held A. D. 325, which being subtracted from A. D. 1750, remains 1425. Therefore from the year of the council of nice to the current (A. D. 1751) exclusive, have elapsed 1425 *Julian* years, which being reduced, contain 520481 days, 6 hours.

In the next place, reduce these 5 assigned quantities of the tropical years to days, then subtracting the several products from the *Julian* reduction, the differences will shew respectively how much these

these 11 computed days want of their exact completion. Here follows

*A TABLE of calculated reductions, and their respective differences from the Julian, in the space of 1425 years, or from A. D. 325, to A. D. 1750 inclusive.*

D h ' " (1)				D h ' " (2)			
365 5 48 55 <i>Longomont.</i>				365 5 48 56 A.			
D h ' "				D h ' "			
<i>Julian</i> 520481 6 00 00				<i>Julian</i> 520481 6 00 00			
Solar - 520470 6 46 15				Solar - 520470 7 10 00			
Difference 10 23 13 45				Difference 10 22 50 00			

D h ' " (3)				D h ' " (4)			
365 5 48 57 <i>Sir I. Newt.</i>				365 5 48 58 B.			
D h ' "				D h ' "			
<i>Julian</i> 520481 6 00 00				<i>Julian</i> 520481 6 00 00			
Solar - 520470 7 33 45				Solar - 520470 7 57 30			
Difference 10 22 26 15				Difference 10 22 2 30			

D h ' " (5)			
365 5 48 59 C.			
D h ' "			
<i>Julian</i> 520481 6 00 00			
Solar - 520470 8 21 15			
Difference 10 21 38 45			

The next Step we are to take is to calculate the nearest approximation of these several differences to the completion of the Day, and to set down

the respective years in which they will be found ; for not one of these assigned quantities will, by any calculation, produce an exact completion. And I urge this exact completion of the day, as one genuine criterion, for I have another in store, of the authenticity and truth of the assigned quantity ; and so, *vice versâ*.

*A TABLE of the nearest approximations of the calculated differences, and of the respective years of the Dionysian vulgar æra, in which they are found, with the sums of the several defects.*

(1) A.D. 1754.	(2) A.D. 1756.	(3) A.D. 1758.
D h ' "	D h ' "	D h ' "
10 23 58 5	10 23 56 24	10 23 54 39
Defect 1 55	Defect 3 36	Defect 5 21

(4) A.D. 1760.	(5) A.D. 1762.
D h ' "	D h ' "
10 23 52 50	10 23 50 57
Defect 7 10	Defect 9 3

It is obvious to perceive that the addition of one year more would, in every instance, cause a proportionable excess above 11 days, as they now, in a certain proportion, fall short of them. And it becomes undeniable matter of fact, that our astronomers have no theories, principles, or laws of calculation, which can so much as suggest the hint, much less lead them into the discovery and know-

knowledge of a commensurating year. Nor can they possibly solve the plain, simple question proposed, but upon the forementioned terms and conditions; *viz.* without either giving entirely up their most elaborate, and most approved solar tables, or rashly impugning an established law, an original ordination of the GOD of nature, and infinitely wise CREATOR of the solar system.

It is no wonder if the doctrine of a commensurability, between the diurnal and the annual motions, should occasion some suspension of judgment and assent, since it is so entirely new and unheard of before. It is evident that Dr. *Holder*, in his account of time, had no apprehension, or even the least suspicion of it, as appears from p. 22.

“ The day is no *aliquot* part of the year, (strictly speaking) neither to compound nor divide the year, so much as by units. If the year comprehend days, it is but as any greater space of time may be said to comprehend a less, tho’ the less space be incommensurate to the greater.

“ And from these differing properties of day and year, arise difficulties in carrying on and reconciling the supputations of time, especially in long measures. Altho’ it must be confessed, that for vulgar use, where is no need of, or regard to, exact calculation, we have no better measure of a single year, than the day, and the artificial solar month, consisting of even days.

“ But if we thus measure many ages of years by *even days*, our computation *will be perplexed.*

“ For

“ For the year (without regard to days) ends,  
 “ and is terminated, with an odd day, and odd  
 “ hours, and odd minutes, and odd *second mi-*  
 “ *minutes*, if we go no farther : so that *it cannot*  
 “ be measured by any even number of days, or  
 “ hours, or minutes.” Thus far Dr. *Holder*; but  
 That the Creator has actually established *such*  
 commensurability, the *Mosaic* style, principles,  
 terms, and data, will furnish us with a direct and  
 irrefragable proof.

First then, I am not only to offer the Rule  
 how to find out these distinguished years, but al-  
 so to settle their series, or true order of succession  
 in the world’s chronology.

Secondly, having settled their series, or true  
 order of succession, I am to deduce, from their  
 essential properties and affections, the true mea-  
 sure of the *Mosaic Shanah*, or solar tropical year.

Thirdly, from the true measure of the *Mosaic Shanah*  
 to shew the exact completion of the 11th day.

We are now entering into the depths of this  
 scheme; and indeed, there are more depths in  
 this original simplicity, more instructive arcana in  
 the astronomy of the *Pentateuch*, than the Rea-  
 der, perhaps, upon a bare view of my general  
 propositions, might be readily induced to imagine.  
 Tho’ possibly he may have some apprehensions of  
 this kind, if he will give himself the trouble to  
 read and consider these necessary

*Præcognita.*

(1) The arithmetical mean 360, and the 7 ra-  
 dical numbers include in them a geometrical pro-  
 portion,

portion, and 4 distinct ratios. (1) A sexagesimal. (2) A quintodecimal. (3) An undecuple. (4) A quadruple ratio. These are set down and noted in the following table (with their complements or fourth numbers) in the form of proportionals.

*A TABLE of geometrical proportions.*

4	:	1	::	60	:	15
4	:	1	::	11	:	2 45
1	:	60	::	2 45	:	165
15	:	1	::	165	:	11
11	:	1	::	165	:	15
1	:	4	::	360	:	1440 the 1st year of commensuration.
1	:	4	::	365 $\frac{1}{4}$	:	1461 quadrants in a <i>Julian</i> year.

It may seem incredible, but the result and it's proofs may evidence, that the calculations of Sun and Moon astronomy are resolvable, not so entirely into principles of science founded upon observation, as into prædetermined ratio, and settled geometrical proportion.

We will, at present, examine more particularly the number 360, the multiple of 60 and 15, which are the 5th and the 7th radicals. And there are special reasons for this; for we can scarcely stir a step in the integral calculations, without the help and concurrence of this well known (and yet, methinks, unknown) auxiliary, together with it's sub-multiples. Here I beg to be informed with candor and ingenuity, from whence had we the division of the ecliptic and the æquator into 360 equal parts? nature directs not to it; and

*Moses,*

*Moses*, in his recorded astronomy of the year of *Noah's* life 600, has enlarged the circle of the year into 365 parts. Will the astronomer say, that as it has descended down, by a usage immemorial, from his forefathers, and the days of old, that therefore he has a great veneration for it's *high antiquity*? or will he choose to say with *Dr. Holder*, in his account of time, p. 27. " that it " is artificial and arbitrary, but *well chosen and* " *pitched upon*, as being a number that abounds " with *integer aliquot parts*, and therefore *most* " *apt for partition*?" He makes this short descant upon it, p. 28. " The number 6 is celebra- " ted for having all aliquot parts, *viz.* 3, 2, 1, " and for being composed of the aggregate of " them all, and therefore is styled the perfect " number. And 10 is the first of the faracenic " figures, or figures with cypher, that great friend " to calculation, or rather, which changeth cal- " culation, strictly so called, into easy computa- " tion. Now the number 360 consists of the " square of 6, *viz.* 36 multiplied by 10, or ha- " ving a cypher added to it.

It is a prevailing notion, and the learned seem to give an unanimous suffrage to it, that we received these 360 days from the antient *Ægyptians*, *Chaldeans*, and *Grecians*. If indeed they are considered as an imperfect measure of the solar year, the hypothesis may be so far admitted: but if as an aggregate of 12 equal 30-day months, then I have manifested from the *Pentateuch*, that it is not true, and must be rejected. So far is this no-  
tion

tion from having any just foundation, that, on the contrary, the first of these 12 equal 30-day months, fixes it's head in the 4th of the Hexaëmeron, and is coætaneous with the annual motion.

The wise Architect of nature, and Framers of the original astronomical year, did not invest this sexagesimal and quintodecimal number 360 with such easy and complying properties and powers, for mean, frivolous, and inadequate purposes.

The table annexed, which is constructed from this great Friend both to the solar and the lunar computation, by it's sub-multiple 15, will supersede the use of every solar table, which does not correspond with the same laws of proportion.

*A sexagesimal and quintodecimal solar table.*

Index	(1) years	(2)	(3)	(4)	(5)	(6)	(7)
1	15	15	165	11	60	165	2 45
2	30	15	330	22	60	330	5 30
3	45	15	495	33	60	495	8 15
4	60	15	660	44	60	660	11 00
5	75	15	825	55	60	825	13 45
6	90	15	990	66	60	990	16 30
7	105	15	1155	77	60	1155	19 15
8	120	15	1320	88	60	1320	22 00
9	135	15	1485	99	60	1485	24 45
10	150	15	1650	110	60	1650	27 30
11	165	15	1815	121	60	1815	30 15
12	180	15	1980	132	60	1980	33 00
13	195	15	2145	143	60	2145	35 45
14	210	15	2310	154	60	2310	38 30
15	225	15	2475	165	60	2475	41 15
16	240	15	2640	176	60	2640	44 00
17	255	15	2805	187	60	2805	46 45
18	270	15	2970	198	60	2970	49 30
19	285	15	3135	209	60	3135	52 15
20	300	15	3300	220	60	3300	55 00
21	315	15	3465	231	60	3465	57 45
22	330	15	3630	242	60	3630	60 30
23	345	15	3795	253	60	3795	63 15
24	360	15	3960	264	60	3960	66 00

A continuation of necessary

*Præcognita.*

(2) The number 360 (so also the 7 radicals) may be considered and used under different denominations and values, as the subject matter in hand shall require, and it will be equally applicable, and will equally adapt itself in the calculation, to all and every one of them. Thus, for example, we may say, either 360 years, as in the table, or equal months, or days, or quadrants, or degrees and minutes, or hours and minutes — but lower than primes we cannot descend, as the integral calculation entirely discards all second minutes.

(3) When any of the radical numbers have a specific denomination given them, suppose, for instance, 11 days, the settled proportions will be invariably preserved; for let 60 denote any integer whatever, 15 is still it's subquadruple, and assumes the same denomination.

(4) 15, the quadrant of 60, may be measured by 3 and 5; so that 5 is equal to  $\frac{1}{3}$ , and 3 to  $\frac{1}{5}$  of 15. This may be properly noted, because the square of a solar revolution terminates by the calculus, in one of these aliquot parts of 15.

(5) If the 3d radical number 11 (without specifying it's denomination or value) be multiplied into the 7th radical number 15, the product 165 being divided back again by 15 will give in the quotient 11 quadrants. And the dividend 165 will be the quadrant of the number 660, which being divided by 60, the quadruple of 15, will give in the quotient a number made up of like fi-

gures, but in a quadruple ratio to the former. This may be illustrated from the table, as may be seen, by setting the numbers, Index 1, Col. (2) (3) (4) over against the numbers, Index 4, Col. (5) (6) (7).

Index 1...15 165 11 quadrants. Index 4...60 660 11 Integers.  
In like manner... 15 360 24 quadrants. . . . . 60 1440 24 Integers.

We, for instance, in our computations of time, divide the nucthemeron, or natural day, into 24 equal parts or hours, every one of which equal parts is measured by 60. But the table above divides the quadrant of the nucthemeron into 24 equal parts, every one of which is measured by 15. Hence it comes to pass, that the number 24 is made a standing and unalterable divisor, in the arithmetical operations, where years are proposed to be reduced to days.

(6) It is necessary to take particular notice, and to bear along in our minds, that these instrumental, operative, and efficacious numbers, collectively taken and considered, are both simple and compounded, and that the greater integrally include the lesser. The number 360, for instance, may be measured by 4, 60, 30, 15, whilst the 3d radical number 11 is the sum of 4 and 7, &c. *vide* p. 249, where these partitions are all noted, and they are mentioned again here, because, being amongst the essentials and fundamentals, they are necessary to be remembered as well as known.

From a clear view and experimental conviction of the inherent astronomical powers, and the native

tive

tive geometrical proportions, of these *Mosaic* numerical data, I am instructed (nor have I any other preceptor) to argue and conclude with an indefectible certainty; and from hence alone was I enabled to lay down that astronomical axiom, p. 250, and 273, which I still offer and urge as a sure criterion.

(7) When the true measure of a solar revolution is allowed to be ascertained, with the minutest exactness, to an indivisible point, and, by a general consent, acquiesced in as such, then it will be proper to give a more explicit account of the above solar table. In the mean time, it is no hyperbole, but a just recommendation of it to say, that in it's use and application (an instance of which will be given in a subsequent calculation) it is absolutely perfect, infallibly certain, and unerringly true: that it's proportions are exactly conformable to nature, and it will be impossible ever to convict it of error.

What a bigoted enthusiast is here? says an astronomical Deist. Let him enter the lists then with this bigoted *Hebraician*, and bring to the test the astronomy of the *Pentateuch*.

To proceed: The advantage and importance of the present research terminates, not in the bare satisfaction of being able to discover and determine the adequate measure of the Sun's year, and to perfect the approximations of the moderns (tho' this is of no small weight in it's self considered) but in a view of the whole result, and of a train of consequences, which dilate and expand themselves

felves into the establishing an excellent theory of meridians, which lie concealed, at present, from philosophic speculation, and must, without some farther improvement, continue to do so to the end of time.

The particular circumstance of our more immediate enquiry is the rule how to find out these commensurating years; but here our labours will be shortened by the table of geometrical proportions, p. 287, for in this parallel line

$$1 : 4 :: 360 : 1440$$

the 4th proportional is, as I shall prove, the number sought; whose place or situation in the lives of the Patriarchs and *Moses's* table of their genealogies, may be easily known. For *Noah* was born A. M. 1056; but A. M. 1440 — 1056 = the 384th year of *Noah's* life, which begins and ends, at the autumnal æquinox, with the first year of commensuration.

The arithmetical mean 360 (whose powers, like it's extract and origin, are truly divine, and I might venture to say, well nigh inexhaustible) is the foundation and aliquot part of these remarkable years; so that their series, or true order of succession, in the world's chronology, may be known and adjusted by only multiplying 360 by the 2d radical number 4, and it's multiples, as in the easy calculation ensuing.

A.M.

	4 = 1440 I.	}	The year of <i>Noah's</i> life
			384.
360 X	8 = 2880 II.	}	The 13th year of the
			judgeship of <i>Eli</i> the
			high priest.
	12 = 4320 III.	}	The 8th year of the reign
			of <i>Constantine</i> the
			great, A. D. 313.
	16 = 5760 IV.	}	The 687th year from the
			æra of the Conquest,
			⊖
			⊙
			A. D. 1753.

Not one intermediate year can be proved to be invested with the same properties and affections, as these four are ; for being reduced to days, they jointly begin and end in one and the same point of the year, day, and computed meridian. So that primitive and patriarchal astronomy teaches us this hitherto unknown lesson ; it instructs us to say, that in the space of 1440 annual revolutions of the Sun, one entire periodical revolution of the meridian epact is completed ; and from the completion of one entire periodical revolution of the meridian epact arises the first year of commensuration. Moreover, the sum total of diurnal revolutions to be subtracted, are equal in quantity to the lunar epact, which is alike in figure to the meridian epact, observing the same laws, and encreasing in the same arithmetical progression by

11. For in 5760 *Mosaic Shanim*, or solar tropical years, there are included (1) 5760 12-month lunar years; and (2) 5760 lunar epacts; and (3) 5760 annual separate quadrants, adhering to the lunar epacts, being the astronomical bonds of connection, appointed to this office *ab origine*; and (4) 5760 inhering meridian epacts, which annually encreasing by a created law, and in a created proportion =  $\frac{11}{88}$ , measure the distance from the computed meridian, to that meridian in which the solar year and the solar day begin together. Here we have a general view, draught or plan, of the primitive laws both of the solar and of the lunar computations.

To keep to the method proposed; here are 4 years of commensuration specified and determined: we are then, from the first or the last, or any one of them indifferently, to deduce, with the minutest exactness, to an indivisible point, the measure of the solar tropical year, and then to demonstrate it's truth and certainty. For between deduction and demonstration there is undoubtedly a very wide difference. Sir *I. Newton*, for instance, has limited this measure to 365d 5h 48' 57". But who ever has, or will undertake, to establish it's authenticity? it stands, at present, but as an *ipse dixit*, liable to be controverted; and it may, and it ought to be corrected, not merely as being deficient 3 seconds of time, but as a repugnancy to nature.

We will reduce the first and the last of these 4 years, *viz.* A. M. 1440, and A. M. 5760.

As

As for the rules of this reduction, I need only refer to p. 261, where they are plainly taught.

Rule I. A.M.  $1440 \div 15 = 96$ .

Rule II.  $96 \times 11 = 1056$ .

Rule III.  $1056 \div 24 = 44$  quadrants.

Yrs. Quad. Quad. Days Q.

R. IV.  $1440 \times 1461 = 2103840 \div 4 = 525960$  o *Jul. reduct.*

Rule V. - - - -44

2103796  $\div 4 = 525949$  o *Sol. reduct.*

Difference from *Julian* 11 0 0'

If we carefully look over and consider the several parts of this calculation, we may perceive, that, in the quotient of the Solar reduction, there are just as many days as there are sexagesimal parts, in a Solar Tropical year: and also, in the number 1440, there are just as many years as there are sexagesimal parts in one diurnal revolution of the Sun. Hence these two numbers, 1440' and 525949', may be reckoned homogeneous quantities: therefore, if we divide the quotients, both of the *Julian* and the Solar reduction by 1440, and the remainder by 60, the quotients arising from this division will exhibit, the one the quantity of the *Julian*, the other of the Solar Tropical, year.

*The arithmetical operation.*

Years	Days	D	h	'	
1440')	525960'	(365	6	0	the Julian year.
	<u>60)</u>	360	(6		

Years	Days	D	h	'	
1440')	525949'	(365	5	49	Sol. Trop. year.
	<u>60)</u>	349.	Differ.	$\frac{11'}{20} =$	Merid. epact.

Q. E. F.

In the next place, we will reduce by the same rules 5760 years, and carry on the calculations jointly, step by step.

Rule I. A. M.  $5760 \div 15 = 384$ .

Rule II.  $384 \times 11 = 4224$ .

Rule III.  $4224 \div 24 = 176$  quadrants to be subtracted.

Yrs. Quad. Quad. Days

R. IV.  $5760 \times 1461 = 8415360 \div 4 = 2103840$  Julian reduct.

Rule V. - - - - -176

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$8415184 \div 4 = 2103796$  Sol. reduction.

Difference 44 0 0'

Years

Years	Days	D	h	'	
5760')	2103840'	(365	6	0	the <i>Jul.</i> year.

$$\begin{array}{r} \div 60 \times 4 = 240' \quad - \quad - \quad - \quad 1440 \quad (6 \\ \hline \phantom{\div 60 \times 4 = 240' \quad - \quad - \quad - \quad} 0 \end{array}$$

Years	Days	D	h	'	
5760')	2103796'	(365	5	49	Sol. Trop. year

$$\div 60 \times 4 = 240' \quad - \quad - \quad - \quad 1396 \quad (5 \mid \text{Differ. } \frac{1}{80}' = \text{Merid. epact}$$

$$4) 196 \quad (49$$

Q. E. F.

Rule V. p. 261, is thus drawn up and expressed. From the sum total of *Julian* quadrants subtract the quotient obtained by Rule III. then, dividing the remainder by 4, this last quotient will complete the reduction, if a year of commensuration be given. Consequently, if, according to the direction of the latter part of Rule V. laid down, p. 272, we multiply the given number of years into  $\frac{1}{80} =$  to the meridian epact, and divide the product by the arithmetical mean 360, the quotient will give the number of quadrants to be subtracted as before, but the remainder will be = 0. And it necessarily must be so, because in such a year the computed meridian is revolved to it's first station precisely; in other words, the original cardinal point of the Solar day (*viz.* noon) is again astronomically connected with the original cardinal point of the year, *viz.* the autumnal æquinox. And this is what I would be understood to mean

( 300 )

by the essential properties and affections of a commensurating year.

*The arithmetical operation.* [Vide p. 272.]

$$\begin{array}{r} \text{A. M.} \\ 144^{\circ} \\ \times 11 \\ \hline 360) 15840 \text{ (44 quadrants.} \\ \hline \text{Remainder } 0 \end{array}$$

$$\begin{array}{r} \text{A. M.} \\ 576^{\circ} \\ \times 11 \\ \hline 360) 63360 \text{ (176 quadrants.} \\ \hline \text{Remainder } 0 \end{array}$$

We need carry on these joint calculations but one step farther. I say then, lastly, if we multiply the sum total of the quadrants [*vide* p. 266.] into the arithmetical mean 360, and then divide the sum total of the sexagesimal parts by the given intervals, or respective number of years; the quotients will contain the exact number of sexagesimal parts in the Solar Tropical year, whilst the remainders will be respectively = 0, as before, and for the reasons just now assigned.

*The*

*The arithmetical operations.*

Quad.

I.  $2103796 \times 360 = 757366560'$  sexag. parts.

II.  $1440'$   $757366560'$  ( $525949'$  in a Trop. year.

Remainder  $0'$ 

Again :

Quad.

I.  $8415184 \times 360 = 3029466240'$  sexag. parts.

II.  $5760'$   $3029466240'$  ( $525949'$  in a Trop. year.

Remainder  $0'$ 

Having deduced the measure of the *Mosaic Shanab*, or of a true Solar revolution, from the first and the fourth years of commensuration; and by the same calculations having rendered indisputably certain the doctrine of a commensurability between the diurnal and annual motions; I am now, by the method laid down, to demonstrate its truth and certainty: I am to make it appear, beyond the power of confutation, that ---  $365d. 5h. 49' 0''$  are not an approximation, but true, in nature, to an indivisible point.

My first argument shall be taken from the completion of the day, which alone and in itself considered is irrefragable, because founded upon the basis of commensurability.

The interval from the vernal æquinox, A. D. 325, which was the year of the Council of *Nice*,

to the vernal æquinox, A. D. 1750, measures 1425 Solar Tropical years. Reduce these 1425 years to days by the table, p. 277; then, subtracting the sum total from 520481 d. 6 h. or the *Julian* reduction, the difference will shew how much the 11 computed days want of being exactly completed, and which not one of the precedent calculations, according to our astronomical laws, could complete.

*The reduction of 1425 years to days by the table,*  
P. 277.

