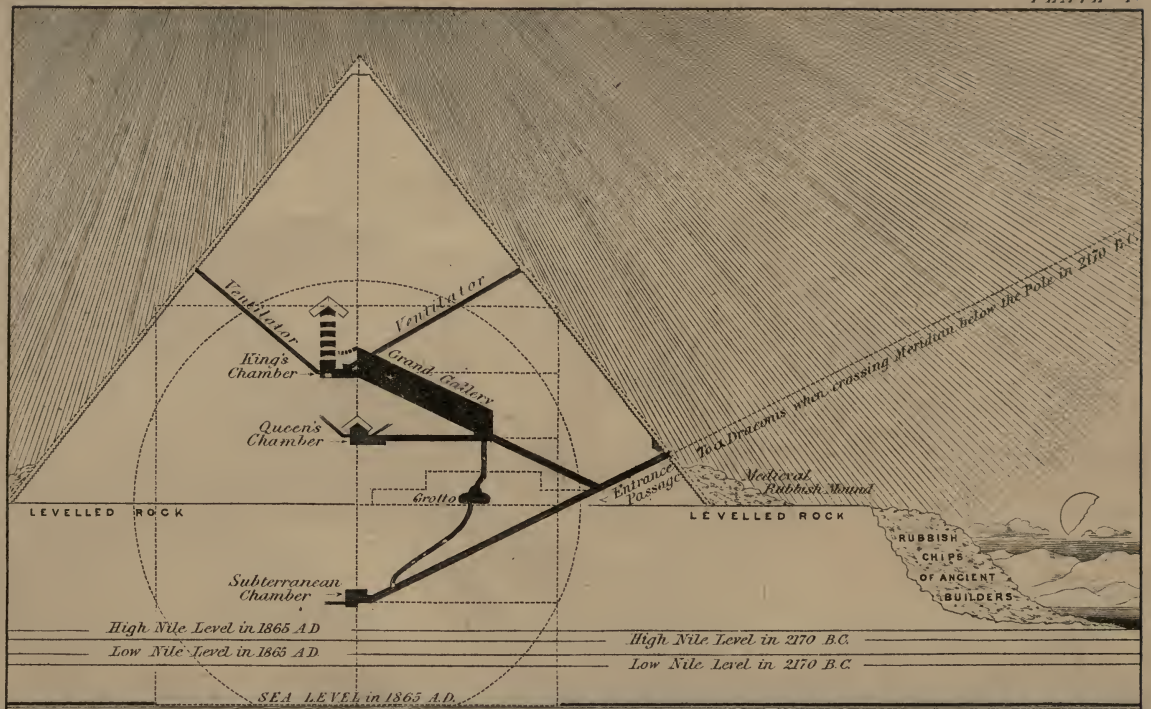
UNIVERSITY OF TORONTO
3 1761 00995620 2

FRONTISPIECE

PLATE I



VERTICAL SECTION (From South to North looking West) OF THE GREAT PYRAMID OF JEEZEH

AT WHAT TIME IT DEVOURS ITS OWN SHADOW SCALE $\frac{1}{2268}$ OF NATURE

PIAZZI SMYTH. DEL!

A RITCHIE, EDIN.

413

OUR INHERITANCE IN

THE GREAT PYRAMID

NEW AND ENLARGED EDITION

INCLUDING ALL THE MOST IMPORTANT DISCOVERIES UP TO THE PRESENT TIME

With Seventeen Explanatory Plates

BY

PIAZZI SMYTH, F.R.S.E., F.R.A.S.

ASTRONOMER ROYAL FOR SCOTLAND

"BECAUSE THAT WHICH MAY BE KNOWN OF GOD IS MANIFEST IN THEM; FOR GOD HATH SHEWED IT UNTO THEM. FOR THE INVISIBLE THINGS OF HIM FROM THE CREATION OF THE WORLD ARE CLEARLY SEEN, BEING UNDERSTOOD BY THE THINGS THAT ARE MADE."

ROMANS i., 19, 20

W. ISBISTER & CO.

56, LUDGATE HILL, LONDON

1874

"David, in a choice of evils similar to these, said, 'Let me fall into the hands of the Lord, for very great are his mercies; but let me not fall into the hand of man' (1 Chron. xxi. 13). The people of England know what it is to experience somewhat of the latter calamity; and though they are bound to acknowledge that their long-protracted griefs are to be preferred to the short but severe sufferings which the nations of the Continent had to endure, they must feel, after all, that it is a deep affliction which many have had to bear. But let them with *Faith* and *Patience* endure their troubles a little longer. *Their redemption draweth nigh.*"

JOHN TAYLOR'S *Wealth the Name and Number of the Beast*, p. 149.

2232
27/4/1840
8

TO THE MEMORY OF THE LATE

JOHN TAYLOR,

GOWER STREET, LONDON,

(DEPARTED JULY, 1864)

AUTHOR OF

"THE GREAT PYRAMID; WHY WAS IT BUILT, AND WHO BUILT IT?"

THIS FURTHER ATTEMPT TO APPLY ACTUAL

SCIENTIFIC EXAMINATION

TO TEST HIS

MOST MOMENTOUS THEORY,

AND MOST PRECIOUS DISCOVERY OF THE AGE FOR ALL MANKIND

IF TRUE,—

IS DEDICATED BY

THE FRIEND OF HIS FEW LAST YEARS,

BUT ADMIRER OF ALL HIS LONG AND EARNEST CHRISTIAN LIFE,

PIAZZI SMYTH.

EDINBURGH, 1874.

"THE GREAT, THE MIGHTY GOD, THE LORD OF HOSTS, IS HIS NAME, GREAT IN COUNSEL, AND MIGHTY IN WORK: . . . . WHICH HAST SET SIGNS AND WONDERS IN THE LAND OF EGYPT, EVEN UNTO THIS DAY."

JEREMIAH XXXii. 18—20.

PREFACE.

WHEN the late worthy John Taylor, of Gower Street, London (originally of Bakewell, Derbyshire) published, first his larger work entitled "The Great Pyramid; why was it built, and who built it?" in 1859; and afterwards, in 1864, his smaller pamphlet which he called "The Battle of the Standards (of Linear Measure): the ancient of four thousand years, against the modern of the last fifty years—the less perfect of the two,"—he opened up for archæology a purer, nobler, more important pathway to light than that study had ever enjoyed before.

But Academic Archæology did not accept it; and meanwhile some portions of the new pathway were so little removed from much of my own scientific professional occupations, that I felt it something like a public duty to examine into the foundation of Mr. Taylor's theory as rigidly and extensively as I could, though by home work only, at first; and my publication of 1864 (*i.e.*, the first edition of the present book) contained the findings so arrived at. Findings, in many points

confirmatory of the principal thread of Mr. Taylor's chief discovery ; but exhibiting in the general literature of the subject a lamentable deficiency in the numerical data required for solid investigation ; and which data of measure, nothing but practical examination at the place could hope to supply.

How, when no one else would volunteer, for the sake of Great Pyramid knowledge alone, and only one gentleman* in all the kingdom, throughout official and private circles alike, kindly tendered a subscription (£50) towards the expenses,—how, I say, my Wife and self determined to sail for Egypt ; and did, very soon after Mr. Taylor's death, through four months of residence on the Pyramid hill itself, employ a large variety of scientific instruments, in obtaining many measures of the mighty monument, some of them to far more accuracy than had ever been attempted before, and others descending to numerous details unnoticed by former observers,—all this was described by me, first in abstract to the Royal Society, Edinburgh, in April, 1866 ; and afterwards (in 1867) at much more length to the world in general in my three-volume book, "Life and Work at the Great Pyramid in 1865."†

That last publication undoubtedly helped to spread a knowledge both of the importance of the question at issue, and the only means for solving it : especially as against the modern hieroglyphic scholars ; who,

* Andrew Coventry, Esq., of 27, Moray Place, Edinburgh.

† Pages 1,653; plates 36. Published by Edmonston & Douglas, Edinburgh.

whatever their learning may be concerning *other* Egyptian buildings, have never troubled themselves to examine the Great Pyramid in the manner now required, and remain singularly and perseveringly ignorant of its mathematical proportions and mechanical features. Indeed, these literary Egyptologists are rather angered than otherwise to hear that such exact data of scientific measure, when collected by others than themselves, tend to establish that the Great Pyramid, though *in* Egypt is not *of* Egypt; and though built in the earliest ages of man upon earth, far before all history, was yet prophetically intended to subserve a high purpose for these days in which we live and the coming days. That it, the Great Pyramid, has never been even remotely understood yet by any race of men, though it has been a standing riddle guessed at by all of them in their successive ages; but that it is able nevertheless to tell its own story and explain its mission most unmistakably: not indeed by reference to, or use of, any written language, whether hieroglyphic or vulgar, —but by aid of the mathematical and physical science of *modern times:* a means fore-ordained both for preventing the parable being read too soon in the history of the world, and for insuring its being correctly read by all nations when the fulness of time shall have arrived.

This spread of purely-obtained Great Pyramid information, unalloyed by the Cainite profanities of Pharaonic Egypt, or the interested errors and perversions of the classic Greeks, brought by degrees several able

intellectualists into the field; and they have, during the last six years, applied so many of my own observations at the place to Mr. Taylor's theory, with a success beyond anything that he had ever hoped for,—that the matter has now completely outgrown its first book, and produced this publication as the best answer that I, with the assistance of the original publishers, can make to frequent demands from various quarters for more information. And there are even some most interesting and hopeful circumstances in the evolution of the scientific contents of the Great Pyramid just now, causing the present time to be almost the beginning of a new era of increased certainty and more precise knowledge regarding all that that ancient building was originally intended for; and which certainly includes much of the sacred, as well as the secular.

And although some well-meaning persons may have too hastily concluded, merely because they do not find the very name of Pyramid written down in Scripture, that therefore there is nothing about the Great Pyramid in the Bible,—yet they may rest perfectly assured that there is a great deal about the Bible subject, in the Great Pyramid. Which building is moreover an earlier document in the history of the human race; while the putting together of its stones into the vocal and deeply-meaning shapes we see them in now, was absolutely *contemporary* with the first of the primeval events to which it was destined to bear indubitable witness in these latter days, and not sooner.

CONTENTS.

PART I.

GEOGRAPHY AND THE EXTERIOR.

CHAPTER		PAGE
I.	INTRODUCTORY STATEMENT TOUCHING THE GREAT PYRAMID	3
II.	GEOMETRICAL PROPORTIONS	12
III.	STANDARD OF LENGTH EMPLOYED IN THE GREAT PYRAMID	27
IV.	FIGURE OF THE EARTH AND THE SUN-DISTANCE	40
V.	GEOGRAPHICAL INDICATIONS IN THE GREAT PYRAMID	55

PART II.

HISTORY AND THE INTERIOR.

VI.	STRUCTURAL ISOLATION OF THE GREAT PYRAMID AMONGST ALL PYRAMIDS	73
VII.	THE PYRAMID COFFER	99
VIII.	WHY OF THAT SIZE?	118
IX.	DENSITY AND TEMPERATURE	146
X.	CONFIRMATIONS BY THE NEW SCHOOL	174

PART III.

NATIONAL WEIGHTS AND MEASURES.

XI.	BRITISH METROLOGY, PAST AND PRESENT	199
XII.	PYRAMID CAPACITY MEASURE	225
XIII.	PYRAMID WEIGHT MEASURE	231
XIV.	LINEAR AND SUPERFICIAL MEASURE	244
XV.	HEAT AND PRESSURE, ANGLE, MONEY, TIME	257

PART IV.

MORE THAN SCIENCE.

CHAPTER		PAGE
XVI.	THE SACRED CUBIT OF THE HEBREWS	281
XVII.	"TIME MEASURES IN THE GREAT PYRAMID"	304
XVIII.	MOSES AND THE WISDOM OF THE EGYPTIANS	328
XIX.	MECHANICAL DATA	348
XX.	SACRED, AND PROPHETIC, TIME	374

PART V.

INEVITABLE CONCLUSIONS.

XXI.	HIEROLOGISTS AND CHRONOLOGISTS	405
XXII.	THE SHEPHERD KINGS	418
XXIII.	SUPERIOR TESTIMONY	435
XXIV.	PREPARATIONS FOR UNIVERSAL METROLOGY	444
XXV.	GENERAL SUMMATION: SECULAR AND SACRED	460

APPENDICES.

APPENDIX I.	Mr. Waynman Dixon's Casing-stone	489
„ II.	Dr. Grant's crucial Pyramid investigations	493
„ III.	Dr. Leider's supposed Pyramid	497
„ IV.	Mr. James Simpson's further Pyramid calculations	499
„ V.	Rude stone monuments *versus* the Great Pyramid	505
„ VI.	Recent attempts to shorten both the Great Pyramid's base-side and the profane cubit of Egypt	511

INDEX 519

ILLUSTRATIONS.

(ENGRAVED BY ALEX. RITCHIE, EDINBURGH.)

PLATE

I. General Sectional View of Great Pyramid (*Frontispiece*).

Alluded to in Chapters I. and VI.; but of more or less serviceable reference throughout the book; and of especial use in showing the respective places of several particular parts of the monument which appear separately in subsequent plates.

II. Casing-stone Testimony to Great Pyramid's π Construction.

Alluded to in Chapter II. The upper figure gives an illustration of John Taylor's π theory, requiring a particular side angle for the Pyramid; and the lower figures give the angle found by Colonel Vyse.

III. Diameter and Circumference Relations.

Alluded to in Chapters II., IV., and X. Certain useful computation numbers, both in angular and linear measure, are entered in their appropriate places on the several Pyramidal figures, and will be found of frequent service.

IV. Diameter and Areal Relations.

The upper figures alluded to in Chapters IV. and X., and the lower figure in Chapter XXV., where they are shown to confirm the numbers in Plate III. most remarkably.

V. Great Pyramid's Place in Egypt, and Egypt's in the World.

See Chapter V. This is a reduction and concentration of the several plates in my "Equal Surface Projection."

PLATE

VI. All the Pyramids of Jeezeh.

See Chapter VI. All these figures being on the same scale, show the Great Pyramid to be absolutely the largest of the Jeezeh group; and the only one with an *ascending* system of passages: and it enjoys the same superiority over *all* the Pyramids of Egypt.

VII. Placing of the Passages in Great Pyramid.

See Chapter X. These two figures illustrate a simple geometrical arrangement, which comes exceedingly close to the actual lengths and angles of the passages in the Great Pyramid.

VIII. The Chamber and Passage Systems in Great Pyramid.

See Chapter VI. This is a generally useful plate to refer to, for the more interesting parts of the interior; when the frontispiece fails from the smallness of its size.

IX. The Queen's Chamber.

See Chapters X., XIX., and XX. A chamber of important symbolisms, beginning with the excentricity of the niche by the amount, apparently, of the length of the sacred cubit.

X. The Ante-Chamber.

See Chapters IX. and X. A small chamber full of symbolisms, especially of the subdivision of the sacred cubit into inches; and the equal area equation of squares and circles.

XI. The King's Chamber.

See Chapters VI., IX., X., XIX., and XXV. The final chamber of the ascending series of passages in the Great Pyramid, the most exquisitely constructed of all the chambers, and with the noblest symbolisms.

XII. The Grand Gallery: ascending and descending.

See Chapters VI., XVII., and XX. The grandest interior feature of the Great Pyramid, unknown in any other Pyramid, and with supposed prophetic Christian symbolisms.

XIII. Mouth of the Well, in Lower Corner of Great Pyramid.

See Chapters VI., XVII., and XX. Two views, one elevational, and the other in perspective, of the exit from the Grand Gallery to the symbolism of the bottomless pit.

PLATE
XIV. Star-Map for Site of Great Pyramid in Antediluvian Times.

See Chapter XVII. Exhibiting the constellations of hostile attributes to man, occupying the mid-heaven at the night beginning of the primeval autumnal year before the Flood.

XV. Star-Map for Site of Great Pyramid at Epoch of its Foundation.

See Chapter XVII. Representing the constellations of friendly attributes to man, at the night beginning of the year of the Great Pyramid's foundation; after both the Flood and the Dispersion.

XVI. Star-Map for Site of Great Pyramid at the Present Time.

See Chapter XVII. Representing the portion of time elapsed since the foundation of the Great Pyramid, as now indicated on the precessional dial of the Pyramid and the heavens.

XVII. The Numbers measured in the Entrance Passage of the Great Pyramid.

See Chapter XX. The numbers entered here are Pyramid inches of distance from the north beginning of the Grand Gallery; and are supposed to represent years B.C.

THE KEY OF ENTRANCE INTO THE DESIGN OF THE GREAT PYRAMID,

AS INVOLUNTARILY PREPARED, YEARS AGO, BY MODERN MATHEMATICS; viz.:—

$$\pi\ ;$$

i.e.,

When a Circle's *diameter* $= d = \frac{c}{\pi} = \frac{4\,a}{c} = 2\,\sqrt{\frac{a}{\pi}}$;

And its *circumference* $= c = \pi\,d = \frac{4\,a}{d} = 2\,\sqrt{\pi\,a}$;

And its *area* $= a = \frac{\pi}{4}\,d^2 = \frac{c^2}{4\,\pi} = \frac{d\,c}{4}$;

Then

$$\pi = \frac{c}{d} = \frac{4\,a}{d^2} = \frac{c^2}{4\,a};$$

$$= 3{\cdot}14159\ |\ 26535\ |\ 89793\ |\ 23846\ |\ +\ \&c.,\ \&c.,\ \&c.$$

$$= \text{log. } 0{\cdot}49714\ |\ 98726\ |\ 94133\ |\ 85435\ |\ +\ \&c.,\ \&c.,\ \&c.$$

And

$$\frac{\pi}{4} = 0{\cdot}785\ 39816 + \&c. = \text{log. } 9{\cdot}895\ 0899 + \&c.$$

$$\frac{\pi}{6} = 0{\cdot}523\ 59878 + \&c. = \text{log. } 9{\cdot}718\ 9986 + \&c.$$

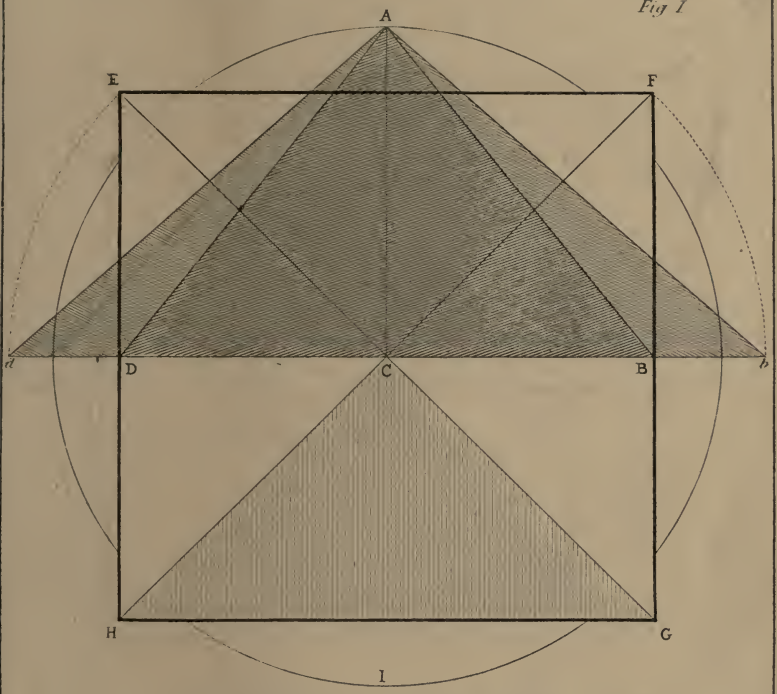
$$\frac{1}{4\,\pi} = 0{\cdot}079\ 57747 + \&c. = \text{log. } 8{\cdot}900\ 7902 + \&c.$$

$$\frac{1}{6\,\pi^2} = 0{\cdot}016\ 88687 + \&c. = \text{log. } 8{\cdot}227\ 5490 + \&c.$$

$$\sqrt{\pi} = 1{\cdot}772\ 45385 + \&c. = \text{log. } 0{\cdot}248\ 5749 + \&c.$$

$$\frac{180^\circ}{\pi} = 57{\cdot}295\ 77951 + \&c. = \text{log. } 1{\cdot}758\ 1226 + \&c.$$

Fig 1



GROUND PLAN OF GREAT PYRAMID.

ITS SQUARE BASE, AND A HYPOTHETICAL CIRCLE HAVING RADIUS EQUAL TO VERTICAL HEIGHT OF BUILDING:

together with elevations of the direct and diagonal vertical sections of the same restored to ancient completeness of outline.

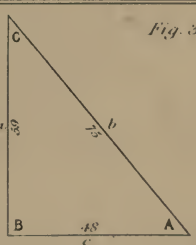
Fig 2.



CROSS SECTION OF VYSE'S GREAT PYRAMID CASING STONE IN SITU

when still attached to the pavement, in middle of North side of BASE.

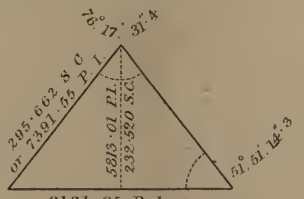
Fig 3.



Residual triangle for computation

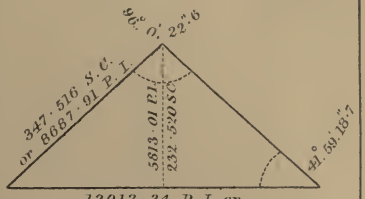
P. A. S. SMYTH DEL.

A. RITCHIE EDIN.R



9131·05 P. I. or
365·242 S. C.

DIRECT VERTICAL SECTION OF GREAT PYRAMID.



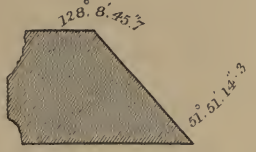
12913·34 P. I. or
516·534 S. C.

DIAGONAL VERTICAL SECTION OF GREAT PYRAMID.

EQUALITY OF BOUNDARIES.



Great Pyramid's square base, and circle with radius = Pyr.ᵈ Vert.ˡ height.



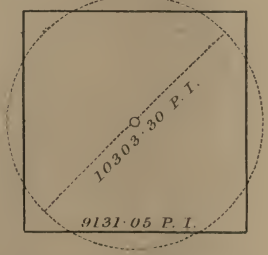
π ANGLES OF CASING STONES OF GREAT PYRAMID;

As affected by its external slope and horizontal masonry courses.

π = 3·14159 26535 + &c.

= log. 0·49714 98726 + &c.

EQUALITY OF AREAS Nº 1.



Area of square base of Great Pyramid = area of a Circle whose diameter is given ÷ 100 in the Ante-chamber.

P. I. = PYRAMID INCHES.

EQUALITY OF AREAS Nº 2.



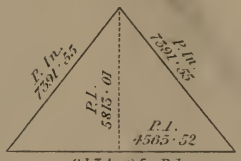
Area of Circle with G.Pyr.ᵈ height for radius = Area of square whose length of side is given ÷ 100 in the Ante chamber.

S. C. = SACRED CUBIT.

FAZZI SMITH CITY A RITCHIE EDINR

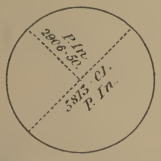
See Chs 2. 4. & 10.

EQUALITY OF AREAS N.° 3.



9131·05 P.I.

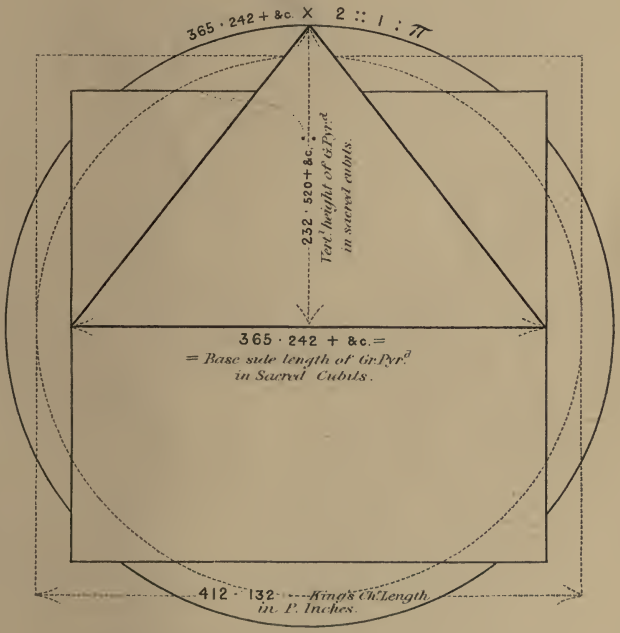
Direct Vertical Section of Gr. Pyr.d



Circle with Diameter Vert.l Height of G. Pyr.d



Square with side computed by π.

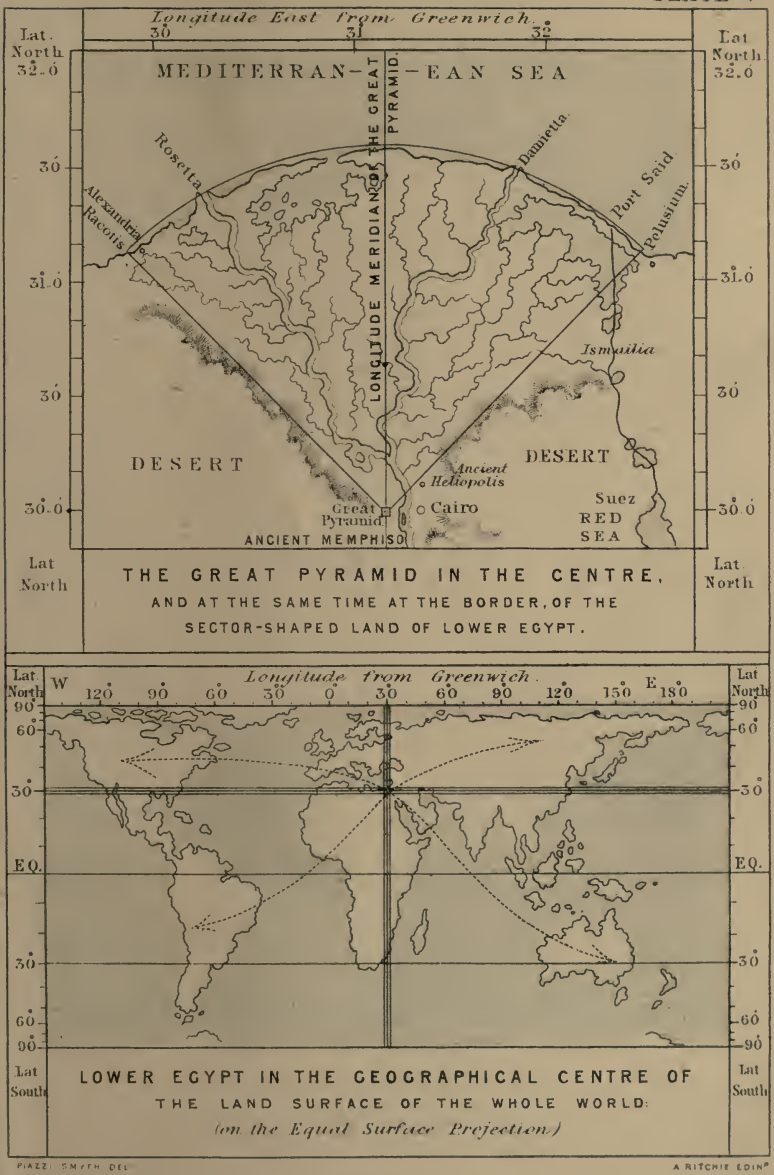


EQUATION OF BOUNDARIES AND AREAS.

CIRCLES AND SQUARES, INCHES INSIDE AND SACRED CUBITS OUTSIDE GREAT PYRAMID. *See Ch.r 25*

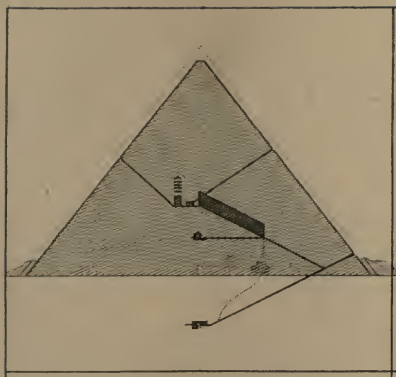
PIAZZI SMYTH DEL.t A. RITCHIE EDIN.r

See Ch.s 10 & 25.

