PRELIMINARY NOTICE OF SOME FACTS

(HERETOFORE UNPERCEIVED)

WHICH WILL BE SHEWN TO AGGREGATE INTO CERTAIN

COSMIC AND METRIC SYSTEMS

IN THE GREAT PYRAMID,

WHEN TAKEN IN CONNECTION WITH

OTHER FACTS TO BE SUBSEQUENTLY CONSIDERED.

The following researches on this Monument confirm those distinctive principles of its design and construction, first announced by the sagacity of John Taylor and Professor Piazzi Smyth, as they were set forth in Professor Smyth's first publication on this subject, "Our Inheritance in the Great Pyramid," first edition, published just ten years ago.

The many fresh facts here noticed, while shewing much further and interesting development of those same principles, add irrefragable proof of their validity as against superficial theories, old and new.

The greater part of the facts here stated were observed by the writer and used for furtherance of their subjects, some time ago; some facts, such as the π proportion of the King's Chamber, its relation to the coffer, &c., and part of the Arctic circle relations of both, were noticed three or four years ago, but owing to the subject of their interrelations, cosmic and pyramidal, increasing and ramifying further and further, every time that the subject was examined for final arrangement (and that has been done four times); so every time the arrangement begun had to be put by, and more extensive and enlightened views of its importance adopted in the basis of arrangement.

Now, however, this subject of the Arctic motion references, is at last in fair progress to a final form; but as it seems possible that it may be some months before it can be completed, and further, as many other inquirers are working in the same directions, it seems expedient and useful for their guidance, to point out succinctly what has already been noticed; especially as it might otherwise when hereafter published appear a mere superstructure suggested by the labour of others.

These reasons have led to the publication of these results in their present form, which though it be a form eminently unsatisfactory to those who see the farther truths and systems which bind these facts together, may yet be useful as not requiring at present, attention to the connexions and complex ramifications of the facts.

All details of small divergences between the amounts here connected, are omitted as requiring much space and an appreciation of the systems connected with them, which explain the facts, and at the same time are strongly supported in many cases by these very divergencies.

The *interrelations* of the dimensions are also but seldom alluded to here, as they are in many cases obvious, and as in general the most important connection is here stated, so that the further interrelations, though often giving much weight to the intention of design, are of less importance.

Many, perhaps most, of these facts were not arrived at by chance searchings for coincidences, but by following out the clue to the arrangement given by other facts, in short by carefully attending to, and acting on, the promethean character of the Pyramid. This is the only method of research by which one is not troubled with examining a host of unintentional, *i.e.* meaningless coincidences; such as the mixture of the numbers of lineal, square, and cubic quantities, which in but very few instances can be at all considered as designed; or another fallacy by which some recent enquirers have been misled, the multiplication of circles or circuits by π, treating them as radii, or adopting interrelations which lead direct to such results, multiplying by $\pi \times \pi \times \pi$ (or stating facts which together imply this) has even been adopted in one case ; the fallacy of this is most decided, as π^2 or π^3 are not used in properly geometrical formulæ, though they may of course be written as imaginary algebraic quantities, and therefore should require *very* strong proof of intention from exact coincidence before it could be even admitted as probable.

There has been exhibited lately a sad tendency to this playing with numbers, a sort of infatuation to give strength to the objections of Wackerbarth and many others, which is fatal to the acceptance of the true Pyramid theories. There has been also a want of following out and analyzing the results of statements, and also of accurately testing by actual numbers every theory of connection brought forward, especially a want of stating the probable error (strictly derivable in any case where several measures are taken) and so stating the probability of connection, especially in all important cases.

It may be asked, Why is not this done here ? The answer is given above, that details of small divergences, (though calculated) are not here stated in this merely preliminary notice, for the two before mentioned sufficient reasons.

The Cosmic relations of the facts and quantities here mentioned, and some facts dependant thereon, are omitted for the present, as requiring far too much space and exposition of system, which is not the object of this notice.

A few facts have been included here which I consider undesigned, from their want of system and connection ; but which, having more evidence in favour of intention than some recently published, I have thought well to notice in this slight and temporary manner, though they are but a few from many which it is to be hoped may never become current as connections to be respected.

The connections have been all numbered for facility of reference.

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A PRELIMINARY NOTICE, &c.

THE PYRAMID, KING'S CHAMBER, AND COFFER.

A = 25 Pyramid inches = Earth polar radius ÷ 10^7.

1 } Radii { Pyramid apex to King's Chamber level = half of slant radius of Pyramid cone.
2 } Radii { " " " = 10 × King's Chamber length.
3 } Radii { " " " = 100 × { Coffer height { or double unit of King's Chamber.

The many interrelations of these facts are omitted according to the above stated plan of this paper.

4 } Their Circles { Circuit of Pyramid at King's Cham. level = 10 × Circuits of King's Ch., N and S. walls.
5 } Their Circles { " " " " = 100 × Circuit of coffer.
6 ∴ Breadth of King's Chamber, is radius of Circuit of King's Chamber side.
and, (as shown by St. J. V. Day)
7 Half the height of the coffer, is the radius of { Coffer half circuit on N. and E. sides specially, as distinct from S. and W. shorter sides.

Also,

8 the two circles inscribable on King's Ch. floor = { the above named circuit length of the King's Chamber side.
9 (Half height of King's Chamber)^3 × 10^9 = Pyramid bulk.
(There are other facts also produced at this half height.)
10 40 King's Chamber heights × Pyramid height = (line down centre of Pyramid face.)^2
11 King's Chamber actual contents to floor = 1250 cubic A
12 " " contents per inch of length = coffer bottom = ½ coffer contents.
13 { King's Ch. N. to S. minus coffer length N. to S. (or clear N. to S. spaces between coffer & walls) } = $\frac{1}{50}$ Pyramid height = antechamber length.
14 King's Ch. floor, above base of its walls = ¼ unit (of King's Chamber.)
15 Top of construction chambers to Pyramid apex 80 double units.

THE COFFER.

See Diagram.

16 Starting with, contents = bulk
17 and $\frac{\text{contents}}{3}$ = bulk of bottom to f } as shown by Prof. Smyth

18 Then we have ∴ Depth of bottom (d to e) = $\frac{1}{6}$ outer height, or $\frac{1}{6}$ King's Ch. unit.
19 ∴ Bulk of bottom, between sides, down to floor (d to e) = $\frac{1}{5}$ contents.
∴ Bulk of bottom under sides or
20 of sides at side of bottom } (d. f. e. section) = $\frac{1}{15}$ contents.
21 also ∴ Surface of inner bottom : surface of outer bottom : : 3 : 5.
22 Also recognizing that inner length is double the outer width, (as others have doubtless perceived) then we have, outer width being W, and thickness of sides and end T,

therefore { Inner length 2 W. × Inner width (W — 2 T) : 3
:: 2 W. × (2 W + 2 T) : 10
2 × outer width × outer length }

or { 3 (2 W + 2 T) = 10 (W — 2 T) }

or 6 W + 6 T = 10 W — 20 T

or 6 T + 20 T = 10 — 6 W

23 or 13 T. = 2 W = internal length.

(This is also capable of mechanical demonstration.)

Finallly, by the above we have
24 Thickness ends and sides = 2
25 Inner length = 26
26 Inner width = 9
27 Outer length = 30
28 Outer width = 13

But, to connect with them the height, some other element of form must be assumed ; and, to connect all relative dimensions with absolute, a second element. The most suitable are ; (1) The absolute contents combined with the absolute height, which is scarcely suitable as the contents are affected by the curved faces which are not here in view : or (2) The diagonal of the inner end rising at 51° 51′ the Pyramid rise, for relative size ; and the outer height being, as assumed for (1), a tenth of the King's Chamber length, or $\frac{1}{250}$ of the Pyramid cone radius, and thus, accurately obtainable (and suitably so as being within probable error of coffer measures,) from the Pyramid base. These two methods result as follows :—

29 Assuming—	Actual size in A inches extreme variations of dimensions recorded by Prof. Smyth.*	(29a) Assuming—
Above mentioned { Coffer contents = bulk; Bulk of bottom = $\frac{1}{5}$ contents; Inner length = 2 outer width } Outer Height = { $\frac{1}{200}$ of cone line; $\frac{1}{10}$ of King's Ch. length } Contents = carefully weighted mean of four connected bulks of coffer, namely— { sides; edges of bottom; external volume; contents }		Coffer contents = bulk; Bulk of bottom = $\frac{1}{5}$ contents; Inner length = 2 outer width } Above mentioned. Diagonal inner end = 51° 51′ 14″·3 i. e. { inner breadth : π :: inner heigth : 4 } Outer height = { $\frac{1}{200}$ of cone line; $\frac{1}{10}$ of King's Ch. length }

Outer length	89·3292	89·1 to 90·34	89·9244	Outer length
,, width	38·7093	38·5 ,, 39·08	38·9672	,, width
,, height	41·2183	41·2 ,, 41·3	41·2183	,, height
Inner length	77·4186	77·45 ,, 78·01	77·9345	Inner length
,, width	26·7987	26·37 ,, 27·07	26·7773	,, width
,, height	34·3486	34·23 ,, 34·41	34·3486	,, height
Thickness sides	5·9553	5·95 ,, 6·10	5·9950	,, Thickness sides
,, bottom	6·8697	6·6 ,, 7·2	6·8697	,, ,, bottom

There is also another instance of π proportion *in* the coffer, besides the case No. 7 *on* the outside of the coffer.

30 The circuit of the inner end of the coffer, = { A circle inscribed on outer end, *i.e.* whose diameter is = outer breadth.

∴ The circuit of either inner end has (by No. 22) its diameter standing at the (Pyramidally) normal position at right angles to the plane of the circuit, the half inner length being the diameter of the circuit of either end.

31 The above circuit of the inner end = $\frac{1}{300}$ of the Pyramid base circle.

∴ The outer breadth is = $\frac{2}{300}$ of the Pyramid height.

And as (by No. 22) mid circuit of coffer, or outer width + inner length } = 3 × outer width.

∴ Mid circuit (horizontal) of coffer = $\frac{1}{25}$ of Pyramid height.

Besides the above lineal results (Nos. 22-29) from Prof. Smyth's two facts, we may also look at the more direct cubic relations resulting from those two facts alone, thus—

16.17 Contents = bulk, and bulk of bottom = $\frac{1}{5}$ contents

20 ∴ bulk of edges of bottom (*d f e* section) = $\frac{1}{15}$ contents.

32 Also bulk of corner of bottom, or smallest cubic unit of coffer, by facts 1, 2, and 7 } = { $\frac{1}{2592·5}$ contents. or { $\frac{1}{500}$ of bulk of bottom nearly.

33 Or at S.E. corner of bottom = { $\frac{1}{300}$ contents. { $\frac{1}{60}$ bulk of bottom exactly.

Taking therefore this cubic unit as the basis of expression of coffer values, both as being the smallest unit defined, and also commensurate with all other parts of the coffer, in one actual expression of it, at the S.E. corner, we may express the relative cubic ratios thus,

34 Smallest cubic unit × 100 = bottom of coffer extended to outside.
× 200 = sides of coffer standing on top face of bottom.
× 300 = bulk of coffer.

35 By the other method of division
Smallest cubic unit × 40 = end extending to outer edges.
× 40 = other end.
× 80 = side bounded by floor and inner ends.
× 80 = other side.
× 60 = bottom cut by inner sides continued.
× 300 = bulk of coffer.

36	Smallest cubic unit × 3000 =	coffer outer length cubed
37	„ „ × 300 =	„ „ height „
38	„ „ × 240 =	„ „ width „
39	„ „ × 2000 =	„ inner length „
40	„ „ × 80 =	„ „ width „

Or, in relation to the whole coffer contents, the cubed lineals are thus—

36	Coffer outer length cubed		= 10 × contents
37	„ „ height „		= contents
38	„ „ width „	× 10	= 8 × contents
40	„ inner width „	× 30	= 8 × contents
39	„ „ length „	÷ 2	= coffer bottom or ⅓ contents
	or „ „ „		= coffer sides or ⅔ contents
41	„ inner height „	÷ 4	= coffer W. side bulk down to floor, corners cut diagonal = ¼ contents

The mean value of the coffer contents by these cubed mean lineals, is 71,400 ± 290 A ins.

Some of the less distinct, systematic, and important, commensurations of the coffer with other quantities are as follows—

43 ⅘ × 10 A inches, cubed (or ⅓ internal breadth, cubed) = $\frac{1}{10}$ coffer bottom or $\frac{1}{30}$ contents, or 10 of the smallest cubic unit.

Taking 2½ King's Chamber units, or a quarter of King's Ch. breadth = M

44 M × ¾ = outer breadth coffer
45 M × ⅔ = inner depth
46 M × ⅘ = outer height
47 M × 7/4 = „ length
48 M = inner length — inner breadth
49 M = outer length — outer breadth
50 M = diameter of sphere = contents
51 Diagonal on inner end of coffer rises at 51° 51′ = Pyramid rise.
52 Contents of π Pyramid of 1 King's Ch. unit in height = $\frac{1}{10}$ coffer contents
53 ∴ Contents of Pyramid from coffer level or 100 double King's Ch. units high = 8 × 10^6 coffers = 10^7 × outer width cubed

54 ∴ Coffer is a model of Pyramid dimensions from its level } in height
circuit
angle
contents
and some other important features not here touched on.

55 East side of coffer is in N. to S. plane of middle of Pyramid.

COFFER REFERENCES IN SCRIPTURE.

56 Contents Noah's Ark = 10^5 coffer contents
57 Contents of Solomon's Temple = 250,000 × coffer bottom or ½ contents
58 Bulk of Ezekiel great altar = 8000 × coffer bottom, or inner width cubed × 10^4
59 „ „ smaller altars = ½ coffer contents
60 Length of Tabernacle, 33 A = 40 King's Chamber units

THE QUEEN'S CHAMBER.

