TABLES OF SCRIPTURE MEASURES, WEIGHTS, AND COINS:

WITH AN APPENDIX.

CONTAINING THE METHOD OF CALCULATING ITS MEASURES OF SURFACE, HITHERTO WANTING IN TREATISES ON THIS SUBJECT

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A MEASURE is a known quantity applied to another of the same kind that is less known, to make its dimensions better known, by help of numbers expressing the proportion that the known quantity bears to the unknown. The dimensions to be measured are three: 1. *Mere length*, which hath but one dimension. 2. *Surface*, which consists of length multiplied into breadth; so it hath two dimensions, as it were interwoven; and this is always measured by some square surface already known, as by a square foot, or a square cubit, or any other square already known, by help of its side. *Moses* generally useth the square cubit. 3. *Solidity* or *Capacity*, which hath three dimensions multiplied into each other: length, breadth, and height, or depth. This is measured by a known cube. From solidity ariseth weight in all sublunary bodies; and by weight we measure the value of coins. Therefore I shall join weights and coins together in the fourth table.

I use = *to signify* Equals; :: *to express* Proportion; *, is called* Separatrix, *parting Decimals from Integers.*

I. TABLE. *Measures of Length.*

I express the Cubit, and its Parts, both by Inch Measure, *and by* Foot Measure; *which I deduce from Inches by this Proportion:*

	Inch. Meas.	Foot. Meas.
As 12. 1. :: 21.888		1.824
	Inch. Dec.	Foot. Dec.
A Cubit is = to	= 21.888	= 1.824
A Span the longer = $\frac{1}{2}$ a Cubit	= 10.944	= .912
Span the less = $\frac{1}{2}$ of a Cubit	= 7.296	= .608
A Hand's breadth = $\frac{1}{6}$ of a Cubit	= 3.664	= .304
A Finger's breadth = $\frac{1}{24}$ of a Cubit	= .912	= .076

Measures of many Cubits Length I express only in Foot Measure.

		Feet Dec.
A Fathom	= 4 Cubits	= 7.296
Ezekiel's Reed	= 6 Cubits	= 10.944
Schœnus, the Egyptian Line for Land Measure, which I think Scripture useth to divide Inheritances. *Psalm* xvi. 6. and lxxviii. 55. They used different Lengths, but the shortest and most useful was,	Cubits. = 80	= 145.92

Herodotus mentions a *Schœnus* just 300 times as long: I judge that all the greater were made in proportion to the least.

The Mile	= 4000 Cubits	= 7296 Feet.
Stadium, $\frac{1}{10}$ of their Mile	= 400 Cubits	= 729.6
Parasang, 3 of their Miles	= 12000 Cubits	= 4 *English* Miles, and 580 Feet.

II. TABLE. *Measures of Surface.*

Moses hath described these by square Cubits. I here express them reduced to our square Feet. The method of this reduction is taught in an Appendix. I first propose three clear examples given by *Moses*; Secondly, I place six instances of greater difficulty.

The clearest examples are,

I. The Altar of Incense. Only two sides of it, *viz.* Its length and breadth, are expressed by *Moses*; each of them is affirmed to be one Cubit. Yet he declares it was four square: whence we collect, that it was just one square Cubit. See *Exod.* xxx. 2. Now it is demonstrated in the Appendix, that one *Jewish* square Cubit amounts to in surface three *English* square Feet, and about 47 square Inches.

II. The Table of Shew-bread, *Exod.* xxv. 23. It is affirmed to be two Cubits in breadth, and one in breadth. None doubt but it was rectangular, containing two *Jewish* square Cubits. These come not to above six *English* square Feet, and above half, *viz.* 91 square Inches.

III. The Boards of the Tabernacle, each 10 Cubits in length, and one and a half in breadth, *Exod.* xxvi. 16. being rectangular, must contain 15 square Cubits, *Jewish*. These are proved to contain very near 50 square Feet of *English* Measure.