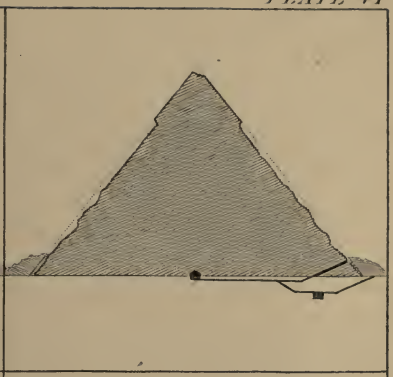


PIAZZI SMYTH DEL. A RITCHIE EDIN.

See Chs 5 & 25



THE GREAT PYRAMID.

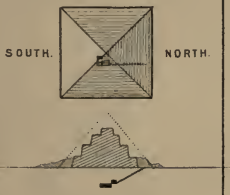


THE SECOND PYRAMID.



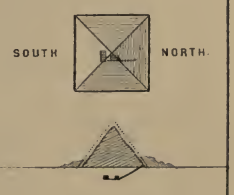
THE THIRD PYRAMID.

GROUND PLAN OF THIS PYRAMID WHEN COMPLETE.



THE FOURTH PYRAMID.

GROUND PLAN OF THIS PYRAMID WHEN COMPLETE.



THE FIFTH PYRAMID.



THE SIXTH PYRAMID.



THE SEVENTH PYRAMID.



THE EIGHTH PYRAMID.



THE NINTH PYRAMID.

ALL THE PYRAMIDS OF JEEZEH IN VERTICAL AND MERIDIAN SECTION,

THEIR ANCIENT SIZE AND SHAPE BEING SHOWN BY THE DOTTED TRIANGLES OVER THEM.

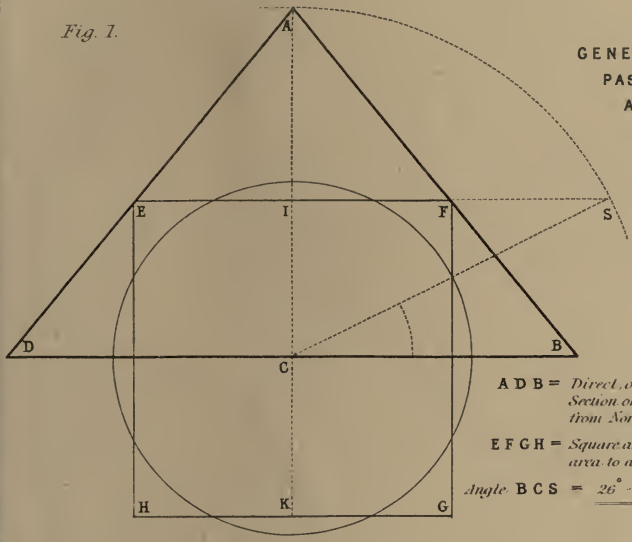
Scale $\frac{1}{2000}$ of Nature.

PIAZZ.I SMYTH DEL.t

A RITCHIE. EDIN.R

See Ch.s 1 & 6

Fig. 1.



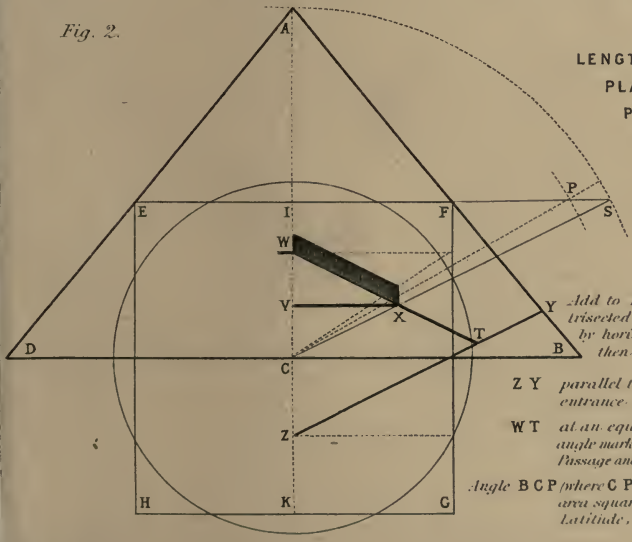
GENERAL PASSAGE ANGLE OF GR.T PYR.D

A D B = *Direct, or right Vertical Section of Great Pyramid from North to south.*

E F G H = *Square and Circle of equal area to above.*

Angle B C S = 26° - 18′ - 40″

Fig. 2.



LENGTHS AND PLACES OF PASSAGES IN GREAT PYR.D

Add to Fig. 1, I C *trisected &* C K *bisected by horizontal lines, then*

Z Y *parallel to* C S. *marks entrance passage.*

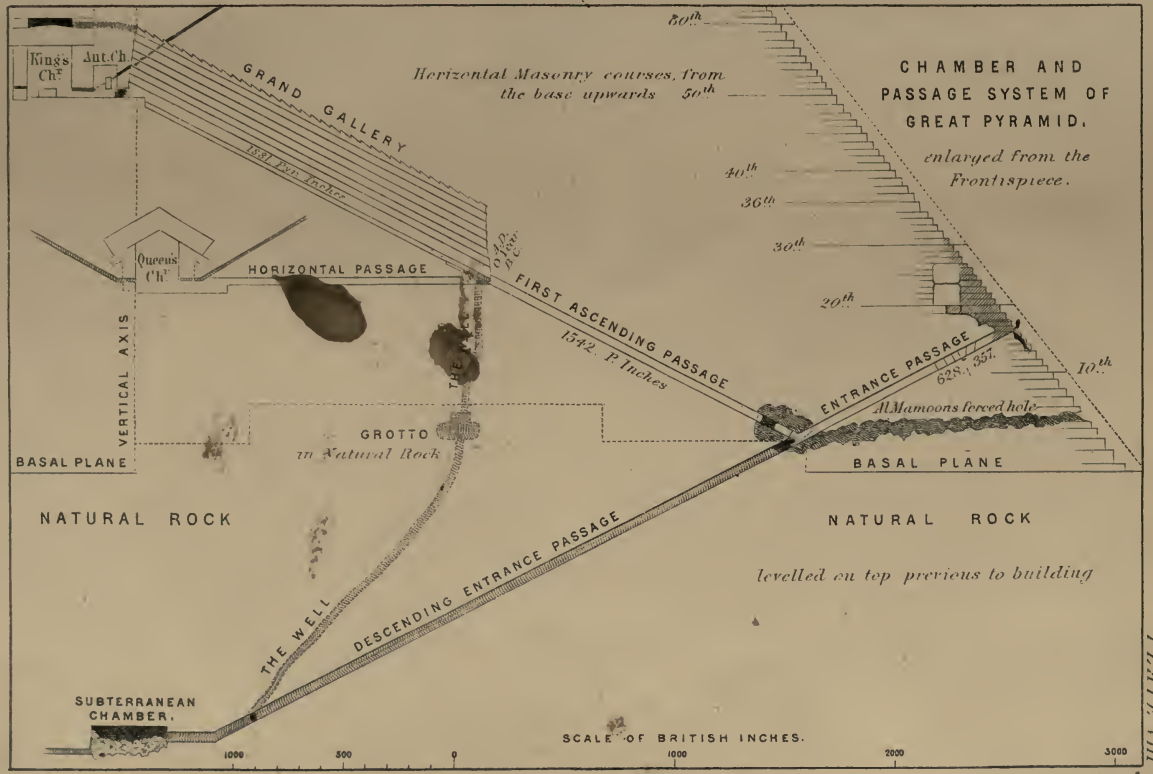
W T *at an equal but opposite angle marks First Ascending Passage and the Grand Gallery.*

Angle B C P *(where* C P *= side of equal area square) = 30° = Latitude, approx.*

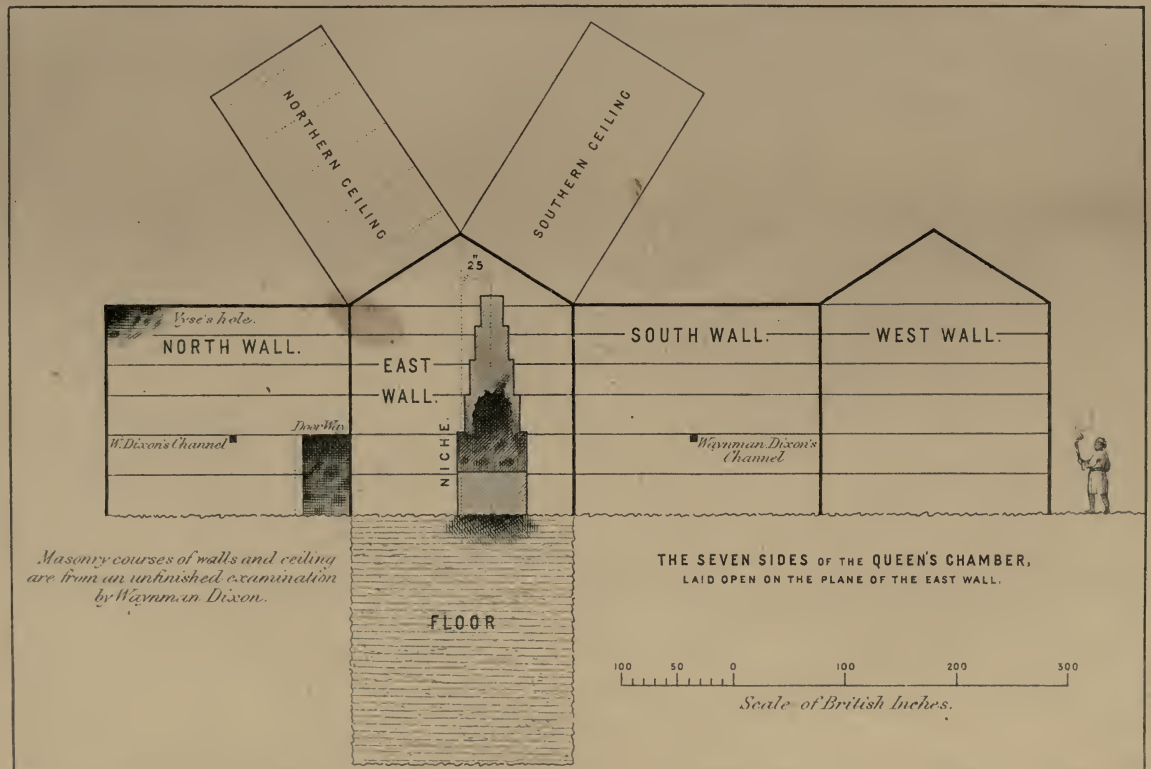
PIAZZI SMYTH DEL.

A RITCHIE EDIN.R

See Ch. 10



See Chs 6, 17, 19 & 20.



Masonry courses of walls and ceiling are from an unfinished examination by Waynman Dixon.

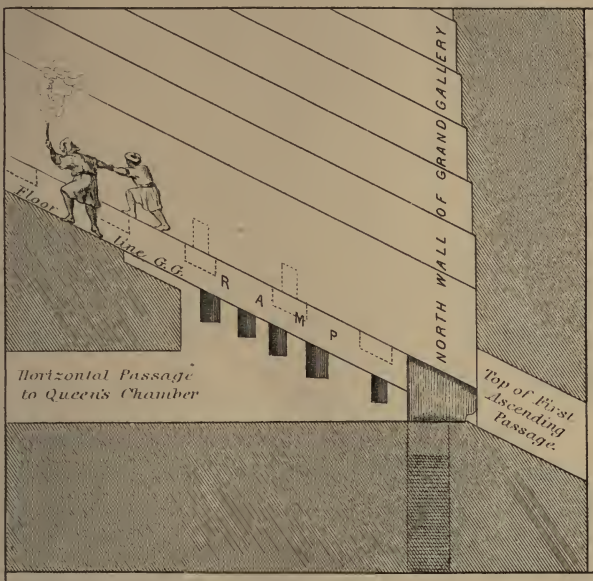
THE SEVEN SIDES OF THE QUEEN'S CHAMBER,
LAID OPEN ON THE PLANE OF THE EAST WALL.

PLATE IX.

PIAZZI SMYTH DEL.

A. RITCHIE EDIN.

See Chs 10.19 & 20

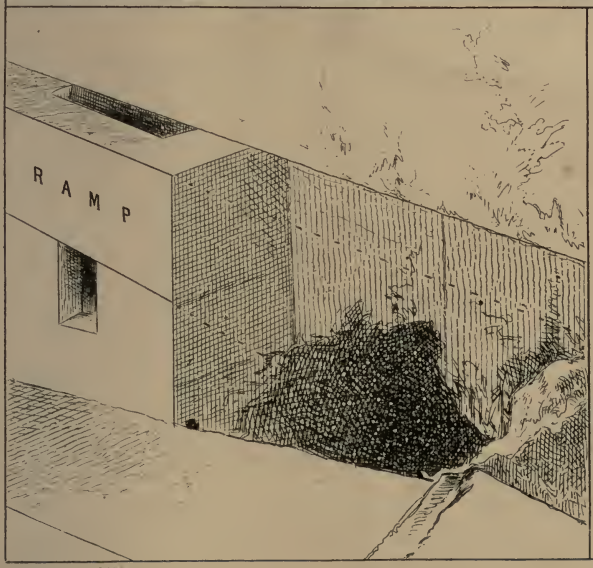


SECTION

(vertical and longitudinal)

LOOKING WEST OF LOWER OR NORTHERN END OF GRAND GALLERY IN GR PYR.D

SCALE OF BRIT. INCHES



ENLARGED PERSPECTIVE VIEW OF THE BROKEN OUT RAMP STONE AND THE ENTRANCE TO THE WELL, *so called*.

PIAZZI SMYTH DEL.

A RITCHIE, EDIN.R

See Chs 6 & 20.



VERTICAL TRANSVERSE SECTION
WITH ARABS ASCENDING
THE GRAND GALLERY, GR. PYR.D



VERTICAL TRANSVERSE SECTION
WITH ARABS DESCENDING
THE GRAND GALLERY, GR. PYR.D

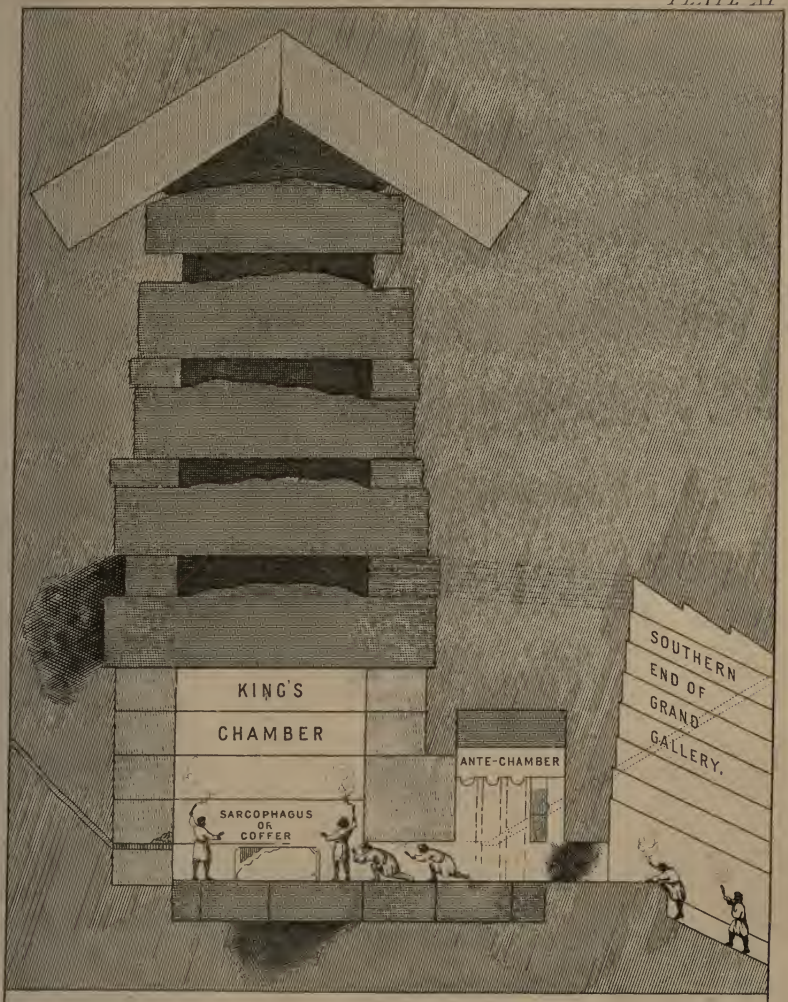
PIAZZI SMYTH. DEL

A RITCHIE, EDIN.R

100 50 0 100

SCALE OF BRITISH INCHES FOR THE SECTIONAL PARTS ONLY.

See Chs 6. 17 & 20.



VERTICAL SECTION *(Looking West)* OF KING'S CHAMBER; ALSO OF ANTE-CHAMBER, SOUTH END OF GRAND GALLERY, AND VYSE'S HOLLOWS OF CONSTRUCTION, ABOVE KING'S CHAMBER. CROSSED LINES INDICATE GRANITE.

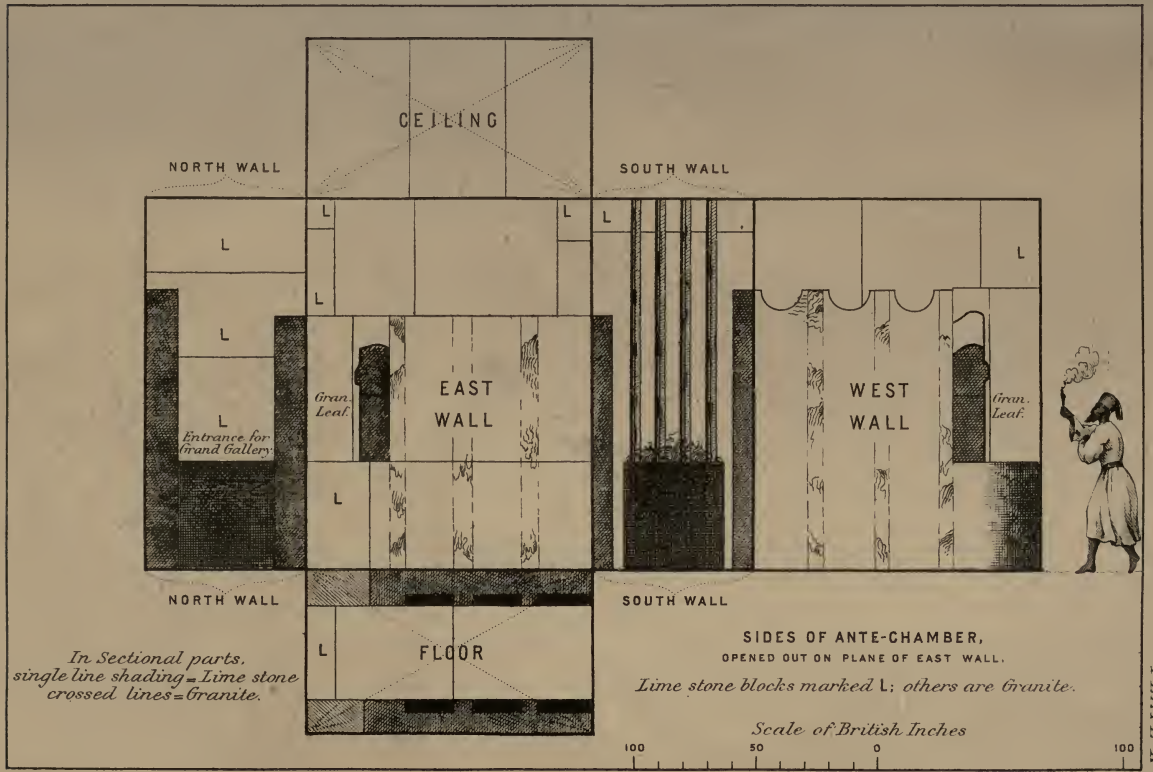
Scale of British Inches

100 50 0 100 200 300 400 500 600 700

PIAZZI SMYTH DEL.

A RITCHIE EDIN.

See Chs 6 9 10 19 & 25


CEILING
NORTH WALL
SOUTH WALL
L
L
L
L
L
L
L
L
L
Gran. Leaf.
EAST WALL
Entrance for Grand Gallery.
WEST WALL
Gran. Leaf.
NORTH WALL
SOUTH WALL
L
FLOOR
In Sectional parts, single line shading = Lime stone crossed lines = Granite.
SIDES OF ANTE-CHAMBER,
OPENED OUT ON PLANE OF EAST WALL.
Lime stone blocks marked L; others are Granite.
Scale of British Inches
100
50
0
100
PLATE X
PIAZZI SMYTH. DELT
A RITCHIE, EDINR

See Chs 9 & 10.



GROUND PLAN OF THE

CIRCLES OF THE HEAVENS ABOVE THE SITE OF THE THEN

UNBUILT GREAT PYRAMID: AT THE ANTEDILUVIAN DATE OF

3440 B.C.

α DRACONIS ON MERIDIAN BELOW POLE, AT ENTRANCE PASSAGE ANGLE:

PLEIADES AND VERNAL EQUINOX NOWHERE VISIBLE.

See Ch 17



GROUND PLAN OF THE

CIRCLES OF THE HEAVENS ABOVE THE GREAT PYRAMID, AT ITS EPOCH

OF FOUNDATION, AT MIDNIGHT OF AUTUMNAL EQUINOX

2170 B.C.

α DRACONIS ON MERIDIAN, BELOW POLE, AT ENTRANCE PASSAGE ANGLE;

AND PLEIADES ON MERIDIAN ABOVE POLE IN 0ʰ R.A.;

OR COINCIDENTLY WITH VERNAL EQUINOX.

See Cn. 17



GROUND PLAN OF THE

CIRCLES OF THE HEAVENS ABOVE THE

PRESENT GREAT PYRAMID

IN THE AUTUMN OF

1881 A.D.

α DRACONIS ON MERIDIAN. BELOW POLE, BUT AT SEVEN TIMES EN. PASS. ANGLE;

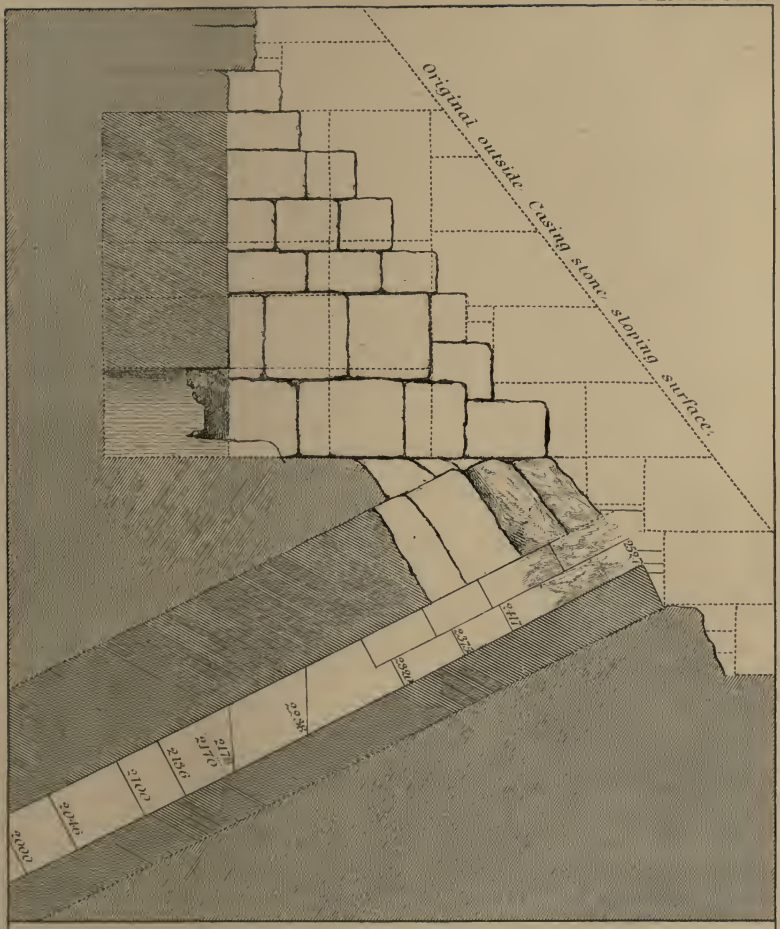
PLEIADES FAR FROM MERIDIAN. EASTWARD;

VERNAL EQUINOX FAR FROM MERIDIAN. WESTWARD;

BUT THE DISTANCE OF THEIR MERIDIANS APART, INDICATING ON THE PRECESSIONAL DIAL

THE AGE OF THE GREAT PYRAMID.

See Ch. 17.



VERTICAL SECTION (looking West.) OF
UPPER OR NORTH END OF ENTRANCE-PASSAGE
OF GREAT PYRAMID;
as it is now; and also by dotted lines, as it is supposed to have been, when originally finished and closed up.

SCALE OF BRITISH INCHES
100 50 0 100 200 300 400

PIAZZI SMYTH DEL. A. RITCHIE EDIN.

See Ch. 20

and in, and throughout, that mighty builded mass, which all history and all tradition, both ancient and modern, agree in representing as the first in point of date of the whole Jeezeh group, the earliest stone building also positively known to have been erected in any country,—we find in all its *finished* parts not a vestige of heathenism, nor the smallest indulgence in anything approaching to idolatry; not even the most distant allusion to Sabaism, or to the worship of sun or moon, or any of the starry host of heaven.

I have specified "finished parts," because in certain unfinished, internal portions of the constructive masonry discovered by Colonel Howard-Vyse in 1837, there are some rude markings for a temporary purpose to be presently explained; and I also except, as a matter of course, any inscriptions inflicted on the Pyramid by modern travellers, even though they have attempted to cut their names in the ancient hieroglyphics of the old Egyptians. But with these simple exceptions we can most positively say, that both exterior and interior are absolutely free from all engraved or sculptured work, as well as from everything relating to idolatry or erring man's theotechnic devices. From all those hieratic emblems, therefore, which from the first have utterly overlaid every Egyptian temple proper, as well as all their obelisks, sphinxes, statues, tombs, and whatever other monuments they, the Egyptians, did build up at any known historical epoch in connection with their peculiar, and, alas! degrading religion.

Was the Great Pyramid, then, erected before the invention of hieroglyphics, and previous to the birth of the Egyptian religion?

No! for there, both history, tradition, and recent exploratory discoveries, testified to by many travellers and antiquaries, are perfectly in accord; and assure us that the Egyptian nation was established, was powerful, and its

spiritually vile hieratic system largely developed, though not arrived at its full proportions, at the time of the erection of the Great Pyramid ; that that structure was even raised by the labour of the Egyptian population ;* but under some remarkable compulsion and constraint, which prevented them from putting their unmistakeable and accustomed decorations on the finished building, and from identifying it in any manner, direct or indirect, with their impure and even bestial form of worship.

According to Manetho, Herodotus, and other ancient authorities, the Egyptians hated, and yet implicitly obeyed, the power that made them work on the Great Pyramid ; and when that power was again relaxed or

* This very important conclusion results from the "quarry marks" of the workmen (see Colonel Howard-Vyse's volumes, "Pyramids of Gizeh," London, 1840), being found in red paint on parts of the stones left rough, and in places not intended to be seen. The marks are evidently in the Egyptian language or manner freely handled ; and in so far prove that they were put in by Egyptians. They are excessively rude, no doubt, but quite sufficient as checks for workmen, whereby to recognise a stone duly prepared at the quarry, and to see it properly placed in its intended position in the building.

That these marks were not meant as ornaments in the building, or put on when there, is abundantly evidenced by some of them being upside down, and some having been partly pared away in adjusting the stone into its position (see Colonel Howard-Vyse's plates of them) ; and, finally, by the learned Dr. Birch's interpretation of a number of the marks, which seem from thence to be mostly short dates, and directions to the workmen as to which stones were for the south, and which for the north, wall.