61	Queen's Chamber apex below King's Ch. floor	= 30 King's Ch. Units
62	Circuit of Queen's Ch. floor	= $\frac{1}{2}$ of circuits of King's Ch. sides, N. and S.
63	" " " has diameter	= diagonal of Queen's Ch. end
64	" " " has radius	= from N.E. corner of gable to S. side above niche centre
65	" " " "	= 2 × doorway height
66	" " " × 10	= 6 × 7 × Queen's Ch. breadth
67	" " vertical, " across middle of floor, and along top of gable	= π × 300 A inches or has diameter = 300 A inches
68	Circuit of gable on E. or W. walls, has diameter	= side of square of 20,000 A square ins.
69	Pyramid apex above Queen's Ch. floor	= 5000 A ins.
70	Queen's Ch. apex above sea level	= 3961·4 A ins. = $\frac{1}{10}$ Pyramid base circuit = 50 × Queen's Ch. N. or S. wall height
71	Queen's Ch. breadth ÷ 4	= Diameter of sphere = coffer contents
72	Cylinder or prism 20 sq. ins. section, and length of Queen's Ch.	= Coffer contents
73	Surface gable on E. or W. wall	= π × 2000 sq. ins. (see No. 68)
74	∴ Contents of gable portion of chamber	= 1 × 20 coffers or 10 volumes
75	Contents of lower rectangular portion	= 6 × 20 coffers "
76	∴ " whole chamber	= 7 × " "
77	Queen's Chamber passage to subterranean passages	= 100 King's Ch. Units in two ways
78	Diagonal Queen's Ch. end (see 63) cubed	= 10^{-4} Pyramid cone bulk

THE ANTECHAMBER.

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79 Total length of Antechamber passages on floor = 8 Double King's Chamber Units.

Divided approximately thus:

80 Length great step, N. to S. = 3 King's Chamber Units.
81 S. end great step to first granite floor stone = 3 " "
82 Thence to end of chamber = 5 " "
83 Thence to King's Chamber = 5 " "

Lines over S. doorway.

84 Breadth between centres = $\frac{1}{2}$ " "
85 Centres of side lines to side of doorway = $\frac{1}{4}$ " "
86 " " to side grooves = $\frac{5}{8}$ " "

85 = Raising of King's Chamber floor. 86 = Half internal depth of coffer.

87 Length Antechamber squared = 8 square double King's Ch. Units.
88 Breadth " " = 10 square King Chamber Units.
89 Pyramid base units (of 100 ins.) in Antechamber circuit = Number of double King's Chamber Units in height.
90 " " " " height = Pyramid arris ÷ Pyramid height or $\sqrt[2]{\frac{\pi^2}{8}+1}$

91 Mean circuit between wainscots
92 Horizontal circuit of granite above wainscots
93 Vertical circuit over E wainscot

} Has diameter = E. wainscot height, or 5 King's Chamber Units, or half King's Chamber radius.

∴ The above circuits are $\frac{1}{4}$ of circuit of King's Chamber wall side.

94 Circuit of leaf grooves, horizontal, = Coffer N. and E. semicircuit.
95 " " itself " = Coffer S. and W. "
96 Bulk of both wainscots = $10 \times$ bulk coffer bottom. / $10^2 \times$ smallest bulk of coffer.
97 Polar line from Pyramid centre intersects on Pyramid face at level of } Top of Antechamber wainscots.
98 Length in Pyramid of said polar line = $10 \times$ circuit of Antechamber at level of said intersection, *i.e.* above wainscots.
99 Height of intersection above base = $5 \times$ the above circuit.

THE GRAND GALLERY.

100	Height at cut off, from Queen's Chamber passage floor to top of ramp		= Antechamber length.
101	Height from top of Antechamber passage to first overlapping		= 2 King's Chamber Units.
102	Grand gallery breadth =	2 × Normal passage breadth	= 4 King's Chamber Units.
103	,, height = (vertical to first overlapping)	2 × Normal passage height	
104	Ramp breadth =	½ Normal passage breadth	= 1 King's Chamber Unit.
105	,, height vertical =	½ Normal passage height.	
106	Short Ramp holes (alternate)	= Ramp breadth	= 1 King's Chamber Unit.
107	Long ,, ,, ,,	= Ramp height.	
108	Between three Northern Ramp holes	= 2 × Ramp breadth	= 2 King's Chamber Units.
109	Between succeeding ,,	= 2 × Ramp height.	
110	Each three Ramp holes and interspaces	= 10 × Ramp breadth	= 10 King's Chamber Units.
111		= Height of great step, on N. face.	
112		= Horizontal length between first and second cut off.	
113		= Height of first cut off ÷ 2½ or × ·4.	
114	Mean vertical height between the overlappings.	= Height of second cut off × 2½ or ÷ ·4.	
115		= Sloping length to main cut off ÷ 6.	
116		= Maximum vertical height in gallery ÷ 12.	
117		= Mean length of gallery on slope ÷ 50.	

PASSAGES.*

118 Total length of the first Ascending Passage = 150 King's Chamber Units.
(including the 10 Unit portions of Waynman Dixon.)

119 Cylinder with length = passage breadth
and diameter = passage height
(*i. e.* that would just roll down the passages) } = Coffer contents.

120 Length of entrance passage, total, = 100 Double King's Chamber Units.

121 Height of entrance above base = 16 " "

EXTERNAL DIMENSIONS OF THE PYRAMID.

122 Pyramid circuit = 355 × } 5 King's Chamber Units or

123 ∴ 2 × Pyramid height or diameter of base circle = 113 × } ½ King's Chamber breadth.

(113 : 355 being the most accurate simple expression of 1 : π within $\frac{1}{11,776,700}$.)

124 Semicircle inscribed in Pyramid vertical section = Length of base side within base circle.

125 Surface of corner sockets
are proportional to } { Surface of habitable earth in their respective quarters, divided at Equator and Pyramid longitude.

126 The ratio of surfaces being 3 : 10^{2}.

127 And probably the levels of the sockets refer to the mean level of each quarter.

128 Height of Pyramid pavement
or of mean terraqueous level } above sea level = 125 (or 5^3) King's Chamber Units.

129 Height of Ark, or Summit of Ararat, above sea level = 10000 (or 10^4) King's Chamber Units.

130 And the N.E. diagonal of the Pyramid, through the largest socket, points straight to Ararat.

THE AZIMUTH TRENCHES.

See Diagram.

131 S P = O P ∴ P is in centre between O and S.
though T U is not = M N ∴ M O = S U (true within errors of measurement).

132 O S = S D = D O ∴ O S D is an equilateral triangle.

133 J E is parallel to O C, or C F = P S.

134 ∴ O C A = angle across top of Pyramid.

135 N C = T C.
Though the middle between N and T is not opposite Pyramid centre, yet this is neutralized by the different azimuths of base and trench axis.

136 N C T = angle of top of Pyramid face, within 1′, quite within errors.

137 V C D = 51° 45′ 27″·05, nearly 51° 51′; ∵ cotan nearly = sine at 51° 51′.

138 As T P J is 180°—angle at top of Pyramid, ∴ = 2 × 51° 51′.
So that 51° 51′ is repeated 3 times. T P J = 2, and J P Q = 1, and Q P N is slightly less than half of 51° 51′, suggesting 7 × 51° 51′ in the whole circle; the surplus over the circle being such that starting from E. side of N. and going E. N. W. S. to W. side of N. we get 7 × 51° 51′; *i.e.* angular breadth of N. from P = (7 × 51° 51′)—360°.

139 Base circle cuts trench axis at O and S, *i.e.* inner ends of N. and S. trenches.

140 P T or length of S. trench from trench centre, × 10 = 4 arris lines of Pyramid.

141 P H or length from step in E. N. E. trench to centre = ½ base diagonal from centre to corner.

142	S T or length of South trench	= 100 King's Chamber Units.
143	V U or base circle on S. side to trench axis	= 100 " "
144	P J or total length E.N.E. trench to centre	= 160 " "
145	Breadth at G, or inner end E.N.E. trench	= 8 " " or $\frac{1}{20}$ of trench length (see No. 142)

PYRAMID WEIGHTS AND MEASURES.

			British Grains.
146*	Cubic cubit (25^3 ins.) of water at 68°·036 Fah.	= { air	3,953,620.
		{ vacuo	3,957,780.
147	1100 shekels at 40 = Pyramid pound (evidently an independent unit, Judges xvi. 5, and xvii. 2.)	= $\frac{1}{10}$ of cubic cubit of water.	
148	Modern quarter of a hundred weight, British	= $\frac{1}{20}$ of cubic cubit of water.	
149	Weight of granite coffer when perfect (if S G 2·74)	= { 12·5 cubic cubits of water.	
		{ or $5\cdot \times 5\cdot \times \cdot 5$ cubic cubits.	

150 Granite of S. G. = 2·75 weighs 1500 Pyramid pounds per cubic cubit.
∴ by 149, S.G. granite : S·G· earth : : $5^{11} \times 10 : 71264^2$.

151 Dense Platinum (20·9 S·G·) weighs 100 pyramid pounds per cubic ½ King's Ch. Unit, or cube 1 King's Chamber Unit in circuit.

146* Note.—The Pyramid barometric pressure being 30·00 Pyramid inches of mercury, the boiling point of water (by careful second differences of the most recent results), will be 212·18231 Fahrenheit or 100·10128 centrigrade.

TABLE OF PYRAMIDAL AND COSMIC MULTIPLES OF THE KING'S CHAMBER UNIT.

This unit being apparently the Cosmic Unit of variable constants, as the Ammah or Sacred Cubit is the invariable unit.

The full series is given to facilitate the comparison of interrelations.

Reference Number.		Multiple.
		½
84, 14	Breadth of divisions in Antechamber. Double raising of King's Ch. floor	1
106, 104, 52	L. of alternate ramp holes. B. of Ramps. Height of a Pyr. of bulk $\frac{1}{10}$ coffer	2
3	Coffer radius. Breadth of all passages	4
102	Breadth of Grand Gallery	5
49	Height of Antechamber, E. wainscot. Diam. sphere = 4 coffer volumes	10
6, 110	Rad. of one circle of King's Cham. side. L. of 3 ramp. holes and spaces	20
6	Radii of both circles of King's Chamber sides, or diam. of one circle	40
6	Diam. of King's Chamber combined circles	50
		100
112	Rad. of the circle = diagonal from base centre. L. of S. Azimuth trench	200
1	Radius of one whole base diagonal. Radius of Pyr. from King's Cham.	400
1	Radius of both base-diagonals. Pyramid cone line, as on face	500
128	Mean terraqueous level, or Pyr. pavement, above sea level, × 4	1,000
		2,000
		4,000
		5,000
		10,000
129	Height of Ararat above sea level	20,000
		40,000
153	Diff. of Polar and Equat. Radii, or Equat. protuberance of earth	50,000
		100,000
		200,000
		400,000
		500,000
		1,000,000
154	Excentricity of Earth's polar section. Height of Arctic segment	2,000,000
155	Distance of foci of earth's polar section	4,000,000
		5,000,000
156	Radius of Arctic circle on earth's surface	10,000,000
157	Diam. " " "	20,000,000
158	Side of a cube of earth's volume *	40,000,000
159	Diff. of major and minor semi axes of earth's orbit	50,000,000
		100,000,000
		200,000,000
		400,000,000
		500,000,000
160	Distance travelled by light in 10^{-5} day, or a Pyramid second	1,000,000,000
161	Diam. of sphere of earth's attraction = sun's attraction	2,000,000,000
162	Side of a cube of $\frac{1}{10}$ sun's volume	4,000,000,000
		5,000,000,000
163	Excentricity of Earth's orbit	10,000,000,000
164	Distance of foci of Earth's orbit	20,000,000,000
		40,000,000,000
		50,000,000,000
		100,000,000,000
		200,000,000,000
		400,000,000,000
165	Side of inscribed square in Earth's orbit	

* Found to have been previously noted by Mr. Simpson.

DOMINANT NUMBERS AND UNITS

OF THE

GREAT PYRAMID.

REMARKS ON THE DOMINANT NUMBERS AND UNITS OF THE GREAT PYRAMID.

This system, of dominant numbers and units, is only one of many determining causes of the size and shape of the Pyramid and its chambers, and the idea of uniformity and symmetry in the design is therefore sometimes overruled, to a great extent, by the more important ideas for which much of the structure was erected, some of which are apparently not yet noticed.

In some cases however, the facts which come under the head of dominant numbers and units are the leading and overruling necessities of the design, as is shewn by the greater amount of accuracy bestowed on them, at the expense of the less important or secondary references;—For instance, in the King's Chamber the dominant unit seems (from the accuracy of its examples) to be the primary cause of the dimensions of the chamber; the other references (of number and measure) being shewn by their less amount of accuracy to be of secondary importance, and among these the contents of the chamber are made to approximate to the supposed intention of $5^3 \times 10$ cubits, but the approximation is designedly improved, perhaps perfected, by the contraction of the walls at the top. This seems to be an exemplification of a *principle* of the Great Pyramid, that where it is otherwise physically impossible to combine several references in one figure, rectangularity and symmetry are overruled as being unimportant, and where necessary, the references are *each* slightly altered, (in proportion to their importance) so as to produce a mean figure sufficiently near to each required reference as distinctly to indicate it; the highest exemplification of this principle is probably the coffer with its incomprehensible irregularity in certain aspects, combined with such marvellous accuracy otherwise, in volume, dimensions, &c.

From this we may fairly conclude that, when we find a reference which is probable—judging from the symbology and dominant numbers and units, and which is distinctly not quite accurate, that there is another reference of some importance which determined that departure from accuracy of form.