Years		D	h	'		
1000	}	contain	}	365242	8	40
400				146096	22	40
20				7304	20	20
5				1826	5	5
				520470 08 45		
From the <i>Julian</i>		520481	06	00		
Subtract - -		520470	08	45		
				Difference		
				10	21	15
				Deficient - -		
				2	45	

Now then from 1440 subtract 1425, the number of years elapsed, and with the remainder 15 enter the sexagesimal and quintodecimal Solar table, p. 290, where, in the first column of the first parallel line, we shall find the same number of  
years

years placed the first in order of those which are set perpendicularly in the same column, and all equally encreasing by 15. As the first and the last parallel lines of this table include the whole ratio of the calculus, made use of by me in the reduction of years to days, I will here transcribe both of them, with all their appendant numbers.

*A transcript of the first and the last parallel lines of the sexagesimal and quintodecimal Solar table.*

Index	(1) Years	(2)	(3)	(4)	(5)	(6)	(7)
1	15	15	165	11	60	165	2 45
24	360	15	3960	264	60	3960	66 00

The present calculation will afford a proper opportunity to illustrate the astronomical properties and powers of this Solar table, in its use and application. If we look back to the last conclusion, we may observe, that the difference between the *Julian* and the Solar computation, in the interval given, was 10 d. 21 h. 15', and the deficiency 2 h. 45'. In the 7th column of the first parallel line, over-against 15 years, we find these very numbers 2. 45. and they are the numbers sought. Here it is worth our while to take notice, with what an exquisite præ-adaptation, I may say, with what an apparently divine mechanism and construction,

struction, they naturally connect themselves with the calculated terminations, 21 h. 15', and measure to a point the complement of the 11th day: For,

	D	h	'
To	10	21	15
Add	.	2	45
	<hr style="width: 100%; border: 0.5px solid black;"/>		

Sum total    11   0   0

Just in like manner, when we calculated, p. 297, the first commensurating year, having substracted the quotient of the Solar reduction, *viz.* 525949 days, from the quotient of the *Julian* reduction, *viz.* 525960 days, the difference between the two accounts was, as here, 11 days precisely. May I not venture, in this place, to set down the initials, *Q. E. D.*? For if this conclusion, arising from *Mosaic* principles, and the *Mosaic* numerical data, be not admitted as demonstrably certain, I must renounce all pretensions to demonstration, and even to the idea of it: for where, in the whole process, is any arbitrary assumption, or precarious and disputable *postulatum*?

Having calculated the exact completion of the 11th day, we must go on to fix the year of its completion. In order to this, to A. D. 1750 add 15 years, which will carry us forward to A. D. 1765. Then from A. D. 1765, the year of completion, substract A. D. 325, which is the epoch of the computation: remains 1440, or the first year of commensuration. From hence arises the force of my argument: from this ground it appears that

that I have, in fact, deduced the quantity of the Solar Tropical year, with the minutest exactness, to an indivisible point : nor can the exact completion of these 11 computed days be obtained, from any other assigned measure, but that of 365 d. 5 h. 49'. 00". ; nor from any year, but that of the 1440th from the head of the account.

I conclude then, from my first argument, that 365 d. 5 h. 49'. 0". is the standard of the Solar Tropical year, and that all the Solar tables ought to be reduced to it.

My second argument shall be taken from the exact completion of the quadrant, as my first was from the exact completion of the day.

In order to establish this conclusion, reduce 5760 Solar Tropical years to days, p. 277 ; and also, by Sir *I. Newton's*.

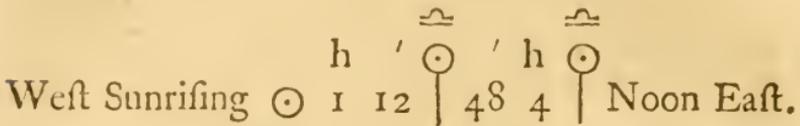
In the next place, subtract the lesser number from the greater, and the remainder will be equal to the complement of the quadrant ; and also, to the sum of the defect in the given number of years : *e.g.*

The Integral Calculation assigns for the measure of the Solar year				The <i>Newtonian</i> Correction assigns for the measure of the Solar year			
D h ' "				D h ' "			
365 05 49 00				365 05 48 57			
Years	D	h	' "	D	h	' "	
5000	} contain	1826211	19 20 00	- - -	1826211	15 10 00	
700		255669	15 40 00	- - -	255669	15 05 00	
60		21914	13 00 00	- - -	21914	12 57 00	
<hr/>				<hr/>			
Integ. Days	2103796	00 00 00		2103795	19 12 00		
	-2103795	19 12 00					
<hr/>				<hr/>			
Difference	- - -	4 48					

Q q

According

According to these different conclusions, the fourth quadrant of the Solar day, which measures from sun-rising to noon, will be divided by the Sun's entry into *Libra*, in the computed meridian, as in this scheme :



In the integral calculation we have a collected sum of integral days, which as the computation commences at noon, must end at noon; and by the essential properties and affections of a commensurating year, they must also terminate in the autumnal æquinoctial, or original, point, and in the same computed meridian. That the given year, A. M. 5760, is the fourth year of commensuration, has been sufficiently proved, in the precedent pages: therefore I argue, that Sir *I. Newton's* reduction, which calculates the Sun to enter *Libra* 12' past 7 in the morning, or 4 hours 48' before noon, must be defective; or more particularly, that the complement of the 4th quadrant of the Solar day, equal, in this case, to 4 h. 48'. is the sum of the defect, in the given number of 5760 years, *Q. E. D.* From the force of this second Argument, I conclude as before, with respect to the ascertained measure of the Solar Tropical year.

My third Argument shall be taken from the completion of the square 4, which arises from the division of the number of sexagesimal parts in  
in

in a true Solar revolution by 15; but ultimately, and originally, from the subtraction of the 3d radical number 11, from the fundamental datum of the *Pentateuch* 15; for  $15 - 11 = 4$ , *vide* p. 246, where these partitions are noted, and amongst others, we may observe that 15 is resolvable in 4, 7, 4, of whose astronomical use and application, we may have somewhat to say hereafter.

When we contemplate these components 4, 7, 4, and find them terminating in 2 squares, the integral and geometrical exactness has something in it very striking both to the eye and to the understanding: but if it either has been already, or may be, rendered certain, that it likewise corresponds with true astronomy, and the inmost constitution of the system; this must needs carry along with it a forcible and convincing proof of the wisdom and geometry of the creator.

If we compare *Longomontanus's* calculation, and that of Sir *I. Newton's* with this, they will jointly appear in this form:

	' "	" "	' "	' "	
Integral Calculation	4 00		00	+7	+4
<i>Longomontanus</i>	3 55		05	+7	+4
Sir <i>Isaac Newton</i>	3 57		03	+7	+4
				}	= 15

It is observable, in the table before us, that these two eminent mathematicians, are so far from aiming to square the circle, that, on the contrary, they directly and respectively tend to unsquare the square, and to substitute the *Trapezium* in its stead. Although the parts of 15 are

indeed preserved by both, yet the true quantity and partitions of time are preserved by neither. When we take a closer view of these dislocations and anomalies, these perceptible deviations from astronomical accuracy and proportion, we are in a high degree prompted to make it a doubt and a question, *εἰ ὁ Θεὸς γεωμετρεῖ*; whether the creator geometrizes in his works or not? for where is order and regularity? where is the beauty and perfection of the square?

If nature can be pressed to give *her sanction* to either of these fractional conclusions, then it may be said, that nature operates by the *Trapezium*: And if it can be proved that nature operates by the *Trapezium*, then Sir *I. Newton's* philosophy would be fundamentally erroneous, because a geometrical antithesis to irregular nature.

But my third argument, taken from the exact completion of the square 4, in every termination of the Solar Tropical year, may be brought to a short issue; for in the following table, the reader may have a clear perception both of its meaning and of its truth, *tanquam in speculo*.

<i>Longomont.</i>	}	supposes the	D	h	'	— 5	55+3=4
A.	}	Solar Tro-	365	5	49	— 4	56+3=4
Sir <i>I. N.</i>	}	pical year				— 3	57+3=4
B.	}	to contain				— 2	58+3=4
C.	}	<i>Q.</i>				— 1	59+3=4
D.	}	<i>E. D.</i>				— 00	00 4 0

I may with equal confidence appeal to this argument for the truth and certainty of my deduction.

What

What I earnestly plead and contend for (upon demonstrable grounds, and with a view to important ends and consequences) is the entirely cashiering *second minutes* from the measure of the Sun's year: for they are ungeometrical; they dissolve the ligaments of created symmetry; they untune the music of the spheres, and introduce a jarring discord into the proportional harmony of periodic motion. God has made all things in *number, weight and measure*.

The *Newtonian* approximation within 3'' seconds of the *root*, and in consequence of that, within 18' + 15'' of the *square*, may be imagined to bear some resemblance to the case of a mariner, who, after having traversed the four great seas, and almost the circumference of the globe; upon his returning back to the place from whence he took his departure, was drowned in stepping out from the ship to the shore.

Having I hope sufficiently ascertained (by accumulated arguments, calculations, and proofs) the *true quantity* of the primitive and patriarchal Solar Tropical year; I shall now go on to consider and explain the *Hebrew* term *Schanah*, as it is applied, in the *Pentateuch*, to the Lunar year.

That the Lunar year makes a part of the *Mosaic* computations is too evident to be made a matter of doubt: *Ye shall observe*, says *Moses* to his *Israelites*, (*Lev. 23*) *the feast of the ingathering on the 15th day of the VIIth month* (of the Lunar year) *in the end or revolution* (i. e. on the cardinal point) of the Solar. *Exod. c. xii.*

v. 2. *This (VIIth) month shall be unto you the beginning of months ; it shall be unto you Rishon, the head, the beginning, the first month (Hafshanah) of the (Lunar) Year.*

There was a time, when the sacred and ecclesiastical Lunar year (could it have been regained) would have been received, and gladly embraced, with a due veneration and esteem by the universal church. Nor are there wanting some, even in this *astronomical age*, who would be very well pleased to see the *Tropical Solar* (beyond all hopes and expectations) become *once again*, as in days of old, the *civil and vulgar year*.

Should public authority, upon a full conviction of the expediency and necessity of it, resolve to enter upon a *due regulation* and correction of the errors and mistakes, which through a long tract of time have crept into, and sensibly disturbed, our civil and ecclesiastical, our Solar and Lunar, computations; where must we apply for the rules of these corrections? Must we have recourse to the antient sacred records? or, to the lectures of modern philosophy? to the determinations and conclusions of modern science?

There are reasons to apprehend, that, notwithstanding all our boasted improvements and attainments in this age, the astronomers stand as much in need of the revelations of the *Pentateuch*, and of the Oracle truly divine, as their predecessors in science, and their first masters and teachers the *Greeks* formerly did.

The

The *Grecian* year in elder times was in a very imperfect state and condition, not at all corresponding with the motions of the two luminaries: so that *Aristophanes* represents the Moon (*reginam siderum*) complaining from the clouds of their total disregard to her. The *Greeks* thought this imperfect state of their year (which they knew not how to remedy) a just occasion to consult the oracle how they must sacrifice, which admonished them that they must sacrifice, *κατα Γ*, i. e. according to *Three*. *Geminus* in *Isagoga*, c. vi.

It is well known, that the *Greeks* were the first practical astronomers. Being excited by the oracle, they began to study the Moon's course, and attempted to calculate its *motions*, its *periods*, and its *synods*. They invented cycle after cycle, with indefatigable pains, that they might bring to an exact reconciliation and agreement the motions of the two luminaries: For they interpreted the oracle to mean, that they must reckon their *years* by the course of the Sun; and their *months* and *days* by that of the Moon; whilst (as *Strauchius* pertinently says) they only took up water in a sieve.

I do not in the least doubt, but that the ambiguous oracle aimed to direct its blind and superstitious votaries to the *Mosaic Three*, viz. *days*, *weeks*, and *years*: but not being able to interpret it rightly (and it was impossible they should) they were led into a mistaken computation, which we have adopted and persist in.

I could not well omit the mentioning of this extraordinary piece of antient history, which so  
plainly

plainly informs us of the origin and rise of *Lunar synodic months*. We learn from hence, that they are entirely of *Greek extraction*, and of a *latter date*. The primitive patriarchs computed them not, and therefore *Moses* has not recorded them.

Since then these *Lunar months*, which measure from synod to synod, had no admittance into the primitive kalendar and computations, a principal branch of our present enquiry must be, from whence did their Lunar year arise? What were its constituent parts? Upon what astronomical basis and foundation was its frame and structure built?

Here the astronomer will be in some pain for me: he will be casting about in his mind, how I shall be able to calculate the Moon's *true place* in its orbit? How æquate its anomalies? What arts and shifts I shall have recourse to, in order to gain admittance to this inaccessible planet?

But here it happens very luckily for me, who am no natural philosopher or physical-ratio astronomer, that I am clearly instructed, by the principles of the *Pentateuch*, that in the exact adjustment of the Lunar year to the *Tekupboth* or revolutions of the Tropical Solar, we are not required, much less under the necessity, to calculate the *Moon's motions* in its orbit at all; any more than we are in order to determine the Sun's place in the ecliptic.

The astronomer wants not to be informed, that the orb of the Moon circulates round the Earth, and by this circulation finishes its periods, by a proper motion in its orbit: whilst the Lunar orbit

orbit itself, in an inseparable union with the orb of the Earth, is carried round the Sun, and, by *this circulation*, finishes its annual period or *Sbanab*. Now this circulation, this annual period, or *Sbanab*, I am able to calculate and adjust, for this very plain and obvious reason, because it is equally and uniformly *measured by the diurnal motion*, the *alone measure* of time to us. For, I say it again, the distinction of years arises not from the distinct motions of the Sun and Moon; but it is a *created distinction*, and is to be reckoned amongst the original establishments, and the primary constitutions of the God of nature.

Let us attend to and consider the terms of the fundamental texts, *Gen. i. 14, 15, 16*. God made two great luminaries,

1. *Lebair gnal Haaretz*, to enlighten the Earth.
2. *Lemognadim*, for (sacred) seasons.
3. *Lejamim vesbanim*, for days and years.

Now I say, first, if the Moon had not an orbit of its own, and a proper motion in that orbit, how would it be qualified to extend its light to both the poles, and sometimes beyond them? But we are not required to understand the physical laws, or even to calculate these unequal unmeasuring motions, or to proceed one single step in our enquiries after them, beyond the evidence of sense.

In the next place, if the orbit of the Moon was not carried round the Sun, in an inseparable union with the orb of the Earth, from whence could

be continued the distinction of *Sbanim*, years? From what source and origin could we deduce, and by what laws could we calculate *Jamim*, the days, both of the solar and the lunar *Sbanab*? And without this annual circulation, how could the Moon discharge its original designation, appointment, and office? God, says the *Psalmist*, appointed the Moon *Lemognadim*: we have here just so much of the solar system revealed to us, as is necessary for our civil and religious uses.

What we have therefore to do, is to find out and determine the annual variation of this *created distinction*, or several distances of the Moon's enlightened orb, from the *Mosaic Tekupha*, or autumnal æquinoctial point. Now the integral lunar computation is nicely adapted to prove, that this annual variation of the lunar epacts is proportional and periodical: and in this proportional and periodical variation of the distances of the new Moon ☾ and full Moon ☉ evenings from the original *Mosaic Tekupha*, lies the excellency, and the admirable perfection of primitive Sun and Moon astronomy, sufficient to convince us, that the antediluvian patriarchs were undoubtedly Θεοδιδάκτοι, primarily taught the praxis of astronomy by the creator of the luminaries himself.

From what is here said, we may already begin to perceive a considerable difference between the lunar computations of the antient patriarchs and of the moderns. Nor need this be thought strange, since the original structure of the lunar year (the sub-

subject of our present enquiry) is not understood, and therefore has never been rightly explained.

Let us first hear what the moderns say upon this head. Mr. *Keil*, Lect. xxviii. p. 361. gives us the following account. “ The civil year is  
 “ the same with the political year, established by  
 “ the laws of a country, according as it is design-  
 “ ed to be regulated by the motions of the Moon,  
 “ or of the Sun. There are two sorts of lunar  
 “ years; the one moveable, the other fixed; the  
 “ moveable year *consists* of 12 *synodic months*, or  
 “ of 12 *lunations*, which are *completed* in 354  
 “ days, and *after that time* the year begins  
 “ again.”

We may observe here, that he plainly makes a distinction between the political and the astronomical year, and visibly adapts his expressions to it.—“ According as it is *designed* to be (not according as *it is truly*) regulated by the motions of the Moon, and of the Sun.” But this *modern distinction* the patriarchs were entire strangers to; for in the first ages of the world, the civil year, and the astronomical year, both solar and lunar, were identically the same.

Mr. *Keil*, in the close of his account, expressly says, “ That a moveable lunar year consists of  
 “ 12 *synodic months*, or of 12 *lunations*, which  
 “ are *completed* in 354 days.” This conclusion is partly true, because a lunar year may have 354 days, but then it is absolutely impossible, in nature, that 354 complete days should be the ade-

quate result of 12 *synodic months*, or of 12 *lunations*, as stated by *Keil*.

It will appear, as we proceed, that a lunar year consists sometimes of 354, and sometimes of 355 integral days; never less than the one, never more than the other. So that there is no room left for appendent hours, minutes, and seconds, &c. no possibility of dispensing with excess or defect. These two quantities, (whose difference and order of succession is regular and determinate) are, by their integrality, nicely fitted and prepared by nature, to measure the distance from the new Moon (☾) or the full Moon (☉) evenings, nearest to the autumnal æquinox in one year, to the new Moon (☾) or the full Moon (☉) evenings, nearest to the autumnal æquinox, in the end of the next year. But how obvious is it to perceive, and how easy is it to prove, that neither the collected sum of 13 periods of the Moon, nor of 12 synodic months, or 12 lunations, can ever be made precisely commensurate, either to 354, or to 355 integral days? And by these *integral measures* the antediluvian patriarchs computed their lunar *Shaninim*.

If the Moon finishes its period, according to mean motion, as some astronomers calculate it to do, in the space of 27 d. 7 h. 43'. 5". these multiplied by 13, will produce 354 d. 22 h. 36' 5". which both exceed and fall short of the integral days.

Again, if according to *Keil*, p. 374, a lunar astronomical month, or lunation, consists of 29 d.  
12 h.

12h. 44'. 3". these being multiplied into 12, produce for the quantity of the lunar year, 354d. 8h. 48'. 36". But if we compare this product with the twofold quantity of complete days, we shall find, with respect to the one, an excess; and with respect to the other, a defect. So that 12 lunations cannot be the *astronomical constituents* of the *integral lunar year*; unless we can admit for an axiom, that all the parts taken together may be both greater and less than the whole.

Thus far my argument has been negative, and has only tended to shew, that neither the 13 lunar periods, nor the 12 synodic months or lunations, (estimated by the mean motion or the true) could be ordained, *ab origine*, to frame and constitute the sacred and ecclesiastical, the civil and historical lunar year.

I must now then proceed to the positive part of the argument, and manifest its true, essential, and divinely appointed constituents; which cannot fail to produce 354, and 355 integral days, without any adhering excess or defect, by an original invariable law.

Here I cannot help making a short reflection; it often happens, that a much desired and useful truth is placed in a strait line directly before us, and yet by an unhappy fatality we over-look it; it is often very near us, on our right hand, or our left, yet we see it not, nor apprehend it.

I fell into this reflection, upon my reading and considering what Mr. *Keil* had advanced concerning the moveable lunar year's consisting of

12 synodic months, or lunations, and that they were *completed* in 354 days. Whereas by the precedent calculus it is evident, that no assigned quantity of a synodic month or lunation can ever divide exactly 354 days. It is true indeed, if from 29d. 12h. 44'. 3". we throw off the odd hours, minutes, and seconds, there will then remain 29 integral days. On the other hand, if we complete these odd hours, minutes, and seconds, into a day, we shall then have, but still by reduction, 30 integral days : and if we add six of the one to six of the other, the amount will be, exactly as Mr. *Keil* has concluded, 354 days. But would he have us only consider this, as a *political* lunar year, established by the laws of a country, which will be found to be an establishment of the king of Heaven ?

It is plain that the calculated lunation is here yielded up by Mr. *Keil*, and a true conclusion substituted in its stead, upon principles not understood, and therefore passed by unmentioned. These 30 and 29 days are mistakenly called by the *Greeks, Jews, Turks*, and the astronomers, lunar months; when they are no more regulated and determined (as cause and effect) by the motions of the Moon in its orbit, than the days of the week are. They are inadequate to the lunar motions (or rather the lunar motions to them) both periodic and synodic; and must be reckoned amongst the primary constitutions, and settled ordinations of the creator. God has appointed, by a law as old as the creation, and to be continued, without any

any future revocation or repeal, that the Moon's enlightened orb should first appear to the inhabitants of the Earth, at the end of every 30 and 29 diurnal revolutions. Hence they become the immutable astronomical measures of the distances between one new Moon (☾) or full Moon (☉) evening and the next interchangeably, though not without some interruption; so that in what certain order they follow one another, no astronomer can readily determine. No astronomical calculation, how accurately soever made, can ascertain, by any known general rule, or any known law of certainty, the *actual visibility* of the Moon, in every instance. If such a rule has been laid down, and acquiesced in, what is it? If the astronomers have it not, nor are able to attain it, what are the obstructions? I will be bold to say, that *such a general rule, such a law of certainty, and perpetual motion* will be found out upon one and the same day. Here the physical-ratio enquirer, and investigator of the Moon's motions in its orbit, will be non-plused, and must be contented to submit to the plain simple principles of the *Pentateuch*.

But here, probably, some one will ask, what reason is there to suppose, that these 30 and 29 days are amongst the principles of the *Pentateuch*? Or that these unequal measures are the very astronomical basis and foundation, on which the frame and structure of the primitive lunar year was built? For in the foregoing pages, was not the patriarchal lunar year set down in this form, *viz.* 330

+24 days? But it must be allowed, that in a continued series of 11 equal 30-day months, there is no appearance of unequal astronomical measures. And therefore the inference must be, either that this form of year is fictitious and imaginary, or that those primitive old men were quite unacquainted with any intermediate astronomical measures.

It must be owned, that from a bare cursory view of the form of the patriarchal lunar year, as it stands expressed above, such inference must necessarily be drawn; but in order to extricate myself from the seeming weight and pressure of this objection, I beg the reader to look back to p. 168, where I have given a scheme of the original twofold year. If he examines Tab. II. of the altered lunar year, he will readily perceive by the column of collected days, that from the autumnal æquinox to the vernal, the antient *Israelites* reckoned 180 days; whilst from the vernal æquinox to the autumnal æquinoctial new Moon (☾) evening, they computed no more than 174 days. Their lunar year had 12 months, and is here partitioned into 6 months and 6 months; divide then 180 days by 6, and the quotient will give 30 days; but if we divide 174 by 6, the quotient will give 29 days; thus we deduce these unequal measures, from the form and structure of their year. To proceed a step farther; if we divide 354 by 12 (the number of months in their lunar year) in the quotient we shall have 11 equal 30-day months, and in the remainder 24 days for the 12th.

These

These easy and obvious calculations inform us, that the frame and structure of the original ancient lunar year was both political and astronomical. As it was political, it was computed and adjusted by 11 equal 30-day months, allotting 24 or 25 days for the 12th. As it was astronomical, it included six measures of 30 days, and six of 29, in exact conformity to nature: I say, to nature; because at the end of 30 and 29 days, the Moon's enlightened orb first appears to the inhabitants of the Earth.