These markings have only been discovered in those dark holes or hollows, the so-called "chambers," but much rather "hollows of construction," broken into by Colonel Howard-Vyse above the "King's Chamber" of the Great Pyramid. There, also, you see the square holes in the stones, by which the heavy blocks were doubtless lifted to their places, and everything is left perfectly rough ; for these void spaces were sealed up, or had been built up outside in solid masonry, and were never intended to be used as chambers for human visitation or living purposes. In all the other chambers and passages, on the contrary, intended to be visited, the masonry was finished off with the skill and polish almost of a jeweller ; and in them neither quarry marks nor "bat holes," nor hieroglyphics of any sort or kind, are to be seen : excepting always those modern hieroglyphics which Dr. Lepsius in 1843 put up over the entrance into the Great Pyramid, "on a space five feet in breadth by four feet in height," in praise of the then sovereign of Prussia ; and which have recently misled a learned Chinese envoy, by name Pin-ch'-un, into claiming a connection between the Great Pyramid and the early monuments of his own country. (See *Athenæum*, May 21, 1870, p. 677.)

removed, though they still hated its name to such a degree as to forbear from even mentioning it,—yet with involuntary bending to the sway of a superior intelligence, they took to imitating as well as they could, though without any understanding, a few of the more ordinary mechanical features of that great work on which they had been so long employed; and even rejoiced for a time to adapt them, so far as they could be adapted, to their own more favourite ends and occupations.

Hence the numerous *quasi*-copies, for *sepulchral* purposes, of the Great Pyramid, which are now to be observed along the banks of the Nile; always betraying, though, on close examination, the most profound ignorance of that building's chiefest internal features, as well as of all its niceties of proportion and exactness of measurement; and they are never found even then at any very great number of miles away from the site, nor any great number of years behind the date, of the parent work.

The architectural idea, indeed, of the one grand primeval monument, though copied during a few centuries, yet never wholly or permanently took the fancy of the Egyptians; it had some suitabilities to their favourite employment of lasting sepulture, and its accompanying rites; so, with their inveterate taste for imitation, they tried what they knew of it, for that purpose; but it did not admit of their troops of priests, nor the seas of abject worshippers, with the facility of their own temples; and so, on the whole, they preferred them. Those more open and columned, as well as statued and inscribed structures, accordingly, of their own entire invention and elaboration, are the only ones which we now find to have held, from their first invention, an uninterrupted reign through all the course of ancient Egyptian history; and to reflect themselves continuously in the placid stream of Nile, from one end of the long-drawn land of

Egypt to the other. They, therefore, are Egypt. Thebes, too, with its hundred adorned Pylon temple-gates, is intensely Egypt. But the Great Pyramid is something perfectly different.

Under whose direction, then, and for what purpose, was the Great Pyramid built; and under what sort of special compulsion was it that the Egyptians laboured in a cause which they appreciated not, and gave their unrivalled mechanical skill for an end which they did not at the time understand; and which they never even came to understand, much less to like, in all subsequent ages?

This has been indeed a mystery of mysteries, but may yet prove fruitful in the present advancing stage of knowledge to inquire into further; for though theories without number have been tried by ancient Greeks and mediæval Arabians, by Italians, French, English, Germans, and Americans, their failures partly pave for us the road by which we must set out. Pave it poorly, perhaps; for their whole result has, up to the present time, been little more than this, that the authors of these attempts are either found to be repeating idle tales told them by those who knew no more about the subject than themselves; or skipping all the really crucial points of application for their theories which they should have attended to; or, finally, like some of the best and ablest men who have given themselves to the question, fairly admitting that they were entirely beaten.

Hence the *exclusive* notion of temples to the sun and moon, or for sacred fire, or holy water, or burial-places, and nothing but burial places, of kings, or granaries for Joseph, or astronomical observatories, or defences to Egypt against being invaded by the sands of the African desert, or places of resort for mankind in a second deluge, or of safety when the heavens should fall, have been for a long time past proved untenable;

and the Great Pyramid stands out now, far more clearly than it did in the time of Herodotus, as a pre-historic monument of an eminently grand and pure conception; and which, though in Egypt, is yet not of Egypt, and whose true and full explanation is still to come.

Under these circumstances it is, that a new idea, based not on hieroglyphics, profane learning, classic literature, or modern Egyptology, but on scientific measures of the actual facts of ancient masonic construction, was recently given to the world by the late Mr. John Taylor, of London, in a book published in 1859.* He had not visited the Pyramid himself, but had been for thirty years previously collecting and comparing all the published accounts, and specially all the best certified mensurations, of those who had been there; and while so engaged, gradually and quite spontaneously (as he described to me by letter), the new theory opened out before him. Though mainly a rigid induction from tangible facts of number, weight, and measure, Mr. Taylor's result was assisted perhaps by means of the mental and spiritual point of view from whence he commenced his researches, and which is simply this :—

That whereas other writers have generally esteemed that the mysterious persons who directed the building of the Great Pyramid (and to whom the Egyptians, in their traditions and for ages afterwards, gave an immoral and even abominable character) must, therefore, have been very bad indeed,—so that the world at large has always been fond of standing on, kicking and insulting that dead lion whom they really knew not,—he, Mr. John Taylor, seeing how religiously bad the Egyptians themselves were, was led to conclude, on the contrary, that those *they* hated (and could never sufficiently abuse) might perhaps have been pre-eminently good; or were, at all

* "The Great Pyramid. Why was it built? and who built it?" (Longmans and Co.)

events, of a *different religious faith* from themselves. He then, remembering, with *mutatis mutandis*, what Christ himself says respecting the suspicion to be attached when all the world speaks *well* of any one, followed up this idea by what the Old Testament records touching the most vital and distinguishing part of the Israelites' religion; and which is therein described, some centuries after the building of the Pyramid, as notoriously an "abomination *to the Egyptians.*" And combining this with certain unmistakeable historical facts, Mr. Taylor deduced sound reasons for believing that the directors of the building, or rather the authors of its design and those who controlled the actual builders of the Great Pyramid, were by no means Egyptians, but of the *chosen race*, and in the line of, though preceding, Abraham; so early indeed as to be closer to Noah than to Abraham. Men who had been enabled by divine favour to appreciate the appointed idea, as to the necessity of a sacrifice for a sin-offering, or an atonement by blood and the act of a Mediator:—an idea coeval with the contest between Abel and Cain, and which descended through the Flood to certain predestined families of mankind; but which no one of Egyptian born would ever contemplate with a moment's patience; for every Egyptian, from first to last, was a genuine Cainite in thought, act, feeling, and continual open profession to the very back-bone.

On this ground it was that Mr. Taylor took his stand; and, after disobeying the public opinion of profane Egyptian tradition, and setting at nought the most time-honoured prejudices of the pagan world so far as to give a full, fair, and impartial examination to the whole case, announced that he had discovered in the arrangements and measures of the Great Pyramid, then recently made upon it, or as it now exists, and on these again corrected for dilapidations and injuries of all intervening

time so as to arrive at its original condition—certain scientific results, which speak of much more than, or rather something quite different from, human intelligence. For, besides coming forth suddenly in primeval history without any childhood, or known preparation, or long-acknowledged duration and slowly growing senility afterwards—without any of those human features, I say, the actual results at the Great Pyramid, in the shape of numerical knowledge of grand cosmical phenomena of both earth and heavens, not only rise above, and far above, the extremely limited and almost infantine knowledge of science possessed by any of the Gentile nations of 4,000, 3,000, 2,000, nay, 1,000 years ago, but they are also, in whatever they chiefly apply to, very essentially above any scientific knowledge of any man up to our own time as well.

This is indeed a startling assertion, but from its subject admitting of the completest and most positive refutation, if untrue. For the exact science of the present day, compared with that of only a few hundred years ago, is a marvel of development; and capable of giving out no uncertain sound, both in asserting itself, and stating not only the fact, but the order and time of the minutest steps of separate discoveries. Much more then can it speak with positiveness, when comparing our present knowledge against the little that was known to man in those early epochs before physical science had begun, or could have been begun, to be seriously cultivated at all.

CHAPTER II.

GEOMETRICAL PROPORTIONS.

John Taylor's First Discovery.

MR. TAYLOR'S first proposition with regard to the Great Pyramid, when slightly but immaterially altered to suit convenience of calculation, is,—that its height in the original condition of the monument, when every one of its four sloping triangular sides was made into a perfect plane by means of the polished outer, sloping, surface of the bevelled casing-stones, and when those sides, being continued up to their mutual intersections, terminated at, and formed the summit in, a point,—that its height then was, to twice the breadth of its base, as the diameter to the circumference of a circle.

Or, as the case is graphically represented in the diagram (Plate II., Fig. 1), where the square E F G H represents the square base of the Pyramid, and the darkly-shaded triangle A B D exhibits a vertical section of the triangular mass of the building taken through the middle of opposite sides ;—

Then A C, the vertical height of the Pyramid, is to B D, the side or breadth of its base, when multiplied by 2, as the diameter to the circumference of a circle ; or, A C : 2 B D :: 1 : 3·14159 + &c. ; this last number, 3·14159, &c., being the quantity known amongst modern mathematicians under the convenient, to us now doubly convenient, designation π.

Or again, as shown more recently by Mr. St. John Day, the area of the Pyramid's right section, viz., A D B, is to the area of the base E F H G, as 1 to the same 3·14159, &c.

Or, as the same fact admits again of being differently expressed, the vertical height of the Great Pyramid, A C, is the radius of a theoretical circle, A I, the length of whose curved circumference is exactly equal to the sum of the lengths of the four straight sides of the actual and practical square base of the building, viz. E F, F G, G H, and H E.

Now this is neither more nor less than that celebrated practical problem of the mediæval and modern ages of Europe, "the squaring of the circle;" and the thing was thus done, truly and properly accomplished at the Great Pyramid, thousands of years before those mediæval days of our forefathers. For it was accomplished by the architect who designed that pyramid, when, over and above deciding that the building was to be a square-based pyramid,—with of course all the necessary mathematical innate relations which every square-based pyramid *must* have,—he also ordained that its height, which otherwise might have been anything, was to bear such a particular proportion to its breadth of base, as should bring out the nearest value of π as above mentioned: and which proportion not one out of millions, or of any number, of square-based pyramids would be necessarily endued with; and not one out of all the thirty-seven other measured pyramids in Egypt has been proved to be endowed with.

If, therefore, the quantity is really found built into fact with exactness at the Great Pyramid, it must have been the result either of some most marvellous accident, or of some deep wisdom not less than 3,000 years in advance of the world in its own time. And that wisdom apparently was building in confidence, not for

its contemporaries, to whom it explained nothing and showed very little, but for distant posterity; knowing well that a fundamental mathematical truth like π, would be understood both in and by itself alone, and without any written inscription, in that distant day when mathematics should come to be cultivated amongst mankind, even as they are now. A most true conclusion too, for experience has shown that neither mathematics nor mechanics can progress in any country in modern times without knowing well the numerical value and calculational quantity of π. In testimony whereof I may mention that in Dr. Olinthus Gregory's "Mathematics for Practical Men," third edition thereof by H. Law, C.E., at page 64 of Appendix, there is a Table 5, of "useful factors in calculation," and consisting of that invaluable number or proportion π, or 3·14159, &c., in no less than fifty-four different mathematical forms.

Enquiry into the Data.

Now of this scientific value of π there is, and can be, in the present day, no doubt anywhere; neither of the Great Pyramid's immense priority over all the existing architectural monuments raised, and much more over all known books ever written, anywhere by any of the sons of men; nor again that the numbers which Mr. Taylor gives for the vertical height and breadth of base of the Great Pyramid do realise the π proportion very closely. But, as we are to take nothing for granted that we can inquire into ourselves in this book, it becomes our duty to ask what foundation John Taylor may have had, for the numbers which he has employed being really those which the Great Pyramid was anciently constructed to represent, or does contain within itself, when duly measured and corrected for modern dilapidations.

In this research I soon found it necessary to read rather extensively in a particular branch of literature, the Egyptological; where the respective authors are not only numerous, but their accounts, as a rule, most strangely contradictory. Colonel Howard-Vyse, in the second volume of his important work,* published in 1840, gives either extracts from, or abstracts made with admirable fairness of, no less than seventy-one European and thirty-two Asiatic authors. Several more are now to be added to the list, and it is extremely instructive to read them all. Unless, indeed, a very great number be read, no sufficient idea can be formed as to how little faith is often to be placed in the narratives even of educated men on a very simple matter; and when measures are given, though they are measures which those learned authors report to having measured themselves, why then, and even because of all their book-lore and classical scholarship, ought we to feel most mistrust, according to the experience acquired in this looking up of pyramid literary modern authorities. Such at least cannot fail to be the unvarying case, unless there are other means of proving that some exceptional instance, among those often able men of letters and metaphysical philosophy, did also really understand what accurate measurement means, and is capable of.

It would be easy to string together a series of so-called measures, made by successive travellers, on the same parts of the Great Pyramid, which should show its blocks of solid stone expanding and contracting between different visits to it, like elastic india-rubber balls; but it will suffice for the present to indicate the necessity of weighing the evidence in every case most scrupulously; to have a large quantity of evidence, a great variety of observers, and to place in the first rank

* "The Pyramids of Gizeh." (Fraser, Regent Street, London.)

of authors to be studied in the original, closely in every word they have written, but not necessarily to be always followed therein:—

Professor John Greaves in 1638,
The French or Bonaparte Expedition in 1799,
Colonel Howard-Vyse in 1837; and
Sir Gardner Wilkinson from 1840 to 1858.

At present the Great Pyramid is, externally to the sight, a huge mass, rudely though regularly and masterly built of rough limestone blocks, in great horizontal sheets, or courses, of masonry; their outer, broken off edges necessarily forming a sort of rectangular steps up the sloping sides; and with a platform of sensible area, in place of a point, on the top. But this spurious or adventitious flattened top, as well as the spurious and adventitious steps on the sides, have all of them merely resulted from the mediæval dilapidations and removal of the pyramid's polished white-stone casing (with its outer surface bevelled smoothly to the general slope, see Plate II. Fig. 2), which had stood for more than 3,000 years, and had in its day given to the structure almost mathematical truth and perfection. This state of things was that described by Greek, Roman, and early Arabian writers, and it existed until the Caliphs of Egypt, about the year 1,000 A.D., profiting by the effects of a severe, and for Egypt very unusual, earthquake recorded to have happened in 908 A.D., began methodically to strip off the polished casing-stone, bevelled blocks; built two bridges to convey them more easily to the river, after chipping off the prismoidal angles and edges; and then employed them in building mosques and palaces; for the lining of the great "Joseph" well, and for other public structures which still adorn their favourite city El Kahireh, or the victorious—the Cairo of vulgar English.*

* Very recently my friends Mr. Waynman Dixon and Dr. Grant have visited the celebrated Mosque of Sooltan Hassan, in Cairo, to see if any

It is evidently then the original, not the present, size which we require, and must have, for testing Mr. Taylor's proposition; and for approximating, by the degree of exactitude that may be found, to whether it was accident or intention which decided the shape of the building; and he has well pointed out, that no one had got the true base-side length until the French Academicians, in 1799, cleared away the hills of sand and débris at the north-east and north-west corners, and reached the levelled surface of the living rock itself on which the Pyramid was originally founded. There, discovering two rectangular hollows carefully and truly cut into the rock, as if for "sockets" for the basal corner-stones, they measured the distance between them with much geodesic skill, and found it to be equal to 763·62 English feet. The same distance being measured thirty-seven years afterwards by Colonel Howard-Vyse, guided by another equally sure direction of the original building, as 764·0 English feet, we may take for the *present* problem where a proportion is all that is really required, the mean, or 763·81 feet, as close enough for a first approximation to base-breadth.

But the height of the Great Pyramid, which we also need to have for the solution of our problem, is not at all easy to measure directly with any sort of approach to exactness; and more difficult still, to reduce from its present to its ancient height safely, after so very much of the original top has actually been knocked away, as to leave a platform "large enough for eleven camels to lie down" in, or beneath, the very place where once the four triangular sloping sides were continued up to a

of the component blocks forming its walls could be identified as having belonged to the Great Pyramid. They found them to be undoubtedly of the same Mokattam stone, but too well squared to retain any of the outside bevelled, and, perhaps, inscribed surface. The enquiry was, however, put a stop to by the Mohammedan janitors, before it had reached some of the most likely places near the top of the Mosque to meet with an accidentally or carelessly left oblique surface of the older building.

point; a sharp point on which an angel, or, as the monkish writer argued, any number of angels, might stand, but not one man. In fact, the key-stone of the whole theory of the Great Pyramid would have been entirely wanting, even up to the present day, but for Colonel Howard-Vyse's most providential finding of two of the "casing-stones" *in situ*, at the foot of the Pyramid; for they enable the problem to be attacked in a different manner; or by angular as contrasted to linear measure. And we might indeed accomplish the solution by reference to angle only; but having begun with linear measure, we may as well on the present occasion employ the angle merely in a subsidiary manner; or to supply, when used in connection with the one linear datum we *have* measured, the other linear datum, which we have *not* been able to measure directly; and both of them against John Taylor's linear numbers also.

Beginnings of Objections by Captious Individuals to the Data on which the Modern Scientific Theory of the Great Pyramid rests.

After reading my first paper on the subject to the Royal Society, Edinburgh, I was seriously warned that two very shrewd and experienced members there had objected to this part of the Pyramid research; one of them, an engineer, saying "that he had passed through Egypt, been to the Pyramids, saw no symptoms of casing-stones bevelled to any angle, and therefore did not believe in them." The other, an Indian naval officer, had also been to the Pyramids on a visit, and "found such heaps of rubbish about the great one, that he could not see how any man *could* measure even its base side length with any degree of correctness, much less casing-stones which he could not see."

The First Objector.

Both these speeches are only too faithful examples of the small extent of information on which many persons, of commanding social rank, will even yet persist in speaking authoritatively on both the present, and long past, state of the Great Pyramid. The first doubter about the casing-stones, should at least have read the accounts of Herodotus, Strabo, Pliny, and many early Arabian authors who described what they saw before their eyes when the casing was still complete, and eminently smooth and beautiful; and then should have taken up Colonel Howard-Vyse's own book, descriptive, in details vocal with simple, naïve truth, both of how he succeeded in digging down to, finding and measuring probably the two last of the bevelled blocks still *in situ*, adhering closely by their original cement to the pavement base of the building; and then how he failed, though he covered them up again with a mound of rubbish, to save them from the hammers of tourists and the axes of Mohammedan Arabs, doubly and deadly jealous of Christians obtaining anything really valuable from the country *they* rule over. Besides which, the large amount of casing-stones, bevelled externally to the slope, still existing upon other pyramids, as on the two large ones of Dashoor; the well-preserved ones of the second Jeezeh Pyramid, conspicuous near its summit, and on a bright day "shining resplendently afar," as says M. Jomard; and the granite ones of the third pyramid, so excessively hard that modern workmen have not cared to have much to do with them—all this, which has long been known, and more which I have presently to relate, should effect much in convincing unwilling minds as to what was the original state of the outside of the Great Pyramid. While a similar case of spoliation to what that building experienced in

A.D. 840, was perpetrated only a few years ago, on the south stone pyramid of Dashoor by Defterdar Mohammed Bey, in order to procure blocks of ready-cut stones of extra whiteness wherewith to build himself a palace near Cairo.*

The Second Objector.

Then the doubter about the possibility of other men succeeding in measuring what would have puzzled him as he looked on idly, should have read the whole account of the French academicians in Egypt, of which the following extract, from p. 63 of "Antiquités, Description," Vol. II.,† is worthy of being more generally known than it is: viz., that after digging down through the rubbish, not merely looking on with their hands in their pockets, "They recognised perfectly the esplanade upon which the pyramid had been established; and discovered, happily, at the north-east angle, a large hollow socket (*encastrement*) worked in the rock, cut rectangularly and uninjured, where the corner-stone had been placed; it is an irregular square, which is 118 British inches broad in

* There is even a large consumption of ancient building-stones in the *accidents* of modern Egyptian life; let alone the oft burning of limestone blocks into lime, for mortar and plaster-work. Thus I was astonished in 1864 at the massive outside stair to his house which one of the Sheikhs of the nearest Pyramid village had made, evidently with stone blocks from the tombs on the Great Pyramid Hill. But in 1873 I am informed by Mr. Waynman Dixon that that village has been in the interval entirely washed away by a high Nile inundation, and that its inhabitants have since then built themselves a new village much closer to the Great Pyramid Hill, and in so far nearer to their inexhaustible quarry of stones, cut and squared to their hand.

† "Ils reconnurent parfaitement l'esplanade sur laquelle a été établie la pyramide, et découvrirent heureusement à l'angle nord-est un large encastrement, creusé dans le roc, rectangulairement dressé et intact, où avait posé la pierre angulaire; c'est un carré irrégulier qui a 3 mètres dans un sens, 3·52 mètres dans l'autre, et de profondeur 0·207 mètres; ils firent les mêmes recherches à l'angle nord-ouest, et ils y retrouvèrent aussi un encastrement semblable au première; tous deux étaient bien de niveau. C'est entre les deux points les plus extérieurs de ces enforcements et avec beaucoup de soins et de précautions qu'ils mesurèrent la base. Ils la trouvèrent de 232·747 mètres."

one direction, 137·8 British inches in another, and 7·9 British inches deep" (measures since then tested by myself, but only after several days spent in digging and clearing the locality by a civil engineer with a party of Arabs). "They made the same research at the north-west angle, and there also discovered a hollow socket (*encastrement*) similar to the former: the two were on the same level. It was between the two exterior points of these hollows, and with much care and precaution, that they measured the base-side length. They found it 763·62 British feet."

The "encastrement," so discovered in the basal rock at the north-east angle, is duly figured in plan amongst the large French plates; and, as I have since verified at the place, has the inner corner curiously pared away, evidently indicating the well-shaped rectangular *outer* corner to be the true starting-point for measure; because, also, it was originally the terminal point of the Pyramid's substance at that lower angle or foot. From the outer corner of the north-east to the outer corner of the north-west "encastrements" of their happy discovery it therefore was, that the skilful French surveyors extended their measuring-bars, and with the result given above.

Mr. Taylor has assisted the explanation of, or presented some apology for, the errors of the better class of earlier observers, by imagining their having been really measuring along some of the elevated steps or ranges of stones, at a height up the sides of the Pyramid; when, from the sand not having been cleared away, they erroneously thought they were at the bottom of the pile. But the apology was hardly required; for none of them sufficiently realised the importance of accuracy in what they were engaged in; and if, indeed, any man really believed the Great Pyramid to be only a tomb, and never to have been intended for anything

but a tomb, as too all our modern Egyptologists boastfully teach, why *should* he trouble himself to measure it as carefully as he would a scientific standard of measure?

For the length of the real, or ancient, base-side of the Great Pyramid, therefore, no measure previous to the French one (which is the first *socket* measure) should or need be used, or can be depended on to within a serious number of feet. And as the French measures cannot now be repeated or replaced by any decidedly better, without previously incurring a large cost in recovering the sites of those important "encastrements" or *fittings-in* of the outer corners of the Pyramid's base, and still more in clearing and levelling the much-encumbered ground between them, we must not let the said French measures drop out of sight.

Colonel Howard-Vyse, indeed, did go to much of this remarkable expense; and not only procured another measure of the very original pyramid base breadth of the builders on the north side from end to end, but, as already mentioned, found near the middle thereof two of the ancient exterior casing-stones still forming, on the rocky platform, both a firmly-cemented part of the old basal line, and a beginning of the northern upward-sloping side of the building.

Howard-Vyse's Casing-stones.

The extreme value residing in these angular relics, was not only because they were of the number of the original casing-stones actually *in situ* and undisturbed, and therefore showing what was once the veritable outside of the Great Pyramid, viz., smooth, polished, dense white limestone softer than marble in a sloping plane; but because they exhibited such matchless workmanship: as correct and true almost as modern work by optical instrument-makers, but exhibited in this instance on

blocks of a height of nearly 5 feet, a breadth of 8 feet, and a length perhaps of 12 feet; with joints, including a film of interstitial cement, no thicker than "silver paper." The angle of the inclined or bevelled outer surface, measured very carefully by Mr. Brettell, civil engineer, for the Colonel, came out 51° 50′; and being computed from linear measures of the sides, made for him by another engineer, came out 51° 52′ 15·5″.* Results extremely accordant with one another, as compared with the French determination (before there was anything on which to determine accurately, other than the present ruined and dilapidated sides of the edifice) of 51° 19′ 4″; or of previous modern observers, who are found anywhere and most variously between 40° and 60°.

But the Colonel's engineers, though good men and true, were not accurate enough for the extraordinary accuracy and merits of the unique piece of ancient work they had to deal with; and in the *linear* measures which he gives in p. 261, Vol. I., of his great book (and the length measures of the *sides* of a triangle, as every practical surveyor knows, are capable of laying down its particulars on paper much more accurately than can be done by using the angles through means of an angle-showing protractor), there is one anomaly which seems to have escaped remark hitherto. The stone itself, in cross section, and its accompanying numbers, stand as in our Fig. 2 of Plate II.

The lengths, having been only attempted to be given to the nearest inch, are lamentably short of the refinement to which they might have been taken; and an accurate measure of such noble sides, would have given the angle by calculation far closer than it could have been observed to, by any clinometer then at the pyramids, or indeed in all Egypt, and perhaps Europe.

* Sir John Herschel, *Athenæum*, April 23, 1860.

By subtracting the upper from the lower surface length the figure is reduced to a triangle for calculation; and we have what should be a right-angled triangle at B (Fig. 3), where $a = 59$, $b = 75$, and $c = 48$ inches all by measure. But the value of the angle A is then found to be so very different, accordingly as it is computed from *b c*, or *a b*, that we may soon perceive clearly that B is not a right angle; and on computing what it is from *the three sides*, it appears to be 88° 22′ 52·6″. This, however, is such an egregious error for workmen like those of the Great Pyramid to have committed, and in their *easiest angle*, that I incline to think Mr. Perring must have made a mistake of an inch in his measure of the base breadth of the stone, his most difficult side to measure. Indeed it would need a little more than an inch to be taken off his number, to bring the angle B up to 90°; but as Mr. Perring does not deal in smaller quantities than an inch, and as none of the sides were likely to have fallen on an even inch exactly, I have not ventured to make so strong a correction upon one of them only, though too it would be to bring it up to the round pyramid number of 100 inches in length; and I leave the twin results of the Vyse casing-stones as given out to the world by their discoverer.

John Taylor's Proposition supported by Howard-Vyse's Casing-stone Angle.

On the whole, then, taking everything into practical consideration, the ancient angle of the Great Pyramid's slope may be considered to be certainly somewhere between the two measured quantities of 51° 50′ and 51° 52′ 15·5″, while there are many reasons for believing that it must have been 51° 51′ and some seconds. How many seconds, the modern observations are not competent altogether to decide: but if we assume for the

time 14·3″, and employ the whole angle, viz. 51° 51′ 14·3″ with the length of the base side as already given from linear measure = 763·81 British feet, to compute the height, we have for that element 486·2567; and from these values of height and base-breadth, computing the proportion of diameter to circumference, there appears 486·2567 : 763·81 × 2 :: 1 : 3·14159, &c.* And this result in so far shows that the Great Pyramid does represent the value of π; a quantity which men in general, and all human science too, did not begin to trouble themselves about until long, long ages, languages, and nations had passed away after the building of the Great Pyramid; and after the sealing up, too, of that grand primeval and prehistoric monument of the patriarchal age of the earth, according to Scripture.

Further Confirmations of John Taylor's Proposition.

Hence the first stage of our trial terminates itself with as eminent a confirmation as the case can possibly admit of, touching the truth of John Taylor's proposition or statement; and I am even in a position now to add the absolute weight of personal examination, as well as of inquiries carried on at the place for a longer time and with better measuring instruments than any of my predecessors had at their command. I was not indeed so fortunate as Colonel Howard-Vyse in finding such large, entire, unmoved, and well-preserved casing-stones as he did; but was enabled to prove that the enormous rubbish mounds now formed on each of the four base sides of the Pyramid consist mainly of innumerable fragments of the old casing-stones, distinguishable both by the superior quality of their component stone and

* John Taylor's numbers for the vertical height and the base-breadth of the Great Pyramid were 486 and 764 feet: evidently the nearest possible approximation by whole feet.

their prepared angle of slope always conformable, within very narrow limits, to Colonel Howard-Vyse's determination. And a number of these almost "vocal" fragments are now deposited in the museum of the Royal Society, Edinburgh.