The more difficult cases reserved to the Appendix are,

I. The Mercy-seat, whose surface is = 12 square Feet and a half.

II. A general method is taught of reducing any given number of *Jewish* Cubits to *English* square Feet.

III. The example of the 15 square Cubits in the Boards of the Tabernacle is made clearer.

IV. The Court of the Tabernacle, described *Exod.* xxvii. 18. is found to be just half the *Egyptian Aroura*, and to contain 1 Rood, 21 Perches, 27 square Feet, &c.

V. The whole *Aroura* is determined, and reduced to our *English* Measures, 3 Roods, 2 Perches, 55 square Feet.

VI. The suburbs, or Glebe Land, given to each city of the *Levites*, *Numb.* xxxv. 3, 4, 5. is shewed to be a square, on each of the four sides of every city, containing a million of *Jewish* square Cubits, or 100 *Aroura*; which amount to in each Square 76 Acres, 1 Rood, 20 Perches, 90 square Feet. Whence we collect, that all the four Squares amounted to 305 Acres, 2 Roods, 1 Perch, besides 51 Feet square

III. TABLE. *Measures of Capacity.*

	Wine Gal.	Pints.	Inch Sol.
Ephi, or *Bath*	7	4	15
Chomer, *Homer* in our translation	75	5	7
Seah $\frac{1}{3}$ of *Ephi*	2	4	3
Hin $\frac{1}{6}$ of *Ephi*	1	2	1
Omer $\frac{1}{10}$ of *Ephi*	0	6	0.5
Cab $\frac{1}{18}$ of *Ephi*	0	3	10
Log $\frac{1}{72}$ of *Ephi*	0	$0\frac{1}{4}$	10
Metretes of *Syria* (*John* ii. 6.) = *Cong. Rom.*	0	$7\frac{1}{8}$	0
Cotyla, *Eastern*, $\frac{1}{100}$ of *Ephi*	0	$0\frac{1}{4}$	3

This *Cotyla* contains Just 10 Ounces *Avoirdupois* of Rain water: *Omer* 100: *Ephi* 1000: *Chomer* 10,000: So by these Weights all these Measures of Capacity may be expeditiously recovered very near exactness.

IV. TABLE. *Of Weights and Coins.*

The *Jewish* Weights are reduced to the Standard Grains of our *Troy* Weight; whereof 438 are equal in the *Roman* ounce, and to our ancient *English Avoirdupois* ounce.

The value of *Jewish* and *Roman* Weights and Coins, at the present rate of Silver and Gold, expressed in Pence and Decimals of a Penny.

	Grains. Dec.	Pence. Decim.	s.	d.	q.
Shekel is the original weight	= 219	= 28.2975	= 2	— 4	— 1
Bekah $\frac{1}{2}$ a *Shekel*	= 109.5	= 14.1437	= 1	— 2	— $\frac{1}{2}$ X
Gerah $\frac{1}{20}$ of *Bekah*	= 10.95	= 1.41437	= 0	— 1	— $\frac{1}{2}$ X
Maneh = 100 *Shekel* wt.	= 21900	Pence. Dec.	l.	s.	d.
Maneh in Coin = 60 Sh.	= 13140	= 1697.25	= 7	— 1	— 5
Talent of Silver = 3000 Sh.	= 657000	= 84862.5	= 353	— 11	— 10ob
Talent of Gold the same Weight			= 5075	— 15	— 7ob
The *Golden Darics*, *Ezra* ii. 69. seem to be Coins of *Darius* the *Mede*. They weighed 12 *Gerahs*.			l.	s.	d
			= 131.4	= 1	— 0 — 4

Roman Money *mentioned in the New Testament.*

	Pence.	Farthings.
Denarius, Silver,	7	3
Assis, Copper,	0	3
Assarium,	0	$1\frac{1}{2}$
Quadrans,	0	$\frac{3}{4}$
A mite,	0	$\frac{1}{2}$