In the Queen's Chamber, the connection with its own dominant unit (the Pyramid base) seems to be sufficient to account for all portions of its height, though it is not likely that the length and breadth of the chamber are *primarily* ruled by the references in the following examples (*e.g.* 5, 8, 38, 39, 40, 41, 42, 43, 44,) however fairly these agree with the dimensions; as these references are (to judge by the King's Chamber) merely secondary; and it is possible, when the primary intention is discovered, that the references in the height to the Pyramid base will be found to be secondary also; the approximate references (23, 24, 25) are only included here, as *possibly* intentional, as they are (though less accurately) on the same system as the height of the Pyramid being $\frac{3}{4} \times 100$ cubits, and the centre of the base side to its intersection with the base-circle being 144 cubits; the references (26, 27,) to the "pivot holes" in the passage are of course entirely dependent on the question of their being mere aids during the building, or being intentional features; if they were merely for the first purpose, it is strange that there should be 4 in a line at nearly equal distances, and none else throughout the remaining $\frac{3}{4}$ of the surface of the masonry core exposed, and apparently no such holes on the outer masonry, over which the casing stones were placed.

The supposed references of the Subterranean Chamber vary mostly from the measures in one case, (though a very important one) which was merely measured from the plates; as no measures of this point (the distance of the step across the chamber, from the end) are given in "Life and Work;" it would be highly desirable to accurately remeasure this chamber, as (if the references of the length, and especially the breadth, to the Pyramid base diagonal, are correct,) the immoveability of the dimensions from earthquakes and excavations, would render this an excellent means of ascertaining the base side, next to the gigantic undertaking of measuring the base itself, and quite as good a means probably as measuring the height of each of the King's Chamber courses.

The Grand Gallery seems to be merely a connecting link between the Queen's Chamber and the Antechamber, and intended to shew that the Antechamber betokens the number 8 in reference to the 7 of the Queen's Chamber (though the Antechamber betokens 3 in itself), the continued rampholes or their representative grooves in the Antechamber, (which we are prepared to find horizontal by the last hole on the great step being in the same position,) shew the same fact very clearly in the subjoined list of numerical examples.

In the Antechamber the triple arrangement of the stones is most striking, and it is curious that nearly all the masonry before the granite leaf is limestone, and nearly all after it is granite; now by Col. Howard Vyse's measures, the plane of the vertical axis of the Pyramid is 1 inch S. of the N. side of the granite leaf, and though more trustworthy measures shew the axis to be about 36 inches N. of the leaf, yet the uncertainty of our present knowledge of the position of the axis is such, that it is quite possible that Col. Howard Vyse's measure may be correct, and that the leaf may be the division of the N. or limestone, and the S. or granite lined, halves of the Pyramid.

It would seem most probable that the dominant numbers and units constitute a system pervading the scheme of the whole Pyramid, in some cases modifying, and in other cases being modified by other requirements of the design; while they give throughout a system of clues to the general intention of each portion and to the ideas betokened therein; doubtless many more examples of dominant numbers would be shewn by an examination of the numbers of the stones in the Queen's Chamber and other portions, and many perhaps or most of the examples have yet to be shewn; but the following cases will probably be sufficient to establish the general idea and characteristics of this system.

References previously recognized have been incorporated with the following (and marked*) as in many cases they were requisite to complete the system of references, or to confirm those which otherwise would appear weak or without foundation.

The coffer has been touched upon but slightly, and the corner sockets and Azimuth Trenches are not noticed here, partly because of their references apparently requiring a rather different treatment, and partly because they have not yet been examined as fully as is necessary for this purpose.

All the dimensions in the Great Pyramid used here and elsewhere, are *strictly unbiassed*. Each dimension stated, as the fact, is the weighted mean of the best actual measurements known, or of the necessary consequences of other measurements (as in the diagonals) where there is a clear mathematical connection, and where direct measures are not feasible.

The dimensions were settled in this way, without having any theoretic results in mind, as these might cause even an involuntary tendency to accommodate the facts.

Theory is only used to give precision where the agreement is far within the small uncertainties of measurement, the theory being also shewn by other evidence to have been clearly intentional in the original designing of the structure.

W. M. Flinders-Petrie,

June, 1872.

This paper is now published from the copy privately forwarded to Prof. Smyth at the above date, though the facts were known some time before. The only alterations since made, have been a few words in the preceding portion, to explain more clearly the ideas put forward, in which I as yet should make no distinct difference; in fact the remarks on the Queen's Chamber have been strikingly borne out by subsequent discoveries. Also in the succeeding portion, a few facts that I subsequently observed, and that seemed important for the subject, have been inserted, and *all* these are extra numbered (*e.g.* 1*a*, 4*a*, 16*a*, 33*a*, in the Queen's Chamber) so as to be easily distinguishable.

W. M. F. P.

April, 1874.

EXAMPLES OF THE DOMINANT NUMBERS AND UNITS OF THE GREAT PYRAMID.

EXTERNAL FORM OF THE PYRAMID.

NUMBERS ABSOLUTE.

4 similar, with 1 superior, making 5.

(1)* 4 *three*-faced corners on the pavement, with 1 *four*-faced corner *above*, making 5.

(2)* 4 *three*-sided faces . . . . with 1 *four*-sided face, *larger*, making 5.

Lines radiating from the apex are

(3) 4 visible slanting arris lines, with 1 invisible unbroken vertical axis, determining the other 4 . . . . } making 5.

NUMBERS PROPORTIONAL.

9, with 10, generally as a basis.

(1)*	Vertical height	:	base diagonal from centre to corner	:: 9 : 10
(2)	Or, centre to intersection of base circle and diagonal.	:	centre to end of diagonal . .	:: 9 : 10
(3)	∴ Surface of both diagonal-vertical sections	:	Surface of base	:: 9 : 10
(4)	and as Surface of two faces . .	:	Surface of the diagonal vertical section	:: 9 : 10
(5)	∴ Surface of two faces	:	Surface of base	:: $9^2 : 10^2$
(6)	∴ The perpendicular of the triangular face	:	Base side	:: $9^2 : 10^2$
(7)	from (1), Side of inscribed square in base circle	:	Base side	:: 9 : 10
(8)	from (4), Apex to centre of base, down face	:	Apex to base circle . . .	:: 9 : 10
	(or perpendicular of the triangular face)		(or line down face where cut by intersecting cone)	
	(And from 7 and, 8 we ∴ have 6)			
(9)	Base diagonal from centre to corner .	:	Part of the base side included in the base circle . . .	:: 9 : 10
(10)	∴ with (1) we have Vertical height .	:	Part of base included in base circle	:: $9^2 : 10^2$
(11)	Chord of quadrant of the base circle or line from apex to base circle .	:	Arris line	:: 9 + 9 : 9 + 10
(12)	Arris line	:	Base side	:: 9 + 10 : 10 + 10

		A inches theoretical.	A inches theoretical.		Differences.
1·2·3·7	Vertical height . .	5829·1510	5227·1030	Base diagonal from centre, $\times \frac{9}{10}$	$\frac{1}{2850}$
4·8	Apex to centre of base.	7412·0815	7419·2975	Apex to base circle . . $\times \frac{9}{10}$	$\frac{1}{1027}$
5.6	Apex to centre of base.	7412·0815	7416·6913	Base side . . . . $\times \frac{9}{10}$	$\frac{1}{2850}$
9	Base diagonal, as above	6474.5587	6494.7771	Base included in base circle $\times \frac{9}{10}$	$\frac{1}{321}$
10	Vertical height . .	5829·1510	5845·2994	Base included in base circle $\times \frac{9^2}{10^2}$	$\frac{1}{362}$
11	Apex to base circle .	8243·0639	8253·472	Arris line . . $\times \frac{9+9}{9+10}$	$\frac{1}{842}$
12	Arris line . . .	8711·9965	8698·5886	Base side . . $\times \frac{9+10}{10+10}$	$\frac{1}{650}$

KING'S CHAMBER AND COFFER.

Numbers Employed.	Unit Employed.
3, 5, and 7, with binary multiples of 3 and 5.	The Conic Radius, or, Line from Apex to Base Circle, 400 or, The Two Base Diagonals, $\pi \times 400$ Referring to Arctic Distance of Poles at Earth's Surface.

Examples of Number.

(1)	The ceiling			7	whole stones.
(2)		or 3×3			partial or whole stones.
(3)	Round the chamber, top course			7	stones.
(4)	„ „ 4th course,	3×2^3			stones.
(5)	„ „ 3rd course,	$3 \times$		7	stones.
(6)	„ „ 2nd course,	$3 \times$		7	stones.
(7)	„ „ lower course,	$3 \times 3 \times 3$			stones.
(8)	Total wall stones		$(5 \times 2)^2$		or 100 stones.
(9)*	The floor	3×2			stripes of stones.
(10)	The coffer standing		5		stripes from the entrance.
(11)	The floor (presumably).	$3 \times$		7	stones.
(12)	∴ The floor and ceiling	$3 \times$			10 stones.
(13)	Number of courses		5		
(14)	Number of courses over door	3			
(15)*	Chambers over King's Chamber		5		
(16)	or considering King's Chamber as a double chamber †			7	
(17)*	Chamber floor above base		5		$\times$ 10 courses.

Examples of Number, and Measure.

(18)	Height of each course	$3 \times 5 \div 2^3$		cubits?
(19)	Height of wall	$3 \times$		π cubits?
(20)	Height of wall projected to slope of Pyramid casing	$3 \times$		100 inches.
(21)	Surface of side of chamber	$3 \times$	$5 \times$	10, cubits.² } Approximately.
(22)	Surface of end of chamber	$3 \times$	5×5	cubits.² } Approximately.
(23)	Surface of floor of chamber, 10,000 ÷ (3 ×		5 × 5)	cubits.² } Approximately.
(24)	Contents of chamber		$5 \times 5 \times 5$.	$\times$ 10, cubits.³

† From floor to roof of King's Chamber being = about two average chamber spaces between the worked roofs.

	π. A. A inches according to the theory of the π series involving example 25.	θ. A. Theoretical A inches.	θ. B. Theoretical Brit. ins.	A. B. Actual Brit. ins.	π A and θ A Difference
18	∴ Height of each course, 47·0545	46·8750	46·9219	47·075 ± ·020	$\frac{1}{263}$
19	∴ Height of wall, 235·2727	235·6194	235·8551	235·37 ± ·10	$\frac{1}{679}$
20	∴ Height of wall, 235·2727	235·9317	236·1676	235·37 ± ·10	$\frac{1}{356}$
24	∴ Contents of chamber Allowing for contraction of walls at top, 1,250·6443.	1250· cubic cubits.		1250·0 ± ·7 cubic cubits.	$\frac{1}{1940}$

Examples of Number, and Unit.

(24a) Horizontal passage to King's Chamber (whole of horizontal length) 16 units.
(25) Radius of circle of side of chamber, or breadth . . . . . 10 units.
(26) Diameter of circle of side, or length of chamber . . . . . 20 units.
(27) Height of floor above bottom of walls . . . . × 4, = unit.
(28) Circuit of sides (north and south) of chamber . × 5 . . = base diagonal.
(29) Circuit of side of chamber . . . . . . ÷ 5 . . = coffer circuit by N. and E. sides.
(30) or Radius of side circle . . . . ÷ 5 . . = radius of coffer circle, or height of coffer.

Examples of Number in the Coffer.

(31) Breadth (N. end) : Length (E. side) of coffer : : 3 . . : 7
(32) or Outer breadth of coffer . . . . . = 3 . . . × $\frac{\text{Base diagonal}}{1000}$
(33) Outer length of coffer . . . . . = . . 7 × $\frac{\text{Base diagonal}}{1000}$
(34) Outer height of coffer . . . . . × 3 . + . $\frac{1}{7}$ = $\frac{\text{Base diagonal}}{1000}$
(35) Thickness of bottom . . . . . . × 3 . . . = unit.
(36) or Depth of bottom : Depth of inside : : 1 . . : 5 . .
(37)* 2 mean walls (end and side) of coffer, down to upper surface of bottom × 3 . . . = Contents of coffer.
(38)* or Bottom of coffer, to outside . . . . × 3 . . . = Contents of coffer.
(39) Bottom of coffer, to inside of walls . . × . 5 . . = Contents of coffer.
(40) or 2 walls (end and side) of coffer down to floor × . 5 . . = outside volume of coffer.
(41) 1 side (W. side) of coffer, down to floor, corners cut diagonal . . . . . × . . 7 = outside volume of coffer.

		θ A Theoretical A inches.	θ B Theoretical Brit. inches.	A. B. Actual Brit. inches.	θ B. and A.B. difference.
					inches.
24a	∴ Length of passage	329·7465	330·0763	330·3	·22
25	∴ Breadth of chamber . . .	206·0916	206·2977	206·30 ± ·07	·003
26	∴ Length of chamber . . .	412·1832	412·5954	412·55 ± ·05	·045
27	∴ Height of floor	5.15229	5·15744	5·25 ± ·13	·10
28	∴ Circuit of sides	2589·823	2592·413	2591·64 ± 1·15	·77
29	∴ Coffer circuit, by theoretical chamber side . . .	258·9823	259·2413	259·10 ± ·27	.14
30	∴ Coffer height	41·21832	41·2595	41·27 ± ·10	·01
32	∴ Coffer breadth	38·84756	38·88621	39·12 ± ·04	·24
33	∴ Coffer length	90·64284	90·73448	90·43 ± ·05	·30
34	∴ Coffer height	41·20172	41·24292	41·27 ± .10	·03
35	∴ Coffer bottom thickness . .	6·86972	6·87659	6·92 ± ·03	·04
		cubic	cubic	cubic	
37	∴ 2 mean walls of coffer . .	23,747·	23,818· ± 10·	23,825· ± 80·	7·
38	∴ Bottom of coffer . . .	23,747·	23,818· ± 10·	23,829· ± 80.	11·
39	∴ Bottom of coffer . . .	14,253·	14,290· ± 6·	14,141· ± 47·	149·
40	∴ 2 walls of coffer . . .	28,506·	28,580· ± 12·	28,670· ± 96·	90·
41	∴ 1 side	20,361.	20,421· ± 9·	20,432· ± 68·	11·

QUEEN'S CHAMBER AND PASSAGE.†

Numbers Employed.	Unit Employed.
7, and subordinately 6, similar or together, and 1, superadded or separate.	Pyramid base. Referring to Length of Earth's Orbit.