Also, by careful measures of the angle of the *whole* Pyramid along all four of its corner or "arris" lines from top to bottom, observed with a powerful astronomical circle and telescope, as more particularly described in my larger book, "Life and Work at the Great Pyramid," in 1865, the same result came out. For that corner angle so measured (see the outer triangle A *d b* in Fig. 1, Plate II., and compare also Figs. 1 and 2 of Plate III.) was found to be 41° 59′ 45″ nearly: and that gives by computation, according to the necessary innate relations of the parts of a square-based pyramid, for the side slope of this "Great" one, 51° 51′ and some seconds; or without any doubt the representative of the angle Colonel Howard-Vyse did observe on the side; and the one which, if it is there, necessarily makes the Great Pyramid express the value of π, or the squaring of the circle, whatever the absolute linear size of the whole building may be.

But that feature of linear size contains other problems within itself, the nature of whose origination is even still more mysterious than this one, now practically solved, touching the angle of rise of each of the four inclined sides and the object thereof.

CHAPTER III.

STANDARD OF LENGTH EMPLOYED IN THE GREAT PYRAMID.

A Foot Standard unsuitable for π on the Great Pyramid's Scale.

IN the process of recomputing Mr. Taylor's circumferential analogy of the Great Pyramid on p. 25, after his own manner by linear vertical height and horizontal base-breadth, the quantities which we employed * were expressed in English feet; but it does not therefore follow that they, or indeed any foot-measures, were employed by the ancient builders.

Certainly the length, want of meaning, and inconvenience of the fractions obliged to be introduced in order to represent the true, or π, proportion of the one Pyramid element to the other, in these particular, absolute, linear terms, tend to forbid the idea. No doubt that a foot is something of a natural and very common measure,† and *may* have been (I do not say that it was) extensively used in Egypt for many agricultural and other operations, which, if lowly, "are innocent and hurt not;" but still there is good reason for disputing whether a "foot" was ever lifted up against that

* Viz., vertical height = 486·2566 feet, and length of one side of base = 763·81 feet.

† The natural or naked foot of man is shorter, say about 10·5 in place of 12 inches; but the practical foot of civilized man, sandalled, shoed, or booted, is often more than 12 inches long.

grandest building of all antiquity, the Great Pyramid, by the authors thereof.

If then a foot-measure was not likely, and the profane Egyptian cubit (whose length was close to 20·7 British inches) gave similarly inconvenient fractions, what sort of standard of linear measure *was* likely to have been employed at the building, or rather by the builder or architect of the whole design, of the Great Pyramid?

What Standard would *suit* π *on the Scale of the Great Pyramid?*

As a first step in such an inquiry, let us see whether an equally exact proportion between linear height and twice base-breadth, to what our long fractions of feet gave, cannot be obtained from some simpler numbers. Take, for instance, 116·5 : 366·0. These do not give the value of π exact, as no simple numbers can, when the proportion itself belongs really to the incommensurables; but it is an astonishingly close approach, and an admirable clearing away of fractional troubles in all approximate work, for such plain and small numbers to make; and the exceedingly trifling fraction* by which the one should be increased, or the other decreased, does not, in the existing state of our pyramidal knowledge, make much practical difference upon most of the questions which we shall have presently to take up.

Are there, however, any other reasons than such mere convenience, why we should attach any significance, touching importance in the design of the Great Pyramid, to these particular numbers?

There are such reasons.

In the *first* place, 366, which represents here (for

* Either 116·5014 : 366·0000, or
116·5000 : 365·9956, would be closer,
but not so convenient in multiplication and division.

our arbitrary diameter of a circle 116·5) the π circumferential analogy of that circle, is also the nearest *even* number of days in a year; or more precisely, of solar days in a mean tropical solar year; or, again, of day-steps in the circle of a year, the most notable and important of all circles to man.

We now know, by modern science, that the exact number of these day-steps in the natural year is 365·2422 + an almost endless fraction of unascertained length; though practically, and for the ordinary purposes of life, all civilised nations now use 365 even; except in leap-year, when they do, evenly also, make their year to consist of 366 days.

In the *second* place it may be stated, that that portion of the Pyramid employed as the chief datum of linear measure in the problem under discussion, viz., the length of each side of its square base as determined by the "socket" measurements, both of the French *savants* and Colonel Howard-Vyse, when it comes to be divided into 366 parts, seems to give each of them a length approaching nearly to one ten-millionth of the earth's semi-axis of rotation, or close upon 25 British inches. Equivalent, therefore, if further and independently proved, to the architect having laid out the size of the Great Pyramid's base with a measuring-rod 25 inches long in his hand; and in his head, the number of days and parts of a day in a year; coupled with the intention to represent that number of days in terms of that rod on each base side of the building.

A Day and Year Standard indicated, with Earth Commensurability.

Now this is a feature, in all sober truth, if that quantity of length was really used intentionally as a standard of measure, of the most extraordinary import-

ance; for it is only since Newton's time that men knew anything exact about, or have attributed anything peculiar in its size to, the earth's axis of rotation as different from any other diameter thereof. It is, therefore, to man, evidently a result of modern science alone; and every modern civilised nation has, during the present century, been obliged to perform gigantic trigonometrical operations and "degree measurings," in order to arrive at any approach to accurate knowledge of the true length of that earth-line, or rotation axis of the earth; and they are still pursuing the inquiry with most extensive establishments of well-trained surveyors and scientific calculators.

Their best results hitherto oscillate generally about 500,500,000 English inches within very narrow limits, though some of the results are as great as 500,560,000, and others as small as 500,378,000.

Such, then, are the ranges of uncertainty in which England, France, Germany, America, and Russia are placed at this moment; and yet they are immensely closer in accord, and nearer to the truth, than they were only fifty years ago; while 1,000, 2,000, or 3,000 years since, even the most scientific of men knew nothing but what was childish about the size of that earth on which it had pleased God to place his last and most wondrous act of creation—man—to dwell, and play his part, for a little season.

Is it possible, then, that at a much earlier date still than 3,000 years ago, or on the occasion of the founding of the Great Pyramid in 2170 B.C., the author of the design of that building could have known both the size and shape of the earth exactly, and have intentionally chosen the unique diameter of its axis of rotation as a reference for the standard of measure in that building?

Humanly, or by human science finding it out then, and in that age, of course was utterly impossible. But

if the thing was inserted there in fact—and if its insertion be not owing to accident, and if traces of the supernatural are attributable only to God and to his Divine inspiration, it must be one of the most remarkable facts that occurred at the beginning of the post-diluvial career of man, outside of Scripture history; and stands next in importance to Scripture itself for man to inquire into, as to how, and for what end, it was allowed or aided by the Almighty to take place.

More Rigid Inquiry into the Absolute Length of the Base-side of the Great Pyramid.

The first thing, therefore, for us to do now, is to ascertain if the alleged fact *is* there; or, rather, to what degree of accuracy it is there; for in all practical work of physical science and nicety of measurement, good scientific men know that nothing whatever can be ascertained absolutely, but only within certain limits of error; those limits becoming smaller as observation improves, but never entirely vanishing.

Is, then, the ten-millionth part of the earth's semi-axis of rotation, or 25·025 British inches (according to the estimate of the axis rotation being 500,500,000 British inches long),* multiplied by 365·242 (the number of solar days in a year), the true length of a side of the square base of the Great Pyramid; and if it is not, by how much does it differ?

The above theoretically proposed quantity evidently amounts to 9,140 British inches, nearly. And at the time of the first edition of this book being published, the only admissible, because the only socket-founded, determinations of the base-side lengths that I was acquainted with, were, 1st, the French one (see p. 21) = 763·62

* The earth's equatorial diameter is about 502,226,000 British inches long.

English feet = 9163·44 British inches; and, 2nd, Colonel Howard-Vyse's, of 764 English feet = 9,168 British inches; and both of them are too large.

This error, if it is so, did not affect our determination in the last chapter for the π shape of the Great Pyramid, because we computed the height in terms of this same base-breadth by reference to an angle observed quite independently. But now we require to know more positively whether the length then used was real or figurative only; and when I was actually at the Great Pyramid in 1865, Messrs. Aiton and Inglis, engineers, succeeded in uncovering all four of the Great Pyramid's corner sockets (as duly detailed in my book, "Life and Work"), and then proceeded to measure from socket to socket every one of the four sides of the base: and with what result? They made them all shorter, far shorter than both the French and the Vyse determinations, or equal only to 9,110 British inches on the mean of the four sides.

Either their measures then must have been very bad and too short, or those of the French and Colonel Howard-Vyse were bad and too long. I inclined to divide the errors between them in my book, "Life and Work," published in 1867; and in 1869, when the Royal Engineer surveyors, returning from the Sinai survey, went (according to orders) to the Great Pyramid, and announced, through their colonel at home, that the mean length of a side of its square base, from socket to socket, was 9,130 British inches, my idea of even-handed justice seemed to be in part confirmed.*

* The Great Pyramid's base-side length was recently quoted from Sir H. James by the Warden of the Standards in *Nature* as 9,120 Br. inches. But this was an error; for on page 7, line 4 *ab imo*, Sir H. James (then Col., now Gen.), R.E., states distinctly in his "Notes on the Great Pyramid," that "the mean length of the sides obtained by the Ordnance Surveyors was 9,130 inches;" and it is only when he goes on to take the mean of his men's 9,130, with Aiton and Inglis's 9,110,—wholly excluding the French surveyors and Colonel Howard-Vyse,—that he announces that "9,120 inches was therefore the true length of the side

But as there are internal features of evidence that none of the measures, not even the last, were accurate enough to be depended on to the third place of figures (whether measured upon only one side, or all four sides, of the base considered *square* by everybody), all men are at this very moment left by the last pyramid base-side measurers of modern times in this predicament—viz., the theoretical length of 9,140 inches, which would imply such almost unutterable wisdom, or such inconceivably happy accident, for that primeval time, on the part of the designer of the Great Pyramid, is really found *amongst*, or as though it were one of, the best results of modern measure. It is, indeed, notably confirmed by them; or may be asserted upon and by means of them, within such limits as they can confirm anything; and if those limits are coarse, that coarseness is entirely the fault of the modern measurers, not of the ancient building; which, founded on a rock (and an admirably firm and nearly unfissured hill of dense rock of nummulitic limestone, in nearly horizontal strata), could not possibly have expanded and contracted between the successive modern dates of 1799, 1837, 1865, and 1869 A.D., as the recent measures seem at first to imply. The variations, therefore, first from 9,163 to 9,168, then to 9,110 and then to 9,130, must be merely the *plus* and *minus* errors of the modern measurers: or of men intending honestly to do well if they could, but erring involuntarily, sometimes to one side and sometimes to the other of exactitude.

of the Great Pyramid when it stood perfect." The reason of this dishonourable shelving of the honourable older observers, with their larger results, is shown in the next line, where the Colonel develops his absurdly mistaken theory of the much later Greek cubit having decided the length of the early Great Pyramid base-side, and *requiring* such a length as 9,120 inches; of which more anon.

The Earth-axis, and Year, Commensurable Result further indicated.

Of course better measures than all that have been yet taken might be made, and should be instituted forthwith, to clear up so notable a point in the primeval history of man; but the expense to be incurred in the preliminary clearing of the ground to allow of accurate measuring apparatus being brought to bear, is beyond the means of any ordinary poor scientific man; and the Great Pyramid is not a favourite subject either with rich men or the wealthy governments of wealthy nations: while the invaluable corner sockets, never properly covered up since 1865, are daily being trodden and broken down at their edges out of shape and out of size; so that we are not likely to see speedily, if ever, any better measures of the base-side length than those already obtained.

But as *they*, when considered by any computer fully, honestly and fairly, do include the theoretical 9,140 British inches, we are already justified so far (and we shall have in a future chapter signal confirmation from the interior of the Pyramid), in upholding the high degree of probability that the reason why the Great Pyramid (made already of a particular *shape* to enunciate the value of the mathematical term π) had also been made of a particular *size*, was,—in part, to set forth the essence of chronology for man in chronicling all his works upon this earth. For evidently this *was* accomplished there, by showing that the number of times that the Pyramid's standard of linear measure would go into the length of a side of its square base, was equal to the number of days, and parts of a day, in the course of a year. That standard of linear measure being, moreover, with a marvellously complete appropriateness, the ten-millionth of the length of the earth's semi-axis of

rotation : or of half of that axis, by the earth's rotating upon which before the sun, that particular number of days for work and nights for rest is constantly being produced for all humanity in the course of the earth's annual revolution around the sun.

Hence there is here wheel within wheel of appropriate and wise meaning, far above any mere single case of simple coincidence of numbers ; and which implies something beyond mechanical accident on the part of the ancient architect, though our own modern Egyptologists and the ancient Egyptians and all the rest of the pagan world too, saw nothing of it. The affair was open, because it was on the surface, during all antiquity, and especially open during the days of the Greek philosophers in Alexandria, when the Great Pyramid was still complete in size and finish, with its bevelled casing-stones forming the then outside finished surface of the whole ; and any of those learned men, by merely dividing the Pyramid's base-side length by the number of days in a year, might have acquired to themselves the most valuable scientific standard of length contained in the whole physical earth ; but none of them did so.

Beginning of Reference to the Great Pyramid's Numbers.

And the affair grows in wonder the further we inquire into it. For Mr. Taylor, led by the numbers of British inches which measure the earth's polar-axis length,—and other men, also led by the dominance of fives in the Pyramid's construction (as that it has five angles and five sides, including the lower plane of the base mathematically as one)—ventured the suggestion, that the author of the Great Pyramid's design both had, and used, as his smaller unit of measure, an *inch*. An inch, though, larger than a British inch by a thousandth part, *i e.* about half a hair's-breadth ; an apparently unimportant

quantity, and yet it is that which enables the round, and at the same time grand, Pyramid number of *five* hundred millions of them, even, to measure the length of the earth's polar diameter with exactitude.

With these inches, the *day standard* of linear measure for the side of the base of the Great Pyramid is 5×5, or just 25 of them; and that length, while it will be shown presently to be fully deserving of the appellation, amongst all Christians, of "Sacred Cubit," we will in the meanwhile only call the cubit of the Great Pyramid's scientific design. Next, as there are four sides to the Pyramid's base, the united length of all of them evidently equals 36,524 Pyramid inches; or, at the rate of a round hundred inches to a day, the whole perimeter of the building (already shown to represent the theoretical π circle) is here found to symbolise once again, in day lengths, the practical circle of the year, so essential to the life and labours of man.

Now is it not most strange,—or rather is it not ominously significant, that the ancient profane cubit of idolatrous Egypt, 20·7 British inches long nearly, if applied either to the Great Pyramid's base-side, or base-diagonals, or vertical height, or axis lines, or any other known radical length of the building, brings out no notable physical fact, no mathematical truth. While the other length of 25·025 British inches (which the profane Egyptians, and the Jupiter and Juno and Venus worshipping Greeks, when in Egypt, knew nothing of) brings out in this and other cases so many important coincidences with nature, as makes the ancient monument speak both intelligibly and most intellectually to the scientific understanding of the present day.

Why, it seems almost to imply,—so far as the closeness of a 25 British inch length, to being the key for opening this part of the design of the Great Pyramid, is concerned,—that there was more of intercommunication

in idea and knowledge between the architect of the Great Pyramid, and the *origines* of the Anglo-Saxon race (whose national unit of linear measure the inch more especially is) than between the said architect or designer of the one Great Pyramid in Egypt, and all the native Egyptian people of all the ancient ages, with their invariable 20·7 inch cubit, which explains nothing, except their early connection with Babylon; and they, the holders of it, idolaters worse than those of Babel, and Cainite religious professors every one of them.

The Great Pyramid's Linear Standard contrasted with the French Mètre.

We have thus arrived by a comparatively short and easy path, at the same chief result touching the Great Pyramid's standards and units of linear measure, and a probability of whence the British inch was derived in primeval days of purity and patriarchal worship before idolatry began,—which Mr. Taylor equally obtained, but by a more circuitous process; and what a result it is, in whatever point of view we look upon it, or by whatever road we have attained to it!

The nations of the world three thousand years ago, of their own selves and by their own knowledge, cared little about their national measures, and knew nothing but what was childish with regard to the size of the earth; so that all our present exact acquaintance with it is confined within the history of the last hundred years. The great attempt of the French people in their first Revolution to abolish alike the Christian religion, and the hereditary weights and measures of all nations, and to replace the former by a worship of philosophy, and the latter by their "mètre," "French mètre," scheme depending in a certain manner of their own upon the magnitude of the earth, as well as to substi-

tute the week of seven days by an artificial period of ten days,—is only eighty years old. And how did they, the French philosophers, endeavour to carry out the metrological part of their scheme? By assuming as their unit and standard of length, the 1-10,000,000th of a "quadrant of the earth's *surface!*" Well may we ask with surprise if that was all that science, trusting in itself, was able to do for them. For the grasp and understanding of the subject, that took a curved line drawn on the earth's surface in place of the straight axis of rotation, was truly inferior in the extreme. Sir John Herschel has well said, but only *after* John Taylor's statement about the Pyramid had lighted up his mind with the exquisite thought, of how near after all the British hereditary inch is to an integral earth-measure, and the best earth-measure that he had ever heard of,—Sir John Herschel, I repeat, has said, "So long as the human mind continues to be human, and retains a power of geometry, so long will the diameter be thought of more primary importance than the circumference of a circle;" and when we come to a sphere, and in motion, the axis of its dynamical labour should hold a vastly superior importance still.

Again, the French philosophers of eighty years ago, in fixing on a Meridional quadrant of *surface* for their mètre's derivation, had no idea that within the last three years the progress of geodesy would have shown that the earth's equator was not a circle, but a rather irregular curvilinear figure,* perhaps ellipsoidal on the whole, so that it has many different lengths of equatorial axes, and therefore also *different* lengths of quadrants of the Meridian in different longitudes. *They*, the *savants* of Paris, could not indeed foresee these things

* See M. de Schubert in "Transactions of Imp. Acad. of St. Petersburg;" and Sir G. B. Airy, Astr. R., in "Monthly Notices of Royal Astron. Soc."

of the present day, or a state of geodesic science beyond them; and yet these things were all taken into account, or provided for, or certainly not sinned against, by the mind that directed the building of the Great Pyramid 4,040 years ago; and the reference for the grand unit, the 10^{7th}, or ten-millionth, part of the earth's polar semi-axis, then adopted, is now shown to be the only sound and scientific one which the earth possesses.

Through those long mediæval periods, too, of darkness, confusion, and war, when our nation thought of no such things as mathematics, geodesy, and linear standards, the same master-mind likewise prevented our *hereditary*, and *quasi* Pyramid, *unit of measure*, the inch, from losing more than the thousandth part of itself; for this is the result, if it turns out as John Taylor believed—and as he was the first of men in these latter days both to believe and to publish his belief—that the Great Pyramid is the one necessarily-material centre from which those practical things, weights and measures, in a primeval age, somewhere between the time of Noah and Abraham, take whatever chronology you will, were *Divinely* distributed to certain peoples and tongues; and carried with the utmost care from land to land, for special purposes of some grand future manifestation, which is yet to make its appearance on the stage of human history.

CHAPTER IV.

FIGURE OF THE EARTH, AND THE SUN-DISTANCE.

John Taylor's Earth and Pyramid Analogies.

HAVING established thus much, and to this degree of approximation, as to shape, size, and linear standard of the Great Pyramid, it may now be worth our while to bestow some special attention on two other analogies between that building and the earth, published by John Taylor; and which, on being examined soon afterwards by Sir John Herschel,* were honourably declared by him to be, so far as he then knew, the only good relations between the size of the earth and the size of the Pyramid which had up to that date been successfully made out; though at the same time he expressed his belief that they were only approximate.

A most useful caution; and keeping it fully in view, let us test them over again and in the terms of those pyramidal units and standards which we ourselves have now obtained; for inasmuch as they allow us to speak of the Great Pyramid in the very primal measures apparently employed by its architect in planning the design, we may thereby be enabled to put his work to a stricter and more direct test.

The first of these two analogies by Mr. Taylor is,

* *Athenæum*, April, 1860; and Mr. Taylor's "Battle of the Standards," 1864. See the Appendix to the Second Edition of his "Great Pyramid." Longmans & Co.

when put into the form subsequently chosen by Sir John Herschel, "a band encircling the earth, of the breadth of the base of the Great Pyramid, contains one hundred thousand million square feet." The built size, in fact, of the Great Pyramid is here stated to bear such a remarkably round and even number, as its proportion to the created size of the natural earth, at the epoch of its human habitation, that an argument for intention rather than accident may spring therefrom, if it hold closely in fact.

The feet to be used on such an occasion, can hardly be any other than pyramid feet, or 12 pyramid inches set in a line; and the part of the earth for the colossal band to encircle, what should that be?

Though it is allowable enough, and very useful too in approximate work, to speak of the earth as a globe, or sphere, whose every great circle, or section through its centre, will have the same length of circumference, we cannot so do, or content ourselves therewith, either in accurate modern science on one side, or in any advanced stage of pyramid investigation on the other; especially when some of our earliest discoveries there, indicated that its design discriminated between the axis of rotation diameter, and any and every other possible diameter through the really spheroidal, or ellipsoidal, or chiefly flattened-at-the-poles figure, of the great mass of the earth.

Let us come to some very clear conclusion then on the size and shape of the earth, in pyramid units of measure too, before we attempt the solution of any further problem supposed to connect the two.

Of the Length of the Earth's Polar Axis.

Expressed in pyramid inches (each of them 0·001 of an inch longer than the national British inch) the

polar diameter, or axis of rotation of the earth, has been stated by different observers of the best modern schools of the present time to be either (see p. 30) 499,878,000 or 500,060,000 pyramid inches in length, or any and almost every quantity between those limits. They cannot, in fact, be determined much closer by the best measures of the best men and the most powerful governments of civilised nations in the present day ; and although one office or nation publishes its results to an arithmetical refinement of nine places of figures, it cannot convince any other office or nation of its correctness beyond the three first places of figures. Some of them may agree to four places, few or none of them to five or six or more places. Therefore in this case and all other similar ones throughout this book, I shall try to simplify all numerical statements of measures by not putting them down to more places of significant numbers than they can be nearly depended on to. Hence the 000 with which the above statements terminate are merely to give the proper value to the preceding figures, and not to indicate that any one man's measures of the earth gave forth an even number of inches in tens, hundreds, or thousands.

"But why do they not ascertain what the length of the earth's axis is, and state it exact?" may ask many a reader, not directly experienced in practical scientific measurement. Well, by all means let any and every such reader ask, and ask again that question in the proper quarter. Let them ask, for instance, at the Ordnance Survey Office in Southampton, or from the Trigonometrical Survey of India, where generations after generations of Engineer officers have been taken away from their proper military duties, and kept at nothing but observations and calculations to get at the size and shape of the earth all their lives long. They have lived and died at that employment alone, and are still

succeeded at the task by others, and yet it is not completed. In fact, the expense of the methods and the men employed, is increasing every day. And not in our country alone, but in every state on the Continent, is similar work going on, and with less chance than ever of one exact, absolute, and universally admitted conclusion being ever arrived at.

Neither is this any fault of those individuals; it is the nature of human science, because it is human and not divine. Human practical science can only go on by approximations, and can never reach anything more than approximations, though it work at one and the same simple subject for ages. And though the subject itself in nature and to the eye of its Creator is absolutely simple, human science makes it so complicated and difficult as it advances with its successive approximations, that the matter is crushed in the end by its own weight, and at last falls out of the range of all ordinary men to deal with, or even to be interested in.

Not only, too, do the experts of two different countries produce different measured results for the size of one and the same earth's axis of rotation, but they produce different results in computing the same observations; until even one and the same computer will produce varying quantities out of the same data by different methods of computation, the absolute correctness of any of which he does not pretend to guarantee, though he can say a great deal for them all, in the present advanced state of the science.

Latest Determination of the Earth's Polar Axis.

A good example of this condition of our best knowledge of the earth's size was given by a volume published by the Ordnance Survey in 1866. It con-

tained some splendid computations by Colonel Clarke, R.E., the chief mathematician of the establishment, and gave perhaps the most highly advanced results of all earth surveys then made by any and every nation. Yet he presents his final results in two different shapes, and by one of them makes the polar axis of the earth (reduced here from British into pyramid inches) to measure by one mode of computation 499,982,000, and by another 500,022,000 ; leaving the reader to choose which he likes, or any mean between the two.

This was, in its day, a great advance upon everything before it ; but now, in place of being contented with either one or other or both those results, all European countries are engaged on further measurements of the earth ; which measurements, after the consumption of more millions of money, may enable the parties concerned, in the course of the next century or two, to amend the above numbers by some very small proportional part ; but which way, there is no saying.

In a work entitled "The Metric System," by President Barnard, of Columbia College, New York, 1872, that able analytical mathematician and forcible writer, at pages 94 to 105, sets forth admirably, and in plain words, the inconceivable practical difficulties which small irregularities in the earth's figure throw in the way of modern science determining the size and shape of the whole earth. And, wonderfully extensive, as well as dreadfully expensive, as have been the geodesic operations of all nations, taken together, during the last hundred years, he considers that all their resulting data, expressed by him shortly as "40 Latitudes," must eventually be increased to not less than 4,000, before the materials for computing the earth's size will be worthily ready for the mathematicians to begin their unwieldy, unenviable, and humanly almost impossible, discussions upon.

Equatorial and other Diameters of the Earth.

Meanwhile we have already assumed as the polar-axis length for computation in the pyramid comparisons, 500,000,000 pyramid inches; and that being a quantity which this recent Ordnance publication may, and to a certain extent does, largely confirm, but cannot overthrow, let us hasten on to an equally close knowledge of what the other diameters of the earth may measure.

These parts depend partly on what amount of elliptical compression the computers assume, as either $\frac{1}{290}$, $\frac{1}{300}$, $\frac{1}{310}$, or anything else; and partly what shape they assign to the section of the earth at the equator where a species of transverse elliptical compression is assigned (not absolutely, but only with a certain slightly different degree of probability that it is so, rather than not) by the Ordnance book; to an extent that makes one of the equatorial diameters 150,000 pyramid inches longer than another.

Without then attempting to decide any one's correctness, I have represented these extremes in the accompanying table, and placed between them the very set of earth measures which I had computed as *probably* nearest the truth in the first edition of "Our Inheritance in the Great Pyramid."

TABLE OF EARTH'S SIZE IN PYRAMID INCHES.

Parts of the Earth referred to.	Result with Clarke's smallest equatorial diam. 1866.	Result adopted in "Our Inheritance." First edition, 1864.	Result with Clarke's largest equatorial diam. 1866.
Polar Diameter .	500,000,000	500,000,000	500,000,000
Diameter in Lat. 60.	500,396,000	500,420,000	500,435,000
" " 45.	500,792,000	500,840,000	500,869,000
" " 30.	501,186,000	501,257,000	501,301,000
" Equator	501,577,000	501,672,000	501,730,000

John Taylor's First Analogy.

With these data at our command let us return to the Taylor-Herschel Pyramid analogy, which asserts that "a band of the width of the Great Pyramid's base-breadth encircling the earth, contains 100,000,000,000 square feet."

An equatorial band is the only one which could encircle the earth in a great circle, and at the same time in one and the same parallel of latitude; we proceed therefore thus: from the equatorial *diameters* given above, we compute the equatorial *circumferences* by multiplying them by that almost magic number to work calculations with, the π of the Great Pyramid, or 3·14159, &c. Reduce them to pyramid feet by dividing by 12, and next multiply by the already determined pyramid base-breadth in Pyramid feet, viz., 760·922; the following results then come out, viz. :—

They all give smaller figures than the required 100,000,000,000; for the smaller equatorial diameter gives 99,919,000,000, and the largest equatorial diameter gives 99,949,000,000.