From these annual, and these intermediate astronomical measures, each consisting of integral days, and in a just correspondency to nature, the integral calculations derive their claim to truth, certainty, and perfection.

The question in debate (*viz.* what were the essential constituents, and what the astronomical basis and foundation of the primitive lunar year) will receive its solution, and the positive part of my argument its conclusion, from the two following tables.

### I.

A table representing the true series, situation, and successive alternate order (though not without interruption) of the divinely appointed astronomical measures of 30 ☾ and 29 ☾ integral days, in every possible variety, through the whole course of time.

Index		1.		2.		3.
1	29	29	30	30	30	30
2	30	59	29	59	30	60
3	29	88	30	89	29	89
4	30	118	29	118	30	119
5	29	147	30	148	29	148
6	30	177	29	177	30	178
7	29	206	30	207	29	207
8	30	236	29	236	30	237
9	29	265	30	266	29	266
10	30	295	29	295	30	296
11	29	324	30	325	29	325
12	30	354	29	354	30	355

(1) This table is digested into 3 columns of collected days, marked 1, 2, 3, at the top.

(2) The odd numbers of the index, (*viz.* 1. 3. 5. 7. 9. 11.) point to a collected number of days in the 1st column, which are respectively less by 1, than the collected number of days over against them, in the 2d and 3d columns.

(3) The even numbers of the index, (*viz.* 2. 4. 6. 8. 10. 12.) point to a collected number of days in the 1st and 2d columns, which are respectively less by 1, than the collected number of days over against them in the 3d column.

(4) A lunar year of 355 days arises from the *interruption* of the *alternate order* in the 2 first astronomical measures præfixed to the 3d column of collected days.

(5) This

(5) This *interruption of the alternate* order of these unequal astronomical measures is, in my apprehension, a point of the most difficult access, in the whole compass and extent of Sun and Moon astronomy. And its inmost grounds and reasons must be learned, not from the gazer of the Heavens, not from the abstruse argument of multiplied lunar æquations, but from the most perfect and determinate astronomy of the patriarchal tetraeteris, or the first 4 years of the world, considered both as solar and lunar.

Now whether I am able to enter into this secret, or solve this difficulty or not, (and I dare not take upon me to say that I am) yet the most skilful and the most experienced astronomer will be scarcely qualified to reproach my ignorance. But at present I may look upon myself as *εξω βελας*, or out of the reach of gun-shot, if I may be permitted to pass my judgment upon the following extract from Mr. Keil, Lect. xxix. p. 374.

“ Because a lunar astronomical month consists  
 “ of 29 days, 12 hours, 44 minutes, and 3 se-  
 “ conds, (which the motion of the Moon re-  
 “ quires, p. 375) the *common people*, who cannot  
 “ distinguish the *small particles of time*, make the  
 “ lunar month to consist of *entire days*, without  
 “ *fractions*, and on *that account they alternately*  
 “ *put one month of 30 days*, and the next of 29  
 “ days. These are called *hollow or cave*, that  
 “ is, *deficient months*, the others full; the 12  
 “ *hours over the 29 days requiring this alterna-*

“ *tion* : but because there are 44 minutes besides,  
 “ which is almost 3 quarters of an hour, in every  
 “ *lunation* ; in 32 lunations, these minutes will  
 “ make up a *whole day*, which is to be added to  
 “ a hollow month ; and by *this means* the *luna-*  
 “ *tions* of the kalendar *will nearly agree* with  
 “ those of the Heavens.”

Should a controversy arise, it might be brought to a very short issue, and the whole resolved into this single question, *viz.* to which of these two *very different* accounts does the visible settled state of nature give its sanction ?

The antithesis here is somewhat very extraordinary, and may be thought worthy of a remark, *viz.* What Mr. *Keil* ascribes to the incapacity of the common people, who cannot distinguish, says he, the *small particles of time* ; this scheme refers to an original created law, to a primary constitution in the very first rise and origin of nature. Now I leave the argument to the judgment of the reader, but before he passes a final decision, he may, if he pleases, look over and consider the following table which includes these unequal astronomical measures, in the political frame and structure of the primitive lunar year.

## II.

A table representing the several astronomical distances of the new Moon (☾) evenings, &c. from the beginnings of the equal 30-day months, throughout the patriarchal lunar year.

This

I	15+15	30	30	I	15+15	30	30
II	15+14+1	30	60	II	15+15	30	60
III	15+15	30	90	III	15+14+1	30	90
IV	15+14+1	30	120	IV	15+15	30	120
V	15+15	30	150	V	15+14+1	30	150
VI	15+14+1	30	180	VI	15+15	30	180
VII	15+15	30	210	VII	15+14+1	30	210
VIII	15+14+1	30	240	VIII	15+15	30	240
IX	15+15	30	270	IX	15+14+1	30	270
X	15+14+1	30	300	X	15+15	30	300
XI	15+15	30	330	XI	15+14+1	30	330
XII	15+9	24	354	XII	15+10	25	355

This table is *corona operis*, and will enable us to adjust the returns of the lunar phases at *unequal* times; I say, unequal, for reasons which our philosophy has not yet explained. It alone holds forth to us the law of certainty; *so far forth* as it was settled, constituted, and appointed by the creator---*In the beginning*. It will render it demonstrably certain, that the primæval kalendar was not only nicely adapted, by its uniform construction, to civil and political uses; but was also, in itself considered, a most true and faithful astronomical index, both solar and lunar. Where is there a kalendar, amongst all the nations of the world, exclusive of the patriarchal line, which may be compared unto it? Or which may stand in any degree of competition with it?

We, being led by the example of the *Greeks*, arrest the Moon in its orbit, 12 times within the compass of a solar year, for the sake of the synods; by this means, 27 days + 8 hours + 2 days + 5 hours,

5 hours, become the *numerical measure* of a synodic month, or lunation. That is, in other words, a synodic month, or lunation, demands for its artificial complement, one entire lunar period, and part of another. So the sidereal year includes one entire tropical year, and part of another: but the astronomers very ingenuously call this the Sun's anomalistical year, or the Earth's anomalistical period in its orbit. For the same reason, and with the same propriety, we may call a synodic month, or lunation, the Moon's anomalistical period.

I meet with it indeed sometimes under the specious appellation and title of the *menstrual revolution of the Moon*. But if a synodic month may be esteemed a menstrual revolution of the Moon; then why not a dichotomical? Why not a panselenian? Why not an amphicurtal lunation? Why may not a revolution be calculated from any given point of the Moon's orbit, to a certain point of the ecliptic? What is there to obstruct our computing from every schematism or configuration, which the Moon, *ἢ ἀλλοιωσεί Ecclus.* in its continual multiplied variations, is capable of assuming?

I would fain know, and may be reasonably indulged the question, whether we were directed to this mutilation of the Moon's periods, by nature, or by the *Greeks*?

The astronomers, perhaps, may take this point into consideration, and judge it meet to restore to the Moon its mutilated and divided period; it is its right and property by nature. Besides, is it  
not

not a tacit reproach, to furnish grounds for saying, that the *Newtonian* astronomer truckles to the suggestions of the *Delphean* tripod, and suffers himself to be juggled into an artificial computation, by the ambiguities of a dæmon? Though not indeed immediately and directly, yet by a fervile and ignoble imitation of the heathenish, superstitious, and idolatrous *Greeks*.

Here *Merlinus Anglicus*, *Philomath*, and *Wing*, with the rest of the climbers up to *Ολυμπια δώματα*, will begin to be one and all alarmed; they will fire with indignant rage at the heretical impugner of fundamental doctrines. What, say they, must we renounce the *Syzigia*, the only substratum of eclipses, the most ingenious (and eke the most laborious and the most operose) calculation *Ἐν Κυκλοπαιδείᾳ*. Not calculate an eclipse? Why, it is the very medulla of an almanac, and the important prophecy of the book: and all this, upon the sole authority, and the lordly dictates of a new-fangled scheme—whose truths are as old as the creation.

But why so indignant, ye celestial sages? My artillery is not planted against fundamentals. To convince ye of this, I beg the favour of your patient attention to one lecture in astronomy, concerning the circumstances, characters, and appendent proportions of the original position of the two great luminaries, which may immediately follow the publication of this treatise, but is too large to be comprehended within its limits. Then  
ye

ye may return to your *prognostications*, to your *malevolent* and *benign aspects*, and *conjure* away, in a *christian* country, (as the *dæmon* of the *Greeks* shall *inspire* you) as fast as ye please, with a—*cum privilegio imprimatur*.

In the mean time, *Moses*, my *Hebrew* præceptor, gives ye to understand, for ye know it not as yet, that the creator of the solar system has placed the original seats of the eclipses, in chaotic spaces, amongst the eccentricities of nature; nor can the great clock of time be compelled to declare, when the first solar or lunar eclipse might have happened, but by a proleptical computation.

From this wise and providential disposition of the chaotic conjunction, and of the chaotic opposition, it was impossible, *in nature*, for the created full Moon (☾ 15. ○) to arise upon the Earth with an intercepted light: and the primary command imposed was, *Lebair gnal Haaretz*, to extend its light from pole to pole. The creator has so effectually secured every the least approach of conjunctions or oppositions, even to the utmost verge, to the most outward limits and boundaries of the two intersecting circles, that no eclipse of the Sun could ever darken the mornings of the first day of the 7th month—*Sabbaton, ziccaron terogneh. Levit. 23, 24.* Nor an eclipse of the Moon ever darken the beginnings of *Chag haasifib*. Hence we have a divine direction from what cardinal point of the day, and from what quality of the Moon

Moon (*viz.* *Megnercb*; ☾) to compute the primitive *Rishon*, *Gen.* viii. 13. and to terminate the primitive full Moon day on the 15th evening from thence exclusive of it. The primitive new Moon evening then is the second from the conjunction; and the primitive full Moon evening is the second from the opposition.

These new Moon and full Moon evenings would annually be found, at the autumnal æquinox, in the central points of two intersecting circles, if not prevented by the eccentric distortions of calculated conjunctions, dichotomies, and oppositions, according to your greciz'd almanac astronomy.

In the *Julian* months of *August* and *September*, and in this current year A. D. 1751, the unequal unmeasuring lunar motions are quartered, by your puzzling, intricate, and perplexed calculations, as in the table subjoined, which is your own.

*August*; A. D. 1751.

New Moon 10 day at 2 morn. 1 d. h. conjunction.  
 First quarter 17 day at 11 night 7 21 dichotomy.  
 Full Moon 25 day at 3 aftern. 7 16 opposition.

*September.*

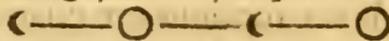
Last quarter 1 day at 10 morn. 6 19 dichotomy.  
 New Moon 8 day at 3 aftern. 17 15 conjunction.  
 First quarter 16 day at 5 aftern. 8 22 dichotomy.  
 Full Moon 24 day at 2 morn. 7 19 opposition.

Now,

Now, who, from these inequalities, these accelerations and retardations, can trace out the perfection of a circle and its center? Or who can apply this speculative ingenuity to any uses whatever, either civil or religious? But if instead of laboriously pursuing the unequal lunar motions, ye had made the original *Mosaic* epact 15, and the principles of the *Pentateuch* the rule of your calculations, your whole and sole guide and directory, they would have enabled you, with great facility and expedition, to have adorned and embellished your almanacs, with this geometrical scheme.

A. D. 1751.

August.      September.



From this distant hint ye may be sensible, what a fine *practical astronomy* ye have lost by your grecizing. *Dictum Sapienti sat est.*

If the annual returns of the new Moon (☾) and full Moon (○) evenings, with a geometrical exactness, to the centers of two intersecting circles, had been discovered, and its demonstration published by some modern philosopher, eminent for his skill in science; no blazing star of the first magnitude would have excited a more universal gaze, or a more intense speculation. But if, on the contrary, the amanuensis of the God of nature has graciously supplied the defects of human science; if the pen of the divine legislator has *alone*  
*opened*

opened to us these *central perfections* (which were co-existent with the first motion of time, and will continue through its whole extent) it is hard to say, which should exceed the other, our admiration or our gratitude.

Mr. *Tindal*, amidst his adventurous exploits, attacks the *Mosaic Cosmogony*, with this very puissant and heroic argument. “What a sad blunder, says he, does (*Moses*) the historian make, at his first setting out? When he talks of the Moon’s being a *great light*, when every one knows that it is an *opaque body*.”

If my eyes and my understanding fail me not, *Moses*, the historian, calls the Moon, *Gen. i. Hammaor Hakkaton*, the *lesser luminary*; as in the same chapter he calls the Sun, *Hammaor Haggadol*, the *greater luminary*.

Alas, poor *Tindal*! that thou shouldst undertake (by the help of some inaccuracies in the *English* translation, and the bias of an infatuated zeal) not only to *scoff*, *ridicule*, and *degrade*, but to *confute* too, the revelations of the *Pentateuch*! but such self-confiding infidelity is as *daring* and *presumptuous*, as it is *blind*, *ignorant*, and *stupid*.

But to return to our subject. It has been plainly made to appear, that the frame and structure of the original lunar year was made up of 12 integral astronomical measures, consisting alternatively of 30 and 29 days, in a just agreement with the settled state of nature. The next question, which, in a regular course, offers itself to our examination is this, *viz.* Since the lunar motions

tions are confessedly incommensurate to those entire days, what are their essential integral constituents? Where shall we find, within the limits of created nature, the latent and true astronomical components of these unequal measures? A more subtle problem cannot be proposed to be solved, nor a more intricate question to be answered. In the last extract from *Keil's* xxixth Lect. p. 290. we were fully informed of his reasonings and sentiments concerning these entire days, without fractions; towards the end, we read as follows:—

“ But because, there are 44 minutes besides, which  
 “ is almost 3 quarters of an hour, in every luna-  
 “ tion; in 32 lunations, these minutes will make  
 “ up a whole day; and by this means, the luna-  
 “ tions of the kalendar will nearly agree, with  
 “ those of the Heavens.”

Mr. *Keil* says, 44 minutes multiplied into 32, will make up a whole day. Let us try the exactness of this. Now  $44 \times 32 = 1408'$ . but in a day there are 1440 minutes. Therefore they will not make up a whole day; they will only, as he says, *nearly agree*,—with a considerable difference.

The calculations of the moderns produce inaccurate and inadequate conclusions. They cannot ascertain one single truth, they can only approximate. Their language and style is indeterminate, and in no exact conformity to the standard of nature. They cannot rightly read the Heavens, nor attain the celestial orthography. And for this evident reason; because they have never once consulted,

sulted, but shewn a total (or perhaps, a supercilious) disregard to the *only true Principia*, laid down in the *Pentateuch* of *Moses*, where they might long since have read the clear, full, and perfect Instructions of the Creator of Heaven and Earth, the all-wise Architect of nature himself.

— If all the members of our Royal Society were to meet together, and to hold a Consultation upon the question proposed, would they be able to agree in the debate? or could they make any notable improvements upon *Keil's* conjectural and inconclusive calculus? Could they, as enquirers into nature, solve the Problem, and give a just astronomical answer to the question? Perhaps, they could not.

Now the solution of this subtle and deeply secreted problem, is closely connected with, and ultimately depends upon, the truth and certainty of the following proposition.

When the Sun enters *Libra*, in any place at noon, on the 15th day from the new Moon (☾) evening; then, I say, that in the end of the 4th revolution from thence, it will again enter *Libra*, on the 14th day from the full Moon (☉) evening, and on the very day in which the new Moon (☾) evening shall fall; by an uniform and invariable law.

The several steps of the demonstration.

In the first place, set down a solar year, and under it a lunar year, with the epact, and annual quadrant.

A solar

	D	D.
A solar year	360	$5 + \frac{1}{4}$
A lunar year	354	$11 + \frac{1}{4}$

Now then, I say, (1) That every solar year has a concomitant lunar year.

(2) Every lunar year has an attending epact, = 11 days, or 10 days.

(3) Every lunar epact has an adhering annual separate quadrant.

(4) Every annual separate quadrant has an inhering meridian epact, = 11 sexagesimal parts.

(5) The sum total of the sexagesimal parts of the multiplied meridian epacts is always greater than the sum total of days, produced by an equal multiplication of the lunar epacts, by as many units, as there are lunar years of 355 days.

(6) In every lunar Triacontaeteris or period of 30 years, there are 19 of 354 days and 11 of 355. And they follow one another nearly in this order of years, 2. 5. 7. 10. 13. 16. 18. 21. 24. 27. 29. I say, nearly, for this is a nice and difficult point which requires practice.

Thus much being premised, I want to calculate the integral distance of the full Moon (O) evening, from the autumnal æquinox, in the end of A. M. 4, the original position being known and admitted. Now this calculation will be extremely easy and concise, requiring no more than those few steps. 1. In 4 solar years there are 1461 days. 2. In 4 concomitant lunar years, there is one of 355 days; now then, from 1461 days  
subtract

subtract 1, and dividing the remainder by 354, the quotient will give the number of 12-month full Moon (○) lunar years; and the remainder, if less than 15, the integral astronomical distance of the full Moon (○) evening from the æquinox. But if after the division, the remainder be more than 15, then divide 15 or its multiple, and this remainder will be the astronomical distance sought.

*The arithmetical Operation.*

From 1461 solar days.  
Subtract 1

Divide the remaind. by 354) 1460 (4, 12-m. lu. yrs.  
1416

From the remainder 44  
Subtract 30

Remains ○14 the full Moon  
epact sought.

But why the full Moon (○) epact? may one say; why may not the calculation be supposed to determine the distance of the new Moon (☾) evening from the æquinox, in this case, as well as the full? Dr. *Prideaux*, in his *Historical Connect.* part 1. l. 6. takes occasion to speak of the cycles of the *Greeks*, and having mention'd the excess of the *Dieteris*, “ for the mending of it, says “ he, the *Tetraeteris* was introduc'd, which “ was a cycle of 4 years, wherein it was thought “ that

“ that an intercalation of one month would bring  
 “ all that to rights, which was overdone by the  
 “ like intercalation of the Dieteris. But 4 solar  
 “ years exceeding 4 lunar years 43. days + 12  
 “ hours, the adding one *lunar month* of 29d. 12h.  
 “ (of which it consists) fell short of curing this  
 “ defect full 14 days” — which agrees, it is  
 true, with the calculated conclusion, but then he  
 gives no intimation, that these 14 days difference,  
 between the solar and lunar reckoning, must be  
 computed from the full Moon, and not from  
 the new.

Here the reply will give me an opportunity to  
 manifest the reality of the double epoch or ra-  
 dix of the Moon's year, and the certainty of the  
 characters of the original position; a principal one  
 amongst which is, that the primæval full Moon  
 day was coincident with the autumnal æquinox:  
 Hence it came to pass, and under these circum-  
 stances it must necessarily have been so, that the  
 lunar computation commenced on the evening of  
 the 4th of the Hexaemeron, with a sacred and  
 ecclesiastical full Moon year; so that the first 4  
 integral lunar years corresponding with the first  
 4 solar tropical years, protruding the epacts, may  
 be express'd with their symbols in this manner.

☉ 1      2      3      4      ☉ 14 = 1461 Sol. days.

On

On the other hand, if we would calculate the integral astronomical distance of the new Moon (☾) evening from the æquinox, in the end of A. M. 4, we must not only again have recourse to the characters of the *Mosaic* radix, but some additional rules, to be derived from thence, will be necessary. In the end of the series of the 4 full Moon lunar years, and within the cardinal limits of the 4th solar year, we have these two numbers,

☾

☉

○ 30. ○ 14. Now if in this place, we set

☾

☉

down the characters of the original position, ☾ 15 we may observe, that the chaotic or imaginary new Moon (☾) evening was at the distance of 15 days from the autumnal æquinox; so that the former computation begins 15 days after the latter, and must also terminate 15 days after it. Now divide ○ 30. ○ into 15 and 15, and note the divisions with their respective symbols; being thus divided and characteriz'd by their symbols, they

☾

☉

will appear in this manner, ○ 15. ☾ 15. ○ 14. From this scheme it is evident to sense, that the new Moon (☾) evening is 15 days before the full Moon (○) and consequently, by so many days more distant from the æquinox. Now then to the calculated remainder ○ 14. add ☾ 15, and the sum ☾ 29 ☾ days, will terminate at the æquinox, and the full Moon (○) evening will be 14 days

U u

distant

distant from the new  $\epsilon$ , according to the proposition, and the calculation. To complete the process, as from these terms  $\bigcirc 15 \epsilon 15 \bigcirc$  we subtracted the two last, *viz.*  $\epsilon 15$ , and added them to the calculated remainder  $\bigcirc 14$ , so to the two former,  $\bigcirc 15$ , add the given epact  $\epsilon 15$ , and we shall have  $\epsilon 15 \bigcirc 15 \epsilon$ ; but  $\epsilon 15 + 15 \epsilon = \epsilon 30 \epsilon$ . and  $\epsilon 15 + 14 \epsilon = \epsilon 29 \epsilon$ ; but are not  $\epsilon 30 \epsilon$  and  $\epsilon 29 \epsilon$  days, the unequal astronomical measures, in their true order of succession, and bounded by nature, in their respective extremes, by the lunar phases?

Now if the astronomers can prove, that we are not under a necessity, by the laws of astronomy, to admit the truth and certainty of the proposition laid down above; by the same arguments it may be concluded, that I have not rightly traced out the origin, and formal constitution, of these unequal astronomical measures of 30 and 29 days.

Assuming these conclusions as true, since the proposition is not yet confuted, we will go on to shew, that these unequal astronomical measures of 30 and 29 days are so far from owing any thing to the lunar motions, or from having any connection with, or dependence upon them, as cause and effect, that they are actually and in fact compounded of the integral lunar epacts, and the annual separate quadrants; these are their essential, internal, and astronomical constituents, as the following calculations will clearly prove.

But before I go on with my account of these 30 and 29 days, which the Creator has appointed to be the immutable and alternative astronomical measures

measures of the distances between one new Moon (C) evening, and the next, or the full Moon evenings, respectively ; I shall acquaint the reader with the motives that induced me to make such a diligent enquiry after them, especially since they are of such great use and importance in this integral scheme of practical astronomy. It is no invidious impeachment of modern science, nor any unbecoming reflection upon its adepts to say, that there are some particulars of no small consequence in the praxis of astronomy, that are not yet clearly understood, and have never been properly explained.

Two inducements prompted me to the present research. In the first place, I consider'd that there is an essential difference, tho' it is not duly regarded, between the parts of time, and the measure of time, which is resolvible into the alone equable motion of the æquator. And whoever is desirous to understand the primitive laws of the lunar computation, he must abstract his thoughts entirely from every species of calculated lunar motions. For whatever their *physical causes* may be (of which I can say nothing, because I know nothing) they were *appropriated, ab origine*, by the Creator, to serve a particular end : and that particular end is (*ipse dixit Moses*) *lehair gnal baaretz*. Hence it has come to pass, that we have never been able (whilst the naturalists have been greatly perplexed how to account for it) either exactly to investigate, or to apply to any civil or sacred uses these *appropriated* motions.