Examples of Number and Proportion.

(1a)	The height of the Pyramid is	7 composed of	6 from Queen's Chamber and passage upwards, and	1 *broader* portion from Queen's Chamber to base.
(1)*	The passage is	7 composed of	6 from N. end to J, and	1 *higher* part, J to S. end.
(2)*	The passage is	7 composed of	6 from S. end to mean of cuts off, and	1 *higher* than all, on to N. end.
(3)	The chamber has	7 courses,	6 vertical faced courses, and	1 much *larger* and *top*-most sloping course.
(4)*	The chamber has	7 bounding surfaces,	6 finished surfaces, and	1 much larger, unfinished.
(4a)	Contents of chamber	7 composed of	6 in rectangular part, and	1 in gable above.

(The unit being 20 × coffer contents or 10 × outer volume.)

(5) The angle of the roof is 7 sloping up, on 6 as a base.
(6) or Width of the roof slabs : 7 : : Breadth of chamber : 6
(7) ∴ Surface of the roof : 7 : : Surface of the floor : 6
(8) Mean height of chamber : 7 : : Vertical wall height : 6
(9) Length of passage : 7 : : $^{2}\sqrt{}$ Surface of chamber floor : 1?
(10) Height of passage higher floor, above base : 7 : : Width of roof slab : 1
(11) Chamber wall height : 7 : : N. end of passage, to J : : 50
(12) or Chamber wall height : 7 : : Mean of cuts off in Grand Gallery, to S. end : 50

		Theoretical A inches.	Theoretical Brit. ins.	Actual British inches.	θ B. and A. B. difference.
					inches.
1a	∴ Height of Queen's Ch. and passage	832·73586	833·56859	838· ± 5·?	5·5
1	∴ J to S. end (passage 1519·4) . .		217·06	216·1	1·0
2	∴ Mean cuts off to N. end . . .		217·06	217·8	·7
5, 6, 7	∴ Vertical height of slope . . .		61·83 ± ·00	61·65 ± ·45	·18
8	∴ Mean height		213·3 ± ·42	213·6 ± ·45	·3
9	∴ $^{2}\sqrt{}$ Chamber floor		217·05	216·07 ± ·31	1·0
10	∴ Height of floor		840·3 ± 1·0	841·7 ± 5·?	1·4
11	∴ Chamber wall height . . .		182·46	182·8 ± ·36	·34
12	∴ Chamber wall height . . .		182·22	182·8 ± ·36	·6

† N. end = N. wall of Grand Gallery. S. end = N. wall of Queen's Chamber.
J = junction of high and low passages, or step down in passage. A = cubit.

(13) N. end to beginning of passage floor : 7 : : Height of beginning of passage floor, and above floor at N. end : 2

(14) Chamber wall height × ·7 × 2 = Chamber floor surface,—niche.

EXAMPLES OF NUMBER AND MEASURE.

(15) Height of higher passage floor, above Pyramid base . . . . 7 × 6 × 20 inches.

(16) Beginning of passage, below King's Chamber floor . . . . 7 × 6 × 20 inches.

(16a) Passage from J. to S. end of Chamber . . . . 7 × 6 × 10 inches.

(17) Mean height of Chamber . . . $\frac{10 \times 6}{7}$ or . . . $\frac{1}{7}$ × 6 × 10 A.

(18) Height of Chamber to top . . . . 7 × 7 × ⅓ A. ?

(19) Mean height of four equal courses over door . . 200 ÷ . 7 inches.

(20) Height of low passage . . . . . . (40 × $\frac{7}{6}$ or) . 40 × 7 ÷ 6 inches.

(21) Height of high passage . . . . . . (80 × $\frac{6}{7}$ or) . (80 ÷ 7) × 6 inches.

(22) Total length of passage continued to S. end of Chamber . . (80 ÷ 7) × 6 A. ?
(nearest simple expression.)

(23) Total length of passage to S. end of Chamber (in round numbers) . . 7 × 10 A.

(24) Total length of passage, S. end to N. end (nearest round number) . . 6 × 10 A.

(25) Highest part of passage (N. end of floor to main cut off) approximately . 7 A.

(26) Distance between extreme "pivot holes" in passage floor, $\left(\frac{7 \times 6}{2}\text{ or}\right)$. 7 × 6 ÷ 2 A. ?

(27) Mean distance between "pivot holes" . . . . 7 A.

EXAMPLES OF NUMBER AND UNIT.

(28) Length of passage from N. end to J . . . . . . Unit ÷ 7

(29) Length of passage from mean of cuts off to S. end . . Unit ÷ 7

(30) Total length of passage N. end to S. end . . . . Unit ÷ 6

(31) Breadth of bottom of niche . . . . $\frac{\text{Unit}}{25}$ ÷ 6

		Theoretical A inches.	Theoretical Brit. ins.	Actual Brit. inches.	θ B. and A. B. difference.
13	∴ Height of floor above N. end . .		6·14 ± ·05?	6·0 ± ·1?	·14
14	∴ Chamber wall height . . .		182·00 ± ·26	182·8 ± ·36	·2
15	∴ Height of floor above base . .	840·0	840·84	841·7 ± 5·?	·9
16	∴ Passage lower than King's Chamber	840·0	840·84	841· ± ·3?	·2
16a	∴ J to S. end of chamber . . .	420·0	420·42	421·9 ± ·4?	1·5
17	∴ Mean height of chamber . .	214·29	214·500	213·6 ± ·45	·9
18	∴ Height of chamber to top . .	245·0	245·245	244·45 ± ·26	·79
19	∴ Mean course height . . .	28·5714	28·600	28·5 ± ·13	·1
20	∴ Height of low passage . . .	46·666	46·713	46·4 or 47·0	
21	∴ Height of high passage . . .	68·571428	68·640	68·25 ± ·5	·4
22	∴ Length of passage, &c. . . .	1714·2857	1716·00	1725·2	9·2
26-7	∴ First to last "pivot hole" . .	525·00	525·52	523·0	2·52
28	∴ N. end to J.	1308·058	1309·366	1303·3	6·0
29	∴ Mean cuts off to S. end . . .	1308·058	1309·366	1301·6	7·7
30	∴ Total length of passage . . .	1526·068	1527·594	1519·4	8·2
31	∴ Breadth of niche	61·043	61·104	61·3	·2

EXAMPLES OF NUMBER AND UNIT—*continued.*

(32) Vertical height of sloping roof . . . . $\frac{\text{Unit}}{25} \div 6$

(33) Breadth of roof slabs . . . . $2 \times \frac{\text{Unit}}{25} \div 6$?

(33a) Length of chamber . . . . nearly $\frac{\text{Unit}}{40}$

(34) Height of wall of chamber . . . . $\frac{\text{Unit}}{50}$?

(35) Mean height of chamber . . . . $\frac{\text{Unit}}{50} \times 7 \div 6$

(36) Total height of chamber . . . . $\frac{\text{Unit}}{50} \times 8 \div 6$

(37) Height of chamber entrance, also of high passage . . $\frac{\text{Unit}}{800} \times 6$?

(38) Diagonal of end of chamber . . . . $\frac{\text{Unit}}{200} \times 6$?

(39) Square root of chamber floor surface . . . . . . Unit $\div (7 \times 6)$?

(40) Mean of Chamber floor surface, with and without niche $\frac{\text{Unit area}}{250} \div 7$?

(41) Chamber 1 roof surface . . . . $\frac{\text{Unit area}}{25{,}000} \times 7 \times 7 \div 6$?

(42) Chamber side surface . . . . $\frac{\text{Unit area}}{100{,}000} \times 7 \times 7$?

(43) Chamber end surface — niche . . . . $\frac{\text{Unit area}}{100{,}000} \times 7 \times 6$

(44) Chamber end surface + niche . . . . . $\frac{(\frac{1}{2}\text{ unit})^2\text{ area}}{20{,}000} \times 7 \times 6$?

(45) Niche floor surface . . . . $\frac{\text{Unit area}}{200{,}000} \times 6$

		Theoretical A inches.	Theoretical Brit. ins.	Actual Brit. inches.	θ B. and A. B. difference.
32	∴ Height of gable	61·043	61·104	61·65 ± ·45	·55
33	∴ Breadth of roof slabs	122·086	122·208	119·94 ± ·47	2·26
33a	∴ Length of chamber	228·910	229·139	226·9 ± ·27	2·2
34	∴ Height of wall	183·128	183·311	182·8 ± ·36	·5
35	∴ Mean height of chamber . . .	213·649	213·863	213·6 ± ·5	·26
36	∴ Total height	244·161	244·405	244·45 ± ·26	·05
37	∴ Height of entrance	68·673	68·742	68·25 ± ·5	·5
38	∴ Diagonal of end	274·692	274·967	275·45 ± ·40	·48
39	∴ Square root of chamber surface .	217·9	218·1	216·07 ± ·31	2·0
40	∴ Mean floor, with and without niche .	47908·475	48004·292	47933· ± 67·	70·
41	∴ Chamber 1 roof surface . . .	27387·75	27442·53	27210· ± 110·	232·
42	∴ Side surface	41081·51	41163·67	41470· ± 90·	303·
43	∴ End surface — niche	35212·728	35283·153	35228· ± 130·	55·
44	∴ End surface	43385·91	43472·68	43950· ± 120·	478·
45	∴ Niche floor surface	2515·195	2520·22	2513· ± 25·	7·

SUBTERRANEAN CHAMBER † AND HORIZONTAL PASSAGE.

Numbers Employed.	Unit Employed.
3 and 8.	$\frac{\text{Base diagonal}}{400}$ Referring to Period of Earth's Pole.

Examples of Number and Unit.

(1)	Length (N.-S.) of horizontal passage leading into Chamber		10 units.
(1a)	Breadth (E.-W.) of " " "		1 unit.
(2)	Breadth (N.-S.) of Chamber		10 units.
(3)	Length (E.-W.) of Chamber from W. end to J.	3 × 3	units.
(4)	Length (E.-W.) of Chamber from J. to E. end	8	units.
(5)	Roof to doorsill of N. horizontal passage	(3 ÷ 8) ×	10 units.
(6)	Roof to doorsill of S. passage		5 units.
(7)	Roof of Chamber below base of Pyramid	100 ÷ 3	units.

CONSEQUENCES OF THE ABOVE REFERENCES.

8 from (2) and (4) we have Surface of floor, J. to E. end is $= \frac{\text{Pyr. base surface}}{1000}$

9 from (2) and (3) we have Surface of floor W. end to J. is $= \frac{\text{Pyr. vertical diagonal section}}{400}$

10 from (2) and (3) and (1) in "External form" we have W. end to J. is $= \frac{\text{Pyr. height}}{20}$

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† W. end = West end of Chamber. E. end = East end of Chamber.
J. = Junction of floors, or step across Chamber.

		Theoretical A inches.	Theoretical Brit. ins.	Actual Brit. ins.	Difference of Theoretical and Actual Brit. ins.
1	∴ Length of passage	323·72794	324·05167	324·	·05
1a	∴ Breadth of passage	32·37279	32·40517	33·	·6
2	∴ Breadth of Chamber	323·72794	324·05167	325·	·95
3	∴ Length, W. end to J.	291·35515	291·64650	292· to 307·?*	0· to 15·0?
4	∴ Length, J. to E. end	258·98236	259·24134	259·3 to 244·?	0· to 15·0?
3 and 4	∴ Total length	550·33751	550·88784	552·	1·1
5	∴ Height at N. entrance	121·30798	121·51938	121·?	·5?
6	∴ Height at S. passage	161·86397	162·02583	161·5?	·5?
7	∴ Depth of roof, below base	1079·0931	1080·1722	1087· ± 5.	7
8	∴ Surface of high floor	83839·83	84007·51	83300? ± 1000·	700·?
9	∴ Surface of low floor	94352·9	94541·6	96180·? ± 2000·	1600·?
10	∴ J. to W. end	291·4575	291·7490	292· to 307·	0 to 15?

* Those measures with ? attached were measured from Plate IV., Vol. III. "Life and Work," in the absence of any better source of information.

THE GRAND GALLERY AND RAMP HOLES.

NUMBERS EMPLOYED.

7, with 8,
at lower end, and upper, respectively
or horizontal, and vertical.
∴ 7, combined with 8, on slope.
(the 7 being the Queen's Chamber, and the 8 the Antechamber.)

EXAMPLES OF NUMBERS.

7 at lower end and 8 at upper end.
- (1) 7 × 2 cubits, height of Grand Gallery at beginning of Queen's Chamber passage floor.
- (1 a)* 7 divisions on lower end of Grand Gallery, and 8 divisions on upper end.
- (2) 7 : breadth of Gallery (encountered at *lower* end) : : 8 × 20 : Length (only ascertained when arrived at *upper* end.)
- (3)† 7 A {horizontal, from beginning of Queen Chamber passage floor, to main cut off} . . 8 A {the same distance, sloping up floor of Grand Gallery.

7 and 8 combined on slope.
- (4) 7 overlappings on sides and ∴ . . . . . . 8 divisions.
- (5) 7 . . . . × . . . . 8 ramp holes.
- (6) $\frac{A}{10} \times 4 \times 7$ (or 70 inches) between inner sides of ramp. holes } A × 4 ÷ 8 (or 12·5 ins.) {united breadth of average pairs of opposite ramp holes.
- (7) ∴ $\frac{A}{10} \times 4 \times 7$ . . . . + ... A × 4 ÷ 8 = breadth of Grand Gallery.

(8) 4 × 7 Ramp holes in Grand Gallery, and . . . . 4 × 8 {ramp holes including the Antechamber holes, or their representative grooves.

(thus showing the Antechamber to be the 8 to which the Grand Gallery points.)