An APPENDIX *to the Second Table of* Measures *of* Surface *described by Moses, shewing the Method of reducing them by Calculation to the Measures used in* England, *for the benefit of those that understand* Decimal Arithmetic, *and desire to try the Reductions given in the Table, or to make further Improvements in this kind of Measures.*

1. *The Mercy-seat.* I SHALL begin with Reduction of the Measures of the *Mercy-Seat*, which was God's Throne of Grace among the *Jews*. *Moses* in *Exod.* xxv. 17 affirms, that its length was two Cubits *Scot.* and a half, its breadth one Cubit and a half. The fractions adhering to its length and breadth make some difficulty to beginners in Arithmetic, which the Decimal way doth much obviate. Suppose therefore, what I have elsewhere proved, that the *Jewish* cubit was in Foot measure 1.824; the length must be expressed in Foot measure, and Decimals thereof, 4.560. The breadth in like measure will be 2.736. Wherefore the product of these numbers multiplied into each other gives its surface 12.47,616: in number of its square Feet, and Decimals thereof, 12 square Feet, and very near half a square Foot; if the Decimals had been .50, it had been just half a Foot. If we desire to express those Decimals of a Foot in square Inches, as is usual in *England*, we must multiply .47,616 by 144, the square Inches of a Foot, and the product will be 68.56,704; which shews that the Decimals we found amount to 68 square Inches, and about half an Inch more: we need not be nicer.

2. *A square Cubit reduced to our Measure.* 2. In the Altar of Incense *Moses* describes the *Jewish* square Cubit, which must be reduced to our Foot measure, thus, $\frac{1824}{1000}$. The product of these numbers multiplied will be the upper surface of this Altar, 3,326,976, that is, three square Feet, and .326,976 Decimals of a square Foot, which we may express by 47 square Inches, and a few Decimals of an Inch square inconsiderable.

3. *The Boards of the Tabernacle.* 3. *Moses*'s description of the boards of the Tabernacle, *Exod.* xxvi. 16, by 10 Cubits in length, and one and a half in breadth, naturally leads a man to discern in each board's surface 15 *Jewish* square Cubits; because if we conceive a line drawn from the end of one Cubit at the bottom of the Board to the end of one Cubit at the top of the Board, this must needs be 10 whole square Cubits an one side of that line, and 10 half square Cubits (=5 whole) on the other side of that line: here therefore are 15 square Cubits. The reduction of these into *English* square Feet is performed by multiplying 15, *viz.* the number of Cubits given into 3.326,976 the Feet and Decimals of one square Cubit, and the product will be 49.90,464, and that is very near to fifty square Feet; for those Decimals amount to above 130 square Inches; and little more than 13 square Inches would make it just 50 Feet, which abatement we need not here regard.

4. *The Court of the Tabernacle.* 4. Let us now go to the measure of the surface of land. But we will begin with the Court of the Tabernacle, the ground on which the Priests performed all the solemn public worship of *Israel* in *Moses*'s time. The Area of this Court is described by *Moses*, *Exod.* xxv. 18 by its length 100 Cubits, and its breadth every where 50 Cubits. Wherefore this Area must be in *Jewish* measure 5000 square Cubits, for that is the product of 100 multiplied into 50. To reduce these 5000 *Jewish* Cubits into *English* square Feet, I must multiply 5000 into 3.326,976, the product is 16,634.88 *English* square Feet.