There is a like difference in nature, between these appointed measures of 30 and 29 days, and an astronomical month or lunation, calculated to consist in a mean of 29 d. 12 h. 44'. 3". as there is between the equable all-measuring motion of the æquator of the Earth's orb, and the unequal unmeasuring motions of the Moon's orb.

These calculated lunations are, properly speaking, neither parts nor measures of time; they are an artificial heterogeneous compound, which can never be reduced, by the art of man, to an integral commensuration; and the moment the astronomer gives them up, he will be freed from an useless and unintelligible puzzle.

I cannot readily believe that God (who is not the Author of perplexity and confusion, but of order and regularity) has designed us to measure the sacred and coæval lunar year, with such inadequate parts. And it was most undoubtedly a very unhappy, as well as incompetent hypothesis of *Keil's*, that the reduction to entire days, without fractions, was owing to no higher cause than the incapacity and ignorance of the vulgar. But these supposed reductions do not constitute lunar months; they can no more be said to be measured by the motions of the Moon in its orbit, than by the belts of *Jupiter*.

But besides these reasonings and convictions, I was led into this enquiry, by recollecting the practice of the latter *Jews*, who lived in the third period; of which *Dr. Prideaux*, in his preface to the first book of his *Historical Connection*, gives

us this account, p. 5. “ when they *saw* the new  
 “ Moon, then they began their months, which  
 “ sometimes consisted of 29 days, and sometimes  
 “ of 30 *alternatively*, according as the new  
 “ Moon did *sooner* or *later appear*. None of  
 “ them had fewer than 29 days, and therefore  
 “ they never looked for the new Moon before  
 “ the night following the 29th day, and if they  
 “ then *saw* it, the next day was the first day of  
 “ the following month. Neither had any of  
 “ their months more than 30 days, and therefore  
 “ they never *looked* for the New Moon after the  
 “ night following the 30th day; but then, if  
 “ they saw it not, they concluded, that the ap-  
 “ pearance was obstructed by the clouds, and  
 “ made the next day the first of the following  
 “ month, without expecting any longer; and of  
 “ 12 of these months their common year consist-  
 “ ed.” From hence, and not from the reduc-  
 tions of the common people, I was instructed to  
 conclude, that these regular and determinate, tho’  
 unequal returns, of the new Moon evenings,  
 were the effects of an original established law, by  
 no means depending, as cause and effect, on the  
 lunar motions.

Here some, probably, will ask on what then  
 are they dependent? what are, in nature, the  
 causes which produce these effects?

The calculation which solves this question has  
 something in its conclusion so very surprising and  
 unexpected, and yet so extremely obvious to an  
 enquirer, when once the right path has opened  
 itself

itself to his view, that it may possibly excite the curiosity of some to read it over more than once, in order thoroughly to sift and examine it.

I must now alter the method of my proceeding, for the present calculation requires me, 1<sup>st</sup>, to reduce the given number of solar years to days, then to lunar years, and in the last place, those lunar years to days. And if, from the collected sum of lunar days, we subtract 15, (= the chaotic new Moon epact) and then place the 3 reductions under one another according to their respective quantities, they will be rightly prepared for the conclusion.

As to the reduction of solar years to days, since in the present case, there are no more than 4, and consequently there is no necessity to have any regard to the number of meridian epacts to be subtracted, we need only multiply 360 d.  $\div$  5 d.  $\div$   $\frac{1}{4}$   $\times$  4, and the product will be 1461 days.

But in order to reduce solar years to lunar years, multiply 360 by 4, then divide the product 1440 by 30, and the quotient  $48 \div 12$ , will give the number of 12-month lunar years, abstracted from the epacts and the quadrants, which are to be accounted for : *e. g.*

$$\begin{array}{r} 360 \\ 4 \\ \hline 30)1440(48 \text{ months} \div 12 = 4 \text{ lun. yrs.} \end{array}$$

If we are required to reduce lunar years to days, less in number than 5, first set down the days of  
both

both years, with the epact and quadrant in this manner.

D. D. D.

The days of the solar year  $354 + 6 + 5 + \frac{1}{4}$ .

The days of the lunar year  $354 + 6 + 5 + \frac{1}{4}$ .

Then to 354 solar days add the disjoined 6, the sum 360 will be the arithmetical mean between the quantities of the two years. Consequently,  $360 - 354 = 6$  days, and,  $360 - 355 = 5$  days. Now, in 4 lunar years there are 3 of 354 days, and 1 of 355 days. Multiply then  $6 \times 3$  and to the product 18 add 5, which will make 23 days: subtract these 23 days from  $1440 (= 360 \times 4)$  and the remainder 1417 will be the true number of days, in 4 12-month lunar years, one of which is of 355 days.

Carry forward the 23 days ( $= 6 \times 3 + 5$ ) and add to them 20 ( $=$  the 5 remaining solar days  $\times 4$ ) the sum 43 will be equal to the sum total of the epacts. For in 4 lunar years there are 3 epacts of 11 days, and 1 of 10; but  $11 \times 3 = 33 + 10 = 43$ . But the sum total of sexagesimal parts of the multiplied meridian epacts are always greater than the sum total of days, arising from an equal multiplication of the lunar epacts, by as many units as there are lunar years of 355 days. Now  $11' \times 4 = 44' - 43 \text{ d.} = 1'$ .

To these 43 days add 1 ( $= \frac{1}{4} \times 4$ ) and the sum 44 will be equal to the sum of 4 integral epacts, and 4 integral quadrants.

The

The collected number of lunar days (commencing from the evening of the full Moon (○) day have been found to be ○ 1417 ○ days. From these subtract 15, and the remainder ◐ 1402 ◐ will be the number of lunar days, computed from the chaotic new Moon evening, and ever terminating within the cardinal limits of the solar year, full 15 days short of the other.

Set down these three reductions, according to their quantities, under one another; then, subtracting the lunar days from the solar, the remainder will express the integral, astronomical distances both of the new Moon (◐) and of the full Moon (○) evenings from the autumnal æquinox.  
*e. g.*

$$\begin{array}{r}
 \text{Solar days } \odot \ 1461 \\
 \text{F. Moon lu. days } \odot \ 1417 \quad \ominus \ 61 - 17 = \odot \ 44 \quad \odot \\
 \text{N. Moon lu. days } \ominus \ 1402 \quad \ominus \ 461 - 402 = \ominus \ 59 \quad \ominus
 \end{array}$$

It appears from the calculation in the margin that if, throwing off the two first similar figures 14, the two last 17 be subtracted from 61, the remainder 44 (○) measures the distance of the full Moon evening from the autumnal æquinox, as the remainder 59 ◐ does of the new Moon evening, but  $59 - 44 = \ominus \ 15 \quad \odot$

But as the marginal numbers, ○ 44 ○ and ◐ 59 ◐, each of them include an astronomical measure of 30 days, add 30 to both collections. Then  $17 + 30 = 47 \quad \odot$ . And  $02 \quad \ominus + 30 = 32 \quad \ominus$ .

But



But  $61 - 47 = \odot 14$ . And  $61 - 32 \curvearrowright = \curvearrowright 29 \curvearrowright$ .  
 Again,  $29 \curvearrowright - 14 = \curvearrowright 15 \odot$ .

Therefore I say, that when the Sun enters *Libra*, in any place at noon, on the 15th day from the new Moon ( $\odot$ ) evening, in the end of the 4th revolution from thence; it will again enter *Libra* on the 14th day from the full Moon evening, and on that very day on which the new Moon ( $\odot$ ) evening shall fall, by an uniform and invariable law.

A. M.  $\odot$ 

A. M. 4.

 $\curvearrowright 15$ . $\odot 14$ .

$$\curvearrowright E. D.$$

Tho' the principal point in view is in a manner already determined, in the course of the precedent calculation; yet if it was not, the deduction is extremely obvious, and the conclusion ready at hand. For if we examine the collected number of new Moon lunar days, 1402  $\curvearrowright$ . we may observe, that they end  $\curvearrowright 59 \curvearrowright$  days before the autumnal æquinox; but these 59 days naturally resolve themselves into the unequal measures 30 and 29. And these, as I shall now make appear, into the sum total of epacts and quadrants, from the beginning of the chaotic year (which we are obliged to include for the sake of connection) to the end of the 4th, computed from the *Mosaic radix*.

The epact in the beginning of the chaotic year, with its adhering quadrants, may be easily ascertained by only subtracting  $11\frac{1}{4}$  from  $14\frac{3}{4}$ , remains  $3\frac{2}{4}$ . Now the following table or series of epacts and quadrants, within the forementioned limits, will conclude and complete the deduction.

*A table of integral lunar epacts, with their adhering quadrants from the head of the chaotic year to the end of A. M. 4.*

	Epacts	Quadrants
	D.	
A. M. 0.	3.	$\frac{2}{4}$
A. M. 0.	11.	$\frac{1}{4}$
A. M. 1.	11.	$\frac{1}{4}$
A. M. 2.	11.	$\frac{1}{4}$
A. M. 3.	11.	$\frac{1}{4}$
A. M. 4.	10.	$\frac{1}{4}$
	0.	$\frac{1}{4}$

The fourth quadrant of the last day which measures from noon to Sun setting

---

( 59 ) = 30 and 29.

From hence we are certified, and may indubitably conclude, that these appointed unequal measures of 30 and 29 days have no more dependence upon the lunar motions, can no more be said to arise from them, than the integral lunar epacts, and the annual separate quadrants, of which they are formally compounded. These

are

are their essential, internal, and true astronomical constituents.

I shall now proceed to the construction (and in the calculations shall illustrate the use and application) of the astronomical table, founded upon the *inverted position* of the two great luminaries, in the beginning and in the end of A. M. 1; and in the beginning and in the end of A. M. 1656, V. N. 600; or of the year of the creation, and of the universal deluge.

To this table, and its demonstrable characters, I appeal, as to a sure and unexceptionable test of the truth and certainty of the *Mosaic* scheme of astronomical chronology, according to the *Hebrew* text.

Here then I lay down these 5 terms, *viz.*  
 (1) (2) (3) (4) (5)  
 O 1 5 :: 24 11 for the basis, which may be thus explained.

(1) The cypher subjoined denotes and expresses the no-distance of the created full Moon (O) from the 4th of the Hexaemeron, which was the autumnal æquinoctial day: and, by means of the *inverted position*, the no-distance of the new Moon (C) evening, from the same *Tekupha*, or autumnal cardinal point, in the end of A. M. 1655, when the last day of the 12-month lunar year fell upon the last day of the tropical solar.

(2) The second term 1 may be read thus; in the beginning of A. M. 1, or of the year of the creation, the first day of the first month of the full

X x 2

Moon

Moon (O) lunar year was coincident with the first day of the first month of the tropical solar year; and by means of the *inverted position*, in the beginning of A. M. 1656, V. N. 600, or of the year of the universal deluge, the first day of the first month of the new Moon (C) lunar year was coincident with the first day of the first month of the tropical solar year.

(3) The third term 5 exhibits the difference, between the 12th political month of the primitive lunar year, which was of 24 days, and the 12th astronomical measure of 29 days for  $29 - 24 = 5$ .

(4) The fourth term 24 may be read thus. Towards the conclusion of A. M. 1. or of the year of the creation, the 24th or last day of the 12th political month of the primitive full Moon (O) lunar year, was coincident with the 24th day of the 12th month of the primitive solar tropical year: And, by means of the *inverted position*, towards the conclusion of A. M. 1656, V. N. 600, or the year of the universal deluge, the 24th or last day of the 12th political month of the primitive new Moon (C) lunar year, was coincident with the 24th day of the 12th month of the primitive solar tropical year.

(5) The fifth term 11 denotes and expresses the integral astronomical distance of the full Moon (O) evening, towards the end of A. M. 1. or of the year of the creation, from the autumnal æquinox; and by means of the *inverted position*, the integral astronomical distance of the new Moon (C) evening, from the same *Tekupha*, or cardinal point,

point, towards the end of A. M. 1656, V. N. 600, or of the year of the universal deluge.

Thus much may suffice for the explication of the 5 terms of the basis.

I shall digest my farther proceedings into these particulars ensuing.

(1) I shall frame from the given basis, 0 1 5 :: 24 11, two distinct tables, corresponding with the two-fold quality of the Moon, and the characters of the *inverted position*.

(2) To these I shall subjoin a table of reduction to the *Julian* calendar, adapted to the autumnal æquinox, and will hold true for the space of between 5000 and 6000 years. I may venture to offer this as a singular curiosity, because it is constructed without any previous calculation, either arithmetical or tabular.

(3) I shall shew the plain, easy, and simple rules, by which these tables are framed.

(4) I shall give a general account of the several proportions, and of the application and use of the 5 distinct columns, and of the 30 distinct parallel lines of these solar and lunar tables.

(5) I shall discover and lay open their 3 essential and most distinguished properties.

From the whole laid together, the grounds and reasons will in due time appear, why I was emboldened to prefix to it this promising title :

A two-fold astronomical table, both solar and lunar, *Mosaic* and *Julian*, constructed from the *inverted position* of the two great luminaries, in  
the

the year of the creation, and in the year of the universal deluge; A. M. 1. and A. M. 1656. V. N. 600. which will stand in need of no alteration or correction, from the first to the last moment of time.

This table exhibits, in one entire view, the several full Moon (○) evenings, as appears by the symbol (○) affixed to the first and the last, and understood to be affixed to each, in the respective days of the 12th month of the patriarchal solar tropical year, with their integral astronomical distances, from the autumnal æquinox, in every possible variety, thro' the whole course of time.

TABLE

TABLE I.

A full Moon (○) lunar table.

Index	(1)	(2)	(3)	(4)	(5)
1	○ 0	1	5	24 ○	11
2	11	12	16	13	22
3	22	23	27	2	33
4	3	4	8	21	14
5	14	15	19	10	25
6	25	26	0	29	6
7	6	7	11	18	17
8	17	18	22	7	28
9	28	29	3	26	9
10	9	10	14	15	20
11	20	21	25	4	31
12	1	2	6	23	12
13	12	13	17	12	23
14	23	24	28	1	34
15	4	5	9	20	15
16	15	16	20	9	26
17	26	27	1	28	7
18	7	8	12	17	18
19	18	19	23	6	29
20	29	0	4	25	10
21	10	11	15	14	21
22	21	22	26	3	32
23	2	3	7	22	13
24	13	14	18	11	24
25	24	25	29	0	35
26	5	6	10	19	16
27	16	17	21	8	27
28	27	28	2	27	8
29	8	9	13	16	19
30	○ 19	20	24	5 ○	30
I	○ 0	1	5	24 ○	11

The second table exhibits, in one entire view, the several new Moon (☾) evenings, as appears by the symbol ☾ affixed to the first and last, and understood to be affixed to each, in the respective days of the 12th month of the patriarchal solar tropical year, with their integral astronomical distances, from the same *Tekupha*, or autumnal cardinal point, in every possible variety, thro' the whole course of time.

TABLE

TABLE II.

A new Moon (☾) lunar table.

Index	(1)	(2)	(3)	(4)	(5)
1	☾ 0	☉ 1	5	24 ☾	11
2	11	12	16	13	22
3	22	23	27	2	33
4	3	4	8	21	14
5	14	15	19	10	25
6	25	26	0	29	6
7	6	7	11	18	17
8	17	18	22	7	28
9	28	29	3	26	9
10	9	10	14	15	20
11	20	21	25	4	31
12	1	2	6	23	12
13	12	13	17	12	23
14	23	24	28	1	34
15	4	5	9	20	15
16	15	16	20	9	26
17	26	27	1	28	7
18	7	8	12	17	18
19	18	19	23	6	29
20	29	0	4	25	10
21	10	11	15	14	21
22	21	22	26	3	32
23	2	3	7	22	13
24	13	14	18	11	24
25	24	25	29	0	35
26	5	6	10	19	16
27	16	17	21	8	27
28	27	28	2	27	8
29	8	9	13	16	19
30	☾ 19	20	24	5 ☾	30
1	☾ 0	1	5	24 ☾	11

Y y

The

A table of reduction to the *Julian* calendar, adapted to the autumnal æquinox, which will hold true, for the space of between 5000 and 6000 years, from the creation.

<i>August.</i>		<i>September.</i>		<i>October.</i>		<i>November.</i>	
1	120	1	89	1	59	1	28
2	119	2	88	2	58	2	27
3	118	3	87	3	57	3	26
4	117	4	86	4	56	4	25
5	116	5	85	5	55	5	24
6	115	6	84	6	54	6	23
7	114	7	83	7	53	7	22
8	113	8	82	8	52	8	21
9	112	9	81	9	51	9	20
10	111	10	80	10	50	10	19
11	110	11	79	11	49	11	18
12	109	12	78	12	48	12	17
13	108	13	77	13	47	13	16
14	107	14	76	14	46	14	15
15	106	15	75	15	45	15	14
16	105	16	74	16	44	16	13
17	104	17	73	17	43	17	12
18	103	18	72	18	42	18	11
19	102	19	71	19	41	19	10
20	101	20	70	20	40	20	9
21	100	21	69	21	39	21	8
22	99	22	68	22	38	22	7
23	98	23	67	23	37	23	6
24	97	24	66	24	36	24	5
25	96	25	65	25	35	25	4
26	95	26	64	26	34	26	3
27	94	27	63	27	33	27	2
28	93	28	62	28	32	28	1
29	92	29	61	29	31		
30	91	30	60	30	30		
31	90			31	29		

Thus

Thus much for construction ; and we are now to shew (2) the plain, easy and simple rules of this construction.

It is obvious to perceive, by only casting an eye over these lunar tables, that they are each of them digested into 5 distinct columns, equal to the number of terms in the basis ; and also, into 30 distinct parallel lines, equal to the number of days in a primitive month ; whilst the outermost column, on the left hand, set at some small distance from the rest, and marked with no figure at the top, is the index to the 30 numbers in each parallel line.

The 30 distinct numbers of the three first columns, and of the fifth, are produced by the continual addition of 11 to—0 <sup>(1)</sup> 1 <sup>(2)</sup> 5—11, <sup>(3)</sup> <sup>(5)</sup> casting off all the 30's, till they return back again into themselves, which they will all do, after 30 undecimal additions are completed.

*E. g.* Take the lowermost parallel line, whose 1st, 2d, 3d and 5th terms are, <sup>(1)</sup> 19 <sup>(2)</sup> 20 <sup>(3)</sup> 24—5 <sup>(4)</sup> : then,  $19 + 11 = 30 - 30 = 0$ . <sup>(1)</sup> And,  $20 + 11 = 31 - 30 = 1$ . <sup>(2)</sup> And,  $24 + 11 = 35 - 30 = 5$ . <sup>(3)</sup> And,  $30 + 11 = 41 - 30 = 11$ . <sup>(5)</sup> And so of all the rest.

The numbers of the fourth column are produced, *vice versa*, by the continual subtraction of 11, adding 30, as oft as is necessary, to make the subtraction.

*E. g.* Take the 1st, the 3d, and the last numbers, *viz.* 24 2 5. Then  $24 - 11 = 13$ . And,  $2 + 30 = 32 - 11 = 21$ . And,  $5 + 30 = 35 - 11 = 24$ , where the fourth term of the basis, *viz.*

(4)  
24, returns back again into itself.

If we compare the several columns with each other, we may observe, that all the numbers of the 2d exceed all those of the 1st by 1. Those of the 3d, all those of the 2d by 4. Those of the 5th, all those of the 1st by 11.

The 30 numbers of the 1st, and of the 4th columns, being added together, are ever equal to 24, or 54.

The 30 numbers of the 2d, and of the 4th columns, being added together, are ever equal to 25, or 55.

The 30 numbers of the 3d, and of the 4th columns, being added together, are ever equal to 29; *i. e.* to the least of the two unequal astronomical measures.

The 30 numbers of the 4th, and of the 5th columns, being added together, are ever equal to 35; *i. e.* to the number of days in the 12th month of the primitive and patriarchal solar tropical year.

The numbers of the 4th, and of the 5th columns, are set at some distance, from those of the 1st, 2d and 3d; because those 3 exhibit the positions of the luminaries to each other, with respect to the beginning of the calculated year; the other 2, at the end of it.

The

The numbers of the 5th column, from 11 at the top to 30 at the bottom (excepting, 31 32 33 34 35) inclusive, represent in one entire view the whole variety of the full Moon and new Moon integral epacts, or nearest distances of the end of the lunar year from the autumnal æquinox, which have ever yet happened, or ever will happen in nature.

The numbers of the 4th column, from 24 at the top to 5 at the bottom inclusive (excepting only as before) represent, likewise in one entire view, the corresponding days of the 12th month of the patriarchal solar tropical year, in the evenings of which the autumnal full Moons and new Moons ever have, or possibly can, fall in their periodic times.

The opposite numbers of the 4th, and of the 5th columns, are ever, without any limitation of time, astronomical indices to each other reciprocally. My meaning is, suppose either the full Moon or the new Moon epact, in any year to be 11; then the opposite number 24, in the 4th column, will ever express the corresponding evening, in the 12th month of the primitive solar year. And we shall ere long be convinced, that the praxis of Sun and Moon astronomy, as God himself has adapted it, *ab origine*, to our civil and religious uses, is *quid determinatum*; and no more requires prolix tables, operose calculations, and the abstruse argument of æquations, than the well-known time of the Sun's rising and setting

setting upon the æquinoctial days, in every region and climate throughout the globe.

The numbers of the 1st column, from the cypher at the top, to 19 at the bottom, are a repetition of the numbers of the 5th column (excepting in the excess above 30) and consequently of the whole variety of the full Moon and new Moon autumnal æquinoctial epacts, which are here considered as prefixed to the head or beginning of the calculated solar year.

The numbers of the 2d column, from 1 at the top to 20 at the bottom, in the 1st, 2d and 3d years of every quadriennial solar revolution, are the seats of the æquinoctial point of the year, in a corresponding meridian: but in every 4th year, computed from the 4th of the Hexaëmeron exclusive, the seat of the æquinoctial point of the year, in what I call the ruling meridian, is transferred from the numbers of the 2d column, to a number of the same value in the first; and that number of the same value in the first column becomes the boundary of the solar year, and the quantity of the lunar epact. This account will be better understood, when we come to treat of the solar, and of the lunar, indices of the quadrants.

If any one number in the 1st column be subtracted from its corresponding number (*i. e.* in the same parallel line) in the 3d column, the difference will ever be 5, from  $0^{(1)} - 5^{(3)}$ , at the top, to  $19^{(1)} - 24^{(3)}$  at the bottom; for  $24 - 19 = 5$ . How fri-

frivolous soever this calculation may either seem or be thought to be, yet it instructs us in a material point, and supplies us with a proper rule how to ascertain the month and day of the month of the solar year, which coincides astronomically with the given month and day of the month of the concurring lunar year, which, in its nature and by its original frame, is incommensurate to the solar: so that from hence we are taught to read the differential number 5, arising from the above sub-

traction of <sup>(1)</sup> 19 from <sup>(3)</sup> 24 in this manner: *viz.* whenever the new Moon (☾) epact is 19, the 24th day of the 1st month of the lunar year, will coincide with the 5th day of the 1st month of the solar: consequently, whenever the new Moon (☾) epact is 11 (as in the end of the year of *Noah's* life 600) the 27th day of the second month of the lunar year will coincide astronomically with the 16th day of the second month of the solar year; for  $57 - 11 = 46 - 30 = 16$ . From hence we infer, that *Moses* computes by the months and days of the lunar year, and not by the months and days of the solar. And should it appear upon a due examination, that the new Moon (☾) epact, at the end of A. M. 1656, was in nature 11, then this argument will be decisive.