Link between the 7 of the Grand Gallery, and the 3 of the Antechamber.

(9) 7 × 10 : Grand Gallery Height : : 3 × 3 : height of passage to Antechamber.

		Theoretical A inches.	Theoretical Brit. ins.	Actual Brit. in.	Difference Brit. inches.
1	∴ Height, at Queen's Chamber passage	350·00	350·35	346·9±·7	3·4
2	∴ Breadth of Grand Gallery . .	—	82·37	82·42±·13	·05
3	∴ { Horizontal floor to cut off . .	175·000	175·17	175·9	·7
	{ Sloping floor to cut off . .	200·000	200·20	198·9	1·3
6	∴ { Between inner sides of holes . .	70·000	70·07	69·89±·35	·18
	{ Mean breadth of two holes together	12·500	12·512	12·53±·06	·02
7	∴ Total breadth	82·500	82·5825	82.42±·13	·16
9	∴ Height of passage to Antechamber . (if Grand Gallery 339·5 ± ·63.)	—	43·65±·08	43·7±·5 ?	·5

† The angle of rise would not give this so nearly, but it is greatly assisted by the sloped fall of the short step at beginning of Queen's Chamber passage floor.

THE ANTECHAMBER AND ITS PASSAGES.

Number employed.	Unit Employed.
3.	$\frac{\text{Pyramid height.}}{400}$ Referring to Earth's Mean Radius Vector.

Examples of Number.

(1) Ceiling . . . . 3 stones.
(2) Floor . . . . 3 stones.
(3) W. wall over wainscot . . . . 3 stones.
(4) W. wainscot . . . . 3 stones.
(5) E. wall, over wainscot, in limestone . . . . 3 stones.
(6) E. wall, over wainscot, in granite . . . . 3 stones.
(7) E. wall, upper course of wainscot . . . . 3 stones.
(8) E. wall, lower course of wainscot . . . . 3 stones.
(9) N. wall, over doorway . . . . 3 stones.
perhaps (10) S. wall, over doorway . . . . 3 stones. ?
if so, then (11) Total of stones bounding chamber . . . . 3 × 10.
(12) On W. wall perfect grooves terminating in the continued ramp holes 3.
(13) On E. wall ditto ditto 3.
(14) On W. wall, horizontal grooves . . . . 3.
(15) On E. wall, courses . . . . 3.
(16) Grooved sides of chamber . . . . 3.
(17) Flat sides of chamber . . . . 3.

Examples of Number, and Measure.

(18) Contents of grooves on E. wall . . . . 10,000×3 cubic inches.
(19) Contents of grooves on W. wall . . . . 100,000÷3 cubic inches.
(20) Contents of chamber to top of E. wainscot . . . . . 100÷3 cubic cubits.
(21) Contents of chamber from top of wainscot to ceiling . . 200÷3×3 cubic cubits.
(22) ∴ Total contents of chamber . . . . 500÷3×3 cubic cubits.

Examples of Number and Unit.

(23) Height of first course in chamber . . . . 3 units.
(24) Breadth of Ramp holes and larger grooves . . . . . . 3 $\frac{\text{units.}}{2}$

		Theoretical A inches	Theoretical Brit. i.	Actual Brit. i.	Difference.
18 ∴	Contents of grooves E. wall.	30,000·	30,900·	30,160±500·	740·
19 ∴	Contents of grooves W. wall	33,333·⅓	33,433·⅓	33,680±500·	247·
20 ∴	Contents of chamber to top of wainscot . . .	520,833·⅓	522,396·	524,370±800·?	1974·
21 ∴	Contents to top of chamber.	351,562·	352,616·	350,990±1250	1626·
22 ∴	Total contents of chamber .	872,395·	875,012·	875,360±1000·	348·
23 ∴	Height of first course .	43·7185228	43·76235	43·7	·06
24 ∴	Breadth of ramp holes .	21·8592614	21·88117	21·85±·10	·03

(25) Breadth of chamber . . . . $3 \times 3 \frac{\text{units.}}{2}$

(26) Height of N. passage . . . . 3 units.

(27) Length of N. passage . . . . $3 \times 3 \frac{\text{Pyr. height.}}{1000}$

(28) Height of S. passage . . . . 3 units.

EXAMPLES OF UNIT.

(29) Length of S. passage . . . . 7 units.

(30) First floor joint (the first line in the chamber) from N. wall . 1 unit (mean position.)

(31)* Length of chamber (the side having 8 divisions) . . . . . 8 units.

		Theoretical A inches.	Theoretical Brit. i.	Actual Brit. i.	Difference.
25 ∴	Breadth of chamber . .	65·577942	65·64352	65·2	·44
26 ∴	Height of N. passage .	43·7185228	43·76235	43·7	·06
27 ∴	Length of N. passage .	52·4623593	52·51482	52·1 to 52·5	0 to ·4
28 ∴	Height of S. passage .	43·7185228	43·76235	43·6 to 43·8	on each side.
29 ∴	Length of S. passage .	102·009939	102·11195	100·5 to 100·9	1·2
30 ∴	First floor joint, from N. wall	14·572877	14·58745	14·5 ± ·05	·09
31 ∴	Length of chamber .	116·5830206	116·6996936	116·52 ± ·165	·18

PYRAMID DEGREES

AND THEIR EQUIVALENTS.

PYRAMID DEGREES

AND THEIR EQUIVALENTS.

ALL degrees here stated are 1000° = circle, unless otherwise specified.

The only hitherto noticed example of a simple equivalent for the *average* size of a Pyramid degree in any angle, is that mentioned by Professor Smyth in Life and Work, Vol. III. p. 209, where it is shewn that there are as many courses as degrees, or one average course per degree of the angle subtended by the slant height of the Pyramid's face, from the subterranean chamber floor as a centre.

This reference is apparently most accurate if taken from the level of the N. door-sill, which is one of the only two floor data in this chamber: this gives $209^{\circ}{\cdot}79$ (being 1182·1 Pyr. ins. below base) and we cannot well assume less than 210 courses, which leaves 280 ins. for the three top courses; in fact 212 ± 2 would seem to be the probably best expression, when stating the probable error.

It may not be amiss to mention here that if we assume $\frac{11}{10}$ cubit (of 25 ins.) along the axis, per course, we have 210 for the nearest whole number of courses; as we also have if we assume $\frac{6}{7}$ King's Chamber Units along the perpendicular of the face, per course. Further $3 \times 7 \times 10$ courses seems a most appropriate number for a π proportioned Pyramid. Two references also near this number may be mentioned here; 1 King's Chamber Unit along the arris, per course, would imply 211 courses (as the nearest round number); and the angle resting on the courses, *i.e.*, up the centres of the faces, across the top of the Pyramid is 212° in round numbers.

Following this clue given by Professor Smyth, we find that in the angle of the arris, *i.e.*, the diagonal profile (the corner of the base being the centre, and the arris and base diagonal the radii) there is a similar instance (though not quite so simple) of 9 courses for every 5° which would imply 209·9862, or evenly 210 courses. Otherwise this may be viewed as 9 courses per 10° in the complement of the diagonal angle over the top, so that as we have the ratio 10 to 9 shewn lineally in the rise of any arris line from the base, we have likewise that number in the continued upward extension of that line from the opposite arris.

Having thus seen the degrees represented by the courses, we may also consider the number of degrees and their equivalents in measure.

One of the clearest examples of this is the arris angle or diagonal profile, which is

$\frac{700°}{6}$* $\left(\text{within } \frac{1}{15,000}\right)$ and along the axis we have 2 cubits or fifty inches per degree of this angle $\left(\text{difference } \frac{1}{1333}\right)$. The equivalent of the degrees of the direct rise, up the centre of the face, of 12×12° $\left(\text{diff. } \frac{1}{3720}\right)$ is not so simple; being $\frac{6\times6\times10}{7}$ inches per degree $\left(\text{diff. } \frac{1}{1697}\right)$ on the opposite slope or perpendicular of face.

The only similar angle is that of the theoretical cone (equal in circumference to the Pyramid), which is also the angle of the Pyramid where the base is cut by the base circle; this angle is 125·° and the degree is represented by $\frac{4}{5}$ of 20 inches along the axis $\left(\text{diff. } \frac{1}{1393}\right)$.

Another way of viewing the external angles is from the apex or radiant point of the Pyramid, the plane of the angle being vertical or coincident with the Pyramid axis, and the equivalents of the degrees are across the base; the top angle between the opposite arris lines is $\frac{8}{5}$ of 100·° $\left(\text{diff. } \frac{1}{15,616}\right)$ each degree is equal to $\frac{7}{6\times6}$ ×10 cubits or 250 inches on the base $\left(\text{diff. } \frac{1}{585}\right)$; here we have $\frac{8}{5}$ × 100° for the arris angle at the top, and $\frac{7}{5}$ × 100° the arris on the base; 7 below and 8 above, like the Grand Gallery. The top angle between the perpendiculars of the opposite faces is 212°, and the degrees are approximately represented by $\frac{5}{7}$ × 100 inches, the difference being much larger than in the other examples $\left(\frac{1}{123}\right)$. The angle from the apex to any two opposite intersections of the base circle and the base, *i. e.* across the top of the Pyramid cone, is 250·°0 and each degree is represented by $\frac{4}{5}$ × 20 inches $\left(\text{diff. } \frac{1}{1393}\right)$ which is necessarily the same as the value of the degrees in the other way of viewing this angle from the base.

The angles of the air channels are unfortunately rather vague, as they only profess to be "within a degree." The N. channel is stated at 32° 45′ sexagesimally, so it is quite possible that it may be 32° 24′ sexagesimal, or 9 × 10° Pyramidal; and apparently from a comparison of measuring we might not be wrong in assuming 1500 inches for the vertical height of its sloping position, thus giving $\frac{1}{3}$ of 50 inches per degree. The S. channel is 45° or 46°, if 45° sexagesimally, it is the circle ÷ 8, or 125°, and (the vertical height being the same as the N. channel) we have 12 ins. per degree from the level of the King's Chamber.

The angular roof stones over the chambers of construction can only be ascertained from the plates in "Life and Work" (the accuracy of which in cases of known measures is considerable,) from which they seem to be 32° 50′ ± 30′ sexagesimally, which is quite possibly the N. air channel angle just mentioned or 90°; the vertical height of this,

* $\frac{700}{2\times3}$ though less simple, would probably be a truer expression here and elsewhere in the external Pyramid, as this is dependant on the π or $3\frac{1}{7}$ proportion of the Pyramid, 7 and 6 combined belonging more especially to the Queen's Chamber.

judging by the plate, seems to be $\frac{9}{10}$ inch per ° of rise ; or if the degree equivalent be considered on the opposite slope, we have $\frac{3}{5}$ inch per degree, and a strong warrant for considering it both ways will be found in the Queen's Chamber. This angle and its equivalents, as well as the angles of the air channels, are only mentioned as conjectures, as the data at present are insufficient to give the ideas much weight.

This, however, is not the case in the angles of the passages, of which we know enough to test any supposed reference properly, and which are so nearly the same that they may be considered as one, the variations being perhaps to accommodate difference of level, or possibly to include references which required slightly different angles.

The angle from "Life and Work" would probably seem to be sexagessimally

26° 27′ 45″ Entrance Passage
± 45″
26° 6′ 20″ First Ascending Passage
± 20″
26° 17′ 44″ Grand Gallery
± 10″.

For considering the general angle perhaps the mean of the Entrance passage and Grand Gallery would be the truest datum, as the First Ascending passage has been stated by Prof. Smyth from its inferiority to give the impression of being merely a necessary means of communication, and therefore not of symbolic importance itself.

The angle to be considered then is (avoiding unnecessary fractions) 26° 23′ ±4′ sexagesimally, or 73°· 3 ±· 2 Pyramidally. This not being a round number or a simple fraction (its nearest simple expression being $\frac{220}{3}$) the question is, if it resembles any number elsewhere used. Now the number of cubits in the base (or earth revolutions in the year) is 366·2563612 which divided by 5 is 73·25127224 (sexagesimally 26° 22′ 13·″649) a very close approach to the mean value 73·3 ± ·2, in fact varying from this mean less than a quarter of the *probable* error.

The equivalent in measure of these degrees, is the next point to consider ; for this there are many originally marked out portions of the passages, of which the vertical heights may be fairly considered, and the number of cubits or inches per degree, on those perpendiculars.

The first example we meet with is the Entrance passage, the vertical height of the total shaft of which contains 1 cubit per degree[(8)]. Then up the first ascending passage, till we come to the level of the theoretical floor of the Queen's Chamber passage (at the roof of said passage), we have for the vertical height of this portion, 10 inches per degree[(9)]. The next marked portion is the beginning of the sloped floor of Grand Gallery, from the main cut off to the South wall; the vertical height of this portion is also 10 inches per degree [6]. There are also some other similar (though not so simple) references, which are not included here as they require confirmation from some other source, before they could be relied on.

The angle of the gable in the Queen's Chamber is one of the most striking cases of combination yet examined; as in a single angle we have 7 and 6, the Dominant numbers of the chamber, *twice* repeated (proportionally) and 7 twice repeated in measure.

The case that I had before perceived, connected with the Dominant numbers, was that the base of the angle (or half breadth of chamber) : the slope :: 6 : 7[D]. The second case is the number of degrees in the angle, this is also most appropriately represented by $\frac{6}{7} \times 100^{\circ}$[E] or $\frac{6}{70}$ of the whole circle. Next come the equivalents in measure, of the degrees; on the perpendicular of the triangle there is $\frac{1}{7}$ of 5 inches per degree [F]; also on the opposite slope $\frac{1}{5}$ of 7 inches [G] per degree, — or 10 inches per 2 × 7 degrees on the vertical, and 2 × 7 inches per 10 degrees on the opposite slope.

The combination of so many examples of a number in one angle would seem apparently impossible, and it is almost certain that the representation of a number so many times, with such accuracy, could not be performed with any other single plane angle and number.