But in cases of such long numbers of Feet we use for brevity's sake, and to help our memories, to reduce them into Perches, or Roods, or Acres, which contain known numbers of square Feet. A Perch contains 272 square Feet and 1-4. A Rood is = to 10,890 square Feet. An Acre is = to 43,560 square Feet. It is plain that the number 16,634.88 hath not integers equal to those of an Acre; but it hath enough to answer those in a Rood, and some overplus; therefore I must divide 16,634.88 by 10,890, which is a Rood. By such division continued in the Decimal way, until I have a fraction at five or six places, which is exact enough, I find the quote to be 1.527,537, which measures me that my number 16,634.88 hath but once entirely in it a whole Rood: but it hath moreover in it many Decimal parts of a Rood. These therefore I reduce to the Perches contained in them, by multiplying them into 40, which is the number of Perches that make up a Rood: and cutting off six places from the product, which is 21.101,469; so I find there are 21 Perches entire, and the figures after the Separatrix are Decimals of a Perch. These also I multiply by 272.25, which are the square Feet and Decimals of a Perch. The product of this last multiplication, after eight places cut off from it by the Separatrix, because there were six places of Decimals in one of the multipliers, and two in the other, is 27,62,793,000. Hence I learn that there are therein just 27 entire Feet, all the eight Decimal places amount to little above half a foot, and therefore I cast them away as inconsiderable in the measure of land. This method of reduction by multiplication of Decimals I find to be easier than the common way of reduction by division, and therefore I propose it to be used by beginners in this practice of surveying. So I find this court to contain in *English* measure 1 Rood, 21 Perches, 27 Feet, and little more than half a foot squared. But reflecting upon *Moses*'s measure by Cubits, and finding them to be precisely 5000 square Cubits, I observed that they were just half 10,000, which I find observed from *Herodotus's Euterpe* to be the Area of the *Egyptian Aroura* by which their land was as generally measured, as ours is by Acres and Roods. See *Herodot.* l. 2. c. 168. I called also to mind a passage in *Manetho* an *Egyptian* Priest, cited by *Josephus* in his first book against *Apion*, where he affirms, that *Manetho* in his history of the reign, wars, and expulsion, of the Pastors (whom *Africanus* affirms to be *Phœnicians*, or *Canaanites*, and *Josephus* vainly believed to be *Jews*) wrote out of the public Records of *Egypt*, that these Pastors made at *Avaris* a very large and strong encampment, that encompassed 10,000 *Aroura*, sufficient to contain 240,000 men, and long to maintain their cattle. Hence I happens, that not only the *Egyptians*, but the *Phœnicians* or *Canaanites* also, that had dwelt among them, and had reigned there during the time of six kings successively, used this measure of land called *Aroura*. Now this was long before *Moses*'s time; for the beginning of *Amosis* or *Tethmosis*, who expelled them out of *Egypt*, was very near the time of *Abraham*'s death, as appears by the annals of the learned Primate of *Ireland*. Wherefore I believe that *Moses*, who was skilled in all *Egyptian* learning, especially surveying, did of choice make the Court of the Tabernacle to be just half an *Aroura*, which was a known measure to him and his people, who had long dwelt in *Egypt*, and Divine Authority directed him so to do.

The Reduction of an Aroura to English measures. 5. Because we have shewn from *Herodotus*, that an *Aroura* is the square of 100 *Jewish* or *Egyptian* Cubits, and 100 such Cubits may in *English* feet measure be expressed by 182.4 *English* Feet, it follows, that the square of this number will express exactly the number of the *English* square Feet that are contained in an *Aroura*. Now by multiplication of 182.4 into itself, I find the product to be 33,269.76: Therefore I conclude that there are 33,269 square Feet entire, and .76 Decimals of a square Foot, in an *Aroura*. Next to reduce these *English* square Feet into Roods, Perches, and the remainder of square Feet, I use the method used in the last paragraph: First, I divide them by 10,890, the square Feet in a Rood, and the quote I find 3.055,074, that is 3 Roods, and .055,074 Decimals of a Rood. Secondly, I multiply those Decimals by 40, which is the number of Perches in a Rood, the product is 2.202,960. Hence I conclude there are therein two Perches, and .202,960 Decimals of a Perch. Thirdly, I multiply these last Decimals by 272.25, which are the square Feet of a Perch. The product is 55,25,565,000, that is 55 entire square Feet; the eight places of Decimals amount to little above 1-4 of a square Foot, therefore I reject them as inconsiderable in measure of land. By all these reductions it is found, that an *Aroura* is in *English* measure three Roods, two Perches, 55 1-4 square feet. Hence it follows also, that it is not well translated by *Jugerum*, for it is much larger; nor is it well in *English* called an