Not absolutely true, therefore, with any allowable equatorial diameter, to the first three places. An interesting approximation therefore, but, as Sir John Herschel truly remarked, *only* an approximation. Let us pass on, therefore, to the next analogy.

John Taylor's Second Analogy.

The height of the Great Pyramid, says Mr. Taylor, is the $\frac{1}{270,000}$th part of the circumference of the earth.

But why $\frac{1}{270,000}$th? That is not any known pyramid number, like the 5·s, and 10·s, and 4·s of its practical construction, or the tendency to the marked π numbers 3 and 7 of its shape; and the only approach to a

reason which I have been able to discover is the following :—The squaring of the "circle" in every way is a continual problem throughout the Great Pyramid ; and if the area of its base be computed in hundredths of feet, the length of the circumference of a circle containing an equal area will be 269,740', not 270,000', of the same terms.

Hence the number 270,000 is not quite accurate to begin with ; and if we multiply that by the Pyramid's height in inches, and divide by π, we have what *should* be a mean diameter of the whole earth in some great circle ; but the result comes out only 499,590,000 ; which number a glance at the previous table will show is too small for all its data ; *i.e.* not fully true when the third place of numbers is reached.

Hence both of these analogies may have been useful in approximately leading an inquirer to a first cosmical foundation, or reason, for the Great Pyramid's size ; but they cannot take the place of that other relation established on pages 31 and 34, between the length of the Great Pyramid's base side in 25-inch cubits, or its whole perimeter in standards of 100 Pyramid inches each, *and* the number of days in a year.

For that relation is apparently true to the fifth place of numbers at least ; and, besides that, is backed by a cosmical relation with good reason of the utmost importance to men ; and to the Pyramid too as an anthropological monument, and in so far as its design *may* contain a message from Heaven to man, touching closely on his personal welfare and future social and governmental condition upon this earth.*

* Even one simple arithmetical coincidence is not so frequently met with as some persons imagine. For whereas in 1869 one of the Ordnance officers attempted to turn the pyramid cubit into ridicule as an earth measure,—"Because," said he, "the British foot is as closely commensurable a measure of an equatorial degree of longitude, in terms of the year and its days too, as the pyramid cubit of the earth's polar semi-axis ; and we *know* that that relation of the modern British foot must be

Grander Pyramid and Solar Analogy.

Yet however valuable these last two basal *cum* annual analogies may be, they only hold their position at all by means of the base-breadth being measured on each occasion in one particular linear standard, and no other. They are neither of them, therefore, that grander relation between the Pyramid as a whole, and something either in the heavens above or the earth beneath, quite independent of the terms of measure, which mankind had been long hungering and thirsting for; but which was only at last obtained by my friend William Petrie, C.E., when studying the mensurations in "Life and Work," in October, 1867.

He then remarked, and naturally enough, that the circle typified by the base of the Great Pyramid has already been proved to symbolise a year, or the earth's annual revolution around the sun; and the radius of that typical circle had also been shown to be the ancient vertical height of the Great Pyramid, the most important and unique line which can be drawn within the whole edifice.

Then that line, said he further, must represent also the radius of the earth's mean orbit round the sun; and in the proportion of 10^9, or 1 to 1,000,000,000; because, amongst other reasons, 10 : 9 is practically the shape of the Great Pyramid. For this building notwithstanding, or rather by virtue of, its π angle at the *sides*, has practically and necessarily such another angle at the *corners*,—see Figs. 1 and 2, in Plate III.,—that for

purely accidental"—yet when I came to test the assertion by calculating the matter out, I found that the officer had taken Colonel Clarke's maximum equatorial radius on the ellipsoidal theory, had used it as though it had been the *mean radius*, and did not get the full number he required for his assertions even then. So that his number, instead of coming out to 365,242·, only reached 365,234·, but had no right to be quoted higher than 365,183·; and there all the scoffer's reasoning and analogy ended, while the Pyramid's continued to go forward to greater things.

every *ten* units its structure advances inward on the diagonal of the base, it practically rises upwards, or points to sunshine, by *nine*. Nine too, out of the ten characteristic parts (viz., five angles and five sides), being the number of those parts which the sun shines on in such a shaped pyramid, in such a latitude near the equator, out of a high sky; or, as the Peruvians say, when the sun sets on the Pyramid with all his rays.*

W. Petrie's Pyramid Sun-distance.

To computation Mr. Petrie instantly proceeded, reducing the 5,813 pyramid inches of the Pyramid's height to British inches, multiplying them by 10^9, and reducing those inches to miles,—when he worked out the quantity 91,840,000. Alas! sighed he, the analogy does not hold even in the second place of figures, for the real sun-distance by modern astronomy has been held during the last half century to be 95,233,055 miles.†

So he threw his papers on one side and attended to other matters; until one fine morning he (a man then almost wholly occupied with chemical engineering) chanced to hear, that although the above number, ninety-five millions odd, had been held to for so long by all the modern world, mainly because it had been produced by

* This 10 : 9 shape of the Great Pyramid was independently discovered soon afterward by Sir Henry James and Mr. O'Farrell, of the Ordnance Survey Office; and it is interesting to notice that the side angle computed from it amounts to 51° 50′ 39″·1; the π angle being 51° 51′ 14″·3; and the angle from Mr. Taylor's interpretation of Herodotus, or to the effect of the Great Pyramid having been built to represent an area on the side, equal to the height squared, 51° 49′ 25″. The vertical heights in Pyramid inches, are at the same time, using the same base-side length for them all—by the 10 : 9 hypothesis, 5,811; by the π hypothesis, 5,813; and by the Herodotus-Taylor hypothesis = 5,807.

† Mr. Petrie may have used a rather greater height, viz., 5,826 inches for the Pyramid, in which case his sun-distance would have been rather greater than 91,840,000; but the general nature of his result, on the quantity approved by all European astronomy fifteen years ago, would have been sensibly just the same.

the calculations of a late first-rate German astronomer (calculations so vast, so difficult, and with such a prestige of accuracy and power about them, that no living man cared to dispute their results), yet the astronomical world had been forced to awaken during the last twelve years to a new responsibility, and not only admit that the number might possibly be erroneous, but to institute some observations for endeavouring to determine what it should be.

Such observations, too, actually had just then been made, and the daily press was full of their new results. And what were they?

Why one group of astronomers of several nations declared the true mean sun distance to be about ninety-one to ninety-one and a half millions of miles; and another group of the same and other nations declared it to be from ninety-two to ninety-two and a half millions of miles. And while they were fighting together as to whose results were the better (an actual duel with swords was expected at one time between M. Le Verrier and the late lamented M. De Launay), Mr. Petrie steps in and shows that the Great Pyramid result actually is between the two; indeed, it is almost exactly the mean between the contending parties, and forms therefore a single representation of all the sun-distance results of all human kind even in the present age.

Granting then that modern science is now so far advanced that it may talk, at least on a *mean* of *all* its results, with some degree of confidence at last of what may not improbably be the true sun-distance,—the correct figures for it were given, and built up, by the Great Pyramid's design 4,040 years ago; or before any nations of mankind had begun to run their independent, self-willed, theotechnic, and idolatrous courses. And if we desired any additional proof to the records of the history of science in general, and of the sun-distance

problem in particular,* that such knowledge could not have been obtained in that early day, when men were few and weak upon the earth, except it came from Divine inspiration,—the modern astronomers are now splendidly, though involuntarily, affording it: giving indeed, proof heaped on proof, in the enormous preparations which they are making, at the expense of their respective nations, to observe the transit of Venus over the sun's disc, merely as one step towards getting the sun-distance number, perhaps a trifle better than before, in the year 1874.

Modern Astronomers are involuntarily proving that Man, unaided by Supernatural Divine Power, could not possibly have measured the Sun-distance accurately in the Age of the Great Pyramid; and yet it is there!

These preparations for observing the next Venus-Sun transit by modern astronomers have already been going on for several years, and nothing of their kind so costly, so scientific, so extensive, were ever seen on the face of the earth before. From Europe to America, and from the most northern nation's old Hyperborean strongholds to the most distant and newest colonies in the Southern Hemisphere, the busy hum resounds. Steam navigation, iron ships, electric telegraphs, exquisite telescopes, both reflecting and refracting, photographic machines of enormous power, refined "regulator" clocks, and still more refined chronographs, transit instruments, equatorials, spectroscopes,

* In the age of the Greeks, the distance attributed to the sun from the earth began with the infantine quantity of about ten miles; it increased slowly to 10,000; still more slowly to 2,500,000; then, after a long delay, increased to 36,000,000, under German Kepler; to 78,000,000 in the days of Louis XIV., under French La Caille; and only at length reached the full quantity, and then clumsily overpassed it, at the beginning of the present century.

altitude-azimuth circles, all these modern inventions and many others, with all the learning of the universities, are pressed into the cause; preparatory computations too, with much printing, engraving, and publication, have been going on for years; and all will be carried out almost regardless of expense, of time, of danger, of obstacles, to the most distant parts of the earth; and where necessary, to parts, some of them in the tropics, and some in frozen oceans, which neither Greeks nor Romans in all their days, nor even our own fathers only seventy years ago, knew anything of.

But all this accumulation of power, of wealth, of numbers, of risk, co-operated in too by every civilised nation, is stated to be absolutely necessary; nothing of it can be spared, nothing omitted, if we are to enrich ourselves, in the present age, with a better result for the sun-distance than mankind has yet obtained; excepting always that one result of old laid up in the Great Pyramid. So the expeditions will set forth gloriously next year, amid the warmest plaudits of the whole modern world, and especially of its scientific associations. Many of the pilgrims may fall like heroes by the way, and some of them leave their bones to whiten distant lands. Large populations at home may in the meanwhile starve for want of the necessaries of life, and the crimes arising out of ignorance uneducated, crowding in squalid residences, and the innate wickedness of human nature when left to its own devices uncorrected, will go on wholesale, making our morning papers hideous. But for all that, the chosen parties will sail with their treasuries of instrumental detail; and, if the usual consequences of successful scientific researches follow, the science of the modern world will have occasion to boast, after it is all over, of having improved its number for expressing the sun-distance,—a little; and its acquaintance with certain disturbing pheno-

mena increasing the difficulty of the observations, and throwing new doubts upon the final result—a great deal.

The Great Pyramid before Science.

What a solemn witness to all these unequal efforts of mankind, is not the Great Pyramid, which has seen all human actions from the beginning; from the time when men broke away in opposition to both the Divine rule and inspired teachings of patriarchal life, and wilfully went after their own inventions.

Placed in the midst among all men, and especially those of the earliest inhabited regions of the post-diluvial earth, thus has been standing the Great Pyramid from dispersion times; and they, the men so honoured, never knowing anything of its knowledge capacity, or suspecting its profound meaning. Yet these things, or the types and measures of them, so far as we have seen them here, were on its surface all the time. Any one, therefore, through all history, who should have known, if he could have known indeed, the true sun-distance, had only to compare the Great Pyramid's height therewith, reasoning at the same time on its shape, in order to be enabled to perceive that the measure of that all-important physical, astronomical, metrological, and anthropological, quantity was hung up there from ancient days, and in figures more exact than any that modern observations have done more than merely approximate to.

But again we shall have to tell, and from facts ascertained and ascertainable in just as eminently practical a manner, that all that wonderful scientific information (more than wonderful for the age and circumstances under which it was placed there) was not introduced into the Great Pyramid solely, or even at all, for strengthening

men in science; much less was it to promote the worldly fame of the introducer.

Science is there, but mainly to prove to these latter scientific days of the earth that the building so designed has a right, a title, an authority, to speak to men of these times, and even to the most scientific of them, on another and far higher subject; and with proofs of things unseen, quick and powerful, piercing even to the dividing asunder of the soul and spirit, and discerning the thoughts and intents of the heart; as may probably develop itself with unexpected clearness, if the inquiry into what the Great Pyramid does monumentally and mechanically testify to, is allowed to progress to the end.

CHAPTER V.

GEOGRAPHICAL INDICATIONS IN THE GREAT PYRAMID.

IT may, however, after our last chapter, be demanded by very earnest inquirers, to be shown some easy and material proofs of astronomy of more ordinary kind, let alone the possibilities of so transcendental a kind, having been *intended* by the primeval designer of the Great Pyramid,—before they can fully admit the entirely non-accidental character of the remarkable numerical coincidences which have just been given.

The request is most reasonable, and I address myself to the answer immediately.

Orientation of the Sides of the Great Pyramid.

To begin, the reader may be reminded, that the square base of the Great Pyramid is very truly oriented, or placed with its sides facing astronomically due north, south, east, and west; and this fact at once abolishes certain theories to the effect that all the phenomena of component parts of that Pyramid depend on pure geometry alone; for to pure geometry all azimuths are alike, and one most particular astronomical azimuth or direction has been picked out there.

In the early ages of the world the very correct orientation of a large pile must have been not a little difficult to the rude astronomy of the period. Yet with

such precision had the operations been primevally performed on the Great Pyramid, that the French Academicians in A.D. 1799 were not a little astonished at the closeness. Their citizen Nouet, "in the month Nivose of their year 7," made refined observations to test the error, and found it to be only 19′ 58″; but with the qualification added by M. Jomard, that as M. Nouet only had the ruined exterior of the Pyramid before him to test, the real error of the original surface might have been less. In this conclusion M. Jomard was doubtless right; for in the similar sort of measure of the angle of slope of the side with the base of the Pyramid, it was proved afterwards, on the discovery of the casing-stones, that his compatriot had erred to a very much larger extent than the original builders.

As it was, however, all the Academician authors of the great Napoleonic compilation were delighted with the physical and historical proof which the Pyramid seemed to give them, when compared with their own modern French observations of stars, "That the azimuthal direction of the earth's axis had not sensibly altered, relatively to the sides of the Great Pyramid's base, during probably 4,000 years."

Possibility of Azimuthal Change in the Crust of the Earth.

Now some action of this kind, one way or the other, has long been a mooted question among astronomers, though chiefly for its bearing on geography, general physics, and geology. In its nature, therefore, it must be kept entirely distinct from the more perfectly astronomical phenomenon, and which few but astronomers care at all about—viz., the direction of the earth's axis *in space*, moving with it the whole substance of the earth at the same time; and wherein the precession of

the equinoxes comes to the surface, with its slow but ceaseless chronological changes from age to age in the apparent places of the stars usually supposed most fixed. But in the rather geographical, and more especially surface-differential, light in which the problem was discussed by the French *savants* of the Revolution, it had also been clearly seen long before, as a cynosure of study, by the penetrating genius of the English Dr. Hooke.

For it was this early, and ill-paid, but invaluable Secretary of the Royal Society of London, who, in his discourse on earthquakes, about the year 1677 A.D., remarks, "Whether the axis of the earth's rotation hath and doth continually, by a slow progression, vary its position with respect to the parts of the earth ; and if so, how much and which way, which must vary both the meridian lines of places and also their particular latitudes? that it had been very desirable, if from some monuments or records in antiquity, somewhat could have been discovered of certainty and exactness ; that by comparing that or them with accurate observations now made, or to be made, somewhat of certainty of information could have been procured." And he proceeds thus : "But I fear we shall find them all insufficient in accurateness to be any ways relied upon. However, if there can be found anything certain and accurately done, either as to the fixing of a meridian line on some stone building or structure now in being, or to the positive or certain latitude of any known place, though possibly these observations or constructions were made without any regard or notion of such an hypothesis ; yet some of them, compared with the present state of things, might give much light to this inquiry. Upon this account I perused Mr. Greaves' description of the Great Pyramid in Egypt, that being fabled to have been built for an astronomical observatory, as Mr. Greaves also takes notice. I perused his

book, I say, hoping I should have found, among many other curious observations he there gives us concerning them, some observations perfectly made, to find whether it stands east, west, north, and south, or whether it varies from that respect of its sides to any other part or quarter of the world; as likewise how much, and which way they now stand. But to my wonder, he being an astronomical professor, I do not find that he had any regard at all to the same, but seems to be wholly taken up with one inquiry, which was about the measure or bigness of the whole and its parts; and the other matters mentioned are only by-the-bye and accidental, which shows how useful theories may be for the future to such as shall make observations."

Dr. Hooke, however—in mitigation of whose acerbity there is much to be said in excuse, for nature made him, so his biographer asserts, "short of stature, thin, and crooked"—this real phenomenon, Dr. Hooke, "who seldom retired to bed till two or three o'clock in the morning, and frequently pursued his studies during the whole night," would not have been so hard upon his predecessor in difficult times if he had known, and as we may be able by-and-by to set forth, what extraordinarily useful work it was that Professor Greaves zealously engaged in when at the Great Pyramid. The Doctor's diatribes should rather have been at Greaves' successors to-be, those who were to visit the Great Pyramid in easy times, and then and there do nothing, or mere mischief worse than nothing. Whence it remains still, to any good and enterprising traveller, to determine with full modern accuracy the astronomical azimuth of the Great Pyramid, both upon its fiducial socket marks, as defining the ends and directions of the sides of the base; and, still more importantly, on its internal passages.

These passages are worthy of all attention; and a

further proof of the importance attached by the primeval builders to the strict "orientation" of the whole building, in each of its parts as well as its mass, is eminently shown by the apparently perfectly parallel position which they preserved for the azimuth of the first, or entering passage, with the base sides on either hand; and this, too, notwithstanding that (as Sir Gardner Wilkinson explains) there were structural or rather deeply politic reasons for their not placing that said entering aperture exactly in the middle of the northern side in which it is found, but a considerable number of feet nearer towards the east than the west end thereof.

Popular Ideas of Astronomical Orientation.

In page 26 of George R. Gliddon's "Otia Œgyptiaca," its acute author does indeed oppose any reference to astronomical skill, by suggesting that all this exactness of orientation indicates, amongst the builders of the "pre-antiquity" day of the Great Pyramid, "an acquaintance with the laws of the magnet." Yet had that been all the founders were possessed of to guide them, their great and lasting work might have been in error by as much as twenty degrees, in place of only twenty minutes, or, perhaps, far less.

George R. Gliddon is truly, on most Egyptological topics, a well-read man, and had nearly a lifetime of Egyptian experience to dilate on, as he does, too, with eloquence; but, unfortunately, he shares the pseudo-scientific belief of a large part of the world in general—to wit, that more wisdom and science are manifested if you do a thing badly and imperfectly by the indications of electricity or magnetism, than well and accurately by plainly visible phenomena of mechanics and astronomy. Had he been able in this

case to show that Egypt was perpetually and for ever in a plague of darkness and enclosure of mist, men would have been thankful for a magnetic needle, maugre all its excessive variations and trembling uncertainties. But when they had in that magnificent climate and almost tropical position, the high climbing sun by day and the exact stars by night, what else did they want to get their astronomical alignment, and the direction of the north, by means of?

At all events, in my own observations there in 1865, I was happy to throw magnetism and its rude pointings overboard, and employ exclusively an astronomical alt-azimuth instrument of very solid construction, and reading to seconds: in that way comparing the socket-defined sides of the base, and also the signal-defined axis of the entrance passage, with the azimuth of the pole-star at the time of its greatest elongation west; and afterwards reducing that by the proper methods of calculation to the vertical of the pole itself.

And with what result? Though a tender-hearted antiquary has asked, "Was it not cruel to test any primeval work of 4,000 years ago by such exalted instruments of precision as those of the Victorian age in which we live?"

Well, it might be attended with undesired results, if some of the most praised up works of the present day should ever come to be tested by the improved instruments of precision of 4,000 years *hence;* but the only effect which the trial of my Playfair astronomical instrument from the Royal Observatory, Edinburgh, had at the Great Pyramid, was, to reduce the alleged error of its orientation from 19′ 58″ to 4′ 30″.*

* The particulars of both observations and computations may be seen in vol. ii. of my "Life and Work at the Great Pyramid, 1867."

Further Test by Latitude.

In so far, then, this last and latest result of direct observation declares with high probability that any large relative change between the earth's axis and a line on its crust, such as Dr. Hooke and the French Academicians speculated on, must, if anything of it exist at all, be confined within very narrow limits indeed.

This conclusion has its assigned reason here and thus far, solely from observations of angular *direction* on the surface of the earth; and without any very distinct proof being touched on yet, that though we find the Pyramid's sides at present nearly accordant in angle with the cardinal points, they were *intended* to be so placed by the primeval builder *for his own day.*

But indication will be afforded presently respecting another test of nearly the same thing, by distance on the surface; or that the architect did propose to place the Great Pyramid in the astronomical latitude of 30° north, whether practical or theoretical; while my own observations in 1865 have proved that it stands in the parallel of 29° 58′ 51″.

A sensible defalcation from 30°, it is true, but not all of it necessarily error; for if the original designer had wished that men should see with their bodily, rather than their mental, eyes, the pole of the sky, from the foot of the Great Pyramid, at an altitude before them of 30°, he would have had to take account of the refraction of the atmosphere; and that would have necessitated the building standing not in 30°, but in 29°58′22″. Whence we are entitled to say, that the latitude of the Great Pyramid is actually by observation between the two very near limits assignable, but not to be discriminated between, by theory as it is at present.

Testimony, from the Great Pyramid's Geographical Position, against some recent Earth Theorisers.

In angular distance, then, from the equator, as well as in orientation of aspect, the land of Egypt, by the witness of the Great Pyramid, has not changed sensibly for all ordinary, practical men, in respect to the axis of the earth, for 4,000 years.

What therefore can mean some of our observers at home, observers too of the present day, who stand up for having themselves, during their own lifetimes, witnessed the sun once rise and set in an exceedingly different direction by the naked eye from what it does now? I have looked over the papers of two such enthusiasts recently (one in England and the other in Scotland), but without being able to convince them of their self-deception.

Again, in the Rev. Bourchier Wrey Savile's work, "The Truth of the Bible," published in 1871, that usually very learned and painstaking author (and much to be commended in some subjects) implies, on page 76, that the direction of the sun at the summer solstice is now, at Stonehenge, no less than twelve degrees different from what it was at the time of the erection of that monument, which is probably not more than half as old as the Great Pyramid. And he quotes freely from, as well as on his own part confirms, a mad-like man now dead, one Mr. Evan Hopkins, in asserting "that the superficial film of our globe is moving from south to north in a spiral path, at the rate of seven furlongs in longitude west, and three furlongs in latitude north, every year; whence the presently southern part of England must have been under a tropical climate only 5,500 years ago."

This astounding assertion is supposed to be supported

by a quotation from one of the Greenwich Observatory Reports in 1861, wherein Sir George B. Airy remarks that "the transit circle and collimators still present those appearances of agreement between themselves, and of change with respect to the stars, which seem explicable only on one of two suppositions—that the ground itself shifts with respect to the general earth, or that the axis of rotation changes its position." But I can venture to be professionally confident that Sir G. B. Airy did not mean to support any such assertion as Mr. Evan Hopkins' and Mr. B. W. Savile's, by that mere curiosity of transcendental refinement in one year's instrumental observation, which he was alluding to in one number of a serial document; a something of possible change, too, which is so excessively small (an angle subtending perhaps the apparent thickness of a spider's line at the distance of fifty feet), that no one can be perfectly certain that it ever exists; and which, if found at any given epoch, does not go on accumulating continually with the progress of time, so as at last to become patent to the common senses of all men.

To confirm, too, this much more sober view of the nearly solid earth we live upon, the Great Pyramid adds all its own most weighty testimony to that both of Greenwich and every public observatory with good astronomical instruments throughout Europe, by declaring the world's surface to be remarkably constant to the cardinal directions; if not indeed for ever, yet at least for a far longer time than they, the modern observatories, can directly speak to. And thus it may come to pass at last, that there will yet be proved to be more of "the truth of the Bible" bound up with both the scientific mechanical definition, and the exactly observed constancy through long ages when so defined, of astronomical directions and geographical positions, than has yet entered into most persons' modern philosophy.

True Primeval Astronomical Orientation, as in the Great Pyramid, opposed by all early idolatrous structures elsewhere.

And thus, in fact, the Great Pyramid, otherwise proved a non-idolatrous, as well as primeval, monument, set the true scientific rule in building, of *orienting* its sides to the cardinal directions. This plan was followed also wherever that Pyramid's example, by overshadowing grandeur, was felt to be compulsory, as it evidently was in the adjacent parts of Lower Egypt,—but nowhere else.

At Thebes, for instance, far away in Upper Egypt, and in Nubia further still, the temples and tombs are put down or founded at every possible azimuth, in almost every quarter of the compass; and those temples and tombs are all of them undoubtedly idolatrous, and speak lamentably to human theotechnic inventions.

In Mesopotamia, again, the Chaldean temples, dedicated glaringly both to false gods, and all the Sabæan hosts of heaven, are not laid out at random like the Theban temples, but in another sort of opposition to the Great Pyramid example; for while their bases, though rectangular are not square, they are set forth with their sides as far as possible from any cardinal point, or at an angle of 45° therefrom; and steadily and persistently thereat from one end of the Interammian country to the other.

The Rev. Canon Rawlinson of Oxford has, indeed, endeavoured to maintain that it was a matter of indifference for the astronomical observations of those Chaldean buildings, whether they were oriented upon, or at 45° away from, the cardinal points—but he can be no astronomer, even as Mr. Fergusson has proved him to have no sound practical views of architecture, though he may be the most profound of all academical

scholars. And when we study the Great Pyramid itself still further, important results follow to its prestige and geographical power upon earth from new developments arising out of its north and south, with east and west, bearings, as well as from its regular figure.

Geographical Aptitudes of the Great Pyramid.

With the general's glance of a Napoleon Bonaparte himself, his Academician *savants* in Egypt, in 1799, perceived how grand, truthful, and effective a trigonometrical surveying signal the pointed shape of the Great Pyramid gratuitously presented them with; and they not only used it for that purpose, as it loomed far and wide over the country, but as a grander order of signal also, to mark the *zero meridian* of *longitude* for all Egypt.

In coming to this conclusion, they could hardly but have perceived something of the peculiar position of the Great Pyramid at the southern apex of the Delta-land of Egypt; and recognised that the vertical plane of the Pyramid's passages produced northward, passed through the northernmost point of Egypt's Mediterranean coast, besides forming the country's central and most commanding meridian line; while the N.E. and N.W. diagonals of the building similarly produced, enclosed the Delta's either side in a symmetrical and well-balanced manner. But the first very particular publication on this branch of the subject was by Mr. Henry Mitchell, Chief Hydrographer to the United States Coast Survey.

That gentleman, having been sent in 1868 to report on the progress of the Suez Canal, was much struck with the regularity of curvature along the whole of Egypt's northern coast. To his mind, and by the light of his science, it was a splendid example on that very account, of a growing and advancing coast-line, deve-

loping in successive curves all struck one after the other from a certain central point of physical origination.

And where was that physical centre of origin and formation?

With the curvature of the northern coast on a good map before him (see Fig. 1, Plate V.), Mr. Mitchell sought, with variations of direction and radius, until he had got all the prominent coast points to be evenly swept by his arc; and then, looking to see where his centre was, found it upon the Great Pyramid: immediately deciding in his mind, "that that monument stands in a more important physical situation than any other building yet erected by man."

On coming to refinements, Mr. Mitchell did indeed allow that his radii were not able to distinguish between the Great Pyramid and any of its near companions on the same hill-top. But the Great Pyramid had already settled that differential matter for itself; for while it is absolutely the northernmost of all the pyramids (in spite of one apparent exception to be explained further on), it is the only one which comes at all close—and it comes very close—to the northern cliff of the Jeezeh hill, and thence looks out with commanding gaze over the sector, or open-fan, shaped land of Lower Egypt; looking over it, too, from the land's very "centre of physical origin;" or as from over the handle of the fan, outward to the far off sea-coast. All the other pyramids are away on the table-land to the south of the Great one, so that they lose that grand view from the front or northern edge; and they appear there, behind, as in a manner the suite and following train only of the Great building; that mysterious Great one who is the unquestioned owner there, and will not allow his servants to dispute his possession with him.

So very close was the Great Pyramid placed to the northern brink of its hill, that the edges of the cliff

might have broken off, under the terrible pressure, had not the builders banked up there most firmly the immense mounds of rubbish which came from their work; and which Strabo looked so particularly for 1800 years ago, but could not find. Here they were, however, and still are, utilised in enabling the Great Pyramid to stand on the very utmost verge of its commanding hill, within the limits of the *two* required latitudes, 30° and 29° 58′ 23″, as well as over the centre of the land's physical and radial formation; and at the same time on the sure and proverbially wise foundation of rock.