W. M. F. P.

July, 1872.

I may further add to this subject, that the polar distance of α draconis was 10°·0 at the Pyramid date approximately, or 2153¾ B C accurately; the entrance passage points 9°·88 ± ·04 below the true pole at the Pyramid latitude.

April, 1874.

		Vertical height. A ins.	Vertical height. B. ins.	Vertical height. Actual B. ins.	Difference.	Total of probable errors.
A	∴	1832· ± 5·	1834· ± 5·	1843· ± 5· ?	9·	10·
B	∴	733· ± 2·	733·7 ± 2·	732· ± 1· ?	1·7	3·
C	∴	733· ± 2.	733·7 ± 2·	734·5 ± 1· ?	·8	3·
D	∴	61·824 ± ·08	61·886 ± ·08	61·65 ± 45	·24	·53
E	∴	61·468 ± ·08	61·529 ± ·08	„	·12	·53
F	∴	61·2244	61·2857	„	·37	·45
G	∴	61·5479	61·6094	„	·04	·45

366·256 *versus* 365·242.

WHICH IS THE PYRAMID BASE CIRCUIT?

ALL THE PYRAMID BASE MEASURES, EXCEPTING VAGUE GUESSES.

	Brit. ins. in base.	100 A ins. in circuit.
WITH CASING.		
1 Le Pere and Coutelle, N. base	9163·43	366·171
2 Howard Vyse on the cleared N. base	9168·	366·36
3 Pliny on the cleared base	9160·	366·0
4 Aiton and Inglis over rubbish mounds mean base	9110·	364·04
5 Royal Engineers " " "	9130·	364·84
WITHOUT CASING, ON BASE LEVEL.		
6 Jomard, accurately outside rubbish, N. base 8949·7 + 216	9165·7	366·26
7 Prof. Smyth, roughly all four sides (8950 ± 15) + 216	9160· ± 15	366·3
8 " " outside rubbish E. side 8952 + 216	9168·	366·4
9 Consul Davison 8952 + 216	9168·	366·4
WITHOUT CASING on higher levels than base and therefore more dubious.		
10 Lane, if on first course level 8796 + 340.	9136 ?	365·08 ?
11 to 17 (Monconys, Thevenot, Melton, Chazelles ?, Fulgentius, Nointel, Graves.) These all agree in 728 feet = 8736 inches which if measured on first course is + 340 if " second " + 428 the second course result is evidently the truth, as the first course result is nearly three times as far from even 365· base as is the second course result.	9164	366·20

NOTES ON THE ABOVE MEASURES.

1 Measured "with a minute attention and most exact methods," in fact "*inattaquable*."

3 Pliny states 883 feet, evidently Egyptian half cubits, of which the nearest example in time, that I know of, is the Elephantine Nilometer measured by Jomard as 527 m.m., Wilkinson's measure only professes the nearest ¼th inch and only varies from Jomard's more accurate measure by that amount.

4 The rubbish heaps are mentioned by Prof. Smyth as making the ground "so excessively difficult to measure over."

5 as 4 and Colonel Sir Henry James, R.E. expressed a very low estimate of its correctness.

6 By description a very accurate measure, the more so as it was taken by the accurate French observers, when the sockets were unknown, and they knew of no better method. The casing allowance is from Life and Work, Vol. III., p. 27.

7 This is stated as between 8900 and 9000 inches, if this means say 30 to 1 against its exceeding these limits, the *probable* error will be about 15 inches.

8 From the Azimuth Trench measures, the two uncertain amounts of which are only on the small portions of 950 and 1120 inches.

The close agreement of these professedly rough measures (7 and 8) with Jomard's accurate measure, should give us great confidence in Prof. Smyth's accuracy in his professedly accurate measures.

9 Davison "frequently visited the Pyramids."

10 This is the only possible reconciliation of his measure, though it is directly opposed to what he says about the inner side of the 144 inch socket being the same as one point from which he measured.

11 to 17. These are all of 17th and 18th centuries, and though probably copied somewhat from each other, are well worth considering. Greaves' measure is omitted as being utterly irreconcileable with his description. The ancient Greek and Roman measures are not noticed as they are only in round hundreds of feet, Pliny excepted.

It is striking to observe, apart from any valuations of the observers' personal correctness, that of the above 17 measurers all but three agree in 366· base direct, or in measures which must imply that base; and further that by far the most accurately circumstanced measures are in this large majority. The only three that point to a shorter base are, Lane whose account must be altered to make any sense of it, suggesting a mistake of a few whole feet in the measure; Aiton and Inglis, and the Engineers, both of which measured over the very troublesome rubbish heap 50 feet high on the side, and about as much from the base; we must also bear in mind that Inglis's far easier measures of the Pyramid height are irreconcileable with those of Prof. Smyth, Le Père and Coutelle, and Jomard and Cecile, who all agree most remarkably. Of the accuracy of this other measure so libellous on the Royal Engineers, the less said the better, as Sir Henry James who had the unpublished details of the measures thought nothing of their being 10 inches wrong, and also as the measures were considered a very unimportant matter, never officially published or put forward, except in a *very* vague form by an official whose last new theory they were measured in order to test.

4a King's Chamber length $= \frac{1}{25} \sqrt[2]{\text{area}}$ of Pyramid base circle -	365·24 ± ·04	
4b King's Chamber length $= \frac{1}{10} \left\{ \begin{array}{l} \text{radius of Pyr. base diagonals;} \\ \text{semi cone line, \&c. : see p. 7, Nos. 1 \& 2} \end{array} \right\}$		366·20 ± ·04

these relations were originally omitted from *this* statement, as being too ambiguous without full discussion, for which see pp. 50-3.

ALL THE REFERENCES AND CONNEXIONS

affected in our present state of knowledge by a difference of the Pyramid base.
With the base length required to produce the hitherto recorded dimensions.

Quantity in question and connection.	A. in required base. Nearest to 365·242	A. in required base. Nearest to 366·256
1 Pyramid height = [illegible] A		366·5191
2 A in Pyramid height = mean diam. of earth in inches ÷ $\sqrt{10^{12}}$	364·6222	
3 Pyramid circuit = 355 × half breadth of King's Chamber		365·77 ± ·03
4 Arris angle of Pyramid rise has 1° Pyramid per 50 Pyr. in. of height		366·495
5 40 × height of King's Chamber × Pyramid height = (slant down face centre²) (or 40 × height ÷ $\sqrt{(\frac{7}{4})^2+1}$ = Pyramid height)	365·50 ± ·16	
6 Half height of King's Chamber, cubed = Pyramid bulk ÷ 10^8		365·96 ± ·16
7 King's Chamber N. or S. wall vertical circuit = $\frac{1}{10}$ diagonal of Py. base (or allowing for contraction of walls at top 366·010, the circuit to floor only (= 363·101) is without a radius, and ∴ inadmissable)		366·151 ± ·085
8 King's Chamber N. to S. *minus* coffer N. to S. = $\frac{1}{50}$ Pyramid height. Top 364·3, Bottom 363·95 } E. 364·85, 367·60 } W. mean	365·2 ± ·6	
9 Coffer mid circuit, or internal length + external breadth (or 3 × external breadth) = $\frac{1}{50}$ Pyramid height. N.E. N.W. S.E. S.W. Mean. Top 366·4 366·3 365·8 365·7 366·05 ; Bottom 366·6 366·3 365·4 365·0 365·8 } total mean		365·9 ± ·17
10 $\sqrt{10}$ coffers × 800 = 4 arris + 4 base lines of Pyramid		366·174 ± ·086
11 Antechamber length = $\frac{1}{50}$ Pyramid height. E. 364·8. W. 366·6. mean		365·7 ± ·6
12 Antechamber circuit = $\frac{1}{10}$ of length of polar line in Pyramid		365·73 ± ·2
13 Queen's Chamber E. or W. wall diagonal cubed × 10^8 = Pyr. cone bulk. low S.E. to high N.E. } 366·88 N.E. S.E. } 366·48 S.W. N.W. } 364·61 N.W. S.W. } 369·26 mean		366.81 ± ·53

	Quantity in question and connection.	A. in required base. Nearest 365·242	Nearest 366.256
14	Queen's Chamber E. or W. wall height $= \frac{1}{50}$ or $\frac{6}{300}$ of Pyramid base; N.E. 364·? N.W. 368·6 S.E. 362·? S.W. 364·? (as none can judge of the weight of these dubious measures but Prof. Smyth, I here take his result). Mean		366 ± 1·?
15	Queen's Chamber mean, or contents, height $= \frac{7}{300}$ of Pyramid base		367·8 ± 1·?
16	" " gable height $= \frac{8}{300}$ " " E. 367·4 middle 365·5 W. 365·9 mean		366·3 ± ·5
17	Queen's Chamber E. or W. wall diagonal $= \frac{9}{300}$ or $\frac{3}{100}$ Pyramid base; low S.E. to high N.E. 366·96, N.E. S.E. 366·56, S.W. N.W. 364·70, N.W. S.W. 369·36 mean		366·89 ± ·02
18	Queen's Chamber niche breath $= \frac{2}{300}$ of Pyramid base		367·4 ± ·5?
19	" " passage length $= \frac{1}{6}$ or $\frac{50}{300}$ " "	364·29	
20	Queen's Chamber passage length to step $= \frac{1}{7}$ of Pyramid base	364·56	
21	" " floor to ramp top at cut off $= \frac{1}{50}$ Pyramid height E. 364·4 W. 366·3 mean (there is an apparent mistake in the vertical measures here, which is evinced by the measures on slope.)	365·3 ± ·7	
22	Pyramid degrees in passage angles = {each 500 ins. in base circuit or each 5 A. on base side; Entrance, 367·53 ± ·17 First Ascending, 362·57 ± ·07 Gr. Gal. 365·21 ± ·04 mean	365·15 ± 1·0	
23	Subterranean first horizontal passage N. to S. $= \frac{1}{40}$ Base diagonal		366·19
24	" Chamber breadth N. to S. $= \frac{1}{40}$ "		367·32
25	" " length + 17 $= \frac{1}{400}$ "		367·01
26	S. Azimuth Trench from centre to S. end $= \frac{1}{10}$ of the 4 arris lines		366·44
27	N. " " to N. end = " "		366·02
	Too far from any base to be included.		
28	Niche height from shelf upwards $= \frac{1}{40}$ of Pyramid height		371·5 ± 2·5?
	Too unsystematic in idea to be included.		
29	Niche height $\times \pi \times 10$ = Pyramid height		366·30
30	Cubic inches in coffer = Length of all arris and base lines	365·18 ± ·16	
31	Diagonal of King's Ch. end : Pyramid base :: a day : a lunation	365·114	
	Too uncertainly measured to be included.		
32	Equilateral triangle O. S. D. in Azimuth Trench diagram		
33	Base circle cuts inner ends of Azimuth Trenches		
34	Trenches end to end subtend top angle of Pyramid face from centre		
35	Subterranean Chamber passage breadth $= \frac{1}{400}$ Base diagonal		
	Cosmic Datum.		
36	Sun's distance (weighted mean) = Pyramid height $\times 10^9$.		366·129

The only way to gather any accurate idea from this table is to take a mean of all the references. It is clear that this must not be a simple mean, as it would be absurd to give to such an unsystematic idea as No. 5 as much weight as No. 7, which is a link of a perfectly homogeneous series; or to give to No. 10, which is a very incongruous idea, as much weight as No. 2, which is a far more regular and suitable connection, so that the first consideration is to weight the connections according to their relative consistency, and systematic nature; this was according done, from a list which gave no clue to the length required for each reference, and by two well acquainted with the subject carefully considering the *pros* and *cons* of every case, without any knowledge of the results to which each case would lead. Further, the numbers are appended below for the consideration of any one equally totally unbiassed.

Another point affects the question, this is the amount of uncertainty as to what base each reference requires; for instance it would be absurd to consider that No. 13 or 23 defined the base as accurately as No. 3, for No. 13 or 23 has a probable error of measurement and variation of masonry which is equal to half the difference between 365 and 366 base, whereas No. 3 only has a probable error of a hundredth of this difference.

How to combine these two valuations of each reference, to weight the references for the mean of all, may not be at first sight clearly apparent to the reader, but it is truly solved thus.

The first mentioned, intrinsic value, of each reference is clearly the maximum height of the probability curve which may be taken to represent the reference: the second, or extrinsic value, stated as the probable-error of workmanship, wear, and measurement combined, is clearly the probable error point of the curve; *i.e.* the height being fixed as the intrinsic value, it is clear that a reference with a large probable error is nearly as valuable to a point a good deal on one side of it, as it is to its maximum point. Or leaving curves for the practical view, if a measured quantity is very variable it is clear that it very ill defines what base it requires; and so in the curve, whatever intrinsic value it has, the said value is as it were smudged aside from the centre, with decreasing value on to all the adjacent possible base lengths.

The actual arrangement therefore was, for each reference to draw a probability curve of mathematically fixed form, taking the probable error point of the curve at the distance of the probable error of the measures from the mean of the measures; then when all these curves were drawn, to sum up all their ordinates, *i.e.* heights, and so form a total curve at each point such as would be formed by the superposed vertical heights of every curve at that point.

This total curve then represents by its maximum height or middle ordinate, the mean of all the references weighted according to their intrinsic probability of design and their extrinsic uncertainty of variations in masonry, by wear, and in measurements.

The probable-error point of this curve represents not the probable error of the central point of the curve, because it is clear that the formative elements of the curve are not at all measures of the same thing, and further that they do not all exactly refer to one base side. This probable-error point, therefore, is not the probable error of workmanship and measurement of similar quantities, but the probable, or equal variation of representation, a variation intentionally produced by the force of other determining causes, and not by blind or careless accident of formation.

With this explanation, I proceed to figures.