I cannot recollect, at present, any more particulars, which might be thought necessary to be added, by way of a farther explication in general of these lunar tables. I shall only say, that how plain and simple soever their construction may

pear ; yet in their use and application they are very extensive and complex. This will be evidenced from what I have to offer in the last place, by the method proposed, concerning their threefold and most distinguished property ; I mean, as they punctually exhibit the annual stations of the two great luminaries ; first, in the 12th 35-day month of the primitive and patriarchal solar tropical year. Secondly, in the form of the *Julian* calendar, rendered, by this undecimal table, for ever commensurate to the *Mosaic Shanah*, or the true solar. Thirdly, in the form of the *Julian* calendar, as it is still used by us, and computed to consist of 365 days, 6 hours ; ever including and carrying along with it, the annual encrease of the meridian epacts ; which must necessarily occasion a retrocession of the cardinal points of the solar tropical year, in the months of the *Julian*.

I shall not presently have occasion for the table of reduction to the *Julian* calendar, and shall therefore defer the explication of it, until it be more immediately necessary ; for methinks I hear the tired and impatient reader say, Come, prithee, be expeditious, and shew us, what we want to know. (1) The true astronomical law of connecting the lunar years with the solar. (2) Open to us the long secreted and hitherto unknown astronomical reasons, why the day of the week is never once expressed in the *Pentateuch*, nor throughout the *Hebrew* bible. (3) Make it appear to us, “ Upon such evidence and proof, as will amount “ in the whole, without exception or reserve, to  
“ a

“ a mathematical certainty,” that *Moses's* table of the genealogies of the patriarchs, both before and after the flood, is, in itself considered, a most accurate astronomical table, both solar and lunar.

(4) Compel us to admit, that it may be proved to be so, independent of any known principles of science, of any known laws of astronomy, or any methods of computation whatever, but what are founded on the principles, data, and terms of the *Hebrew Pentateuch*, and the *created position* of the Moon to the Sun : for if these things be so, it would be, undoubtedly, no less than an arrogant and presumptuous theomachy to go about to resist the almighty force of a demonstration, built upon an original establishment, a primary constitution of the God of nature.

As I now look upon myself to be peremptorily called upon to demonstrate the astronomical certainty and exactness of the *Mosaic* solar and lunar tables, I shall readily comply with the demand ; and here I offer, for the grounds of the demonstration, these 3 astronomical data of the *Pentateuch*, which have been noted before : *viz.* 1. The characters of the original position. 2. A continued series of 1656 *Shanim*, or true solar revolutions, computed from the 4th of the Hexaëmeron, which was the autumnal æquinoctial day, and ending in the year of the deluge, and on the autumnal æquinoctial day of that year. (3) The distance of 11 entire days from the new Moon (C) evening, to the same cardinal point exclusive, in the conclusion of the given interval.



☾ 15

☾ 12

From these data, 1656 years, we are plainly taught, that the astronomical bonds of connection, between the two extremes of this given series of *Mosaic* years, were the Sun's transit over the autumnal æquinoctial point on the 15th day from the new Moon evening, in the head or beginning of it ; and its transit over the same cardinal point in the end of it, on the 12th day from the new Moon evening. What I would advance from hence is this, that *Moses's* conclusions in astronomy may be established into general propositions, which will hold universally true in nature, apply the epoch of the calculation to any meridian, or determinate place, and to any intermediate age of the world whatever : admit but of the circumstances of the former transit, the like circumstances of the latter are sure to return, at the end of the given interval by an immutable law. I should think it but a very petty concession, should I hear an astronomer say, that he had made a calculation for A. M. 1656, as situated by this scheme of the world's chronology, and was satisfied that the Moon was in the end of that year, at such a distance from the Sun, that it might be visible at its setting 11 days before the autumnal æquinox. This is not sufficient, nor saying so much as the case demands : for the original position, and the true quantity of the *Mosaic Sbanah*, or solar tropical year being granted, it must necessarily happen as stated and recorded by *Moses* ; and it is im-

impossible in nature it should be otherwise. The conclusion and determination is as sure and certain, as when from 15 we subtract 4, the remainder must necessarily be 11. I will proceed a step farther and say, that the original position admitted, then in the beginning of the 1657th solar tropical revolution from thence, the 15th day from the autumnal new Moon (♋) evening must necessarily coincide with the 4th day from the æquinox inclusive; and that this conclusion and determination is as sure and certain, as when from 15 we subtract 11, the remainder must necessarily be 4. And these calculations (if the grounds of them were rightly understood) are alone and in themselves considered, not only a sufficient, but a conclusive proof of the truth.

The more diligently we examine into and consider it, the more we shall be open to conviction, that *Moses's* account of the universal deluge is a most extraordinary record; not only with respect to the circumstances of the history, but also to its chronology and its astronomy. But I would not willingly have my deduction of the lunar epact 11, nor the grounds of its certainty, to be misunderstood: for the argument was not framed nor designed to run thus, *viz. because Moses* has related *Noah's* entrance into the ark, on the 17th day of the 2d month of one lunar year, and his receiving the divine command to come out of it on the 27th day of the 2d month of the next, following in immediate succession; that *therefore*, in the year of *Noah's* life 600, in which the de-

luge began and ended, there *must* have been a coincidence of the lunar year with the solar, and that the epact in the end of that year *must* have been 11: for the very reverse of this is the truth; and the argument is designed to run thus; *viz. because*, in the beginning of the year of *Noah's* life 600, the first day of the first month of the lunar year fell, by the annual courses of the two luminaries, and their various relations to each other, on the first day of the first month of the solar year, and must by its frame and structure end 11 days before the solar; *therefore* *Moses* has stated and recorded the astronomy of that distinguished year: nor can the stile and circumstances of *Moses's* historical narration be interpreted to record any other discoverable position of the two incommensurate years, but that which *was in real matter of fact* the true one.

We are now then to examine into the certainty of this matter of fact, and to sift and try, whether my astronomical interpretation of *Moses's* historical record has its foundation in nature, and in real fact or not, A. M. 1656, V. N. 600.

It is an allowed, and a sure method of proof to assume a principle as true, and to argue from it as such; for if all things happen, as they necessarily must have happened, in case the principle had been a certain truth, then the assumption cannot be false.

I assume then these two numbers 15 and 11, deduced from the *Hebrew* text of the *Pentateuch*, according to my interpretation of it, as true astro-

nomical data, and I will argue from them as such; afterwards we will examine, and bring to some other test the conclusions.

From 15 subtract 11, and then we shall have 3 numbers, *viz.* 15 11 4. Now I desire the assistance of no other mediums besides these 3 numbers, 15 11 4, to enable me to adjust the twofold lunar year to its corresponding tropical solar, in those 5 years, which my own fancy (though perhaps, not quite without reason) induced me to select. And these selected years are, (1st) The chaotic year; by chaotic, I mean that year which may be supposed to precede *Moses's* account of the origin of time; and this no-year is necessary to be considered for the sake of connection, &c. (2dly) The year of the creation, or A. M. 1. (3dly) The second year before the flood, or A. M. 1654. V. N. 598. (4thly) The year immediately preceding the deluge, or A. M. 1655. V. N. 599. (5thly) The year of the universal deluge, or A. M. 1656. V. N. 600.

I shall now proceed by these several steps.

First, I shall make tables of these 5 selected years; with 3 of which the reader is already in some measure acquainted; but they are now laid again before him with a higher view, *viz.* in order to ascertain their reality (excepting only the first, which is chaotic and imaginary, but reduced to a calendar for the sake of connection) and to demonstrate the astronomical certainty of their several

veral parts, amongst which are to be reckoned the quadrants, though concealed from the view.

Secondly, I shall make it appear, how, and in what particular manner I was enabled and directed to make these tables by the alone assistance of these 3 numbers, 15 11 4. The two former of which are here assumed as true astronomical data of the *Pentateuch*.

Thirdly, I shall confirm and establish the truth and certainty of every one of these characters, both solar, lunar and hebdomatic, by a plain, easy, and simple arithmetical calculus; independent of any known principles of science, of any known laws of astronomy, or of any methods of computation whatever, but what are founded on the principles and terms of the *Pentateuch*, and the *created position* of the Moon to the Sun, as it is revealed to us by the author of the system. This, I may presume, will be a sufficient and satisfactory answer to the demand upon me.

In the first place, I here exhibit 5 distinct solar and lunar tables, from whence we may easily learn what were the true astronomical and primitive laws of connecting, and jointly computing by, the two incommensurate years.

(1)		(2)
A.M. o.	A. M. o.	A. M. I.
☽	☽	
☉	☉	
○ 19	11 ○ 354 ○	354 ○ 11
☾ 4	350 ☾ 15	339 ☾ 26

(3)		(4)	(5)	
A. M. 1653	end- V. N. 597 Sing.	A. M. 1654 V. N. 598	A. M. 1655 V. N. 599	A. M. 1656 V. N. 600
☽	☽	☽	☽	☽
☉ 24	6 ○ 355 ○ 4	350 ○ 15	339 ○ 26	☉
☾ 9	346 ☾ 19	11 ☾ 354 ☾	354 ☾ 11	

Secondly, I shall make it appear, how, and in what particular manner, I was enabled and directed to make these tables, by the alone assistance of these 3 numbers, 15 11 4. The two former of which are here assumed as true astronomical data of the *Pentateuch*.

Within the limits of these tables, there are 7 full Moon (○) and 7 new Moon (☾) epacts (reckoning the cypher twice repeated for 2) and of these 14 epacts, the 3 numbers 15 11 4, as they occur twice over, make six; which may seem, at the first view, not a little promising, as I consider them of such importance, and rank them with fundamentals. But notwithstanding these promising verisimilitudes, the question still recurs,  
and

and must be satisfied, *viz.* whether it was true in fact, that in the end of A. M. 1656, the new Moon (☾) first appeared at the distance of 11 entire days from the autumnal æquinox; for no one will or can allow that my deduction, without farther proof, has ascertained it. But how reasonable soever such surmises to the contrary may be thought, I shall not scruple to argue from it, as an established conclusion and a certain truth; and shall undertake by its assistance, and the radical number 4, to determine, with an astronomical exactness, the twofold series of 2 years epacts, *i. e.* quite back to the end of the 3d year before the deluge, A. M. 1653. V. N. 597.

In the following determinations then (for I shall give 4, exclusive of the lunar tables, p. 307, 308. and a regular arithmetical proof) the calculus proceeds by the continual addition of the 2d radical number 4, to the *Mosaic* datum 11, and to its result successively, according to the number of years, which are here computed backwards from the recorded epact 11. *E. g.*

$$\begin{array}{l}
 \text{A. M. 1656} \\
 \text{V. N. 600}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A. M. 1656} \\ \text{V. N. 600} \end{array}} \right\} \text{Tab. (5) } \text{☾ } 11 + 4 =$$

$$\begin{array}{l}
 \text{A. M. 1655} \\
 \text{V. N. 599}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A. M. 1655} \\ \text{V. N. 599} \end{array}} \right\} \text{Tab. (4) } = \text{○ } 15 + 4 =$$

$$\begin{array}{l}
 \text{A. M. 1654} \\
 \text{V. N. 598}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A. M. 1654} \\ \text{V. N. 598} \end{array}} \right\} \text{Tab. (3) } = \text{☾ } 19 + 4 =$$

$$\begin{array}{l}
 \text{A. M. 1653} \\
 \text{V. N. 597}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A. M. 1653} \\ \text{V. N. 597} \end{array}} \right\} \text{Tab. (3) } = 23 + 1 = \text{○ } 24.$$

The reason why one is added to 23 in the last deduction is, because the lunar year, connected with its corresponding solar, A. M. 1654, tab. (3) was of 355 days, and the additional day is here taken in.

We may observe, that these new Moon (C) and full Moon (O) epacts, or integral distances from the autumnal æquinox follow one another alternately, and that these 3, viz. C11 O15 C19, encrease in arithmetical progression by 4; and so likewise do O15 C19, and O24, excepting the last, for the reason abovementioned. But as 4 are omitted, they may be thus obtained; only premising that,  $11 + 15 = O26$ .

$$\left. \begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array} \right\} \text{Tab. (5) } O26 + |4| = 30 - 30 =$$

$$\left. \begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 599} \end{array} \right\} \text{Tab. (4) } = C0 + |4| =$$

$$\left. \begin{array}{l} \text{A.M. 1654} \\ \text{V.N. 598} \end{array} \right\} \text{Tab. (3) } = O4 + |4| = 8 + 1 =$$

$$\left. \begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 597} \end{array} \right\} \text{ending, } = C9$$

This is the first method of discovering and setting the several full Moon and new Moon epacts of the given years, by a continual addition of the 2d radical number 4, beginning at the datum C11, in a backward computation. The next proceeds by a continual subtraction of the datum 11, still computing backwards, in the following manner.

$$\left. \begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array} \right\} \text{Tab. (5) } \text{C } 11 - |11| = \text{C } - 0$$

$$\left. \begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 599} \end{array} \right\} \text{Tab. (4) } \text{C } 3|0 - |11| =$$

$$\left. \begin{array}{l} \text{A.M. 1654} \\ \text{V.N. 598} \end{array} \right\} \text{Tab. (3) } = \text{C } 19 - |11| = 8 + 1 =$$

$$\left. \begin{array}{l} \text{A.M. 1653} \\ \text{V.N. 597} \end{array} \right\} \text{ending, } = \text{C } 9$$

$$\left. \begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array} \right\} \text{Tab. (5) } \text{O } 26 - |11| =$$

$$\left. \begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 599} \end{array} \right\} \text{Tab. (4) } = \text{O } 15 - |11| =$$

$$\left. \begin{array}{l} \text{A.M. 1654} \\ \text{V.N. 598} \end{array} \right\} \text{Tab. (3) } \text{O } 4 + 30 = 34 - |10| =$$

$$\left. \begin{array}{l} \text{A.M. 1653} \\ \text{V.N. 597} \end{array} \right\} \text{ending, } \text{O } 24$$

In the third method we will make use of the 3 numbers, 15 11 4, promiscuously as occasion requires, but principally and chiefly of 15. *E. g.*

$$\left. \begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array} \right\} \text{Tab. (4) } \quad 11 + |15| = \text{O } 26$$

$$\left. \begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array} \right\} \text{Tab. (5) } \text{O } 26 + 4 = 30 - |15| = \text{O } 15$$

$$\left. \begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 599} \end{array} \right\} \text{Tab. (4) } \quad 3|0 \text{C } + 4 = 34 - |15| = \text{C } 19$$

$$\left. \begin{array}{l} \text{A.M. 1654} \\ \text{V.N. 598} \end{array} \right\} \text{Tab. (3) } \text{C } 19 + 5 = 24 - |15| = \text{C } 9$$

$$\left. \begin{array}{l} \text{A.M. 1653} \\ \text{V.N. 597} \end{array} \right\} \quad \text{C } 9 + \quad |15| = \text{O } 24$$

I have set down these various determinations to shew, that these 3 fundamental numbers, and astronomical data of the *Pentateuch*, 15 11 4, are closely connected, like the links of a chain with each other, and are by nature adapted to produce conclusions scientifically true, as the subsequent calculations will abundantly and clearly evidence.

The remaining deduction arises from the subtraction of the epacts, from the days of the corresponding solar year, and the days of the lunar year, which fall within the cardinal limits of the solar, from the residue, which will carry us back to the same conclusion. *E. g.*

$$\begin{array}{l}
 \text{A.M. 1656} \\
 \text{V.N. 600}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A.M. 1656} \\ \text{V.N. 600} \end{array}} \right\} 365 - 11 = 354 - 354 = \text{C } 0$$

$$\begin{array}{l}
 \text{A.M. 1655} \\
 \text{V.N. 599}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A.M. 1655} \\ \text{V.N. 599} \end{array}} \right\} 365 - 354 = 11 \text{ And } 30 - 11 = \text{C } 19$$

$$\begin{array}{l}
 \text{A.M. 1654} \\
 \text{V.N. 598}
 \end{array}
 \left. \vphantom{\begin{array}{l} \text{A.M. 1654} \\ \text{V.N. 598} \end{array}} \right\} 365 - 19 = 346 \text{ And } 355 - 346 = \text{C } 9$$

$$365 - 26 = 339 \text{ And, } 354 - 339 = \text{O } 15$$

$$365 - 15 = 350 \text{ And, } 354 - 350 = \text{O } 4$$

$$365 - 4 = 361 \text{ And, } 361 - 355 = 6 \text{ And } 30 - 6$$

$$\qquad \qquad \qquad [= \text{O } 24.$$

By these several calculations I have sufficiently informed the reader, how and in what particular manner I made these tables (excepting the additional unit) by the joint assistance of 3 of the 7 radical numbers; which is more, I am pretty confident, than he expected from my engagement; and indeed, he had no just grounds to expect it,

especially in such a variety of methods, from any known principles of science, or any known laws of astronomy, which have been taught mankind, since its first rudiments were imbibed by the *Greeks*.

I shall give one more representation of this two-fold series of epacts, from the full Moon (O) and new Moon (C) lunar tables, p. 351 and 353; first, begging leave to make two short, but necessary, remarks. (1) When, in any calculated year, we have occasion to make use of those parallel lines, in which the numbers of the 4th and 5th columns,  $1. \overset{(4)}{34}. (\text{index } 14) 2. \overset{(4)}{33}. (\text{index } 3)$   
 $3. \overset{(4)}{32}. (\text{index } 22) 4. \overset{(4)}{31}. (\text{index } 11)$  are found, the 50<sup>s</sup> must be over looked, and as the primitive solar year is digested into  $360 + 5$ , as well as into  $330 + 35$  days, the numbers of the 4th column must be read, the 1<sup>st</sup> of the 5, the 2<sup>d</sup> of the 5, the 3<sup>d</sup> of the 5, and the 4<sup>th</sup> of the 5 appendent days.

(2) It has been already noted, p. 356, that the numbers of the 3<sup>d</sup> and 4<sup>th</sup> columns being added together, are ever equal to the least astronomical measure 29 days; but as a lunar year of 355 days ever begins and ends with 30 days, the 3 first numbers of the calculated parallel line must be transferred to that line, in which the number of the 4<sup>th</sup> column, being added to the number of the 3<sup>d</sup>, shall be equal to 30. We shall have 2 instances of this in the following extract from the tables.

From

From the full Moon (○) table, p. 352.

	(1)	(2)	(3)	(4)	(5)	A.M.		
Index 24				11○	24	1653		
25	14	○24	25	29	3 1○	4	1654	
	15	○	4	5	9	20○	15	1655
	16	○	15	16	20	9○	26	1656

} ending.

From the new Moon (☾) table.

	(1)	(2)	(3)	(4)	(5)	A.M.			
Index 9				26☾	9	1653			
10	29		☾	9	10	14	16☾	19	1654
	30		☾	19	20	24	5☾	30☾	1655
	1		☾	0	1	5	24☾	11	1656

} ending.

It is scarcely to be imagined by those, who have not had the conviction of experience, what an accumulated congeries of sure and infallible *criteria* of time (which will stand the test of the most nicely inquisitive, the most diligent and skilful examiner) may be collected, and by irrefragable proof established, from *Moses's* historical account of the flood, and his 3 terms of computation days, weeks, and years (which are by this time, I suppose, admitted to be both solar and lunar) carefully remembering these two important observations, (1) that there is no word in the *Hebrew* bible to express the hour: and (2) that the 4 cardinal points of the æquinoctial Nuthemeron are expressly denominated.

The system of 7 days is an original and positive divine institution, and in the scheme of sacred chronology

nology is of prime use, and of the greatest importance. It is an infallible criterion of time, in union with the solar and lunar characters, and a just astronomical medium of proof; nor can the diurnal revolution of the Sun measure one single day of our existence, abstracted from this divinely appointed septenary system, in a close and undivided connection with the *Mosaic Hexaëmeron*, on the 4th of which the first motion of time commenced: for although the rotation of the Earth about its axis subsisted 3 days and  $\frac{3}{4}$ , prior to the annual; yet, in that single and unconnected state, it measured no part of a year. Time began to be measured, when God said—*let them be for days and years.*

With respect to this divine hebdomatic measure, the following reasonings are indisputably certain, *viz.* All chronologists postulate the worlds *determinate* past duration, though their conclusions have been various. From hence it follows, by sure consequence, that a determinate number of annual revolutions of the Sun must include a determinate and corresponding number of diurnal; these being divided by 7, must give in the quotient a determinate and corresponding number of weeks, either with or without a remainder.

Now then, suppose, I wanted to know what day of the week was the 6th of *September*, A. D. 1750; independent of the year of our Lord, according to the vulgar æra, and of the cycle of the dominical letter; and moreover, of all the methods which are known and made use of by us to find out the day of the week, in any given *Julian* month,

month and year ;—Is not this the same in fact as asking, what day of the week was the 4th of the *Mosaic* Hexaëmeron, when the annual motion commenced on the autumnal æquinoctial day? And likewise what is the precise solar (both annual and diurnal) measure, from the *Mosaic* radix, to the 6th of *September* A. D. 1750? And these two extremes are as certainly connected by the hebdomatic, as by the solar and lunar characters.

But although it must be owned, and it is too notorious to be denied, that very voluminous and almost endless controversies and disputes have arisen from the dissentient opinions of the learned, concerning the authenticity, (1) of the *Hebrew* chronology, (2) of the *Samaritan Pentateuch*, (3) of the septuagint version (4) of *Josephus*, as if each of them might claim to be the standard, and had a native inherent right to challenge the preheminance; yet am I not discouraged, and shall assume the *Hebrew* as the only true chronology. I shall try (after so many fruitless and unsuccessful trials) if we cannot adjust, at last, its litigated claim, and vindicate the right of its pretensions.

The principal view of this first part of my design being to lay open, assert, and explain the Sun and Moon astronomy of *Moses's* genealogical and chronological tables, I shall not digress from this main point, in order to settle every branch and period of the *Hebrew* astronomical canon: that is reserved for a future work. But since one single year cannot upon Scripture grounds, and  
upon

upon Scripture authority, be either added to, or substracted from, the following collection of years (as I am ready to prove against all opposition) I shall distribute them into 5 large intervals, which were never offered before as I know of, and give to the whole this denomination and title.

*The world's chronology collected from the Hebrew bible, and Ptolomy's canon of kings.*

FROM the 4th of the Hexaëmeron (exclusive) to the death of *Joseph*, and to the autumnal æquinoctial day of that year, exclusive.