Now Lower Egypt being, as already described, of a sector shape, the building which stands at its centre must be, as Mr. Henry Mitchell has acutely remarked, at one and the same time both at the border thereof, and in its nominal middle; or, just as was that monument, pure and undefiled in its religion though in an idolatrous land, alluded to by Isaiah; the monument which was both "an altar to the Lord in the midst of the land of Egypt, and a pillar at the border thereof;" but destined withal to become a witness in the latter days and before the consummation of all things, to the same Lord and to what He hath purposed upon mankind.

Whether the Great Pyramid will eventually succeed in proving itself to be really the one and only monument alluded to under those glorious terms or not, it has undoubtedly most unique claims for representing much that is in them, both in plain mechanical fact and broad chorography; while its excelling characteristics of situation by no means end there. For, proceeding along the globe due north and due south of the Great Pyramid, it has been found by a good physical geographer as well as engineer, William Petrie, that there is more earth and less sea in that meridian than in any other meridian all the world round; causing, therefore, the Great Pyramid's meridian

to be just as essentially marked by nature across the world, as a prime meridian for all nations measuring their longitude from, as it is more minutely marked by art and man's work for, the land of Egypt alone.

Again, taking the distribution of land and sea in parallels of latitude, there is more land surface in the Great Pyramid's parallel of 30°, than in any other. And finally, on carefully summing up all the dry land habitable by man all the wide world over, the centre of the whole falls within the Great Pyramid's territory of Lower Egypt.*

Of the Mental Accompaniments of these Several Facts.

It is useless for objectors to go on complaining that the profane Egyptians, the mere slaves of Pharaoh, did not know anything about the existence of America, Australia, New Zealand, or Japan, and therefore could not have made the above calculation rightly, for I have never accused those profane Egyptians of having had anything to do with the design of the Great Pyramid; and have no intention of limiting my statements of what science may find in the measured facts of the building, merely to what Egyptological scholars tell us, from their questionable studies, that the vile animal-worshippers of old Egypt either did, or did not, know.

The fact is there in the Great Pyramid, and in the world, for every one who likes to test on absolute grounds; to try it for our own times first, and then to reduce it to the days of the Pyramid, if there are or were sensible changes in the distribution of sea and land on the whole, going on.

But that would seem not to have been the case: and, indeed, for the special period of the truly human,

* See my "Equal Surface Projection," published in 1870 by Edmonston and Douglas, Edinburgh. See also Fig. 2 of Plate V., in this book.

or division into nation, time of the world (or since both the Deluge and the Dispersion), there is every reason to believe that the dry land surface spot which was central 4,000 years ago is central still, and will continue to be so until the end of man's trial on earth. And if we be further enabled before long to illustrate that the directors of the building of the Great Pyramid were not natives of Egypt, but came into Egypt out of a country having a different latitude and longitude, and went back again to that country of theirs immediately after they had built the Great Pyramid; and that there, in their own country, though no mean architects, yet they built no second pyramid,—will not that go far to indicate that, assisted by a higher power, they had been taught and had confessed of early time, that there was only one proper and fully appropriate spot all the wide world over whereon to found that most deeply significant structure they had received orders to erect on a certain plan, viz., the Great Pyramid?

But if the *exterior* of that unique building, in these days almost ruinous under the successive attacks of twenty nations, leads so abundantly, when carefully studied and scientifically measured, in spite of all those dilapidations, to ennobling views (the like of which too were never made out in all past time for any other building of the earth, not even for a single one of the other Pyramids of Egypt, which, all of them, err utterly in angle, size, and position), what may we not expect from the Great Pyramid's better-preserved *interior*?

PART II.

HISTORY AND THE INTERIOR.

"WHO HATH LAID THE MEASURES THEREOF, IF THOU KNOWEST? OR WHO HATH STRETCHED THE LINE UPON IT?

"WHEREUPON ARE THE FOUNDATIONS THEREOF FASTENED? OR WHO LAID THE CORNER STONE THEREOF;

"WHEN THE MORNING STARS SANG TOGETHER, AND ALL THE SONS OF GOD SHOUTED FOR JOY?"—JOB XXXVIII. 5, 6, 7.

CHAPTER VI.

STRUCTURAL ISOLATION OF THE GREAT PYRAMID AMONGST ALL PYRAMIDS.

THERE is little enough of hollow interior to any of the Pyramids, as they are generally all but solid masses of masonry; and yet what little there is, has shown itself quite enough to raise up a radical distinction of kind, as well as degree, between the Great Pyramid and every other.

What the Ancients knew of the Interior of the Great Pyramid.

The progress of human historical knowledge with regard to what constituted the hollow interior of the Great Pyramid, was both slow and peculiar. Had we now before us in one meridional section of the building all the ancient knowledge with regard to what it contained, it would amount to little more than this—that when the Great Pyramid stood on that hill-top in the primeval age of the world in solid masonry, with the secret of its nature upon it, clothed, too, complete on every side with its polished bevelled sheet of casing-stones, rising from a duly levelled area of rock-surface in four grand triangular flanks up to a single pointed summit,—that then it also contained (trending down

from the north and entering at a point about 49 feet above the ground on that side) an inclined descending passage of very small bore, leading to a subterranean, excavated, rock chamber 100 feet vertically under the centre of the base of the whole built monument.

This subterranean chamber had been *begun* to be carved out in the heart of the rock with admirable skill. For the workmen, having cut their way down to the necessary depth by the passage, commenced with the ceiling, which they made exquisitely flat and smooth, though 46 feet long by 28 broad; then sinking down the walls therefrom in vertical planes, there was every promise of their having presently, at that notable depth inside the limestone mountain, a complete rectangular chamber, whose walls, ceiling, and floor should all be perfect, pattern planes. But when they had cut downwards from the ceiling to a depth of about 4 feet at the west end, and 13 feet at the east end, they stopped in the very midst of their work. A small bored passage was pushed on into the rock a few feet further towards the south, and then that was also left unfinished; and a similar abortive attempt, though downwards, was begun, but probably in modern times, in the broken rock of the uneven floor itself; the whole floor from one end of the chamber to the other being left thus a lamentable scene of confusion, verily (seeing that the whole light of day was reduced down there to a mere star-like point at the end of the long entrance passage), verily, "the stones of darkness and the shadow of death." (See Plate I. and Plate VIII.).

This one item of its internal construction, moreover, there is good reason for believing, was *all* that the Egyptians themselves knew of, from within a generation after the Great Pyramid had been built, to the latest times of their nation; excepting only certain men who

broke into the building at the epoch of, or near to, the Persian invasion; and for them see Part IV.

That the Egyptians themselves as a people knew thus much, we may readily allow; because they could hardly have known less of the interior than the Romans; and there is proof, in the shape of good uncial letters marked in carbon, and recorded to have been seen by Signor Caviglia when he first recovered in modern times the re-entry to that part of the Pyramid, that *they*, the old Romans, were once inside the subterranean chamber.

There appears also, it is asserted by some Egyptologists of rather a sanguine turn of mind, some small probability that pyramids with this single characteristic—viz., a descending entrance passage and subterranean, or call it positively, a sepulchral, chamber, but of poor workmanship, were indigenous in Egypt before the erection of the Great Pyramid; which in that case, therefore, began so far in deference to some native ideas; though, as will be seen presently, the Great Monument did not care to complete *them*, nor carry out the either intended or pretended sepulchral chamber to such a condition of floor state, that any stone sarcophagus could have been decently, and in order, established there.

In the undoubtedly subsequent second and third Jeezeh pyramids, on the contrary, the subterranean rooms *were* finished, floors and all, and sarcophagi introduced. *Their* architects, moreover, attempted to adorn those chambers with a large amount of complication; but it was only useless and confusing complication, without any very sensible object; unless when it was to allow a second king to make himself a burial-chamber in the pyramid-cellar already occupied by a predecessor; and then it was bad. Gradually, therefore, as the researches of Colonel Howard-Vyse have shown, on the fourth, fifth, sixth, seventh,

eighth, and ninth Jeezeh pyramids (all these being very small ones, let it be remembered) the native Egyptians dropped nearly everything else that they had tried, except the one single, partly descending and partly horizontal, passage, with a subterranean chamber for burial purposes ; and that they kept to, so long as they practised their petty pyramid building at all, most religiously. (See Plate VI.)

Lepsius' Law of Egyptian Pyramid Building.

Still further, that the making of such descending passages with subterranean chambers, and using them for sepulture, is precisely what the Egyptians usually did when they were their own masters and the directors of their own works ; and that they did little more, except it was to decorate them with images of false gods, boasting inscriptions in hieroglyphic writing, and portraits of themselves, is also testified to from quite another quarter. For all the Egyptologists of our age, French, English, German, and American, have hailed the advent, on their stage of time, of the so-called "Lepsius' Law of Egyptian Pyramid Building;" they universally declaring that it satisfies absolutely all the observed or known phenomena. And it may do so for every known case of any Egyptian pyramid, *except* the Great Pyramid ; and there it explains nothing of what *it* chiefly consists in.

Taking, however, the cases which it does apply to, viz., the profane Egyptian examples, this alleged "law" pronounces, that the sole object of any Pyramid was to form a royal tomb—subterranean as a matter of course—and that operations began by making an inclined descending passage leading down into the rock, and in cutting out an underground chamber at the end of it. The scheme thus begun below, went on also

growing above ground every year of the king's reign, by the placing there of a new heap or additional layer of building stones, and piling them layer above layer over a central, square-based nucleus upon the levelled ground, vertically above the subterranean apartment; and it was finally (*i.e.*, this superincumbent mass of masonry) finished off on that king's death by his successor, who deposited his predecessor's body embalmed and in a grand sarcophagus in the underground chamber, stopped up the passage leading to it, cased in the rude converging sides of the building with bevelled casing-stones so as to give it a smooth pyramidal form, and left it in fact a finished Egyptian, and Pharaonic pyramid to all posterity:* and no mean realisation either of prevailing ideas among some early nations, of

* In Dr. Lepsius' Letter 7, March, 1843, that eminent Egyptologist says distinctly enough with regard to the above theory,—"I discovered the riddle of pyramidal construction, on which I had been long employed;" but in the letterpress attached to Frith's large photographs of Egypt (1860 ?), by Mrs. Poole and R. S. Poole, the discovery is given categorically to another person. As the passage is accompanied with a very clear description of the theory, there may be advantage in giving it entire from this opposite side; as then proving beyond all doubt *how much* of the whole internal arrangement of the Great Pyramid, as *now* known and presently to be described, the approved pyramidal theory of the most learned Egyptologists really accounts for:—

"The principle of their (the ancient Egyptians) pyramid construction was discovered by Mr. James Wild, the architect who accompanied the Prussian expedition. A rocky site was first chosen, and a space made smooth, except a slight eminence in the centre, to form a peg upon which the structure should be fixed. Within the rock, and usually below the level of the future base, a sepulchral chamber was excavated, with a passage, inclining downwards, leading to it from the north. Upon the rock was first raised a moderate mass of masonry, of nearly a cubic form, but having its four sides inclined inwards; upon this a similar mass was placed, and around, other such masses, generally about half as wide. At this stage the edifice could be completed by a small pyramidal structure being raised on the top, and the sides of the steps filled in, the whole being ultimately cased, and the entrance passage, which had of course been continued through the masonry, securely closed; or else the work could be continued on the same principle. In this manner it was possible for the building of a pyramid to occupy the lifetime of its founder without there being any risk of his leaving it incomplete (to any such degree or extent as would afford a valid excuse for his successor neglecting to perform his very moderate part, of merely filling up the angles, and smoothing off generally)."

burying their monarchs *sub montibus altis,* in impressive quiet, immovable calm, and deep in the bosom of mother earth.

Classic Antiquity on the Interior of the Great Pyramid.

There has been some scholastic question of late years, whether Herodotus, Strabo, Pliny, and others of the ancients, or their immediate informants, were ever actually inside the Great Pyramid; for sometimes it has been maintained that the edifice was inviolably sealed, and that what they mentioned was only on the reports of tradition; while at other times it is averred that they must have seen something more accurately than through others' eyes, in order to have described so graphically as they did; describing, however, always a vast deal more about the exterior than the interior. The very utmost, indeed, that they had to say about the latter was touching a certain removable stone, and then a dark groping "*usque ad,*" or right away to, the far subterranean chamber where M. Caviglia in A.D. 1820, as already mentioned, found blackened Roman letters upon its roof;* and half the world has seen, since then, the unfinished, unquarried out floor; or a room with an excellent ceiling and walls too, so far as they go, but no floor, if that be possible.

To that point, then, and through that descending passage also of the Great Pyramid, occasionally (and probably only at very long intervals) various nations did penetrate, aided by the removable block of stone. The machinery of that sliding block and the opportunity of sometimes working it, seemed to act as a safety-valve to the Pyramid-curiosity of early times, which was thus admitted on rare occasions to see the interior of the greatest of all the Pyramids; and then, after frantic

* Howard-Vyse's "Pyramids," vol. ii. p. 290.

exertions, men saw and made acquaintance with—what? Nothing but a descending entrance passage and a subterranean chamber; that chamber which ought to have been a sepulchral one according to both ordinary Egyptian ideas, and the "Lepsius' Law," but was not. Consistently too with the Lepsius theory, it should have been the first thing finished about the whole mighty fabric, but yet it was never even pretended to be finished at all; the very chamber which ought to have contained sarcophagus, mummy, paintings, and inscriptions, but which only really held the rock contents of the lower part of the room, not yet cut out of the bowels of the mountain.

In short, the classic nations knew nothing whatever about the real interior of the Great Pyramid's scientific design.

Medieval Arabian Learning on the Interior of the Great Pyramid.

In the course of the dark ages, even what Greece and Rome once knew, was lost, besides the Pyramid being assailed by driving storms of desert sand. Hence, when the Caliph al Mamoun, a Caliph with an inquiring turn of mind, like his father Haroun al Raschid, of the "Arabian Nights," but attending to higher things—(indeed, he was said by Gibbon to have been a prince of rare learning, "continually exhorting his subjects in *excelsior* vein assiduously to peruse instructive writings, and who not only commanded the volumes of Grecian sages to be translated into Arabic, but could assist with pleasure and modesty at the assemblies and disputations of the learned")—when this British Association genius of his day then, coming down from Bagdad to Cairo, desired to enter the Great Pyramid, A.D. 820, there was only a very indistinct rumour to guide him towards trying the northern, rather than any other, side.

But Al Mamoun, the then Prophet-descended ruler of the Mohammedan world, was likewise flattered almost as a god in the rhapsodies of his court poets. They, inventing some new pleasure for him every day, could only not give him the Great Pyramid itself. Emulating, however, on a basis of Coptic tradition derived from the then innumerable Egyptian monasteries, the enchanted tales of Bagdad, they drew gorgeous pictures of the contents of the Pyramid's interior; as well as of the astounding history of that mighty and mysterious triangular masonic fact, so patent as to its exterior in the eyes of all Cairo, so recluse as to its interior against both the world and time.

In describing these matters, most of the reciters seemed only intent on putting in everything of value they could possibly think of. All the treasures of "Sheddad Ben Ad," the great antediluvian king of the earth, with all his medicines and all his sciences, they declared were there, told over and over again. Others, though, were positive that the founder-king was no other than Saurid Ibn Salhouk, a far greater one than the other; and these last gave many more minute particulars: some of which are at least interesting to us in the present day, as proving that amongst the Egypto-Arabians of more than 1,000 years ago, the Jeezeh Pyramids, headed by the grand one, enjoyed a pre-eminence of fame vastly before all the other Pyramids of Egypt put together; and that if any other is alluded to after the Great Pyramid (which has always been the notable and favourite one, and chiefly was known then as the East Pyramid), it is either the second one at Jeezeh, under the name of the West Pyramid; or the third one, distinguished as the Coloured Pyramid, in allusion to its red granite, compared with the white limestone casings of the other two; which, moreover, from their more near, but by no means exact, equality of size, went fre-

quently under the affectionate designation of "the pair."

But what seemed more to the purpose of Al Mamoun at the time, was the very exact report of Ibn Abd Alkokm, as to what was then still to be found in each of these three Pyramids; for this was what, according to that most detailed author, the primeval King Saurid had put into them and safely locked up; though where in the scanty hollow interior of any, or all, of the Pyramids, he could have found space for so much, is more than any one now knows.

"In the Western Pyramid, thirty treasuries, filled with store of riches and utensils, and with signatures made of precious stones, and with instruments of iron, and vessels of earth, and with arms which rust not, and with glass which might be bended and yet not broken, and with strange spells, and with several kinds of *alakakirs* (magical precious stones), single and double, and with deadly poisons, and with other things besides.

"He made also in the East Pyramid divers celestial spheres and stars, and what they severally operate in their aspects, and the perfumes which are to be used to them, and the books which treat of these matters.

"He put also into the Coloured Pyramid the commentaries of the priests in chests of black marble, and with every priest a book, in which the wonders of his profession, and of his actions, and of his nature were written; and what was done in his time, and what is and what shall be from the beginning of time to the end of it.

"He placed in every Pyramid a treasurer; the treasurer of the Westerly Pyramid was a statue of marble stone, standing upright with a lance, and upon his head a serpent wreathed. He that came near it, and stood still, the serpent bit him of one side, and wreathing round about his throat, and killing him, returned to his place. He made the treasurer of the East Pyramid

an idol of black agate, his eyes open and shining, sitting on a throne with a lance; when any looked upon him, he heard on one side of him a voice which took away his sense, so that he fell prostrate upon his face, and ceased not, till he died.

"He made the treasurer of the Coloured Pyramid a statue of stone, called *albut*, sitting; he which looked towards it was drawn by the statue, till he stuck to it, and could not be separated from it till such time as he died."

Some of these features were certainly not encouraging; but then they were qualified by other tale-reciters, who described "three marble columns in the Great Pyramid, supporting the images of three birds in flames of fire of precious stones beyond all value and all number. Upon the first column was the figure of a dove, formed of a beautiful and priceless green stone; upon the second, that of a hawk, of yellow stone; and upon the third, the image of a cock, of red stone, whose eyes enlightened all the place. Upon moving the hawk, a gigantic door which was opposite, composed of great marble slabs, beautifully put together, and inscribed with unknown characters in letters of gold, was raised; and the same surprising connection existed between the other images and their doors."

Exciting wonders, of course, appeared beyond those strange portals; but what need *we* to disentomb these Arabian romances further? In Egypt they believe pretty seriously in enchantments and Jinn or Genii of marvellous proportions still; how much more then in the days of the son of Haroun al Raschid, and when the Great Pyramid was a mystery of old, fast sealed? To ascertain, therefore, what really existed inside it then, was evidently a very definite and promising sort of labour; and why should *not* the young Caliph Al Mamoun undertake it?

Caliph Al Mamoun attacks the Northern Flank of the Great Pyramid.

He did so, and directed his Mohammedan workmen to begin at the middle of the northern side ; precisely, says Sir Gardner Wilkinson, as the founders of the Great Pyramid had foreseen, when they placed the entrance, not in the middle of that side, but twenty-four feet away to the east. Hard work, therefore, was it to these masons, quarrying with the crude instruments of that barbarous time, into stone work as solid almost, at that place, as the side of a hill.

They soon indeed began to cry out, "Open that wonderful Pyramid ! It could not possibly be done !" But the Caliph only replied, "I will have it most certainly done." So his followers perforce had to quarry on unceasingly by night and by day. Weeks after weeks, and months too, were consumed in these toilsome exertions ; the progress, however, though slow, was so persevering that they had penetrated at length to no less than one hundred feet in depth from the entrance. But by that time becoming thoroughly exhausted, and beginning again to despair of the hard and hitherto fruitless labour, some of them ventured to remember certain improving tales of an old king, who had found on a calculation, that all the wealth of Egypt in his time would not enable him to destroy one of the Pyramids. These murmuring disciples of the Arabian prophet were thus almost becoming openly rebellious, when one day, in the midst of their various counsel, they heard a great stone evidently fall in some hollow space, within no more than a few feet from them !

In the fall of that particular stone there almost seems to have been an accident that was more than an accident.

Energetically they instantly pushed on in the direc-

tion of the strange noise; hammers, and fire, and vinegar being employed again and again, until, breaking through a wall surface, they burst into the hollow way, "exceeding dark, dreadful to look at, and difficult to pass," they said at first, where the sound had occurred. It was the same hollow way, or properly the Pyramid's entrance passage, where the Romans of old, and if they, also Greeks, Persians, and Egyptians, must have passed up and down in their visits to the subterranean chamber and its unfinished, unquarried out, floor. Tame and simple used that entrance passage to appear to those ancients, but now it stood before another race, and another religion, with its chief leading secret, for the first time since its foundation, nakedly exposed. A large angular-fitting stone that had made for ages a smooth and polished portion of the ceiling of the inclined and narrow passage, quite undistinguishable from any other part of the whole course, had now dropped on to the floor before their eyes, and revealed that there was, at and in that point of the ceiling, another passage, clearly ascending towards the south, out of this descending one! (See Plate VIII.)

But that ascending passage was closed, for all that, by a granite portcullis, formed by a series of huge granite plugs of square wedge-like shape dropped in, or rather slided down and jammed immovably, from above. To break them in pieces within the confined entrance passage space, and pull out the fragments there, was entirely out of the question; so the grim crew of Saracen Mussulmans broke away sideways or round about to the west through the smaller masonry, and so up again (by a huge chasm still to be seen) to the new ascending passage, at a point past the terrific hardness of its lower granite obstruction. They did up there, or at an elevation above and position beyond the portcullis, find the filling material of the ascending passage only

limestone ; so making themselves a very great hole in the masonry alongside, they there wielded their tools with energy on the long fair blocks which filled that passage-way. But as fast as they broke up and pulled out the pieces of one of the blocks in this strange ascending passage, other blocks above it, also of a bore just to fill its full dimensions, slided down from above, and still what should be the passage for human locomotion was solid stone filling. No help, however, for the workmen. The Commander of the Faithful is present, and insists that, whatever the number of stone plugs still to come down from the mysterious reservoir, his men shall hammer and hammer them, one after the other, and bit by bit to little pieces, until they do at last come to the end of them. So the people tire, but the work goes on ; and at last the ascending passage beginning just above the granite portcullis, is announced to be free from obstruction and ready for essay. Then, by Allah, they shouted, the treasures of the Great Pyramid, sealed up from the fabulous times of the mighty Ibn Salhouk, and undesecrated, as it was long supposed, by mortal eye during three thousand years, lay full in their grasp before them.

On they rushed, that bearded crew, thirsting for the promised wealth. Up no less than 110 feet of the steep incline, crouched hands and knees and chin together, through a passage of royally-polished limestone, but only 47 inches in height and 41 in breadth, they had painfully to crawl, with their torches burning low. Then suddenly they emerge into a long tall gallery, of seven times the passage height, but all black as night ; still ascending though at the strange steep angle, and reaching away farther and still more far into the very inmost heart of darkness of this imprisoning mountain of stone. In front of them, at first entering here, and on the level, see another low passage ; on their right

hand (see Plate XIII.) a black, ominous-looking well's mouth, more than 140 feet deep, and not reaching water but only lower darkness even then; while onwards and above them, a continuation of the glorious gallery or hall of seven times, leading them up to the possession of all the treasures of the great ones of the antediluvian earth. Narrow, certainly, was the way—only 6 feet broad anywhere, and contracted to 3 feet at the floor —but 28 feet high, or almost above the power of their smoky lights to illuminate; and of polished, glistering, marble-like, cyclopean stone throughout. (See Plates VIII., XI., and XII.)

That must surely be the high-road to fortune and wealth. Up and up its long ascending floor-line, ascending at an angle of 26°, these determined marauders, with their lurid fire-lights, had to push their dangerous and slippery way for 150 feet more; then an obstructing three-foot step to climb over; next a low doorway to bow their heads beneath; then a hanging portcullis to pass, almost to creep under, most submissively; then another low doorway in awful blocks of frowning red granite both on either side and above and below; but after that they leapt without further let or hindrance at once into the grand chamber, which was, and is still, the conclusion of everything forming the Great Pyramid's interior; the chamber to which, and for which, and towards which, according to every subsequent writer, in whatever other theoretical point he may differ from his fellows, the whole Great Pyramid was built. (See Plate XI.)

And what find they there, those maddened Muslim in Caliph Al Mamoun's train? A right noble apartment, now called the King's Chamber, 34 feet long, 17 broad, and 19 high, of polished red granite throughout, both walls, floor, and ceiling; in blocks squared and true, and put together with such exquisite skill that the joints are barely discernible to the closest inspection.

Ay, ay, no doubt a well-built room, and a handsome one too ; but what does it contain ? What is the treasure ? The treasure ! yes indeed, where are the silver and the gold, the jewels, medicines, and arms ? These fanatics look wildly around them, but can see nothing, not a single *dirhem* anywhere. They trim their torches, and carry them again and again to every part of that red-walled, flinty hall, but without any better success. Nought but pure, polished red granite, in mighty slabs, looks upon them from every side. The room is clean, garnished too, as it were ; and, according to the ideas of its founders, complete and perfectly ready for its visitors, so long expected, so long delayed. But the gross minds who occupy it now, find it all barren ; and declare that there is nothing whatever for them, in the whole extent of the apartment from one end to another ; nothing except *an empty stone chest without a lid.*

The Caliph Al Mamoun was thunderstruck. He had arrived at the very ultimate part of the Great Pyramid he had so long desired to take possession of ; and had now, on carrying it by storm, found absolutely nothing that he could make any use of, or saw any value in. So being signally defeated, though a Commander of the Faithful, his people began muttering against him ; and to exclaim, too, in most virtuous phrases of religious repentance upon both their own waste of time, and the treason and treachery of some one.

But Al Mamoun was a Caliph of the able day of Eastern rulers ; so he had a large sum of money secretly brought from his treasury and buried by night in a certain spot. Next day he caused the men to dig precisely there, and behold ! although they were only digging in the Pyramid masonry just as they had been doing during so many previous days, yet on this day they found a treasure of gold ; "and the Caliph ordered it to be counted, and lo ! it was the exact sum

that had been incurred in the works, neither more nor less. And the Caliph was astonished, and said he could not understand how the kings of the Pyramid of old, before the Deluge, could have known exactly how much money he would have expended in his undertaking, and he was lost in surprise." But as the workmen got paid for their labour, and cared not whose gold they were paid with so long as they did get their wage, they ceased their complaints. While as for the Caliph, he returned to his city home, musing on the wonderful events that had happened; and both the King's Chamber and the "granite chest without a lid" were troubled by him no more.

The poets of El Kahireh did indeed tune their lutes once again, and celebrate their learned patron's discoveries in that lidless box of granite. According to some of them, a dead man with a breast-plate of gold, and an emerald vase a foot in diameter, and "a carbuncle which shone with a light like the light of day, and a sword of inestimable value and 7 spans long, with a coat of mail 12 spans in length" (all of them very unlike an Egyptian mummy of the usual type), rewarded his exertions; though, according to others, the chest was really crammed to the brim with coined gold "in very large pieces;" while on the cover, which others again maintained was not there then and is certainly not to be seen now, was written in Arabic characters, "Abou Amad built this Pyramid in 1,000 days." But nothing further of importance was actually done in a cause which men began now to deem, in spite of their poets, to be absolutely worthless, and in a region more profitless to all mere sensualists than the desert itself. The way of approach, however, once opened by Al Mamoun, remained then free to all; and "men did enter it," says one of the honestest chroniclers of that day, "for many years, and descended by the slippery

passage which is in it ;" but with no other result than this, "that some of them came out safe and others died."

Reaction after the Excitement.

A still more edifying account, in a moral and correctional point of view, was attempted by one "Masondi in the Akbar-Ezzeman," writing, one would think, for children of tender years; for this is the burden of his tale.