No.	Intrinsic probability or weight of the probability of design of each reference.	Extrinsic improbability, constructive or measurative divergences *inter se* combined with the constant probable measurative error ($\frac{1}{3000}$ about) and expressed on the principle of probable error.	Remarks on the Intrinsic probability.
1	100	*nil*	
2	60	*nil*	
3	140	.01	Strongly warranted by analogy.
4	100	*nil*	
5	40	·16	Partly warranted by certain cosmical references waiting for publication.
6	110	·16	
7	600	·085	Very strongly warranted by the large homogeneous system of which it is a link.
8	80	·6	
9	200	·17	Strongly warranted by the coherent system.
10	10	·086	Irrational to add arris and base lines.
11	70	·35	
12	150	·2	Strongly supported by the reference of level.
13	110	.53	Supported by the similar case of No. 6.
14	100	1· ?	
15	100 } 400	1· ?	Supported by the series of fractions.
16	100	·5	
17	100	·62	
18	25	·5	
19	25	.06	
20	25	·06	
21	60	·7	Supported by Nos. 8, 9, and 11.
22	80	1·0	
23	120	·5 ?	Strongly supported by each other, and also by No. 35.
24	120	·5 ?	
25	80	·4 ?	
26, 27	180	·15 ?	Supported by S. trench length = ½ cone line, which runs beside the arris.
28	1	2·5 ?	Much too far from any base to be probably intended.
29	1	·2 ?	Totally incongruous to ×π, and so produce a radius.
30	4	·16	No material warrant.
31	6	·15	Totally unsupported by any system.

On then carefully viewing the total curve derived from these figures, with the aid of a probability curve of the nearest approximate form, and without any idea of the value of any point of the curve, or even of its scale, the result arrived at from an exhaustive consideration, and mapping of the centre of the curve at about 20 various heights was

366·256
± ·006

for the intentional mean of all the references to the external size of the Pyramid from its internal features, and the point of probable or equal variation of representation is ± ·8 on the above 366·256 A. cubits in the base side.

This result is truly astonishing, as it is precisely the value given by the sidereal day base, though not in any way dependant thereon or resulting therefrom, any more than from the solar day base; and it will be seen from what has been above stated that the result was perfectly secured from any (even unintentional) bias in favour of either the sidereal or solar day base.

THE CONNECTION OF THE KING'S CHAMBER WITH THE PYRAMID BASE.

It will doubtless be noticed that although great stress has been laid recently on the King's Chamber giving the true base side, yet no use of this fact agreeing to the 365· base, appears in the preceding list of base and internal connections of the Pyramid. In the previous list of new facts may be seen the explanation, *i.e.* that there is another connection there mentioned, which also explains the Chamber on the 366· base, and therefore that this connection is partly ambiguous.

Now in all connections there is internal evidence by the simplicity and systematic nature of the connections, to which it is most important to attend.

Let us therefore examine the actual working of these two connections. But, first, is the unit of reference of the Pyramid externally to be the height or the base. Now, although all the connections have been stated by the base length required, this has only been done because—1st. The base is the only directly and accurately measureable amount ; and, 2nd. The base cosmical connection is known to four or five places of figures further than the height connection of the sun's distance. Now though these are very necessary working reasons, owing to our imperfect knowledge of the cosmical and pyramidal quantities required, yet this has nothing to do with the relative importance, in the Pyramid design, of the two quantities ; and as Sir John Herschel has well observed on the metre, "Every geometer will agree that the radius of a circle is a more fundamental or primary parameter, or unit of linear dimensions, than its circumference." Accordingly, it is evident that the Pyramid radius or height is the unit to which we must refer all connections, for the purpose of best estimating their design.

The connection with the 366· base (detailed at p. 7) may be mathematically expressed thus (calling the height H) ; $\frac{H}{\sqrt[3]{2}} = 10 \times$ length of Chamber, and therefore (by the π proportion of the Chamber) $\pi H \sqrt[3]{2} = 10 \times$ circuit of Chamber, N. and S. sides.

The connection with the 365· base may be expressed thus, $\sqrt[3]{H^3 \pi}$ or $H \sqrt[3]{\pi} = 25 \times$

length of Chamber, and therefore $2\pi\sqrt[2]{H^2\pi}$ or $2\pi^{3/2}H$ is equal to 25 × the circuits of the sides.*

Now the consideration is, Which is the most intelligible and rational formula? It may be objected that the $\sqrt[2]{2}$ in the first formula is an irrational and unreasonable element; but viewed as the side of one square of 10 × length of King's Chamber in the side, diagonally inscribed in another square of the Pyramid height in the side (and strong Pyramidal warrant there is, for the Pyramid height squared as will be shewn) the irrationality disappears greatly, and by this view we see clearly how the formula can be put into a square root form like the 365 base derivation, thus,

$\sqrt[2]{\frac{H^2}{2}} = 10 \times$ length of King's Chamber, and $2\pi\sqrt[2]{\frac{H^2}{2}} = 10 \times$ circuits in King's Chamber on the 366 base.

against $\sqrt[2]{H^2\pi} = 25 \times$ length of King's Chamber, and $2\pi\sqrt[2]{H^2\pi} = 25 \times$ circuits in King's Chamber, on the 365 base.

Now these 366 base formulæ are rational and suitable, but the case is far different with the others; the first might be rational, but the π proportion of the King's Chamber N. and S. walls, as expressed by the second formula, is completely killing to any idea of rationality in the connection. $\pi\sqrt[2]{\pi}$ is hopelessly artificial and the more condensed form $\pi^{3/2}$ looks still worse, and is a quantity never geometrically required or simply producible.

We find in the Pyramid the π proportion, in the King's Chamber the same, and in the coffer the same, with many analogies of similar construction and division connecting them: on the 366· base all the radii of these circles, and their relative circuits, stand in a pure decimal relation to each other (see New Facts 1 to 5): on the 365· base all this even and superfinely simple connection of parts is destroyed, and the heterogeneous idea is required, of the *radii* of the King's Chamber and coffer circles being commensurate with the *circle* of the Pyramid, and the *circuits* (which are as plain as possible) of the King's Chamber and coffer being commensurate with nothing Pyramidally expressed or intelligibly expressible in the outside form.

There is no comparison between the intrinsic reasonableness of these alternative connections.

* The cosmical relation implied by conjoining these alternative connections of the King's Chamber and the base is as follows:—

$$\text{On } 365{\cdot}242\ \frac{H\sqrt[2]{\pi}}{25} = \text{King's Chamber length} = \frac{H\sqrt[2]{2}}{20} \text{ on } 366{\cdot}256$$

$$\therefore \frac{\sqrt[2]{\pi}}{5} : 366{\cdot}256 :: \frac{\sqrt[2]{2}}{4} : 365{\cdot}242$$

$$\text{or } 4\sqrt[2]{\pi} : 366{\cdot}256 :: \sqrt[2]{50} : 365{\cdot}242$$

$$\text{or } 4\sqrt[2]{2\pi} : 366{\cdot}256 :: 10 : 365{\cdot}242$$

Ancient traditional testimony.

Here another consideration comes in ; the only piece of really useful and accurate information on the design, that the classical writers give, is that collected by the earliest literary visitor to the monument.

The original statement made to Herodotus (as most harmoniously interpreted by John Taylor) was that the height squared was equal to the area of one face, and that this doubly-represented quantity was equal to 8 arourai of 100 cubits in the side. Now, as we have already seen, this Egyptian cubit is exactly equal in mean value to the 400th of the Pyramid cone line on 366· base, and accordingly half the cone line, or 200 of these cubits square, or 100 Double King's Chamber units square, is exactly (by the π proportion) as already mentioned, equal to half the square of the height ; in short, this account given to Herodotus is the tradition of the true derivation of the Egyptian cubit from the whole external and then accessible Pyramid, an account of connection sufficiently complex not to have been accidentally discovered if undesigned, and yet a true account of the connection and derivation of that cubit from its great prototype and originator.

Further, if we even could reject the intention of this beautiful harmony of the Egyptian tradition with the actual facts, it is certain that if the 365· base be assumed, the length of the Egyptian cubit required to produce the relationship asserted, is far from what can be legitimately deduced from the total of known examples.

An objection has been raised, that the solar day is the day which concerns *man*, and therefore should be represented in the base, in place of the sidereal day. Now though all such ideas of what *should be* have absolutely no value in the face of what *is*, still it may be desirable to shew that the Great Pyramid is not irrational, as some seem to suppose, by referring to the *sidereal* day. Though it is objected that but few in the kingdom know the beginning or end of the sidereal day, yet it is true that no one knows, or cares to know, the true beginning or end of the solar day. In professing to use solar time we are obliged to resort to *mean* solar time determined by the stars, which is never the *actual* solar time but twice in the year, rather in the way that a clock standing still is always right twice a day.

It is only barbarians and savages in science that could resort for proper time to a timekeeper so bright no one can look at it, and so broad that no accurate shadow can be cast by it. The stars, on the contrary, are the perfection of timekeepers, as perfect as any natural objects can be, clearly visible and observeable, infinitely narrow angularly, so as to disappear or transit instantaneously, and by observing them the equable motion of the earth is not interfered with, and complicated, by such a complex allowance as must be made for the solar trouble of the earth's orbit being elliptic, and moreover, of variable ellipticity.

All our solar mean time is obtained from the stars, and an allowance made, why then object to the propriety of representing the day a stage earlier in the observation of it, by the omission of the constantly required cumulative and cumbrous correction? and why should not the reality instead of the appearance be attended to as is the rule throughout the Pyramid references.

Are not the Pleiades, that most perfectly positioned group of stars for observation at Pyramid date, the timekeepers for long periods? and why not for each day also?

Finally, although the sidereal day is at least as reasonable as the solar, I may repeat that the whole question really turns on what is the actual fact, and this is I think sufficiently clearly answered by the preceding list of measures.

THE KARNAK CUBIT, ITS LENGTH AND ORIGIN.

The object of this sketch is to consider, 1st. Whether the Karnak Cubit, (meaning by this all ordinary Egyptian cubits of 20·5 to 20·8 ins.), is the same length as the King's Chamber Unit, and, 2nd. Whether it originated as a metric unit before, or whether it was derived from, the said King's Chamber Unit.

As to its length, the researches of Sir Isaac Newton on the "Cubit of Memphis" are unfortunately not applicable for the present enquiry, as *all* his data were derived from the examples of the King's Chamber Unit in the Pyramid, which he considered identical with the Karnak Cubit; also, Mr. Perring derived most, if not all his data from the Pyramid, his result therefore will be equally inapplicable for the present question.

We are therefore thrown for our conclusions on actual examples of the cubit, and those measures of ancient buildings which are evidently round numbers of cubits; the data we have are, I should imagine, quite sufficient for our purpose; namely, The list of cubits in Sir Gardner Wilkinson's "Ancient Egyptians," and Eleven measures (giving concordant results) of the Temple of Edfou :—

Firstly, Sir Gardner Wilkinson's list, which is as follows, (omitting his column of millemetres) :—

		Brit. inches.
1	"Cubit in the Turin Museum according to my measurement	20·5730
1a	"The same according to M. Jomard	20·5786
2	"Another he gives	20·6180
3	"Another	20·6584
4	"M. Jomard's Cubit of Memphis	20·4729
5	"Cubit of Elephantine according to M. Jomard	20·7484
5a	"The same according to my measurement	20·6250
6	"Part of a cubit found by me at A'Souan, apparently about	21·0000
7	"The cubit at the Pyramids according to Mr. Perring	20·6280
8	"Mr. Harris's Cubit from Thebes	20·6500"
8a	The same by John Taylor	20·73
8b	The same by Sir Henry James	20·699

Now taking the mean of 1, and 1a,—and of 8, 8a, and 8b, as single data, also omitting 7, as it is derived from our opposite object of comparison, and also omitting 6, as being too rough to be of any value, and 5a, as being probably of far less accuracy than 5, we may form the following list, omitting the last decimal as baseless:—

	Authorities.	Brit. inches.
Cubit in Turin Museum	mean of Jomard and Wilkinson	20·576 ± ·002
A Cubit	Jomard	20·618
A Cubit	Jomard	20·658
Cubit of Memphis	Jomard	20·473
Cubit of Elephantine	Jomard	20·748
Cubit of Karnak	mean of Taylor, Wilkinson, and James	20·693 ± ·02

To which I may add:—

Cubit of Edfou	deduced from measures in Penny Cyclopædia, "Egypt"	20·641 ± ·04
	Mean cubit	20·629 ± ·024

We may then assume this 20·629 ± ·024 British inches, to be the true mean length of the Karnak or ordinary Egyptian Cubit; having settled this, (with no precise remembrance of the King's Chamber Unit being in my mind, and not having made any subsequent alteration of this mean in the faintest degree), we now turn to the Pyramid, and looking for the most exact expression (by cosmic connection) of the King's Chamber Unit, (*i.e.*, $\frac{1}{100}$ of a radius whose circle is one of the base diagonals, or $\frac{1}{400}$ of the slanting cone radius), we find it to be 20·62977 British inches, or exactly identical with the above mean to $\frac{1}{20}$ of the *probable* error, if this is an unconnected coincidence, what can ever be a proof of connection.

Our second point for consideration was, Whether the Karnak Cubit originated as a metric unit before, or Whether it was derived from the King's Chamber Unit. Now, as we have no pre-pyramid buildings or remains extant, we cannot have any direct evidence on this point, but we have the following facts to consider, 1st. The unit we find in common use, at, and just after, the Pyramid date, is *not* the Karnak Cubit, in any of the cases I am acquainted with, *i.e.*, the supposed Tomb of Shofo, and the many tomb fronts and portions of tombs in the British Museum, of Pyramid date, all the latter are in terms of the original cubit of 25·025 British inches, presumably continued since the time of Noah as the great and universal unit, testified to by early India, Arabia, Persia, and Japan, which we may presume to have branched from the rest of the human race long before the Pyramid date; if we therefore do not find this Karnak Cubit in use *at* the Pyramid date, we cannot suppose it to have been universal in Egypt before that date, especially as the 25·025 British inch cubit is not so plainly shewn in the Pyramid, and therefore the use of it immediately afterwards, which we find, was not likely to be derived therefrom.