From the death of *Joseph*, to the uncontested æra of *Nabonassar*, and to the autumnal æquinoctial day of that year, exclusive.

From the æra of *Nabonassar*, to the death of *Antoninus Pius*, A. D. 161, and to the autumnal æquinoctial day of that year, exclusive.

*Mosaic Shanim* or tropical years.

I.  $\overset{\sim}{\ominus}$  2369  $\overset{\sim}{\ominus}$  *Genesis*.

II. 892 In the reign of *Abaz* kind of *Judab*.

III. 907 *Ptolomy's canon*.

A. M. 4168

From

From the death of *An-*  
*toninus Pius*, A. D. 161,  
to the æra of *William I.*  
the conqueror, A. D. 1066,  
and to the autumnal æqui-  
noctial day of that year, ex-  
clusive.

4168 Brought up.

IV. 605 Ecclesiastical and  
civil history.

From the æra of *Will. I.*  
A. D. 1066, to the end of  
the 24th year of the reign  
of his present majesty *George*  
*II.* A. D. 1751, and to the  
autumnal æquinoctial day of  
that year, exclusive.

V. 685 *English* chronicle.

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Sum Total—A. M. 5758.

Of these 5 intervals, only the 2d is liable to dis-  
pute, which collects 892 years between the death  
of *Joseph* and the commencement of the æra of  
*Nabonassar*: but without staying, at present, ei-  
ther to support this collection, or to examine,  
compare, and judge of the different accounts which  
have been, and probably may be, given by others;  
I shall assume 5758 solar tropical revolutions as  
the true adequate measure of the world's past du-  
ration, from the 4th of the *Hexaëmeron* exclusive  
to the last autumnal æquinox, in this current year,  
A. D. 1751: I shall calculate from it as true, and  
let those overthrow or invalidate the truth of the  
assumption, by astronomical arguments, who can;  
I shall hereafter ascertain the several particulars of  
this collection against any opponent.

I was obliged to fetch this compass to enable me to answer this single question, *viz.* What day of the week was the 6th of *September*, A. D. 1750? But in the discussion of this point, I shall take occasion, not only to lay down and illustrate by example the rules of the integral calculation (for a full explication of the ratio of every particular will require not a few pages, and must be postponed to the close of the whole) but also to make good that entirely new and all-cementing proposition, which is emboldened to assert,

IX. That there can be no chasm in the (*Hebrew*) Scripture chronology, because it may be demonstrated that there is no interruption in the Scripture astronomy.

For the basis of this demonstration we have these two express astronomical data. (1) The *created position* of the Moon to the Sun, as stated and recorded by *Moses* in the first chapter of *Genesis*, and explicitly in the *Levitical* law. (2) A continued series of 5758 solar tropical revolutions; from hence subtracting 1, remains A. M. 5757, which will terminate at the autumnal æquinox, A. D. 1750.

Now I say, that these two express astronomical data, are sufficient for a full and satisfactory solution of the following

PROBLEM.

If, in the beginning, the Sun crossed the *Mosaic*  
 cardinal, or autumnal æquinoctial point, on the  
 5th

5th day of the week (for that day of the 7 was, as will be proved, the 4th of the Hexaëmeron) and on the 15th day from the new Moon (☾) evening, then in the end of the 5757th solar revolution from thence, it is required to determine, (1) At what distance, in entire days, from the new Moon (☾) and the full Moon (☉) evenings respectively, did the Sun again cross the same cardinal point of the year? (2) On what days of the 12th 35-day month of the patriarchal solar year, brought down to the present times, did the new Moon (☾) and the full Moon (☉) evenings fall respectively? Here it is necessary to remember, that the primitive new Moon (☾) evening is the second from the conjunction, and the primitive full Moon (☉) evening is the second from the opposition. (3) On what days of the week respectively? (4) In what *Julian* months, and on what days of the month respectively?

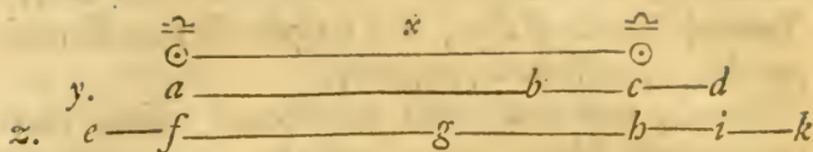
It is obvious to infer, without the help of a comment, how much a true astronomical solution of all the particulars of this problem, will contribute towards the completion and the full confirmation of my scheme. When we return back to the *Mosaic* tables, the reader will be enabled from *hence* to form a truer judgment, and will have a more ready conception both of the calculus and the conclusion, in the remote ages of the world. From *hence* he will be made quite sensible, that the characters, by which every given Scripture year is distinguished from another, are the day of the month, the day of the week, and the cardinal

point of the day (with respect, I mean, to that meridian in which the solar year and the solar day begin together, which they annually do by an uniform law) in which the Sun makes its transit over the *Mosaic* cardinal point of the year: which are the most perfect laws of connection in nature, between the two incommensurate years, the solar and the lunar. *vide* Prop. V. From *hence* he will gain as true a knowledge of the original antient year, as he has of the *Julian*; and also, of the primitive laws of computing the times, by solar, lunar, and hebdomatic characters; and he will be able to judge too, whether the antient or the modern computation deserves the preference. Lastly, from *hence* he will be thoroughly instructed, that the civil præcession of the æquinoctial points, and the lunar anticipation, græcè, *σεληνιακή προηγησις*, (which I may venture to reckon amongst the *προσκόμματα*, or stumbling blocks of modern science) have no foundation in nature; but are equally owing to, and equally arise from, not only a mistaken method of computation, but more immediately, to the not apprehending one of the most curious, and the most useful practical laws in Sun and Moon astronomy, in our allotment in the solar system.

These several advantages, and perhaps more than these, will accrue from a just solution of the precedent problem. What remains now then is to reduce these 5757 solar tropical years to days; then to lunar years, and those lunar years to days: for though time be measured in a circle, yet being  
mea-

measured, it stretches out into a line; and *Orech Jamim, length of days*, is a scriptural expression of peculiar aptness and propriety.

Should any one with confidence assert, that the stile of *Moses* alone, and the very terms in which he records the circumstances of his plain historical narration, spontaneously suggest, and with the powers of a true and faithful index, immediately direct us to a discovery, of the general rules, of the necessary and fundamental laws, both of the solar and the lunar computations, and all within the compass of the 4 primary operations of common arithmetic, who would implicitly credit the assertion? But there is nothing like appealing to matter of fact: thus then *Moses* writes; God made two great luminaries, and God said,—let *them* be for *days* and *years*. These words are our directory: we are from hence expressly taught to calculate the diurnal and the annual revolutions, and to compute the successions of ages by days and by years. So that instead of complex diagrams, an operose algebraic process, and the continual solution of geometrical problems; the sum and substance, and the whole praxis of Sun and Moon astronomy, may be clearly and fully exhibited by the primitive simplicity of the following rectilineal scheme; which like an universal algebraic theorem comprehends all subordinate cases.



Here are 3 strait lines, marked  $x y z$ .  $x$  represents the collected sum of solar tropical years (following one another in a continued series, and uniformly beginning and ending at the autumnal æquinox) reduced to days.

The strait line marked  $y$ , denotes the reduction of full Moon ( $\ominus$ ) years to days.

The strait line marked  $z$ , represents, on the contrary, the reduction of new Moon ( $\overset{\curvearrowright}{\ominus}$ ) years to days (which by the characters of the original position of the two luminaries, begin and end 15 days before the other) within the cardinal limits of the current solar year, whenever the full Moon ( $\ominus$ ) evening comes immediately before the æquinox. And when this happens, as it necessarily must 11 times in the space of 30 years, then the full Moon ( $\ominus$ ) epact, of whatever quantity, becomes the astronomical regulator of the sacred and ecclesiastical lunar year, which invariably confines the Moon, or more properly speaking, the 15th of the 30-day month, to the law of its original position. And the feat of *cbag haafiph* will be found after the æquinox, and may be determined by subtracting the new Moon epact, of whatever quantity, from 45, by a perpetual law.

*a* Denotes and expresses the coincidence of the original full Moon (O) day with the 4th of the Hexaëmeron, and the *Mosaic Tekupha*, or the autumnal æquinox.

*a b* The collected sum of full Moon (O) years reduced to days.

*b* The full Moon (O) evening coming immediately before the æquinox.

*b c* Its distance from it.

*c* Its coincidence with it.

*c d* The distance of the *Mosaic Tekupha* from the new Moon (C) evening.

*e* Represents the chaotic and imaginary new Moon (C) evening.

*e f* Its distance from the 4th of the Hexaëmeron, and the original *Tekupha*.

*f g* The collected sum of new Moon (C) years reduced to days.

*g b* The distance of the new Moon (C) evening from the æquinox.

*b* Its coincidence with it.

*b i* Its distance immediately after it. And when this happens then the feat of *chag baasiph* will be on the 15th of day from thence, *viz.* in *k.* if the astronomical measure be of 30 days; but if of 29 days, it will be the 16th, because then the political 30-day month will be divided in this manner,  $15 + 14C + 1$ .

To finish this general explication; it is the office and adequate property of the integral calculation, to discover and determine the precise measure, in entire days, of these several distances.

And

And how plain and simple soever, the *Mosaic* and primitive laws of the solar and lunar computations may appear at the first view, to a physical-ratio philosopher, and to a scientific genius, the praxis will most surely approve itself, not only to the curious in general, but to the most acute, and the most expert mathematicians, without entering into depths. The uniform truth, the unerring certainty, and the perfection of the conclusions, beyond what invented science could ever attain to, will gradually lead us to acknowledge that they are truly admirable; that there is something in them superior to all the most studied rules of art; that they lie out of reach of science founded upon observation, and are evidently stamped and impressed with the signatures of divinity.

It will soon appear, upon a close examination, that there are 3 several causes concurring, to render every astronomical calculation by the tables, especially in the remote and far distant ages of the world, more or less precarious and uncertain. And they are, 1st, The meridians. 2dly, The prosthaphæresis. 3dly, The assigned quantity of the solar tropical year. Now, in every calculation, all these 3 are assumed as true, and yet who can be said to have ascertained the *exact truth* of any one of them? Whilst the integral calculations, founded on the principles, data, and terms of the *Pentateuch*, are attended with no adhering imperfections; they are not so much as liable to produce erroneous conclusions in Sun and Moon  
astro-

astronomy; if they are, then, I repeat it again, they cannot be *Mosaic*.

But from a general explication of this rectilinear theory, we must now descend to a minute and circumstantial praxis; we must take no small pains, and exert our best endeavours, to obviate the sarcastical reproach which will be sure to attend a failure, and it may perhaps be already said,

*Projicit ampullas & sesquipedalia verba.*

In the following demonstrations, which will put an end to this book, I shall include the whole contents of my several propositions (which some, as I am informed, have pronounced to be *impossible*) and illustrate by examples the use and application of my astronomical table, both solar and lunar, *Mosaic* and *Julian*; whose simple construction, and yet complex properties and powers, will cause, as I apprehend, no small speculation amongst the connoisseurs in science.

My 2d proposition is indisputably fundamental; for it offers to determine what day of the week was the 4th of the Hexaëmeron, which, in the scheme of sacred astronomical chronology, is a most useful and a most necessary first principle.

*Moses*, in the 1st chapter of *Genesis*, historically relates, in what manner the creator finished the operations of his hands in the space of six successive natural days; I call them natural, because each of them had its *Gnereb*, *i. e.* its

æquinoctial time of Sun-setting; and also its *Boker*, i. e. its æquinoctial time of Sun-rising.

In the 2d chapter, which may be considered as a supplement to the 1st, it is revealed to us, *God blessed the 7th day, and sanctified it, because in it he rested from all the work which he had made.*

From this historical account of *Moses*, it is plain, that 7 is resolvible into  $6+1$ . Now then query, what day of the week does this detached unit express? To which I answer, the very day of the week in real fact, which corresponds with its value; and that is the 1st, or our *Sunday*.

But the deduction does not rest here; we may draw the same conclusion several different ways, and all of them equally true. For, 1st, the 3 *Mosaic* terms of computation are years, weeks and days. But years may be reckoned, in some sort, as a system of days; therefore reduce them to weeks and days; then to one week and one day; express these in numerals, and we have, 1. 7. But 7 is resolvible into  $6+1$ , so that these numbers, placed in this order, 1. 6. 1. represent the true position of the *Hexaëmeron*.

2dly, In the 7th chapter of *Genesis*, in the 1st and 4th verses we read, *ver. 1. And the Lord said unto Noah—ver. 4. For yet seven days, and I will cause it to rain upon the Earth 40 days and 40 nights.* The day in which *God* spake unto *Noah* must be one day, so that we have again the numerals 1. 7. and consequently the same order as before, 1. 6. 1. But what I would principally remark here is this, *viz.* These two last units on each

each side of 6 denote the very days of the week, in which God revealed his intentions to *Noah*, and in which *Noah* and his family entered into the ark; so that all the days of the week throughout the year of the deluge, and quite back to the end of the 3d year before it, *viz.* A. M. 1653, V. N. 597, may be determined from hence with a demonstrable certainty, as will be evident in the calculations.

The remaining deduction is more unexpected, and much more surprising still; for the last number, *viz.* 4. which arises from this next calculation, of itself expresses (see the beginning of the chaotic calendar both solar and lunar at the end of this book) both the day of the month, and the day of the week, as the astronomer would find it; so that by the number 4, (which is also the distance of the (supposed) new Moon evening from the æquinox) the true astronomical series of the days of the week, down to these times, are from hence settled and determined from before the foundations of the world.

The deduction consists of these few particulars: 15 is the original new Moon (☾) exact. But

☽

365—15=350. And 354—350=☾ 4. Again, 15 is resoluble into 4. 7. 4. From 354 throw off 350, and we have these numbers, 4. 4. 7. 4. The two first of these numbers being added together constitute an octave, *viz.* 4+4=8. But 8—7=1, we have now these numbers, *viz.* 1. 7. 7. 4. But each of these sevens is resoluble into 6+1, so

that now they will stand in this order, 1. 6. 1. 6. 1. 4. This last number 4 is the 4th of the *Mosaic* 6, in its original and true astronomical position. And  $1+4=5$  is the corresponding day of the week. From the 4th entire day subtract  $\frac{1}{4}$ , remains 3 days  $-\frac{3}{4}$ , or the time which the diurnal motion subsisted prior to the annual. *Vid.* p. 56.

Resolve 7 into its days, and also 6 into its days, and then set the latter under the former in this manner.

Days of the week.

1	2	3	4	5	6	7	1.
							7.

From hence we may observe, that the 4th of the 6th falls upon the 5th day of the week, and the 6th upon the 7th; and that the original 7th falls upon the 1st, as stated before. I shall conclude these determinations with this table:

1	6	1
2	6	2
3	6	3
4	6	4
5	6	5
6	6	6
7	6	7

We have expressed here the whole variety of every possible position of the *Mosaic* six days; but I assume the first as true, and shall argue from  
it

it as such. And should its truth be doubted, I am able to offer more than 100,000 over and above two millions of proofs, and an objector may chuse where he pleases.

Having laid this foundation, I can now, by the help of the only proper medium in nature, readily determine what day of the week was the 6th of *September*, A. D. 1750; and this, without being under the necessity of making any appeal either to the *Julian* period, or to the years of our Lord, according to the vulgar æra, or to the cycle of the dominical letter; which privileges the astronomer would not willingly be debarred from.

I am now to reduce the collected number of 5757 *Mosaic Shanim* or solar tropical years to days; which might be readily done by the table p. 263, but I rather chuse to calculate by the radical numbers upon the account of the entire quadrant or quadrants, which, by this method, will remain over and above the complete days; and as I have no occasion to be solicitous about the meridian, I will, after the 1st division by 15, take in the remainder, which is the only alteration I shall make in the rules of reduction. p. 254.

## The reduction of 5757 solar tropical years to days.

Rule I.  $5757 \text{ years} \div 15 = 383 \text{ remainder } 12.$

Rule II.  $383 \times 11 + 12 = 4225.$

Rule III.  $4225 \div 24 = 176 \text{ quadrants to be subtracted. D. h.}$

Rule IV.  $5757 \text{ years} \times 1461 \text{ quad.} = 8410977 \text{ quad.} \div 4 = 2102744 \text{ 6 Jul. reduct.}$

Rule V.

$$\begin{array}{r} 8410977 \text{ quad.} \\ \underline{176} \\ 8410801 \text{ quad.} \end{array} \div 4 = 2102700 \text{ 6 fol. reduct.}$$

Julian excess 44 0

From this reduction of years to days, I am to find out what day of the week was the 6th of *September*, A. D. 1750; but first we must determine the *Julian* stations of the autumnal æquinox in this age. In order to this; from the *Julian* excess of 44 days, subtract 30, and with the remainder 14 enter, either of the 2 tables, p. 351, 353, and look for it in the 4th column, then set down the number of col. 2. in the same parallel line. *E. g.*

Index 21  $\left. \begin{array}{c} (1) \textcircled{C} \\ | \\ |11| \\ | \end{array} \right\} (3) \quad \left. \begin{array}{c} (4) \\ | \\ |14| \\ | \end{array} \right\}$  Now I say, that the number 14, col. (4) becomes the autumnal æquinoctial *Julian* index to the opposite number 11, which stands in that column at the head of which is placed the symbol of the Sun's entry into *Libra*. If from 14 we subtract 1, and look for the remainder 13 in col. (4) we shall

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find over against it in col. (2) the number 12; to find out the month, from 29, subtract mentally 11, and to the remainder 18 add 61, (the reason will be given hereafter) the sum 79, in the

the table annexed will be found over against *September 11*. Consequently the 11th and 12th days of *September* are, in this age, the *Julian* stations of the autumnal æquinox.

In the next place, from *September 11*, subtract *September 6*, the difference will be 5. We have but two easy steps more to bring us to a conclusion; (1) from the sum total of solar days subtract these 5; and (2) divide the residue by 7. Now I say, if there remains 0 after this division, then the 6th of *September* was *Thursday*, or the same day of the week as was the 4th of the *Hexæmeron*, *i. e.* the 5th. But if after the division by 7, there be a remainder, add 5 to it, and the sum, if 7 or under, will be it; if more than 7, the difference will be the day of the week required. *E. g.*

$$\begin{array}{r}
 \text{From } 2102700 \text{ solar days.} \\
 \text{Subtract} \quad \quad \quad 5 \\
 \hline
 7(2102695(300385 \text{ compl. weeks.} \\
 \hline
 \text{Remainder } 0
 \end{array}$$

Now because there are no remaining days, the 6th of *September* must necessarily be *Thursday*, or the same day of the week as was the 4th of the *Mosaic* fix, from whence *exclusive* the computation is dated.

The dominical letter for A. D. 1750 was *G*, therefore *D* must be the character, or calendar letter of *September 6*, and so it is. *Q. E. P.*

The being able to determine, with an astronomical certainty, the day of the week, as occasion requires, from the *Mosaic* radix to the current day, is a fundamental point secured; and Dr. *Halley's* sanguine physical hopes, of which Mr. *Whiston* has informed the public may, possibly, in due time, according to my sanguine Scripture astronomical hopes, be defeated.

But now the inquisitive reader wants to be let into the secret of some particulars; and will be ready to ask, I suppose, why is the 6th of *September*, A. D. 1750 culled out, and a preference given to it before all the rest of the days of the *Julian* calendar, of which, as every body knows, there are 365?

But an answer to this enquiry is ready at hand. The 6th of *September* A. D. 1750 was made choice of, because it is linked, in a close astronomical connection, with the *Mosaic* radix in a double respect; 1st, as has been already proved, by the hebdomatic; and 2dly, as I am going to prove, by the full Moon character. For was the 4th of the *Hexaëmeron* the primitive full Moon day, or the second from the opposition? So also was the 6th of *September*, A. D. 1750. Again, was the 4th of the *Mosaic* fix, the 5th day of the week, or our *Thursday*? So also was the selected 6th of *September*. These two characters united, at the distance given, from the  
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*Hebrew bible*, and *Ptolemy's canon of kings*, jointly concur to the establishing the truth of,

Prop. IX. *viz.* That there can be no chasm in the Scripture chronology, because it may be demonstrated that there is no interruption in the Scripture astronomy.

Here it must be carefully observed, and as carefully remembered, that this sameness and union of characters entirely depends upon, and immediately arises from, a sure astronomical and uninterrupted connection with the original position of the two great luminaries, as stated and recorded by *Moses* in his *Pentateuch*. And should any one object, that the interval of 5757 years may be changed, and that many will contend for a change; yet still I say that such a change, be it more or less, can never be authorized by the *Hebrew bible*, and *Ptolemy's canon of kings*: besides the *Mosaic radix* is unalterable, because fixed by a divine original law. And therefore, supposing a correction of the interval should be attempted, it must be, either by subtraction or addition; if by the former, then, as the radix is immutable, the calculus by reduction would produce in the conclusion the characters of some one year which came before A.D. 1750; if by addition, then of some one year that would come after it; and each of those characters would be in exact correspondency with the number of years added or subtracted; whilst the characters of the current year would never be ad-

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justed,

justed, which is a point that was never yet considered; because the method of calculation by days and years from a fixed radix, as clearly taught by *Moses*, has never been known or practised by us.

Not to push this conclusive and unanswerable argument any farther, I shall go on to prove that the 6th of *September*, A. D. 1750, was the primitive full Moon (O) day, or the next after the opposition. In the course of this calculation, I must reduce the collected number of 5757 solar years to lunar, and those lunar years to days.

But I have a mind, antecedent to a regular calculation and independent of it, to let the reader see the powers of these primitive solar, lunar and hebdomatic characters; and how they are adapted to produce astronomical truths: so that, in any year, if one lunar, and one hebdomatic character be determined and known, several others, like the links of a well compacted chain, immediately follow together with it, and from hence likewise may be easily determined and known. I have given some proof of this already, from the *Mosaic* datum or new Moon (C) epact 11, discoverable from the historical account of the circumstances of the deluge; and am now able to enlarge it from the hebdomatic character, which offers itself to our view, in the deduced position of these numbers 1. 6. 1.

I shall, at present, give another distinct proof of this, from the number 5, which in the foregoing arithmetical operation we subtracted from the sum total of solar days; and I shall consider  
this

this number 5 as a datum, because it did not arise from a regular calculation, terminating upwards in the *Mosaic* radix; although such a calculation, as we shall soon see, will confirm it.

Now suppose some one should be prompted to argue with me in this manner; A. D. 1750, the primitive full Moon day, which immediately follows after the opposition, was at the distance of 5 entire days from the autumnal æquinox; from this number 5, it is required to ascertain the *Julian* month, the day of the month, (and also by calculation to fix the day of the week) on which this primitive full Moon fell. And farther, from this datum in union with the calculated day of the week (see the above arithmetical operation) it is required to determine the respective distances, in entire days, both of the primitive full Moon (O) and of the primitive new Moon (C) evenings from the original *Tekupha*, or cardinal point, in the head or beginning of A. D. 1750, carried back to the autumnal æquinox, in the end of A. M. 5756, A. D. 1749. And also, the *Julian* months, the days of the month, and the days of the week respectively. And lastly, the respective days of the 12th 35-day month of the patriarchal solar year, brought down to these times.