"Certain explorers who had formed a party," said he, "discovered in the lowest part of the Great Pyramid a square chamber, wherein was a vase containing a quantity of fluid of an unknown quality. The walls of the chamber were composed of small square stones of beautiful colours, and a person having put one of these stones into his mouth, was suddenly seized with a pain in his ears, which continued until he had replaced it. They also discovered in a large hall a quantity of golden coins put up in columns, every piece of which was of the weight of 1,000 dinars. They tried to take the money, but were not able to move it. In another place they found the image of a sheikh, made of green stone, sitting upon a sofa, and wrapped up in a garment. Before him were statues of little boys, whom he was occupied in instructing. The discoverers tried to take up one of these figures, but they were not able to move it. Continuing their researches, they came to a female idol of white stone, with a covering on her head, and lions of stone on each side attempting to devour her ; on seeing which they were so immensely frightened, that they took to flight. This happened," the educational sage Masondi is particular to record, in order to clinch its date, "in the time of Yerid Ben Abdullah ; though who he was, is a problem."

Another writer aims at the Caliph himself, who is

described in the third person, as "one who employed three years, and considerable sums, in endeavouring to enter the Pyramid, and who found little or no treasure; but saw an inscription in letters of gold on the side of the chamber, declaring that "the impious violator of the tomb should experience, as his sole reward, the regret of having committed a sacrilegious action without any successful result." While, finally, a surveying British general officer of the Royal Engineers, determined to bend the bow the other way, freely announces in 1869 that the king's body (that is, Cheops'), after a repose of 2,960 years, was thrown out of its tomb by Al Mamoun, and "treated with grossest indignities by the rabble of the streets of Cairo."

But to return to something like the sober chronicles of the period, it was years after the Caliph's assault on the inside of the Pyramid, that there began that despoiling of its outside which was carried on by many generations of Cairenes systematically, until all the white and polished blocks of the casing (except the two which Colonel Howard-Vyse was to bring to light 1,000 years afterwards) had been removed for the building of new Cairo; and the grand old primeval inscription on the outside of the Pyramid, "engraved," somewhere about the days of Job, "with an iron pen and lead in the rock for ever,"—what became of it: and what would it have told if translated by a more able linguist and impartial judge, than the idolatrous Egyptian priest who put off Herodotus with an idle jest?

The European Mind enters into the Question.

Centuries passed by, and then modern European travellers began to look in at the Great Pyramid. The Eastern day-dream of wealth had departed, but that empty stone chest still offered itself there in the interior

for explanation. Why was it in such a place of honour? Why was the whole Pyramid arranged in subservience to it? Why was it so unpretending and plain? Why had its lid been forgotten? Why was the whole thing empty? Why was it utterly without inscription?

Gradually the notion grew that it might be a sarcophagus; that it was a sarcophagus; and that it had been intended for "that Pharaoh who drove the Israelites out of Egypt; and who, in the end, leaving his carcase in the Red Sea, never had the opportunity of being deposited in his own tomb."

But this idea was effectually quashed, for, amongst other reasons, this cogent one,—that the Great Pyramid was not only built, but had been sealed up too in all its more special portions, long before the birth even of that Pharaoh. Nay, before the birth of Isaac and Jacob as well; which disposes likewise of the attempt to call the Great Pyramid "the tomb of Joseph," whose mortal remains being carried away by the Israelites in their Exodus, left the vacancy we now see in the coffer or stone box.

Then wrote some, "here was buried King Cheops, or Chemmis, but his body hath been removed hence." Whereupon Professor Greaves pointed out "that Diodorus hath left, above 1,600 years since, a memorable passage concerning Chemmis, the builder of the Great Pyramid, and Cephren, the founder of the work adjoining: "Although," saith he, "these kings intended these for their sepulchres, yet it happened that neither of them were buried there. For the people being exasperated against them by reason of the toilsomeness of these works, and for their cruelty and oppression, threatened to tear in pieces their dead bodies, and with ignominy to throw them out of their sepulchres. Whereupon both of them, dying, commanded their friends to bury them in an obscure place."

And again, other scholars brought up the very clear account of Herodotus, that King Cheops was *not* buried in the Great Pyramid building above, because he was buried in a totally different place; viz., "in a subterranean region on an island always surrounded by the waters of the Nile." And if that necessarily and hydraulically means a level into which the Nile water could always flow, it must have been at a depth of more than fifty feet below the very bottom of even the unfinished subterranean chamber carved deep in the rock underneath the Great Pyramid, and not in the direction of the grand, upper, built room with its empty stone chest discovered by Al Mamoun in the sub-aërial masonry of the building.

The Tombic Theory.

So in later years, all the single sarcophagus propositions for the benefit of the empty stone chest having failed, they have been merged into a sort of general sarcophagus theory, that some one must have been buried there. And this notion finds much favour with the hierologists and Egyptologists, as a school; for these gentlemen will insist on keeping up a hold over the Great Pyramid, as being a valuable part of their art, and a grand chariot to drive withal before the wondering gaze of mankind. They allow, that in no other pyramid is the *sarcophagus* — as they boldly call the stone chest, or granite box, or porphyry coffer (though it is not porphyry either) of other authors—contained high up in the body of the Pyramid, far above the surface of the ground outside; that in no other case is it perfectly devoid of adornment or inscription; that in no other case has the lid so strangely vanished; in no other case are the neighbouring walls and passages of the Pyramid so devoid of hieratic and every other emblem; in fact,

they allow that the red granite coffer, with all that part of the Pyramid's chambers and ascending passages where it is found, and which opened itself so strangely to the eyes of the Arabians after 3,000 years of concealment, is entirely unique and peculiar to the Great Pyramid. The coffer and its chamber, the Grand Gallery and the passages leading to it, form indeed a sort of machinery which is altogether in addition to what the other pyramids possess; while what *they* have, the Great Pyramid has also, though it never completed and used it; viz., the subterranean chamber and descending passage intended to be—sepulchral-notion inspiring, or sepulchral, if you will, but never finished—though left enterable at any time through all antiquity.

Observe also with the alleged "sarcophagus," in the *King's* Chamber (for so is that apartment now most generally, though perhaps erroneously, termed), that there was no ancient attempt to build the vessel up and about in solid masonry, in the most usual manner for securing a dead body inviolate. On the contrary, there were magnificently built white stone passages of a most lasting description, and in a different material to the rest of the fabric, as well as fit for continued use through long ages, leading straight up to such sarcophagus from the very entrance itself; while, more notably, the shapely King's Chamber was intended to be *ventilated* in the most admirable manner by the "air channels" discovered by Colonel Howard-Vyse; evidently (as the actual fact almost enables us to say with security) in order that men might come there from time to time, and look on, and deal with, that open granite chest, and live and not die.

But how is it known, or can it be proved, that there are not similar secret chambers in the other pyramids also?

Something may be done in this way; *firstly*, with

the example of the Great Pyramid to go by, during 1,000 years, the other pyramids have been abundantly examined, and industriously probed for like features, regardless of expense, but without success. In the *second* place, some of the others have become dilapidated to an extent that should show such chambers if they were there; and in the *third* place, whereas the third Pyramid of Jeezeh has been admired by some authors * as the third and most perfect work of the true Egyptian pyramid builders, where every excellence of their system was introduced, that very pyramid was bored centrally and vertically through by Colonel Howard-Vyse without detecting anything but solid masonry until its subterraneans were finally reached; and then the scene partook decidedly of Egypt the profane, with a richly ornamented sarcophagus and an idolatrous dedication in Mizraite hieroglyphics on the coffin board.

What then was the purpose of all that upper system in the Great Pyramid, above its one entrance passage which descends ultimately to the lower, or underground chamber? Why too was not that unique upper system of sub-aërial chambers, Grand Gallery, and ascending passages made easy of access to Egyptians, Persians, Greeks, and Romans in their time; or rather, why was it so entirely and scrupulously concealed from every one of them through all their long historical day?

Hieroglyphics, and their modern Egyptologist interpreters, are plainly at fault here; for, always excepting the quarry-marks in strokes of red paint on the unfinished stones in the black hollows of construction, there are no hieroglyphics to translate upon either the granite coffer, the chamber which contains it, or even the whole of the Great Pyramid. Nor has anything, in all hieroglyphic literature throughout all Egypt, ever been dis-

* H. C. Agnew, "Letters on the Pyramids," 1838.

covered throwing the smallest light on, or displaying the most distant knowledge of, the ascending interior of this one, most unique, of all the pyramids.

The Exclusively Tombic Theory receives a Shake.

Meanwhile, some few good men and true in scientific researches—witness M. Jomard in the celebrated "Description de l'Egypte," and Sir Gardner Wilkinson in his own works—have begun to express occasional doubts as to whether any dead body of a king or other mortal man ever was deposited in the strangely-shaped vessel of the King's Chamber.

The actual words of that most philosophic Egyptologist, Sir G. Wilkinson, are: "The authority of Arab writers is not always to be relied on; and it may be doubted whether the body of the king was really deposited in the sarcophagus;" *i.e.*, of the Great Pyramid; and the remark, so far, is unassailable. But when he goes on to say, "I do not presume to explain the real object for which the pyramids were built, but feel persuaded that they served for tombs, and were also intended for astronomical purposes," why then it is plain that he is mixing up two very different things, viz., the one Great, pure and anti-Egyptian Pyramid, with any number of other pyramids truly and absolutely Egyptian and Pharaonic.

Another Egyptologist, of less mature years, but loud in talk, rushes in thus heedlessly where his better, with reason, had feared to tread, declaring, "The pyramids were in all cases tombs, and nothing more. That they were places of sepulture is enough, to any one acquainted with the character of the ancient Egyptians, to prove that they had *no other use;* but were it not so, our knowledge of their structure would afford conclusive evidence." And then follows that

author's knowledge of their structure, and it leaves out, neatly and completely, though painted by his own admiring self, all that is peculiar to the Great Pyramid.

Now it was precisely when another, viz. M. Jomard, was studying that grand phenomenon's peculiar features, and comparing them day after day with the ordinary forms of old Egyptian pyramids, that he, discussing the matter at leisure with the other members of the French Academy then in Egypt, began shrewdly to suspect that the object of both the coffer itself, and the place it was in, "might be entirely and totally different" from either the treasure-theory of the East, or sepulchral, *i.e. tombic,* theory of Western minds: and would probably prove, if correctly understood, to be something gifted with a very high value indeed for nations who were far advanced in civilisation and intellectuality. He even fancied that it might have something to do with a standard measure of length, and believed at one time that he had detected an analogy to the then new French mètre on one part of the coffer.

Something of a metrological kind had also been speculated on by Sir Isaac Newton more than a century earlier; and though sufficiently accurate measures at last failed him, yet he did succeed in getting out, so far as he had foundations to go on at all, a number of instances indicating with much probability that certain harmonious proportions of a fixed measure of length were generally adhered to in the formation of many of the Pyramid's passages and chambers.

Yet, notwithstanding this good beginning, little more was subsequently tried by any one else in the same direction. The crowd in society still belonged to either the treasure, or the tombic, school; and both parties were equally offended at the poverty of the contents of the chamber in general, and the lidless granite chest in particular.

Each had expected riches after their own heart's desire; and instead of them, merely found this plain stone box, made indeed, they allowed, with exquisite geometric truth, rectangular within and without, highly polished, and of a fine bell-metal consistency, in a sort of hard, compact, faultless, syenitic granite; but then it was empty, they said, and the lid was gone. So they were all grievously offended at it, and are so still: one man, as an example of the civilised, wealthy, and educated modern Europeans, hits the coffer a bang with a big hammer, merely to hear over again what fifty persons had recorded before him, viz., "that it rings like a bell on being struck;" another actually breaks off a portion for a "specimen;" another tries to do the same and cannot, though he tries with all his might; and though the Anglo-Indian soldiers under General Sir David Baird succeeded only too well.* While, finally, Dr. Lepsius, whom Gliddon states with pride, "has been justly termed by the great Letronne, *the hope of Egyptian study*," planted a young palm-tree in the hollow of the ancient coffer, to act as a German Christmas-tree; a gracious tree, on whose branches he should hang some baubles which he had bought in Cairo, as presents for himself and his Prussian friends; whom he fondly calls "children of the wilderness," on the strength of having been resident for a few weeks in the comfortable parts of Lower Egypt.

John Taylor's Theory.

In the midst of such scenes, illustrating, unfortunately, what is actually going on among the Egyptologists in the nineteenth century, comes out the late John Taylor with the result of his long researches; and suggests that, "The coffer in the King's Chamber of

* "Description de l'Egypte;" and Dr. Clarke in his Travels; but defended against them by Colonel Howard-Vyse.

the Great Pyramid was intended to be a standard measure of capacity and weight fit for all nations; and certain nations did originally receive their weights and measures from thence; so that those of them who still preserve, more or less successfully, with their language and history their hereditary weights and measures, may yet trace their pre-historic connection substantially with that one primeval, standard, metrological centre, the Great Pyramid."

Take, for instance, our own case. When the British farmer measures the wheat which the bounty of Providence has afforded him as the increase of his land, in what terms does he measure it? In *quarters.*

Quarters! Quarters of what?

The poor farmer does not know; for there is no capacity measure now on the Statute-book above the quarter; but, from old custom, he calls his largest corn measure a quarter.

Whereupon John Taylor adds in effect: "The quarter corn measures of the British farmer are fourth parts or quarters of the contents of the coffer in the King's Chamber of the Great Pyramid; and the same Pyramid's name, instead of being descended from πῦρ, fire, may rather have been derived from πυρὸς, wheat, and μέτρον, measure; signifying a 'measure of wheat.' To establish the ground-work of an international standard to that end, though not at *that time* to publish it generally, would seem to have been a leading purpose of the Great Pyramid ages ago; and the true value, in size, of its particular measure, has not sensibly deteriorated during all the varied revolutions of society in the last 4,040 years!"

This is a statement requiring full examination.

CHAPTER VII.

THE PYRAMID COFFER.

THE first part of the problem now immediately before us should be both short and simple; for it is, merely to determine the cubical contents of the vessel known successively or variously as "the sarcophagus, the empty box, the lidless stone chest," or more philosophically and safely, so as not to entangle ourselves with any theory, "the coffer" in the King's Chamber of the Great Pyramid; "the only and one thing," says that quaint old traveller, G. Sandys, "which this huge mass containeth within his darksome entrails."*

Reported of a plain rectangular figure within and without, carved out of a single block; of moderate size therefore for a man to examine and survey, and accessible on every side, what should present so easy an admeasurement for any educated man to make, as this coffer of the Great Pyramid? How often, too, has it not been admeasured, and by some of the most learned academicians of Europe? even as though they all held firmly that it had been originally designed and constructed only for that one end, purpose, and intention.

From Colonel Howard-Vyse's important work are drawn forth and arranged, in the following table, the

* George Sandys' "A Relation of a Journey begun A.D. 1610."

chief measures which have been taken between 1550 and 1840 A.D., some of the principal authors being consulted in their original writings. Their measures, generally given in feet, or feet and inches, or mètres,* are all here

MODERN MEASURES OF THE GREAT PYRAMID-COFFER UP TO A.D. 1864.

AUTHORS.	DATE.	Material as named.	EXTERIOR.			INTERIOR.		
			Lngth.	Brdth.	Depth.	Lngth.	Brdth.	Depth.
	A.D.		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Bellonius . . .	1553	Black marble .	144·	72·	...	...	...	...
P. Alpinus . .	1591	Black marble .	144·	60·	60·	...	...	...
Sandys . . .	1610	.....	84·	47·	Breast-high.	...	...	...
De Villamont . .	1618	Black marble .	102·	...	60·	...	...	...
Professor Greaves .	1638	Thebaic marble	87·5	39·75	39·75	77·856	26·616	34·320
De Monconys . .	1647	.....	86·	37·	40·	...	...	...
M. Thevenot . .	1655	Hard porphyry	86·	40·	40·	75· ?	29· ?	...
M. Lebrun . .	1674	.....	74·	37·	40·	...	...	...
M. Maillet . .	1692	Granite	90·	48·	48·	...	...	...
De Careri . . .	1693	Marble	86·	37·	39·	...	...	...
Lucas . . .	1699	Like porphyry	84·	36·	42·	74· ?	26· ?	...
Egmont . . .	1709	Thebaic marble	84·	...	42·	72· ?	...	...
Père Sicard . .	1715	Granite	84·	42·	36·	...	...	...
Dr. Shaw . . .	1721	Granite	84·	36·	42·	72· ?	24· ?	...
Dr. Perry . . .	1743	Granite	84·	30·	36·	...	...	...
M. Denon . . .	1799	?	84·	48·	38·	...	...	...
M. Jomard and Eg. Fr. Ac. . .	1799	Granite	90·592	39·450	44·765	77·836	26·694	37·28
Dr. Clarke . .	1801	Granite	87·5	39·75	39·75	...	...	...
Mr. Hamilton . .	1801	Granite	90·	42·	42·0	78· ?	30· ?	...
Dr. Whitman . .	1801	.....	78·	38·75	41·5	66· ?	26·75 ?	32·
Dr. Wilson . .	1805	.....	92·	38·	...	80· ?	26· ?	34·5
M. Caviglia . .	1817	.....	90·	39·	42·	78· ?	27· ?	...
Dr. Richardson .	1817	Red Granite	90·	39·	39·5	...	...	...
Sir Gard. Wilkinson	1831	Red Granite	88·	36·	37·	...	...	...
Col. Howard-Vyse .	1837	.....	90·5	39·0	41·0	78·0	26·5	34·5

N.B.—A note of interrogation after any of the *interior* measures, indicates that they have been obtained by applying to the *exterior* measures the "thickness" as given by the observer; such thickness being supposed to apply to the sides, and not to the bottom.

set down in inches, to give a clearer view of the progress of knowledge in this particular matter. And now, our only bounds to exactness will be, the capability of these educated men of Europe, to apply accurate measure to a

* The feet of all authors, when not otherwise particularized, have been here assumed as English feet, and in some cases may require a correction on that account, but not to any extent sufficient to explain the chief anomalies observed.

regularly formed and exquisitely prepared specimen of ancient mechanical art.

Reflections on the Numbers as measured.

Look at them, then. Surely the list is not a little appalling. An ordinary carpenter amongst us talks of sixteenths of an inch quite fluently, and sometimes undertakes to make a special piece of cabinet work "fit to half a sixteenth:" but our learned travellers commit errors of many whole inches; and this when they are measuring the one and only internal art-object which the Great Pyramid contains, and on which indeed its whole structure focusses and concentrates itself; a building too where no less than forty centuries are beholding their proceedings, just as they are said to have done with admiration those of the French soldiers in 1799;* but are also, in these now quiet times, weighing rich travellers, learned philosophers, and modern education in the balance of truth together.

My own part here must be very moderate; for I am a would-be measurer too, never perfectly exact. Yet even I have to say, after the most favourable consideration possible, that out of the twenty-five quoted authors no less than twenty-two must be discharged summarily as quite incompetent, whatever their mental attainments otherwise, to talk before the world about either size or proportion in any important practical matter. These rejected ones have also been, to so lamentable an extent, uniformly persevering in the error of only applying their measures directly to the *exterior* of the coffer, when the *interior* is the really valuable feature for theory and use (and is the more lasting fact of the two, as a measure, because protected from injury by

* "Soldats! du haut de ces Pyramides quarante siècles vous contemplent."—Napoleon in Egypt.

the very existence of the exterior), that one is compelled at last to doubt these men's very principles of proceeding as well as every practical outcome of their measuring skill.

Professor Greaves in 1638, the French academicians in 1799, and Colonel Howard-Vyse in 1837, are therefore the only three names that deserve to live, as coffer measurers, in the course of 250 years of legions of visitors. Of these three parties thus provisionally accepted, the foremost position might have been expected for the academicians of Paris. Professor Greaves lived before the day of European science proper, and when Ptolemy's works, with sundry Arabian authors, were almost the only books thought worthy of study after the classical writers of Greece and Rome, and one or two of re-arising Italy; and simply because there were so very few others. While Colonel Howard-Vyse did not lay himself out for very refined measurements, but rather went through what he felt himself obliged to undertake in that direction, in the same fearless, thorough-going, and artless manner in which the Duke of Wellington was accustomed to review a picture exhibition in London; beginning with No. 1 in the catalogue, and going through with the whole of them conscientiously to the very last on the list.

The Colonel's measures, therefore, are respectable and solidly trustworthy with regard to large quantities, but not much more.

With the French academicians it is quite another thing; they were the men, and the successors of the men, who had been for generations measuring arcs of the meridian, and exhausting all the refinements of microscopic bisections and levers of contact in determining the precise length of standard scales. Their measures, therefore, ought to be true to the thousandth, and even the ten-thousandth part of an inch: and

perhaps they are so in giving the *length* and *breadth* of the coffer; but, alas! in their statements of the *depth*, both inside and out, there seems to have been some incomprehensible mistake committed, amounting to nearly three whole inches.

I have looked up the original authorities in the "Description de l'Egypte," have reduced the mètre to inches from several different copies, but cannot come to any other conclusion than that this vital portion of the Academy's work is hugely erroneous. Their length and breadth numbers are not far from a mean of good modern observers; but those for the depth are outside all other good men, in the most improbable manner to be true. I have written to the Perpetual Secretary of the Academy in Paris upon the subject, but have got no answer; and all my attempts to prevail on friends to seek admission to the original documents of the Egyptian expedition, if still in existence, have failed.

Under such circumstances, I have been compelled to discharge the French Academy also, from the list of fully trustworthy competitors for usefulness and fame in Pyramid coffer metrology. Only two names, therefore, are left—Howard-Vyse, who has been already characterised, and Greaves, in whom we have most fortunately a host indeed.

Of Professor Greaves, the Oxford Astronomer in 1637.

He lived, no doubt, before the full birth of European science, but on the edge of an horizon which is eventful in scientific history. Immediately behind him were, if not the dark ages, the scholastic periods of profitless verbal disquisitions; and in front, to be revealed after his death, were the germs of the mechanical and natural philosophy which have since then changed the face of the world. There is no better a life-point that can be

taken than Greaves', whereby to judge what Europe has gained by the exercise of civil and religious liberty, coupled with the study of nature direct, through two and a half centuries of unrestricted opportunity. When as much more time has passed over the world, as now separates us from Greaves' age, then—say many of the safest interpreters of the sacred prophecies—a further Divine step in the development of the Christian dispensation will have commenced.

But of Greaves himself, it was somewhat strange, though not inexplicable,* that he should make the

* He relates his ideas, to a certain extent, thus in the "Pyramidographia:"—

"These proportions of the chamber, and those which follow of the length and breadth of the hollow part of the tomb, were taken by me with as much exactness as it was possible to do; which I did so much the more diligently, as judging this to be the fittest place for fixing the measure for posterity—a thing which hath been much desired by learned men; but the manner how it might be exactly done hath been thought of by none. I am of opinion that, as this Pyramid hath stood 3,000 years almost" (this material under-estimate for what is nearer 4,000 years, arose from a mistaken theory of Professor Greaves for identifying Herodotus's name of the Jeezeh Pyramid-builders, Cheops, Chefren, and Mycerinus, with kings of Manetho's twentieth, in place of his fourth, dynasty), "and is no whit decayed within, so it may continue many thousand years longer; and, therefore, that after-times measuring these places by the assigned, may hereby find out the just dimensions of the *English* feet. Had some of the ancient mathematicians thought of this way, these times would not have been so much perplexed in discovering the measures of the Hebrews, Babylonians, Egyptians, Greeks, and other nations."—GREAVES, vol. i. p. 126.

At p. 346, in the conclusion of his "Denarius" dissertation, Professor Greaves gives the following special instances of his measures, which should all be repeated at the earliest opportunity:—

"The first and most easterly of the three great Pyramids in Egypt hath on the north side a square descent; when you are entered a little past the mouth of it, there is a joint or line, made by the meeting of two smooth and polished stones over your head, which are parallel to those under your feet; the breadth of that joint or line is 3·463 of the English foot" = 41·556 Greaves' English inches.

"Within the Pyramid, and about the midst of it, there is a fair room or chamber, the top of which is flat, and covered with nine massy stones; in it there stands a hollow tomb of one entire marble stone; the length of the south side of this room, at the joint or line where the first and second rows of the stone meet, is 34·380 feet" = 412·560 G. E. inches.

"The breadth of the west side of the same room, at the joint or line where the first and second row of stones meet, is 17·190 feet" = 206·280 G. E. inches.

great exertion he did to visit the Pyramids in the dangerous times of 1638 and 1639; and should, as some of his contemporaries tauntingly observed, though he was a professor of astronomy, take so much more care in providing himself with a linear measuring-rod, than with any astronomical instruments proper. But the use which he made of that same measuring-rod ("a ten-foot radius, most accurately divided into 10,000 parts, besides some other instruments, for the fuller discovery of the truth"), when he had entered the Pyramid, and approached the granite coffer of the King's Chamber, has something in it which is passing strange indeed.

Almost every other visitor, both before and since, paid vastly more attention to the exterior than the interior of the coffer. Why, then, did Professor Greaves, when engaged on the exterior, merely give it in feet and inches, as thus,—"the exterior superficies of it contains in length seven feet three inches and a half,—in depth it is three feet three inches and three-quarters, and is the same in breadth"? But when he comes to the interior, why does he immediately address himself to it, as to a matter requiring vastly more accuracy than all that he had been looking to before? "Of the hollow, therefore, within," the coffer—or, as he calls it, "the king's monument,"—he writes, "It is in length on the west side, six feet, and four hundred and eighty-eight parts of the English foot, divided into a thousand parts" (that is, 6 feet, and 488 of 1,000 parts of a foot); "in breadth at the north end, two feet, and two hundred and eighteen parts of the foot divided into a thousand parts" (that is, 2 feet and 218 of 1,000 parts of the English foot.) "The

"The hollow, or inner part of the marble tomb near the top, on the west side of it, is in length 6·488 feet" = 77·856 G. E. inches.

"The hollow, or inner part of the marble tomb near the top of it, on the north side, is in breadth 2·218 feet" = 26·616 G. E. inches.

depth is 2 feet and 860 of 1,000 parts of the English foot."

And he defends his practice in this instance by adding: "In the reiteration of these numbers, if any shall be offended either with the novelty or tediousness of expressing them so often, I may justify myself by the example of Ulug Beg, nephew of Timurlane the Great (for so is his name, and not Tamerlane), and Emperor of the Moguls, or Tatars (whom we term amiss Tartars). For I find in his astronomical tables (the most accurate of any in the East), made about two hundred years since, the same course observed by him when he writes of the Grecian, Arabian, and Persian epochas, as also those of Cataia and Turkistan. He expresseth the numbers at large, as I have done; then in figures, such as we call Arabian, —— ——, which manner I judge worthy of imitation, in all such numbers as are radical, and of more than ordinary use."

Greaves' and Vyse's Coffer Capacity Determinations.

Exactly why, or fully wherefore, it was put into the heart of the mediæval Oxford Professor of Astronomy to consider, contrary to the usual ideas of other scientific visitors and admeasurers, the numbers for the interior of the coffer so extra-remarkably "radical and of more than ordinary use," we may come to form an opinion by-and-by; but in the meantime we should accept the fact with thankfulness, as the very thing of all others which is directly to the point, where a measure of capacity is concerned.* Hence we have for the cubical contents of

* To preserve that humility which is equally necessary to insure ultimate success in the paths of scientific research, and in a certain narrower and more important way as well, it should be known to Professor Greaves' countrymen that in his comparatively careless treatment of the *exterior* of the coffer, he made an error of about one inch in the height, and somewhat more in the length.

the coffer in English inches, from Greaves' original measures, in 1638—

$$77{\cdot}856 \times 26{\cdot}616 \times 34{\cdot}320 = 71{,}118.$$

And by Howard-Vyse's measures, also just as taken in 1837—$78{\cdot}0 \times 26{\cdot}5 \times 34{\cdot}5 = 71{,}311$.

Several small corrections may possibly be applicable to these mere numbers as rudely read off; but for the present we may provisionally accept for a first approximation the simple mean of the above statements, or 71,214 cubic inches, as the apparent capacity contents of the coffer of the King's Chamber.

Wherefore now, what proportion does that number bear to the capacity of four modern English corn quarters, in terms of which British wheat is measured and sold at this very hour?