If the Karnak Cubit was derived from the Pyramid, it is on the one hand extremely probable that the mean of all its various lengths would be the same as its original in the Pyramid, about as closely as the probable error of the mean of all the variations, and we have already seen it in fact very much closer.

But on the other hand, if the cubit had preceded, and had *therefore* been used for, the Pyramid, it is extremely improbable that the length of that example should be so exact a mean of all the others.

2nd. We have the internal evidence of the divisions of the cubit ; no reason has, so far as I know, ever been assigned, why the division by 7, 14, and 28, should be so universal in this cubit, and we naturally turn to the Pyramid to see if any such division, or reason for it, can be traced in the King's Chamber Unit ; now the great example of the King's Chamber Unit is the cone slant, which is the height $\times \sqrt[3]{2}$, therefore, if we wish to express the Pyramid height we should say 400 King's Chamber Units $\times \frac{1}{1.414}$, or in round numbers $\frac{5}{7}$, therefore each palm, or $\frac{1}{7}$ of the Karnak Cubit is $\frac{1}{2000}$ of the Pyramid height within $\frac{1}{70}$th.

Another interesting fact concerning the palm or $\frac{1}{7}$ of the Karnak Cubit, consequent on its connection with the Pyramid height, is that a pendulum 10 palms in length beats $\frac{1}{100,000}$ of a day ; this is very accurate with a pendulum $\frac{1}{200}$ of Pyramid height, (being at Pyramid within $\frac{1}{7000}$ of the time), but the pendulum of 10 palms would beat only about $\frac{1}{200}$ longer, (or $\frac{1}{300}$ longer at the pole), than the $\frac{1}{10^5}$ of the day as above mentioned.

But what has the King's Chamber Unit and its fractions to do with the Pyramid height more than any other part of the structure ? 1st. We find it is connected with it in a simpler way than with any other dimension ; and, 2nd. We find the Pyramid height as a unit in the Antechamber, which is subordinate and leading to the King's Chamber, (whose unit is the King's Chamber Unit), the Unit in the Antechamber being nearly 20 digits or 5 palms ; and what more natural than the fact that when those chambers were finally closed, the Units used in them should be preserved with great care, (and eventually combined to show their connection), being irrecoverable by direct measure (without any calculation) from the external dimensions of the Pyramid, the other Unit, (in the Queen's Chamber) used in the sealed parts, being a fraction of the directly measurable base side ; another reason for the conjunction in the Karnak Cubit was that thereby square measure was facilitated, as 20 digits, 10 condyles, or 5 palms squared, was nearly $\frac{1}{2}$ the square of the square cubit ; and thus a unique sort of help to square measure was established.

Having thus seen both external evidence from the earliest buildings, and internal evidence from the divisions of the Karnak Cubit, I think we cannot hesitate to say that the Karnak Cubit was derived from the King's Chamber Unit, unless we can suppose a far less probable alternative—that it was derived from a previous set of facts similar to those in the Pyramid.

W. M. Flinders Petrie.

October 21, 1872.

Since writing the above sketch, from a very careful and exhaustive consideration of recorded dimensions, it is clear that in Persepolis especially, also at Mourgaub and Nineveh, there was a unit employed of 14·5 ± ·15 inches in length.

Now, exactly as the Karnak Cubit was derived from the King's Chamber Unit, so this Persepolis covid (as we may call it, as being very near, and *only* near, the Chinese covid or chik, of all the known national measures) is presumably derived from the Antechamber Unit; which, long before perceiving this covid, I had (in "Dominant Units.") fixed as a 400th of the Pyramid height, or 14·587 British inches, and it was only some time after seeing clearly, and wondering at, the existence of the covid, that it first occurred to me that it was identical with the Antechamber Unit, or a 400th of the Pyramid height.

Thus the two foundations of national measures, besides the Sacred Cubit and its inch, are the King's Chamber Unit = a 400th of the Pyramid cone radius slanting, and the Antechamber Unit = a 400th of the Pyramid cone radius horizontal, *i.e.* the Pyramid radius or height. Therefore, the covid squared is half the area of the Karnak Cubit squared, or the square covid would just go diagonally in the square Karnak Cubit, the squares being lineally a 400th of the squared Pyramid height (for which we have abundant evidence) diagonally inscribed in the squared cone line. So that, in another aspect, the covid was a multiple of the palm of the Karnak Cubit, elevated into a primary standard. Further, as the cone slant of the Pyramid to the King's Chamber level is equal to the Pyramid height; it is also, by before mentioned facts, 400 covids.

Thus, in the Great Pyramid we see the fountain head of all the ancient metrology subsequent to the Sacred Cubit and the coffer contents, which were used in its predecessor, the Ark of Noah, as well as in its successors, the Tabernacle and the Temple.

W. M. F. P.

April, 1874.

CONSTANTS REQUIRED FOR CALCULATION.

Resultant from the π proportion of the Pyramid and King's Chamber,
Sidereal Day Base, and
Cone Radius and Base diagonal origination of King's Chamber.

		Natural Number.	Logarithm.
Pyramid height : half base circuit :: 1 : π	=	3·1415926	0·4971499
	1 ÷ π	·3183099	$\bar{1}$·5028501
Rise of Pyramid side 51° 51′ 14″·300	sine	·7864390	$\bar{1}$·8956651
	cosine	·6176679	$\bar{1}$·7907550
	tangent	1·2732396	0·1049101
	cotangent	·7853981	$\bar{1}$·8950899
Rise of Pyramid, diagonal section, 41° 59′ 50″·00	sine	·6690946	$\bar{1}$·8254875
Pyramid face, angle on lower corners, 58° 17′ 51″·75	"	·8507900	$\bar{1}$·9298224
angle on upper corners, 63° 24′ 16″·50	"	·8941900	$\bar{1}$·9514298
Base circuit	A inches	36625·636	4·5637852
Base length corner to corner	"	9156·409	3·9617252
Base length centre to corner	"	4578·205	3·6606952
Height	"	5829·151	3·7656053
Base diagonals	"	25898·235	4·4132702
Base diagonal, centre to corner	"	6474·559	3·8112102
Slant radius of Pyramid cone, $\left(\frac{\text{Base diagonals}}{\pi}\right)$	"	8243·064	3·9161203
Slant height down centre of side, or face perpendicular	"	7412·081	3·8699402
Slant height along arris, or length from apex to corner	"	8711·998	3·9401178
Centre of base, to intersection of base circle and side (or half of the base side in the base circle)	"	3608·210	3·5572917
End of base side, outside base circle	"	969·995	2·9867606
Area of base square	square inches	83,839,830·	7·9234504
Area of base circle	" "	106,748,100·	8·0283604
Pyramid total contents	cubic inches	162,905,000,000·	11·2119344
Pyramid cone contents	" "	207,417,100,000·	11·3168445
King's Chamber, side length	inches	412·1832	2·6150903
" " end breadth	"	206·0916	2·3140603
" " height of walls	"	235·2727	2·3715709
" " height from floor	"	230·1204	2·3619551

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Sidereal Day Base, and
Cone Radius and Base diagonal origination of King's Chamber.

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Pyramid face, angle on lower corners, 58° 17′ 51″·75	"	·8507900	$\bar{1}$·9298224
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Height	"	5829·151	3·7656053
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Base diagonal, centre to corner	"	6474·559	3·8112102
Slant radius of Pyramid cone, $\left(\frac{\text{Base diagonals}}{\pi}\right)$	"	8243·664	3·9161203
Slant height down centre of side, or face perpendicular	"	7412·081	3·8699402
Slant height along arris, or length from apex to corner	"	8711·998	3·9401178
Centre of base, to intersection of base circle and side (or half of the base side in the base circle)	"	3608·210	3·5572917
End of base side, outside base circle	"	969·995	2·9867696
Area of base square	square inches	83,839,830·	7·9234504
Area of base circle	" "	106,748,160·	8·0283604
Pyramid total contents	cubic inches	162,905,000,000·	11·2119344
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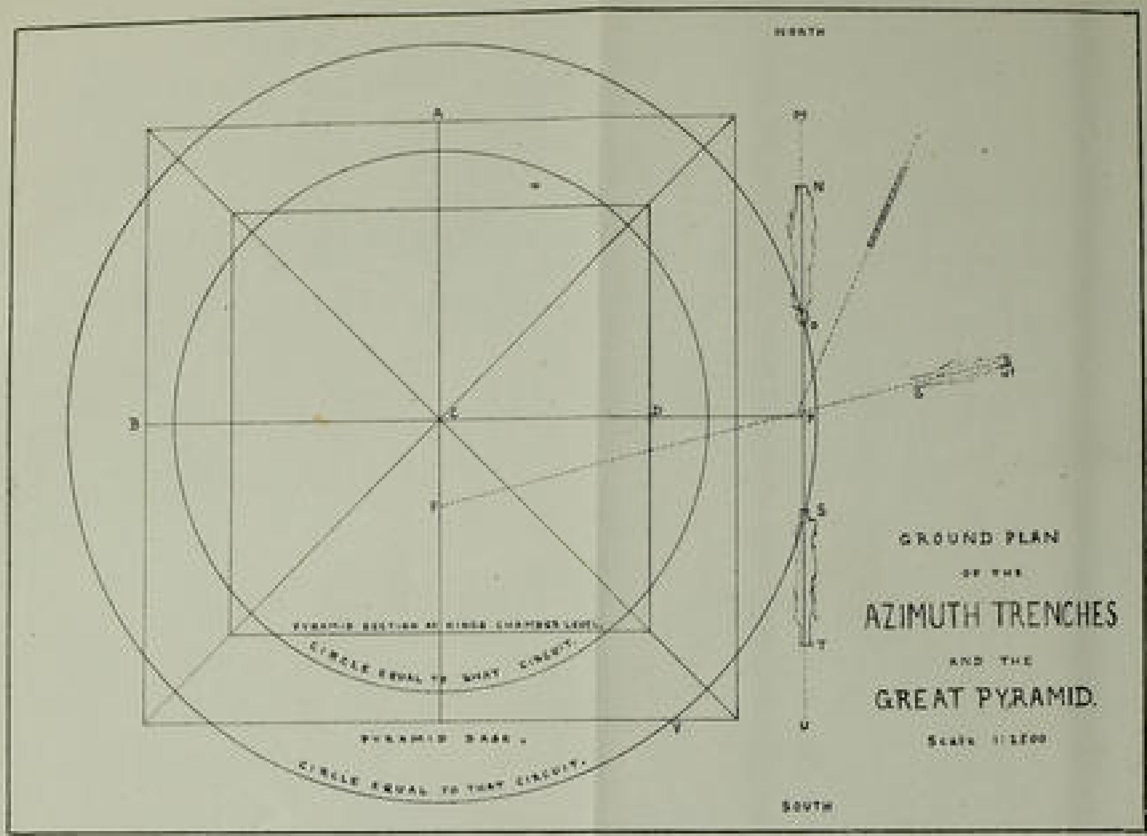
NORTH
A
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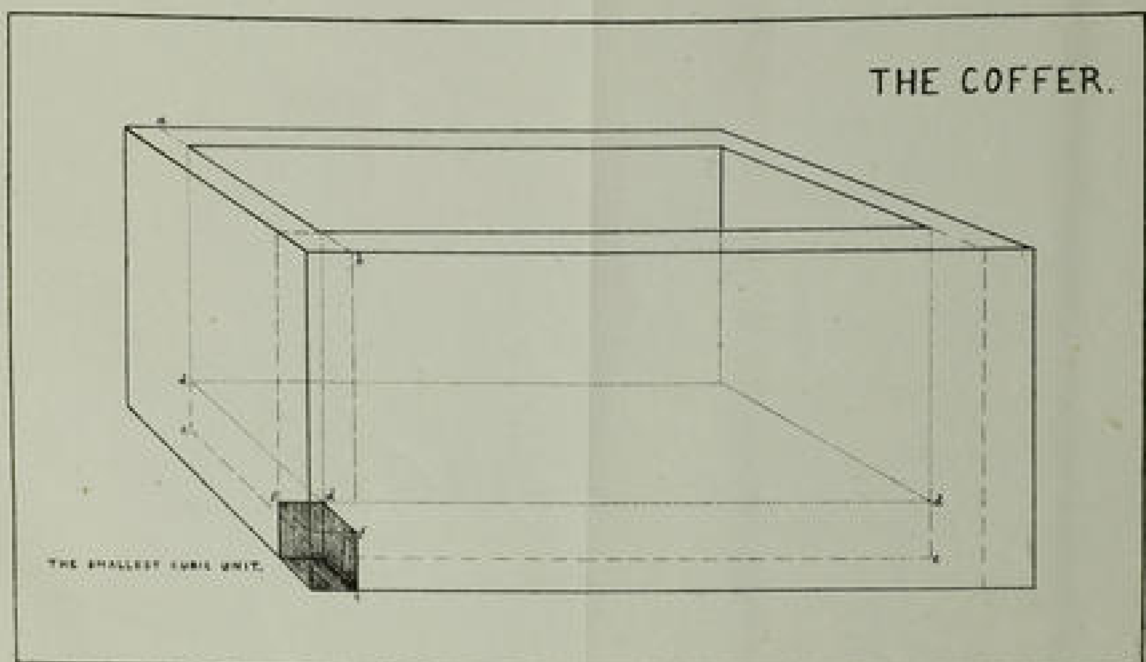
PYRAMID SECTION AT KINGS CHAMBER LEVEL.
CIRCLE EQUAL TO THAT CIRCUIT.
PYRAMID BASE.
CIRCLE EQUAL TO THAT CIRCUIT.
SOUTH
GROUND PLAN
OF THE
AZIMUTH TRENCHES
AND THE
GREAT PYRAMID.


THE COFFER.
THE SMALLEST CUBIC UNIT.