These several points are to be settled and adjusted by the assistance of the given number 5, and its coadjutor the calculated day of the week, which was found to be our *Thursday*, or the 5th day. But how easy, and how ready is the true astronomical solution of all these demands? In

the first place, it appears by the precedent calculation, p. 351, that the *Julian* excess of 5757 years, over and above the corresponding number of true solar reduced to days, was 44. From these subtract 30, and to the remainder 14, add the given number 5; then look in the full Moon (O) table, p. 351, for that parallel line in which the

sum 19 stands in col. (2) index 19 : 19. 23. 6. O.  
<sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>  
 to the middle number 23 add 61, and the sum 84 will be found in the table of reduction to the *Julian* calendar (which remains to be explained) over against *September* 6 O, with the symbol of the full Moon affixed to it. Therefore, by this medium 5, and by this table, the selected 6th day of *September*, A. D. 1750, was connected with the 4th of the Hexaëmeron, as it was the 5th day of the week, and as it was the primitive full Moon day. I now look into any common almanac for A. D. 1750, where I find this notation, *September*. Full Moon 5 day at 1 morn. Q. E. P.

The next solution of the required distances, &c. is easier still; for we have only to say,  $O5 + 4 = C9$ . and we have one determination at the end of A. M. 5756, A. D. 1749. Again,  $5 + 15 = 20 + 4 = O24$ . This last calculus limits the distance, in entire days, of the primitive full Moon evening, and the former (C9) of the primitive new Moon evening, from the autumnal æquinox, A. D. 1749. The one being the 2d from the conjunction; the other, from the opposition: only  
 it

it must be observed, that if either the new Moon, *i. e.* (conjunction) or the full Moon, *i. e.* (opposition) happens after six o'clock in the evening, and before 12 at night, another day both of the month and of the week is begun, in primitive account.

Having obtained, what I chiefly aimed at in these concise calculations, I mean a similarity of primitive full Moon (○) and new Moon (☾) characters, or equal distances from the autumnal æquinox, in the end of A. M. 1653, V. N. 597; and in the end of A. M. 5756, A. D. 1749; which are distant from each other 4103 *Mosaic Shanim* or solar tropical years, as appears by subtraction, I shall set down their solar and lunar tables, one after the other, and separate them by the interval.

A. M. 1653	A. M. 1654
V. N. 59	V. N. 598
	☽
	☉
○ 24	6○355○4
☾ 9	346 ☾ 19

Interval. 4103 *Shanim* or solar tropical years.

A. M. 5756	A. M. 5757
A. D. 1749	A. D. 1750
	☽
	☉
○ 24	6○354○5
☾ 9	345 ☾ 20

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Whoever will look over and compare the several characters of these two tables, as they are placed in the same view, will soon perceive that the only observable difference betwixt them arises from the different quantities of the two complete full Moon (○) years, which fall within the cardinal limits of their corresponding solar; the former, under A. M. 1654, consisting of 355 days, and its attending epact of 4; the latter, under A. M. 5757, of 354 days, and its attending epact of 5; I need not carry these remarks any farther, because they are needless in things evident to sense.

The difference of an entire day between the quantities of these two lunar years, and of their attending both full Moon (○) and new Moon (☾) epacts, will afford the astronomer an opportunity to form a proper judgment of the truth or falsity, the accuracy or inaccuracy of these tables; and likewise, of those calculations, which, by their conclusions, will support and establish every particular exactly as it is here set down.

Another very considerable advantage may be gained by the joint calculations of these two distant years; the one lying in the remote ages of the Antediluvian world, the other in the present times. For from hence we shall be certified by demonstration, that what we call and consider as the civil præcession of the æquinoxes, and the lunar anticipation, is a mistake in fundamentals. And they must, each of them, be ascribed amongst other causes, to an erroneous method of

com-

computation : from hence and the annual defect of 3 seconds of time, it has come to pass that we have never been able to apply the solar tropical year to civil use.

In the front of each table, we have these simi-



lar characters,  $\text{O} 24 \text{O} \text{O} 24$ , which may be thus expressed in words, *viz.* In the end of A. M. 1653, and likewise, of A. M. 5756, at the distance of 4103 years, the primitive full Moon evening fell 24 entire days before the autumnal æquinox, and on the 5th day of the week, in the first case, and on the 6th in the latter. But how does the certainty of these hebdomatic characters appear, may one say? Now since the calculations will require me to adjust this somewhere, I will take occasion to do it here ; and should it be reckoned amongst my digressions, sure I am it is no impertinent one.

The particulars on which a backward computation from a given or calculated day of the week depends are these, *viz.* If 354 or 355 days be divided by 7, the remainder, in the first case, will be 4 ; in the latter, 5. If 30 be divided by 7, the remainder will be 2 ; if 15, 1. To apply these rules ; the 6th of *September*, A. D. 1750 was, by calculation, the 5th day of the week, or our *Thursday*. Therefore  $5 - 4 = 1 - 1 = 0 = 7 - 1 = 6$ , which is the day of the week sought.

On the other hand, this position of these numbers, 1. 6. 1. expresses the day of the  
week

week on which *Noah* entered into the ark ; the full time of his abode there was 365 days, which being divided by 7, the remainder 1 again denotes the true day of the week, on which he was commanded to come out. He was commanded to come out on the 57th day from the new Moon (C) evening nearest to the autumnal æquinox. But  $57 \div 7 = 56$ . And  $57 - 56 = 1$ . Then complete the octave, and say,  $1 + 7 = 8 - 7 = 1$ . Now I say, the unit ascertains astronomically the day of the week on which *Noah* received the command of God to go forth of the ark, and the number 7, of the new Moon (C) evening. Therefore,  $7 - 4 = 3 + 7 = 10 - 4 = 6 - 2 = 4 + 7 = 11 - 5 = 7 - 1 = 5$ , which is the day of the week sought. And I will venture to pronounce before hand, that when 1653 solar tropical years are reduced to lunar, and those lunar years to days, that, after the division of these by 7, the remainder will be 0 ; if not, the deduction and backward computation founded upon it is false ; but if it should be 0, both are established beyond the reach of confutation.

I shall now undertake to prove, by an arithmetical calculus, that these lunar and hebdomatic characters, as stated above, are true in fact ; and, should they be found, by calculation, to be true in fact, then it will be undeniably certain, that the number 11, in the end of the year of the flood, is a *Mosaic* astronomical datum, and must have, as they mutually infer and confirm each other, a sure connection in nature.

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Without any farther remarks, I am now to reduce 1653 and 5756 solar tropical years to days, and by this reduction to settle the exact measure of the strait line  $x$ , in both examples.

These exact measures may be readily obtained by the table of reduction p. 277, as noted in this scheme,

$$\begin{array}{r} \text{1653 years.} \\ \simeq 603745 \text{ Days } 14 \text{ h. } 57' \simeq \\ x. \odot \text{-----} \odot \end{array}$$

$$\begin{array}{r} \text{5756 years.} \\ \simeq 2102335 \text{ Days } 00 \text{ h. } 44' \simeq \\ x. \odot \text{-----} \odot \end{array}$$

But since it is not required to adjust the present calculation to a fixed meridian, but to that in which the solar year and the solar day begin together, we must complete the 14 h. 57' into a day in the first case, and throw off the 44 in the other, and then they will stand in this form.

I. II.

Solar days 603746 2102335.

The next step of our enquiry is, how many astronomical measures of 30 and 29 days are included in these solar years? And then, how many moveable lunar years, each consisting of 12 of these measures? Lastly, how many days?

## The arithmetical operation I.

- I.  $1653 \div 30 = 55$ , remain 3 years, which reserve.
- II. The quotient  $55 \times 371$  (by a perpetual law)  $= 20405$  astronomical measures.
- III. The remainder 3 years  $\times 12 = 36 + 1 = 37$ .
- IV.  $1653 \div 630 = 2$ , remainder reject.
- V.  $20405 + 37 + 2 = 20444$  astronomical measures of 30 and 29 days.
- VI.  $20444 \div 12 = 1703$  moveable lunar years, remain 8 astronomical measures.
- VII.  $1703$  lunar years  $\div 30 = 56$ , remains 23, for which add 8.
- VIII.  $56 \times 11 = 616 + 8$  (for the remainder 23)  $= 624$  lunar years of 355 days.
- IX.  $1703 \times 354 = 602862 + 624 = 603486$  days in 1703 lunar years.

D.

- |                                |                                  |
|--------------------------------|----------------------------------|
| IX.                            | 603486 (1)                       |
| X. For the remaind. 8 (VI) add | 236 days.                        |
|                                | <hr style="width: 100%;"/>       |
|                                | To the sum total. O 603722 O (2) |
| XI. Add                        | <hr style="width: 100%;"/> 15    |
|                                | <hr style="width: 100%;"/>       |
|                                | To this sum, C 603737 C (3)      |
| XII. Add                       | <hr style="width: 100%;"/> 15    |
|                                | <hr style="width: 100%;"/>       |
|                                | The sum total. O 603752 O (4)    |

If,

If, for brevity's sake, we take the two last figures of the solar days, which are 46, and the two last of N°. (2) which are 22 O, and of N°. (3) which are 37 C, and of N°. (4) which are 52 O, and then compare them together, we shall soon perceive, that the two first sums of the lunar computation are less than the solar, whilst the

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last is greater. Subtract then 22 O, from 46 and the remainder will give the integral distance of the primitive full Moon evening from the autumnal æquinox, which by the table, and by a backward computation from the *Mosaic* datum 11, has been prædetermined to be 24 days, and

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so it is; for  $46 - 22 = 24$ . Q. E. D.

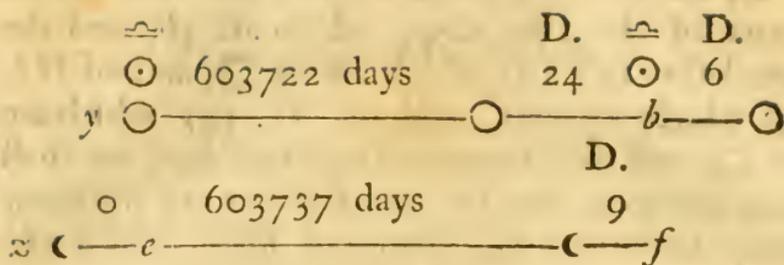
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Again,  $46 - 37 = 9$ , Q. E. D. Lastly, 52

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$-46 = 60$ , which is the feat of *chag haasiph*; and it fell A. M. 1654, on the 6th day of the first month of the solar tropical year, as in the table.

Now we are able to express the measures of the 2 strait lines,  $y$  and  $z$ , and of their several distinct parts, with an astronomical and mathematical exactness, as in this scheme.



○ As to the days of the week, it has been already prædetermined by a backward computation from the new Moon evening, (in the end of the year of the flood) which was the 7th day of the week, or our *Saturday*, that the full Moon evening, nearest to the autumnal æquinox, A. M. 1653 ending, fell on the 5th day of the week, or on our *Thursday*, and the new Moon evening next following, on the 6th, or our *Friday*; and consequently, the original festival *chag haasiph*, which was the 15th day from thence, must be the 7th. If these prædeterminations are true, then if N°. (2) be divided by 7, the remainder must necessarily be 0; and, if N°. (3) be divided by 7, the remainder will be 1; lastly, if N°. (4) be divided by 7, the remainder will be 2. I say farther, that if these several sums of collected days being severally divided by 7, do give these remainders, 0. 1. 2. then these prædeterminations and calculations will never be convicted of error. Let us try.

$$\begin{array}{r}
 7) 603722 \quad (86246 \\
 \underline{41342} \\
 \text{o. } \mathcal{Q}. \text{ E. P.}
 \end{array}$$

$$\begin{array}{r}
 7) 603737 \quad (86248 \\
 \underline{41356} \\
 \text{1. } \mathcal{Q}. \text{ E. P.}
 \end{array}$$

$$\begin{array}{r}
 7) 603752 \quad (86250 \\
 \underline{4135} \\
 \text{2. } \mathcal{Q}. \text{ E. P.}
 \end{array}$$

Having calculated and adjusted the nearest distances of the primitive full Moon and new Moon evenings from the autumnal æquinox in the end of A. M. 1653, together with the respective days of the week, and the feat of the original festival *chag haasiph*, we must now determine the corresponding days of the month, first in the primitive astronomical calendar, whose 12th month was of 35 days; and secondly in the *Julian*, considered under a twofold view: 1st, As rendered for ever commensurate to the tropical solar, which excludes the *civil præcession* of the æquinoxes, and the lunar anticipation: And 2dly, as used by us, under the quantity of 365 d. 6 h. which includes and carries along with it both.

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The first enquiry will be very short; for as the 12th month is of 35 days, the epacts being known, the corresponding days of the month are known by simple subtraction, *viz.*  $35 - 24 = 110$ . And  $35 - 9 = 26\text{C}$ .

But they may be also fixed by an easy arithmetical calculus in this manner. To the two last figures 22, N<sup>o</sup>. (2) add 35, and from the sum 57, subtract the two last figures in the collected sum of solar days, *viz.* 46, remains 110, or thus,  $35 - 15 = 20$ . Then 37, N<sup>o</sup>. (3)  $+ 20 = 57 - 46 = 110$  as before. Again, 52, N<sup>o</sup>. (4)  $+ 20 = 72 - 46 = 26\text{C}$ . Q. E. P.

But in order to make an immediate transition to the corresponding month and days of the *Julian* calendar, rendered for ever commensurate in the solar and lunar table, p. 351, 353, to the primitive tropical solar, we need only subtract 10 from the calculated days. *E. g.*  $110 - 10 = \text{October } 10$ . And  $26\text{C} - 10 = \text{October } 16\text{C}$ . And we cannot be at a loss to understand the reason of this; for if we look into the calendar at the end of this book, we may perceive in the close of it, that the number 35 stands over against *October* 25, but

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$35 - 25 = 10$ , and *vice versa*,  $35 - 10 = \text{October}$

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25.

In order to find out the original *Julian* stations of the Sun and Moon at the creation from my table,

table,

table, p. 351, look for the chaotic epact 15, index 5, column 2, and set down the numbers of column 2, 3, and 4, which are these, index 5, <sup>(2)</sup> 15. <sup>(3)</sup> 19. <sup>(4)</sup> 10. Now then to the middle number 19, add 31, the sum 50, in the table of reduction, will stand over against *October* 10 ☾. *October* 10 then, is the original *Julian* station of the Moon, and the integral epact 15 expresses its distance from the autumnal æquinox. But *October* 10 ☾

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+ 15 = *October* 25. Look for index 20, and set down the numbers of column 2, 3, and 4. index 20 : <sup>(2)</sup> 0. <sup>(3)</sup> 4. <sup>(4)</sup> 25. To the middle number add 31, and the sum 35 will be found over against *October* 25, which was the original *Julian* station of the Sun at the autumnal æquinox, the cypher column 2, denotes its no departure from it ; nor will there ever be a departure from it to the end of time.

So then, whenever we adjust the epacts to the primitive calendar, we must look for them in column (5) and the corresponding days of the month will be over against them in column (4). In like manner, when we adjust the epacts to the *astronomico-julian* calendar, we must look for them in column (2) and the corresponding days of the *Julian* month will be over against them in column (4) at ten days distance from the former. *E. g.* table

I. p. 351, index 24. <sup>(4)</sup> 11 <sup>(5)</sup> 0 24. And table II.

p. 353, index 9.  $26^{(4)} 9^{(5)}$ . But  $110 - 10 = \text{October } 10$ . We have here an immediate transition to the *Julian* calendar. Now look for index 14,

and we have,  $24^{(2)} 28^{(3)}$ .  $10^{(4)} 14$ , here the epact is in the 2d column, and the day of the month still in the 4th, at the distance of ten days, by an

invariable law. Again, index  $29 : 9^{(2)} 13^{(3)} 16^{(4)}$ . But farther, as the numbers of column 4, 5, being added together, are ever equal to 35; so the numbers of column 2, and of column 4, being added, are ever equal to 25. And as the two former are astronomical indices to each other reciprocally, throughout all ages of the world; so also are the two latter, which merits observation.

Having settled the original *Julian* stations of the Sun and Moon, the *Julian* month and days may be known by the same easy arithmetical calculus, as the other. *E. g.*  $22, N^{\circ} (2) + 25 = 47 - 46 = \text{October } 10$ ; or thus,  $37 N^{\circ} (3) + 10 = 47 - 46 = \text{October } 10$ . Again,  $52 + 10 = 62 - 46 = \text{October } 16$ . *Q. E. P.*

Having determined the stations of the primitive full Moon and new Moon evenings, in the months of the *Julian* calendar, as agreeing in quantity with the patriarchal solar tropical year; I shall now consider it as including and carrying along with it the civil præcession of the æquinoxes, and the lunar anticipation; and the present enquiry may be proposed in this form; *viz.* Suppose some one astronomer, should make a calculation backwards

wards 4103 years from the autumnal æquinox, A. D. 1749, this backward computation would terminate in the head or beginning of the year of *Noah's* life 598, A. M. 1654. Then, quæry, in what month and day of the month *Julian* would he calculate the day after the conjunction, and the day after the opposition, nearest to the autumnal æquinox; which is the same as asking, how many days the Sun would have departed from *October* 25, and the Moon from *October* 10. ☾. And since, if 1653 be divided by 19, the quotient will give 87 decennial cycles, and the remainder 0; consequently 1653 years will be a proper interval, by which we may estimate the quantity of the lunar anticipation.

First then, the quantity of the *Julian* excess may be readily known from these few easy steps,

$$1653 \times 11 = 18183 \div 360 = 50 \div 4 = 12 \text{ days.}$$

Now then  $024 + 12 = 36 - 30 = 6$ . Look for index 26, table I. p. 351, and set down the numbers as directed above. Index 26. <sup>(2)</sup> 6. <sup>(3)</sup> 10.

<sup>(4)</sup> 19. <sup>(3)</sup> 10. to 10, add 61, and the sum 71 will be found in the table of reduction over against *September* 19. But *September* 19. ☉, as well as *October* 1. ☉, is 24 days distant from the æquinox;



for *October* 25 — 12 = 13, + *September* 30 = 43 — 19 = ☉ 24.

Again,  $\text{C } 9 + 12 = 21$ . Look for index 11, table II. p. 353, and set down the numbers as before, index 11:  $21$ .  $25$ .  $4$ .  $\text{C}$ . To  $25$  add  $31$ , the sum  $56$  will be found in the table of reduction over against *October 4. C*. But *October 4. C*. is at the same distance from the autumnal æquinox, as *October 16. C*. for  $25 - 12 = 13$ . And  $13 - 4 = \text{C } 9$ .

Here I must not omit to remark, that in the first *Julian* reduction the full Moon evening fell on *October 1. O*, but in this last on *September 19. O*; whilst both of them are at equal distances from the æquinox. But if to *October 1* we add the new Moon epact  $9$ , the calculation will terminate in *October 10. C*. which was the Moon's original *Julian* station. On the contrary, if to *September 19. O*, we add the same new Moon epact  $9$ , the calculation will terminate in *September 28* at  $12$  days distance from it. Therefore  $12$  is the quantity of the civil præcession in complete days, rejecting the odd hours and minutes; and *October 10. C* — *October 4. C* =  $6$  is the quantity of the lunar anticipation in 1653 years, completing the odd hours and minutes into a day.

Thus I have in some measure shewed the use and application, and illustrated by example, the threefold property of my astronomical table, constructed from the inverted position of the Sun and Moon, in the beginning and conclusion of the antediluvian world.

My 5th Prop. asserts, that the several characters, by which any given Scripture year is distinguished from another, are (1) the day of the month, (2) the day of the week, (3) the cardinal point of the day, in which the Sun crosses the *Mosaic* cardinal point of the Heavens. The 3d and last of these is the only point which remains to be spoke to; excepting the meridian of the garden of *Eden*, which will neither be established nor overthrown by a single calculation.

The 3d particular, which I am now to speak to, depends upon these few principles. (1) All these computations are dated from the autumnal æquinoctial day at noon. (2) The days of the lunar year begin and end invariably at 6 o'clock in the evening, or the time of Sun-setting at the æquinox. Consequently (3) the days of the solar year and the days of the lunar year are never coincident, but when the Sun enters libra at its setting, which it constantly does in the end of every 1st, or the beginning of every 2d year, in the series of quadriennial revolutions, but not in a fixed meridian.

To give the reader a clear view of this, we will here set down again the 4 æquinoctial quadrants, together with their corresponding cardinal points and their appendant indices, as in the following table.

The Solar } Indices of the cardinal  
 Lunar } points of the day.

$\overset{\sim}{\circ}$					
$\circ$					
4	—	1	—	2	—
3	—	0	—	1	—
3	—	2	—	3	—
Noon.	Sun-setting.	M.N.	Sun-rising.	Noon.	

We may perceive from this table of indices, that on the 4th of the Hexaëmeron, the 1st day of the solar year anticipated the beginning of the 1st day of the lunar year by one whole quadrant; the solar index being 4, and the lunar index 3. In the end of A. M. 1, they were coincident, and there the lunar index is 0, the note of coincidence; I need not mention any more particulars.

Now then, in order to determine the cardinal point of the day of the Sun's entry into Libra, divide the given number of years by 4 (having first subtracted 1) and the remainder will be the index of it. *E. g.*  $1653 - 1 = 1652 \div 4$ , remains 0, which corresponds with Sun-setting; therefore in the end of A. M. 1653, the Sun entered Libra at 6 o'clock in the evening; and at that point of time the solar year and the solar day began together in a corresponding meridian.

I will now collect together and enumerate all the particulars, which have been hitherto stated and explained in the precedent calculations; that the reader may have an entire view and a clear

con-

conception what kind of astronomy may be discovered, by a diligent and attentive perusal of the antient sacred records, according to the *Hebrew* text.

I say then, that towards the end of the year of *Noah's* life 597, A. M. 1653, (1) the primitive full Moon evening fell on the 11th day of the 12th month of the solar tropical year. (2) At the distance of 24 entire days from the autumnal æquinox. (3) On the 5th day of the week, or our *Thursday*. (4) The primitive new Moon evening fell on the 26th day of the 12th month of the solar tropical year. (5) At the distance of 9 entire days from the æquinox. (6) On the 6th day of the week, or our *Friday*. (7) In the beginning of the year of *Noah's* life 598, which runs parallel with the solar tropical year of the world 1654, the Sun crossed the *Mosaic* cardinal, or autumnal æquinoctial point, (7) On the 25th day from the primitive full Moon evening. (8) On the 10th day from the primitive new Moon evening. (9) On the 2d day of the week, or our *Monday*. (10) Cardinal point of the day of the Sun's transit, in the ruling meridian of the year, Sun-setting. (11) The *civil* præcession of the æquinoxes, in the space of 1653 years, 0. (12) The lunar anticipation, in the same interval, 0.

Submitting these conclusions to the examination of the astronomers, I proceed to the reduction of 5756 years to days; but as I proceed by the same rules, with only one addition, this work will be  
short-

shortened, as I have nothing more to do, than to make a calculation in the same form and method.

The arithmetical operation. II.

I.  $5756 \text{ years} \div 30 = 191$ , remainder 26, which reserve.

II. The quotient  $191 \times 371 = 70861$ .

III. The remainder,  $26 \times 12 = 312 + 9$  (for the remainder 26)  $= 321$ .

IV.  $5756 \div 630 = 9$ .

V.  $70861 + 321 + 9 = 71191$ , astronomical measures of 30 and 29 days.

VI.  $71191 \div 12 = 5932$  moveable lunar years, remains 7 astronomical measures.

VII.  $5932 \text{ lunar years} \div 30 = 197$ , remains 22.

VIII.  $197 \times 11 = 2167 + 8$  (for the remainder 22 (VII))  $= 2175$ .

IX. Because A. M. 5756 follows after A. M. 3300 add 1, which makes 2176 lunar years of 355 days. D.

X.  $5932 \text{ lunar years} \times 354 = 2099928 + 2176 = 2102104$  D.

XI. To the collected sum  $2102104$  (1)  
Add for 7 astronom. meas.  $207$

The sum total.  $\bigcirc \overline{2102311} \bigcirc$  (2)

XII. Add  $\text{---}$   $15$

The sum total.  $\text{C} \overline{2102326} \text{C}$  (3)

XIII. Add  $\text{---}$   $15$

$\bigcirc \overline{2102341} \bigcirc$  (4)

As

As I am only directed by the *Hebrew* text to a reduction in general, but am left to find out the rules as well as I can, I have not troubled the reader with a particular explication of my rules, being chiefly solicitous about the truth and exactness of the conclusions; and scruple not to say in the words of *Horace*—

—*Si quid novisti rectius istis,  
Candidus imperti ; si non, his utere mecum.*

Having completed the reduction, in order to determine the primitive full Moon and new Moon integral epacts, we must proceed, as before, by the plain easy rules of common arithmetic, first throwing off the similar figures from the respective sums of the collected days. *E. g.*

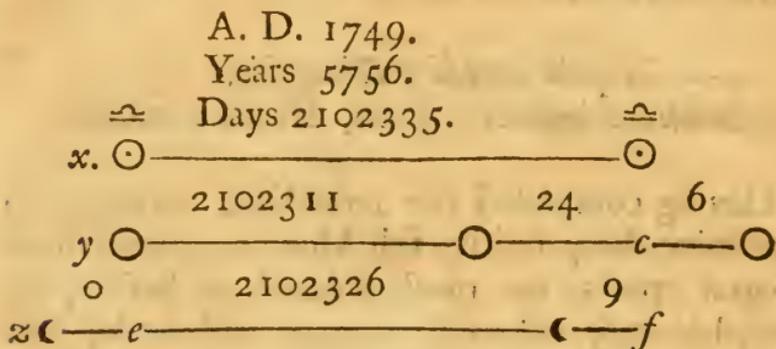
(1)  $35 - 11 \text{ N}^\circ$ . (2)  $= \text{O} 24$ . Here the epact 24 includes the first solar quadrant of the æquinoctial day, which measures from noon to Sun-setting. For the cardinal point of the day of the Sun's transit is, in this case, noon; and may be known by subtracting 1 from 5756, and dividing 5745 by 4, the remainder 3 will be the index of the quadrant; and from Sun-setting to noon there are 3 quadrants.

(2)  $35 - 26 \text{ N}^\circ$ . (3)  $= \text{C} 9$ . The primitive new moon epact.

(3)

(3) 41 N°. (4)  $-35 = \odot 6$ . The feat of the original festival *ckag haafiph*.

(4) By these calculations the exact measures of the 3 strait lines  $x$ ,  $y$ ,  $z$ , and of the several parts of  $y$  and  $z$ , will stand expressed thus.



(5) As to the respective days of the week, it has been prædetermined by a backward computation from *September 6*, (which was calculated to be the 5th or our *Thursday*) that the full Moon evening fell on the 6th; the new Moon evening on the 7th; and consequently the 15th day from thence, or the festival day, must have been the first. Now I say, if these prædeterminations are true, then divide N°. (2) by 7, the remainder will be 1, because  $6 - 5 = 1$ . if N°. (3) be divided by 7, the remainder will be 2, because  $7 - 5 = 2$ . Lastly, if N°. (4) be divided by 7, the remainder will be 3, because  $3 + 5 = 8 - 7 = 1$ . and *vice versâ*;  $1 + 7 = 8 - 5 = 3$ . E. g.

$$7) \begin{array}{r} 2102311 \\ 00221 \\ \hline \end{array} (300330$$

1. Q. E. P.

$$7) \begin{array}{r} 2102326 \\ 002214 \\ \hline \end{array} (300332$$

2. Q. E. P.

$$7) \begin{array}{r} 2102341 \\ 002238 \\ \hline \end{array} (300334$$

3. Q. E. P.

(6) The rules for ascertaining the corresponding days of the month both in the patriarchal calendar, and in the *Julian*, considered under a two-fold view, are so extremely easy, as to require no explication; *E. g.*  $35 - 24 = 11 \text{ O} - 10 = \text{October } 1. \text{ O}.$

$$(7) 35 - 9 = 26 \text{ O} - 10 = \text{October } 16 \text{ O}.$$

$$(8) 11 + 35 = 46 - 35 = 11 \text{ O}, \text{ or thus, } 35 - 15 = 20, \text{ and, } 26 + 20 = 46 - 35 = 11 \text{ O}.$$

$$(9) 41 + 20 = 61 - 35 = 26 \text{ C. Vide tab. p. 351.}$$

$$(10) 11 + 25 = 36 - 35 = \text{October } 1 \text{ O}.$$

$$(11) 26 + 10 = 36 - 35 = \text{October } 1 \text{ O}.$$

$$(12) 41 + \text{October } 10 = 51 - 35 = \text{October } 16 \text{ C}.$$

*Vide table p. 353, index 29.*

(13) The *Julian* excess in 5756 years, 44. Then  $44 - 30 = 14$ , and  $\text{O}24 + 14 = 38 - \text{Aug}.$

$31=7$ . Look for index 7, and column 2, 3, 4, where are these numbers, 7. 11.  $::$  18. To the middle number 11, add 92, and the sum 103 in the table of reduction will stand over against *August* 18. But *August* 18 is 24 days before the æquinox; for *September*  $11+31=42$ —*August*  $18=0$ 24. I look into an almanac for A. D. 1749, where I find it thus set down.

Full Moon the 16th day at 12 at night.

But this being past six o'clock, it must be reckoned *August* 17, therefore *August* 18 is the day after the opposition.

The calendar letter is *f*, and the dominical letter *A*, therefore it was the 6th day of the week.

(14)  $44-30=14$ . Then  $14+9=23$ . Look for index 3 in table II. p. 353, where are these numbers, 23. 27.  $::$  2. C. To the middle number 27, add 61, and the sum 88 in the table of reduction will stand over against *September* 2. But *September*  $11-2=C$  9.

I look into an almanac for A. D. 1749, and I find it set down thus, new Moon the 31st day of *August* at 8 at night.

But because it was past 6 o'clock, therefore in the primitive account it must be reckoned *September* 1, and consequently *September* 2, is the day after the conjunction.

The calendar letter for *September* 2, is *g*, the dominical letter *A*, and therefore it was the 7th day of the week.

(15)  $44 - 30 = 14$ . Then  $24 + 14 = 38 - 30 = 8$ . Look into table I. p. 251, for the index

18, where are these numbers,  $\overset{(2)}{8}$ .  $\overset{(3)}{12}$ .  $\overset{(4)}{::}$  17. O.

To the middle number 12, add 61, and the sum 73 will be found in the table of reduction over against *September 17*. Now says *Moses, Levit. ch. xxiii. ver. 39.* on the 15th day of the 7th month, when ye have gathered in the fruit of the land, ye shall keep a feast unto the Lord. But *September 17—September 2*,  $\ominus = 15$ , and *Septem-*



*ber 17—September 11 = 6.*

The calendar Letter of *September 17* is *A*, which is dominical.

I will now enumerate all these characters, and lay them before the reader in one entire view.

In the end of A. D. 1749, A. M. 5756, the primitive full Moon evening fell, (1) On the 11th day of the 12th month in the patriarchal calendar.

(2) At the distance of 24 days before the æquinox. (3) On the 6th day of the week. (4)

The primitive new Moon fell on the 26th day of the 12th month of the patriarchal calendar. (5)

At the distance of 9 days before the æquinox. (6) On the 7th day of the week. (7) In the begin-

ning of A. D. 1750, A. M. 5757, the Sun crossed the *Mosaic* cardinal, or autumnal æqui-

noctial point, on the 24th day from the primitive full Moon evening. (8) On the 9th day from

the primitive new Moon evening. (9) On the

2d day of the week. (10) Cardinal point of the day, noon; with respect, I mean, to that meridian, in which the solar year and the solar day began together; beginning the computation from noon. (11) The civil præcession of the æquinox, in the space of 5756 solar tropical revolutions=0. (12) The lunar anticipation in the same space of time=0.

Here I shall rest at present; and must now submit it to the judgment and determination of the reader, whether, in these calculations, I have included or not the whole contents of my several propositions, excepting the certainty of the first meridian, which will require some time and pains to adjust. But the more immediate points to be examined into and considered are, (1) Whether as a Scripture chronologist, I have made it appear, in a satisfactory manner (however new and unexpected the proofs may be thought) that *Moses* measures by the true solar year, and computes by the months and days of the lunar? (2) Whether the *Hebrew* chronology of the antediluvian world (to which period I confine my present enquiries) is undeniably ascertained in a method *a priori*, by data which are true in nature? By solar, lunar and hebdomatic characters, which exactly correspond with the *Hebrew* computation, and not possibly with any other? (3) Whether the ages of the patriarchs at the birth of their recorded sons, according to the *Hebrew* verity, constitute an uninterrupted successive chronology, and astronomically ascertain the true extent of the world's past  
du-

duration? (4) Lastly, whether it must be implicitly admitted, as a late great and eminent author has taken the freedom to postulate (Letter III. of sacred history, p. 102) “*That he who expects to find a system of chronology, or sufficient materials for it, in the Pentateuch, and the other Books of the Old Testament, expects to find what the authors of these books never intended?*” I shall venture to add, (5) If my 9th proposition is allowed to be established, then it follows, by sure and certain consequence, that the purity of the original *Hebrew* text has been conveyed to us and preserved entire, “*by a perpetual standing miracle.*” Since in the space of somewhat more than 3200 years from the death of *Moses* to the present times, amidst an indefinite variety of transcripts, not one error has crept in, to give any the least disturbance to its chronological series of years, from the creation to the burning of *Solomon’s* temple, where *Ptolomy’s* canon comes in as an auxiliary, and by its uncontested authority, completes the interval. Now the excess or defect of a single year, arising from the mistake of a single numeral, must have occasioned a dislocation of the parts, and consequently, an interruption in the astronomy. But there is no interruption in the astronomy, and therefore no chasm in the chronology, and no error in the *Hebrew* numerals, which constitute the Scripture scheme. On the contrary, let some one try to apply this argument either to the *Greek* translation, or to the *Samaritan Pentateuch*, he will soon become sensible of the dif-

difference between the authenticity of the former and of the latter.

Letter III. of sacred history, p. 94. It has been said by *Abbadie*, and others, “ *That the accidents which have happened to alter the texts of the Bible, and to disfigure, if I may so say, the Scriptures in many respects, could not have been prevented without a perpetual standing miracle, and that a perpetual standing miracle is not in the order of providence.*”

“ Now I can by no means subscribe to this  
 “ opinion. It seems *evident to my reason* that the  
 “ *contrary* must be *true* ; if we suppose that God  
 “ acts towards men according to the moral fitness  
 “ of things ; and if we suppose that God acts ar-  
 “ bitrarily, we can form no opinion at all. I  
 “ think these *accidents would not have happened,*  
 “ or that the *Scriptures would have been preserved*  
 “ *entirely* in their *genuine purity*, if they had been  
 “ entirely dictated by the holy Ghost : and the  
 “ proof of this probable supposition, according  
 “ to our clearest and most distinct ideas of wis-  
 “ dom and moral fitness, is obvious and easy.”

I heartily join issue with this fine theological remark ; and, with no small pleasure observe, that this reply to *Abbadie* and others, is penned with the true spirit of a zealous and discerning Scripturist. It is animated with a sentiment which plainly informs us, that the acute and penetrating author (though strongly biased with an unbecoming prejudice) had exactly weighed and maturely considered the necessary result, the uniform truth and providential incorruptibility

ruptibility of a book, which was entirely dictated, influenced and directed by the infallible spirit of God. And I wish I was qualified to transmit *so just and well grounded a sentiment of revelation* down to the latest times.

To draw to a conclusion; there are many excellent and useful, though, alas, latent truths, in the *Hebrew* Scriptures; a clear evolution and full explication of which cannot fail of giving a proportionable satisfaction to every Christian reader. Even the stiff-necked and obdurate *Tyndalists*, who have eyes and see not; who have ears and hear not; whose hearts are waxed gross, and understandings darkened, will find themselves compelled to acknowledge thus much at least; that the priest of *Midian's* son-in-law, the *Ægyptian* fugitive, was, in troth, a notable clever fellow, and learned in all the wisdom of the *Egyptians*.

Upon an attentive perusal and the closest examination of this most antient record, this venerable code, it would be injurious to it not to say, if *Sanconiatho's Phœnician* annals, translated into *Greek* by *Philo Biblius*; if the *Egyptian* dynasties of *Manetho* the *Sebennyte*; if the *Chaldean* dynasties of *Berosus*, a priest of *Belus*; if the *Laterculus* of *Eratostenes*; if the *Septuagint version*, the *Samaritan Pentateuch* and *Josephus*; if the accounts of *Herodotus* the most antient *Greek* historian, of *Diodorus Siculus*, and of *Strabo*; if *Ptolemy's* canon of kings; if *Georgius* the Monk, and the collections of *Julius Africanus* and *Eusebius*; if the most studied at-

tempts

tempts and labours of the moderns, can offer any scheme or plan of chronology, which may stand in competition with the antediluvian and postdiluvian genealogies, then doubtless these *Mosaic* both solar and lunar tables, cannot be justly placed at the head of things, nor, like an universal monarch, claim a prerogative supreme.

Pursuits after astronomical improvements have been for some time neglected, checked, and, I had almost said, entirely superseded by the sole influence and authority of Sir *Isaac Newton*; who was professedly, in scientific speculations, so eminent a genius, so profound an adept, that *Moses*, the writer of the *Pentateuch*, can alone upon Earth, with respect to praxis, be entitled to a superiority, and challenge the right hand of præeminence. And methinks I see the *Jewish* legislator, *Ish Elohim*, seated on his glorious throne, and beaming, from his shining countenance the impressed rays of divinity, with this motto inscribed over his head,

MAGNA EST VERITAS, ET PRÆVALEBIT.

Hail! *Amram's* son! astronomer divine,  
 Offspring of *Jacob's* loins, of *Levi's* priestly line;  
 What heavenly treasures does this world below,  
 To *flags*, and the *Nilotic papyre*, owe!  
*Moshe!* extracted from the flood of *Nile*,  
 Inspired *Moshe!* born to bless our isle.  
 Born to instruct a philosophic age,  
 Give knowlege to the learn'd, and wisdom to the sage.  
 To *thee* shall sons of art and science flow,  
 To *thee* shall cultivated nations bow;  
 Thy *Pentateuch* all farther progress bars,  
 This the enlightening Sun, and arts the twinkling stars.

P O S T-



## P O S T S C R I P T.

UPON a review of the whole, I am sensible of some mistakes, which are of a different nature from those that are inserted in the table of errata ; and I think it incumbent upon me to take notice of two.

First, p. 19. in the bottom paragraph, instead of — *between the poles and the polar circles* — it should have been wrote, *at the poles* ; for what I there say concerning the six-month day, and the six-month night, is strictly true only at those points.

Secondly, p. 251, I enter upon the explication of prop. 8. and there, instead of the 969 years of *Methusalah*, I have substituted the age of *Enoch*, who lived just as many years as there are days in a solar year. These 365 years of *Enoch's* life, I have mistakenly called the square of a solar revolution, and have repeated it in the reduction. But there is no occasion to regret an emendation of this form of expression, since, instead of weakning, it strengthens and enlarges my argument ; for, upon reconsidering the *Mosaic* table of genealogies, I now find myself able to ascertain the true measure of the Sun's year, from the

age of *Adam*, or of any one of the Patriarch's indifferently, throughout the table, which did not occur to me at first : And I now perceive by my own experience, that long secreted and unsuspected truths open and discover themselves by degrees.

Before I draw up and publish any more propositions for the subject of another book, I shall wait to see what material objections may be urged against what I have advanced and endeavoured to establish in this first part of my undertaking. I am far from being puffed up with a conceit that I have done due justice to the important subject, in my method of treating it ; on the contrary, I am humble enough to rank myself amongst the number of those who would be extremely well pleased to see a satisfactory solution of the following queries, from any one who has taken some pains, in the usual methods, to acquaint himself with the solar system.

First, For what particular ends and purposes, with respect to us the inhabitants of the earth, has the great Creator (all the operations of whose hands are directed by infinite wisdom, which is gloriously displayed in the establishment of final causes) ordained a solar tropical year to consist of one fourth part of a day, over and above 365 ?

Secondly, How much less than one fourth part of a day exactly ? and likewise,

Thirdly, For what particular ends and purposes, with respect to us ?

Fourthly,

Fourthly, By what settled and determinate rules may the separate quadrant be annually computed, as well as annually measured, and still the day, in civil reckoning, shall ever have an immutable epoch?

Fifthly, By what law of computation may we avoid the numeral denomination of a 13th month in the lunar year, which the *Jews* call *Embolimæan*, and in the altered year, *Ve-Adar*?

Sixthly, Should it be alledged that, in the lunar computation, I have not observed the exactness of minutes and seconds, I would, in my answer, propose it as a nice and just matter of enquiry, whether the author of the system did not originally intend the cardinal points of the day for the perfect terminations of the astronomical calculus, which an adherence to minutes and seconds can never attain to?

Lastly, Should any one be desirous to know by what authority, and by the direction of what law, I have placed two separate and two intersecting circles, in the front of the patriarchal table; my answer in general is this: I was directed to this scheme, by contemplating the circumstances, characters, and appendent proportions, of the *created position* of the Moon to the Sun; and to evince the reality of this, and its true foundation in the primary constitution of nature, I here lay before the reader,

*A TABLE of the astronomical and proportional divisions of the patriarchal 30-day month, which includes the Mosaic Tekupha, or autumnal cardinal point.*

	1	2	3	4	5	6	7	8	9
			x				☾		
1	○	15	☾			15	☉		
2	○	14	x	1	☾	14	☾	1	○
3	○	13	x	2	☾	13	☾	2	○
4	○	12	x	3	☾	12	☾	3	○
5	○	11	x	4	☾	11	☾	4	○
6	○	10	x	5	☾	10	☾	5	○
7	○	9	x	6	☾	9	☾	6	○
8	○	8	x	7	☾	8	☾	7	○
9	○	7	x	8	☾	7	☾	8	○
10	○	6	x	9	☾	6	☾	9	○
11	○	5	x	10	☾	5	☾	10	○
12	○	4	x	11	☾	4	☾	11	○
13	○	3	x	12	☾	3	☾	12	○
14	○	2	x	13	☾	2	☾	13	○
15	○	1	x	14	☾	1	☾	14	○
			x				☾		
I	☾	15	○			15	☉		

If we compare the first parallel line of this table with the last, we shall find that the positions of the luminaries are inverted, and that the new Moons and full Moons have changed their places in such a manner, as to be situated in each other's centers, as, by inspection appears. Thus they were situated in the beginning, and in the end of the old world; and here we have a semiperiod of these proportional variations from the original centers: Therefore, in order to its completion, we must make the last position the first parallel line of another table.

	1	2	3	4	5	6	7	8	9
1	☾	15	☉			15	☽		
2	☾	14	x	1	☉	14	☽	1	☾
3	☾	13	x	2	☉	13	☽	2	☾
4	☾	12	x	3	☉	12	☽	3	☾
5	☾	11	x	4	☉	11	☽	4	☾
6	☾	10	x	5	☉	10	☽	5	☾
7	☾	9	x	6	☉	9	☽	6	☾
8	☾	8	x	7	☉	8	☽	7	☾
9	☾	7	x	8	☉	7	☽	8	☾
10	☾	6	x	9	☉	6	☽	9	☾
11	☾	5	x	10	☉	5	☽	10	☾
12	☾	4	x	11	☉	4	☽	11	☾
13	☾	3	x	14	☉	3	☽	12	☾
14	☾	2	x	13	☉	2	☽	13	☾
15	☾	1	x	14	☉	1	☽	14	☾
			x				☽		
	☉	15	☾			15	☽		

The same table without the symbols of the full Moons  $\bigcirc$ , new Moons  $\text{C}$ ,  $x$ , and  $\sphericalangle$

1		0	15	0	15
2		14	1	14	1
3		13	2	13	2
4		12	3	12	3
5		11	4	11	4
6		10	5	10	5
7		9	6	9	6
8		8	7	8	7
9		7	8	7	8
10		6	9	6	9
11		5	10	5	10
12		4	11	4	11
13		3	12	3	12
14		2	13	2	13
15		1	14	1	14
1		0	15	0	15

These may be justly reckoned valuable, because they will approve themselves, in the praxis, to be very useful, tables ; for they express, with the integral exactness, the whole variety of the epacts both full Moon and new Moon, which come immediately **before** the æquinox, through the successions of **ages**.

Now,

Now, I say, that whilst our astronomers continue to calculate conjunctions, dichotomies, and oppositions, they will never be able to discern these divisions of the thirty-day month ; much less will they be able to ascertain these proportional variations of the primitive full Moons and new Moons from their created centers, and returns to them, in determinate times ; with which remark I shall conclude this first book.

*F I N I S.*





*A Table of the most material Errata. For two other  
Corrections, vide Postscript.*

- P**AGE 69. l.26. for, polar—revolution, read,  
polar revolution, without a separating line.
- P.70. l.17. for, Beshanim, read, Veshanim.
- P.84. l.10. for, September 8+October 31, read,  
November 8+October 31.
- P.87. l.8. dele, which.
- P.90. l.5. at intelligible, place a coma for the period;  
and for, now, read, nor.
- P.105. l.24. for, 59 h. 8 m. read, 59' 8".
- P.112. l.1. for, 9+30, read,  $9 \times 30 = 270$ .
- P.163. l.10. after 360, add the word, days.
- P.188. l.10. for, ben somo, read, ben jomo.
- P.199. l.21. for, the 15th day after the 16th of *Nisan*,  
read, the 50th day.
- P.213. l.9. for, Mogdanim, read, Mognadim.
- P.368. l.16. the references should be 351, 353.
- P.396. l.2. for, p. 351, read, p. 390.

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