Referring to the almanac for the Act of Parliament on the subject, we find in our copy a declaration, that the gill "is equal to 8·655 cubic inches;" and then going through the continued multiplications for pints, quarts, &c., up to four quarters, we have for that collective quantity, 70,983·680 cubic inches. But in another copy, one gallon is declared 277·274 cubic inches; which, being similarly multiplied for bushels, quarters, and four quarters, yields 70,982·144 English cubic inches.

Preferring, then, this latter quantity as having undergone less multiplying than the other, the degree of agreement between a quarter British and a fourth part of the coffer, or granite box, and possible type of a corn-measure in the Great Pyramid, is at this present time as 17,746 : 17,801.

Qualities of the Coffer's "Quarter" Measure.

A sufficiently fair amount of agreement is this, between the things compared (viz., the Pyramid coffer on one

side divided into four by not very modern *savants*, and on the other, the old Anglo-Saxon corn-measure after being too often "adjusted" by Acts of Parliament, since those halcyon days of rest when Edgar "the peaceable" reigned over England at Winchester); sufficiently near, I repeat, to allow all friends of worthy old John Taylor to say that the Great Pyramid, with its coffer of four corn-quarter capacity yet measurable, is in so far still capable of fulfilling the purpose of its ancient name,—under one form of interpretation at least: and if there be after all anything in any *word* or *name* more worthy the attention of science, than ancient contemporary mechanical facts that may still be handled and measured before our eyes.

To nations in a more or less primitive condition, the first application of capacity measures would, with little doubt, be in the exchange of corn; and through whatever subsequent stage of power or luxury or refinement they may pass, the measuring of the staff of life will probably still keep up a permanent importance over every other object of measuring or weighing, even though it be of drugs, or silver, or gold,—in perfect accordance so far with our Lord's Prayer, where the only material supplication is, "Give us day by day our daily *bread*."

Yet it is to be remarked, that if any given means for measuring corn were devised by a very superior intelligence, they should eventually be found applicable also, so far as principles of accuracy go, to many of the more artificial and precise purposes to which the after progress of mankind may introduce them, as well as to the rude original employ.

Thus, the moon, with its frequently recurring variations and phases, serves man in the savage, and did serve him in the primitive and patriarchal state, as a coarse method of chronicling time over a few months. In a more artificial and civilised condition, some of the

larger cycles of lunations enable him to speak exactly of many years at a time, and approximate to some eclipses. In a further advanced condition, the moon's subsidiary features of movement enable the sailor in the midst of the broad surface of ocean, assisted by data from the astronomer and mathematician on shore, to measure his precise longitude. And amongst the ablest minds of the present day, the theory of those movements and the computation of their nature, forms an arena where every man may measure off his own intellectual height at the base of an infinite cliff which he may never hope to stand on the summit of.

In exact proportion, therefore, as man has become able to profit by God's moon, which he, man, was originally told was merely intended to rule the night, so has the divinely appointed luminary been found capable of more and more applications; and whenever any difficulty has occurred, it has never been any want of perfect accuracy in the lunar machinery itself (for that really seems infinite), but merely in the power of man to interpret the working of it.

Is there, then, anything approaching to the same suggestive principle connected with John Taylor's idea of the "corn measure" of the Great Pyramid?

There can be no harm in inquiring, as we proceed with our grand research; and it will be the surest way too of guarding against any possibility of our having been misled thus far, by attending overmuch to some single fortuitous coincidence.

Let us conclude this chapter, however, of rather old, and much improvable data about the coffer's *size*, by a glance at the *material* of this most interesting vessel.

Granite, the true Material of the Coffer.

A reference to the third column of our table on page 100, will show that travellers have assigned the

coffer to almost every mineral, from black marble to red granite, and porphyry of a colour which no one has ventured to name. The majority of modern authors are in favour of red granite. I was for a long time before going to Egypt inclined to porphyry, doubting if anything so well known and distinctly marked as red granite would ever have been called black marble; and having been further at that period so distinctly assured about the coffer by a railway engineer who had been much in Egypt, that "it is undoubtedly porphyry:" an assertion which he backed up by describing some of the differences in character between the material of the coffer, as witnessed by himself, and the indubitable red granite walls of the chamber.

This granite he traced to the quarries of Syene, 550 miles up the river from the Pyramid; for nearer than that, there is not a particle of granite rock on the banks of the Nile, or within many days' journey from them on either side: but there, at the cataracts of the Nile above Syene, it abounds; and Syene was in fact a storehouse of granite (of the syenitic variety, but still eminently to be called granite rather than by any other mineral name equally understood by the public at large) for every dynasty that sat on the throne of Egypt subsequently to the building of the Great Pyramid.

Porphyry may not improbably be also found at Syene, amongst the veins and extravasations of granite and basalt which there abound: but the most celebrated Egyptian quarries of porphyry, both red and green, were much nearer the Red Sea than the Nile, or at and about the Gebel Dokkan and Mount Porphorytes; therefore in much closer geographical proximity to, and, perhaps, geological connection with, the granite mountains of Sinai than the plutonic beds of Philæ and Syene.

Nevertheless, I having at last visited Egypt in 1864-5,

after the publication of the first edition of this book, spent almost whole days and weeks in this King's Chamber of the Great Pyramid, until all sense of novelty and needless mystery in small things had worn away; and then decided, without the smallest hesitation, for the material of the coffer being syenitic granite; exceedingly like, but perhaps a little harder as well as darker than, the constructive blocks of the walls of the King's Chamber containing it.

Granite in the Dark, and Semi-dark, Ages now gone by.

Modern measures of the coffer are still awaiting us; but first I will plead for a little more about *granite*, so necessary is it for every one to know intimately both where that mineral is, and where it is not, in the structure of the Great Pyramid: besides also understanding what is implied mechanically, and also, if possible, what was intended to be held symbolically, whenever the primeval architect abandoned the use of the limestone he had at hand, and adopted the granite procured with utmost toil and expense from a distance; whether it came from Syene, as modern Egyptologists usually determine, or from Sinai, as Professor Greaves would rather infer.

Recent travellers have indeed abundantly detected the cartouches or ovals of both King Cheops and King Chephren, or Shofo and Nou-Shofo, of the Jeezeh Pyramids, on certain quarried rocks in the Sinaitic peninsula, near Wadee Maghāra; but the "works" with which these inscriptions were connected are generally supposed to have been copper mines and emerald pits; and the following original note by Professor Greaves, evidently written long before the day of mineralogy, may be useful for a different purpose. The passage runs as follows:— "I conceive it" (the material of the coffer) "to be of that sort of porphyry which Pliny calls leucostictos,

and describes thus :—'Rubet porphyrites in cådem Ægypto, ex eo candidis intervenientibus punctis leucostictos appellatur. Quantislibet molibus cædendis sufficiunt lapidicinæ.' Of this kind of marble there was, and still are, an infinite quantity of columns in Egypt. But Venetian, a man very curious, who accompanied me thither, imagined that this sort of marble came from Mount Sinai, where he had lived amongst the rocks, which he affirmed to be speckled with party colours of black and white and red, like this ; and to confirm his assertion, he alleged that he had seen a great column left imperfect amongst the cliffs almost as big as that huge and admirable pillar standing to the south of Alexandria. Which opinion of his doth well correspond with the tradition of Aristides, who reports that in Arabia there is a quarry of excellent porphyry."

Sad confusion here between granite and porphyry in the seventeenth century : while in the "unheroic eighteenth century" Anglo-Saxon ignorance of granite went on increasing. No fresh granite was then being worked anywhere direct from nature, and the monuments of antiquity composed of it were first suspected, and then alleged, to be factitious ; as thus stated by a Mediterranean traveller in 1702 :—"The column of Pompey at Alexandria. Some think it of a kind of *marble*, but others incline rather to believe that 'twas built of *melted stone* cast in moulds upon the place. The latter opinion seems most probable, for there is *not the least piece of that stone to be found in any part of the world*, and the pillar is so prodigiously big and high that it could hardly be erected without a miracle. I know 'tis alleged by those who believe the story of the Rhodian colossus, that the ancients had the advantage of admirable machines to raise such bulky pieces ; but I should reckon myself extremely obliged to those gen-

tlemen if they would show me any probable reason why, among so great a variety of Egyptian monuments of antiquity, there is not one of *marble;* and by what unaccountable accident the stone called *granite,* which was then so common, is now grown so scarce that the most curious inquiries into the works of nature cannot find the least fragment of it that was not employed in ancient structures.

"And even though I should suppose, with my adversaries, that the quarries out of which this stone was dug were by degrees so entirely exhausted that there is not the least footstep of 'em left, and that Nature herself has lost so much of ancient vigour and fecundity that she is not able to produce new ones, I may still be allowed to ask why granite was only used in obelisks or columns of a prodigious bigness; for if it were really a sort of stone or marble, I see no reason why we might not find small pieces of *it,* as well as of *porphyry* and other precious kinds of marble.

"These reflections, in my opinion, may serve to confirm the hypothesis of those who believe that all these admirable monuments were actually cast in a mould; and if they would take the pains to view this column attentively, they would soon be convinced by the testimony of their own eyes that 'tis only a kind of cement composed of sand and calcined stone, not unlike to mortar or lime, which grows hard by degrees."

Another century of modern civilisation rolled on, and then we find the celebrated traveller Dr. Clarke quite convinced that granite is a natural substance, and that hand specimens of it may be found by those who will search from country to country through the world; but yet so seldom met with, that he has all this trouble in explaining to London society seventy years ago what common rock material it is that he is talking about:—"By Greaves' Thebaick marble is to be understood that most

beautiful variety of granite called by Italian lapidaries *granito rosso* (see 'Forbes' Travels,' p. 226, London, 1776), which is composed essentially of *feldspar*, of *quartz*, and of *mica*. It is often called *Oriental granite*, and sometimes *Egyptian granite;* but it differs in no respect from *European granite*, except that *feldspar* enters more largely as a constituent into the mass than is usual with the *granite* of Europe. The author has seen *granite* of the same kind, and of equal beauty, in fragments, upon the shores of the Hebrides, particularly at Icolmkill."

Sixty more years of modern civilisation passed away. Macdonald at Aberdeen had by that time taught his countrymen how to work in polished granite, both red and grey, far and wide over Scotland. From tombstones to brooches, and from banks and insurance-offices to kettle-holders and ear-rings, cut granite (poured forth since then without any stint both by the pale Queen of the North and her blushing sister of Peterhead) is now used on every side; until all society, and the children too, talk as glibly in these our days about the once awfully mysterious tri-speckled stone, "as maids of thirteen do of puppy-dogs." And yet the thing is not plain to all our educated gentlemen even yet.

When, for instance, my wife and I were living through several months in a tomb of the eastern cliff of the Great Pyramid hill in 1865, a Cambridge man, with a most respectable name in science, and a sage-looking, experienced, head of iron-grey hair, called upon us and remarked, to the lady too, who knows a great deal more about minerals than I do, "What a fine *granite* cavern you are living in." Granite, indeed! poor man! when the petrified nummulites were staring at him all the time out of the naught but limestone on every side! And other travellers within the last few years have confidently talked of having seen granite in the entrance

passage of the Great Pyramid, granite in the subterranean chamber, granite forming the casing-stone heaps outside, granite, in fact, anywhere and everywhere, and basalt dykes in the Pyramid hill too, though in a country of pure nummulite limestone.

They, however, being free and independent writers, cannot be easily interfered with; but will my readers at least excuse me for insisting upon it, that for any would-be pyramidist scholar it is a most awful mistake to say granite, when he means limestone, or *vice versâ;* and to see limestone, where the primeval architect went to infinite pains to place granite. To talk thus interchangeably of the two is, indeed, over and above saying the thing that is not in mineralogy, over and above too taking hard for soft, and soft for hard; Neptunian for plutonian; repletion with traces of organic existence for naught but crystals that never had a breath of life in them,—it is also on the part of such individual a depriving himself of the only absolutely positive feature that he can, or should, speak to in all pyramid inquiry; as thus:—

Questions of angle, line, and measure of weight are all questions of degree of approximation only; or of limits of approach to a something which may never be actually touched, or even defined. But if nummulitic limestone cannot be distinguished absolutely from red granite, without our being told authoritatively, by university scholars, that one of those substances glides so insensibly into the other, that no man can say with confidence where one begins and the other ends—the age for interpreting the long-secret interior of the Great Pyramid has not yet arrived.

But I will not consent to any such state of mind afflicting the readers of this present edition of 1873; and would rather, with them, as one amongst friends and equals and often betters, request their attention

(before returning again to the coffer in the King's Chamber) to a prevailing feature of the manner in which the Great Pyramid makes its chief use of this rock, of so many colours and strange traditions, granite.

There is granite in the Great Pyramid, and granite in various small pyramids; yet so far from their being therefore alike, it is on that very account, or by that very means, that most difference may be detected both in their designs and even in the very minds of their designers.

Take the third pyramid as an example; the world hailed it as the "Coloured Pyramid;" coloured, forsooth, because its casing-stones more than half-way up were of red granite. That that little third pyramid was therefore more expensive than the Great one, all its friends admit, and even boast of: but what else did it gain thereby? Lasting power, is the general idea; because granite is so proverbially hard. But, alas! granite, besides being hard, is also so very brittle on account chiefly of its tri-crystallization, and so largely expansible by heat, that under the influence of a hot sun by day and cold sky by night, it loosens and crushes minutely the materials of its own surface to little pieces, film by film, and age after age—until now, after 3,000 years, those hard granitic casing-stones of the third pyramid are rounded into pudding shapes, which can hardly indicate the angle they were originally bevelled to, within a handful of degrees. Yet the softer, and fair, white limestone which was chosen for the casing-stones of the Great Pyramid (a variety of limestone found in the Mokattam hill on the east side of the Nile), and which was begun to be exposed to the weather before the third pyramid or its builders were born, has, joined to that softness, so much tenacity, smallness of heat expansion, and strong tendency to varnish itself with a brownish iron oxide exudation, that it has in some instances pre-

served the original angle of the casing-stones within a minute of a degree, and their original surface within the hundredth of an inch.

But *because* the Great Pyramid architect found limestone to answer his purpose for casing-stones, did he therefore use it everywhere? No, certainly not. He knew it to be too soft to keep its size and figure in places where men do tend to congregate; and where strains and wear and tear may accumulate, and have to be strenuously resisted. In and towards the centre, therefore, of the whole mass of the Great Pyramid, where strains do increase and the treasure was supposed to be kept, and where Caliph Al Mamouns in one age, and middle-class passengers from steamers in another, rush in to see what they can get,—there its architect began, and in a very special and marked manner, to use granite in place of limestone. And in that deep and solemn interior, where he did so use it, there was no sun to shine and heat up by day, no sky to radiate cold at night, as at the casing-stones of the third pyramid; but only darkness and a uniform temperature from year to year, and century to century.

There was, therefore, no tendency in granite to separate its component crystals there; but very great necessity for its hardness to resist the continual treading, hammers and mischief-working by the countless visitors of these latter days. For the granite portion of the Great Pyramid (excepting only the portcullis blocks at the lower end of the first ascending passage) begins in the so-called ante-chamber apartment, through which those visitors must all pass, in order to reach that further and final King's Chamber wherein the employment of granite culminates: and wherein is to be seen standing loose and movable on the open, level, granite floor that pyramid coffer, or long and high granite box, which is still awaiting our further examination.

CHAPTER VIII.

WHY OF THAT SIZE?

IF we grant, temporarily, for argument's sake, that the long rectangular box, lidless chest, or open granite coffer, in the King's Chamber of the Great Pyramid was intended by the precise, measured, amount of its cubic contents to typify, as Mr. Taylor has suggested, a grand and universal standard of capacity measure—can any reason in nature or science be shown, why it should have been made of that particular size and no other?

In a later age the designer of such a vessel would have been hampered by custom or led by precedent; but in the primeval day of the foundation of the Great Pyramid, who was there then to control its architect; or from whom could that truly original genius have copied anything; or what was there to prevent his making the coffer of any size he pleased?

Of Scientific References for Capacity Measure.

The affair of the wherefore of the coffer's precise size is indeed a question of questions, for there is no ready explanation lying on the surface; and the subject, viewed as one of capacity and weight measure, is capable of such peculiar perfectionings and remarkable refinements, that we may have to dig extremely deep before discovering the real reason, if it is there.

Not that modern nations have shown a very particular care for the teachings of science, or extensive acquaintance with nature either, in ordering for themselves the size of their several standards of *capacity* measure, having generally left this one standard to something like arbitrary fancy; and seeming even still to think the subject either a vulgar and publican matter, or one ruled altogether by their own more scientific proceedings in *linear* measure. Thus, the late eminent Francis Baily, in his report on the standard scale of Great Britain,* says, after a magnificent introduction in favour of the importance of permanent standard measures, "such measures are usually divided into those of *length*, *capacity*, and *weight*; but as the two latter may in all cases be deduced from the former, it will be necessary to consider only measures of length;" and measures of length are accordingly the only ones which he cares to take notice of in that very large and learned paper.

French Metrical Reference for Capacity Measure.

Not very dissimilarly too, did the French philosophers act when establishing their metrical system; for after having scorned—in the cause and for the sake of accuracy—to adopt a *short* natural unit for linear reference, such as the second's pendulum, lest in applying it to long distances errors should creep in by continued multiplication; and having insisted on taking there a *long*—that is, an earth large—natural unit, and obtaining, what they required in practice subsequently, by continued subdivision (in that manner producing their metre out of the measured meridional distance from pole to equator), they went

* "Royal Astronomical Society's Memoirs," vol. ix.

the very reverse way to work in obtaining their units of capacity and weight.

To procure these upon parallels to their "linear" principles, they ought evidently for the one, to have subdivided the capacity of the shell of the earth; and for the other, to have similarly divided the weight of all the matter, whatever it is, that fills or occupies that shell of the earth, and gives it on the whole that general mean specific gravity, which is better adapted than anything else known to man to be his grand cosmical unit for the physics of universal matter. But they attempted neither the one nor the other.

They did not even employ their metre itself in the large, in this part of their metrology, and necessarily adopt thereby a good honest size for their capacity and weight standards—which they would then have been less extravagantly multiplying, in the common affairs of daily life; but, as every one knows, they took the 1-10th part of the metre, cubed, for the capacity measure; and filled the 1-100th part of that with water for their ridiculous little unit of weight measure—a something so small that a poor countryman wishing to weigh his daily load therewith, can hardly either see or feel it: while the learned doctors themselves, in speaking of, and recommending, it as a universal standard of weight to the practical world, have to break through all their artificial scheme of nomenclature; and, while presenting their *mètre* pure and simple, are obliged to multiply their *gramme* by 1,000; introducing it indeed into the units place, but with the name of *kilo*gramme. Wherefore even now in Italy the metrological combat is between the old Roman foot and pound on one side, and on the other the modern French metre and *kilo*gramme; shortened however by the country-people into "metre" and "kilo," to the still more inextricable confusion of the proprie-

ties of a too learned, as well as too narrow, attempt to coin new names.

The French Academicians had, no doubt, a something in their little mite of a "gramme" which could be referred, through both the metre outrageously minified, *and water* when in a curious condition very difficult to hit upon and keep it to—viz., its maximum density at a little above freezing—to that one element; and not a very large one, in the size of the whole earth. But if there was such extraordinary mental satisfaction previously felt at the metre, a linear human measure, being a neat commensurable fraction of a linear length along a quadrant of the earth—and poor Englishmen have had this flaunted and flouted in their faces for fifty years past, until at last it has been proposed * to abolish the British hereditary measures in favour of the new French inventions, because the former are so utterly unscientific, and the latter so perfectly replete with science—why should there not be mental satisfaction also, when a capacity measure in some way gives us a neat commensurable fraction of the capacity of the earth; or at all events reminds us of its shape and capacity-giving power: and when a weight measure gives us a similar proportion of what is even more important in nature, and special to our terrestrial globe; viz. the weight, or what goes practically to make what is by persons in general called the weight, of the earth as a planet in space?

There may, indeed, be some remarkable difficulties in the way of accomplishing this reference; for not only are the arrays of numbers appalling, but there may be some logical doubt as to how to proceed in comparing a weight on the surface, against the weight of each equal portion of a sphere, whose own attraction it is

* President's opening address to the British Association, Newcastle, 1863.

which gives all the appearance of weight to anything laid upon it. The affair is difficult, and perhaps of a transcendental character: yet not more so than, according to many eminent men, with able mathematicians amongst their number, are various other scientific problems already accomplished in the service of modern civilisation. In the meanwhile, too, the earth *has* a weight, or mass; and not only so, but it is precisely the grand French metrical school of mathematical astronomers, who care not a straw for the *visible size* of sun, moon, or planets. They want only to know their mass as a term in an equation; and then, having obtained that, they proceed in all their admirable calculations—where so few of us can hold pace with them—for the orbital movements of those planetary bodies under the influence of gravity, as though the mass were concentred, in the case of each separate sphere, into an infinitely small point at its centre. To them, the high-class French mathematicians, in sad truth it is almost an impertinence to be told by the telescope that the substance of a planet is expanded into a globe of such or such a size in miles; or into one large and several small globes as attendant satellites. These great men want only to know the weight of the matter contained in each system, simple or compound, reduced to a point or points, together with certain distances asunder, and then they will set their equations in array, and compute you any length of orbital consequences.

Why, then, did not those confessedly most acute and extraordinarily able men, when preparing a completely new metrological system for France (and, as they hoped, for the world through France), give us some symbolization or expression in harmonious commensurabilities of that which is astronomically far more important than a sphere's linear measure, and is already a term in their immortal equations, viz. the weight or mass of the earth as a whole?

Perhaps they did not think of it; or if they did, perhaps they could not devise any means of accomplishing it. Certainly they did not do it, nor has any one else amongst men done so, throughout all the historical period of science and the reign of the schools.

Is it worth while, then, to examine the Great Pyramid of 4,040 years ago, to ascertain if a practical solution was made and enshrined there in a material or substance undoubtedly *ære perennius*, and older than Abraham, though only recently brought to the light of human life and thought?

Not altogether fair, perhaps, to expect it; but somehow, from the unique and unprecedented character amongst human works which the whole of this gigantic mass of pure masonry of the Great Pyramid, unvitiated by any idolatrous design, is taking, on being submitted to the searching examination of the science learning of modern times, we have begun to look for high things from every part of it. At present, however, we have merely to inquire why, for any reason whatever, was, or may have been, that smooth-sided and rectangular granite box, the coffer, made of the particular size, exclusive of shape, which we now find it to be?

John Taylor on the Origin of the Coffer's Capacity Size.

On opening Mr. Taylor's valuable work* with reference to this question, we may see that he had—and quite characteristically of so invaluable an author—*expected* that his reader would require some explanation of this matter. But after perusal, I regret to say that what he has written on the subject, being on the furthest confines of his researches and discoveries into the Pyramid mystery, has not, for me at least, his usual powers of satisfying, if even he was content with

* "The Great Pyramid," p. 195.

it himself. He shows, for instance, that the cube-root of the contents of the coffer is equal, very nearly, to the length of a certain ancient Egyptian double cubit in wood, found accidentally some years since, on pulling down an old temple at Karnak; thence called the cubit of Karnak; and believed now to have been one of the veritable mason's measures by which the profane buildings of that day were measured and set out.

Not, indeed, that Mr. Taylor would imply that that rod was either the original standard, or the Government copy thereof belonging to the Pharaoh of that day, or indeed any standard at all: or that a measure exactly equal to it was first used in, and therefore characteristically belonged to, the Pyramidically distant and most idolatrous city of Karnak. But without, so far as I can find, putting anything much more distinct than the above into its place, as the reason why the founders of the non-idolatrous Great Pyramid chose to make their coffer of its actual size in cubic contents, he goes off into a disquisition on its shape—an interesting disquisition also, but on a much less important question, if the subject really be one of a *capacity* standard and measure.

That the coffer should be oblong-rectangular in place of simply cubical, Mr. Taylor thinks a matter of symmetry and convenience; expressly saying at page 197 of his "Great Pyramid,"—"But why, it may be asked, was not the coffer made at once in the shape of the cube of the Karnak cubit? From its obvious unfitness, if it were of that shape and size, to serve as a *model measure*. The framers of the standard would naturally have regard to the portability and convenient use of the wooden capacity measures which were to be founded on that model; and if men of the present day would prefer the shape of a (rectangular) *trough* to that of a cube of such inconvenient dimensions, we

may give the founders of the Great Pyramid credit for so much common sense as would lead them to the same conclusion. To all the inhabitants of the East the *hot bath* was a familiar object, and in the appropriation of its form to the purpose of a *corn measure*, we see how it happened that this vessel received the name of *caldarium*, *chaldron*, or *laver*. It was that which it had possessed from the earliest times, long probably before its employment as a *corn-measure* had been thought of."

Joseph Jopling on the same.

Next after studying Mr. Taylor's account, I chanced to fall in with a recently published paper,* which promised great things, and began most admirably thus :— "In what is called the King's Chamber of the Great Pyramid of Egypt, there is a coffer of porphyry (granite really) commonly supposed to have been the sarcophagus of the royal builder. This coffer, however, does not resemble an ordinary sarcophagus, and its form presents numerous definite and peculiar proportions, so that it is impossible to conceive the structure to be accidental. Having found the proportions geometrically accurate, the author of this paper believes that this coffer is a treasure-chest of science, and that its proportions deserve careful observation and study."

Then followed a theory, based on "squares inscribed, or to be inscribed, in the circles of the human eye," as a nearly invariable natural reference of length in man, from childhood to old age (conveniently small for a popular unit, but very difficult, and highly dangerous to the subject either to take off with the points of a pair of compasses, or to apply directly in practice)— and some very astonishing results were brought out,

* By Joseph Jopling, architect, in the *Leisure Hour*, 1863.

in the play of arithmetical numerations, by themselves. But on adopting the given size of the unit, and the number of them stated to exist in the length, breadth, and depth of the coffer according to the geometrical formula, and comparing them with actual coffer measures—the results were far wider than most of those which we have already found it necessary to condemn, as not representing observations of the fact. Mr. Jopling's arithmetic is indeed one thing, and the coffer in the King's Chamber of the Great Pyramid quite another.

Hekekyan Bey and M. Dufeu on the same.

After this, a more remarkable volume came up for study; a book printed privately in 1863, by "Hekekyan Bey, C.E.,* of Constantinople, and formerly in the Egyptian service." It is entitled, on the "Chronology of the Siriadic Monuments," and contains a large plate of the sectional interior of the Great Pyramid (not very good), and an allusion to the coffer, under the name of "The *King's Stone*,† *deposited by the Arions in the sanctuary of the first Pyramid, as a record of their standard metric system.*" In so far as that the book shows an Eastern mind breaking through the tyrannical Western hypothesis of a burial sarcophagus and *nothing else*, it is well; but the method of deducing a value for the profane Nile cubit out of certain arbitrary propor-

* The author enjoys the following favourable introduction in Mr. F. Sopwith's "Notes on Egypt," 1857:—"We next called on Hekekyan Bey, who occupies a spacious and handsome house in the same locality, near the north-west corner of the Place Esbekeeh. Hekekyan Bey spent some thirteen years in England in early life, and thus acquired a perfect knowledge of the language and institutions of the country. I greatly enjoyed his conversation, which embraced several subjects of national interest, and his general opinions and sentiments appeared to be those of an enlightened citizen of the world."

† Early writers were particular in notifying that the coffer was cut out of a single block of stone; but this present name is a more peculiar designation of it, and may indicate a tradition of its having something of a special hidden virtue, recalling the fabled "philosopher's stone."

tions of both the outside and inside measures of the said King's Stone, is clumsy in a scientific point of view; overlaid with masonic mysteries; and discloses no better knowledge of the real dimensions of the coffer, than those taken by Greaves 240 years ago: measures thus reproduced in Egypt without any of those necessary subsequent corrections for the length of their standard scale, or investigations of Greaves' large errors in the granite box's outside elements of size, which have led long since to grave discussions at home. The author, in fact, though living, and flourishing too, in a wealthy social position in Cairo, with the Great Pyramid in view from the top of his house, knew nothing of the coffer by personal measure; his acquaintance with it was confined to the pages of an English book more than two centuries old!

In the course of the present year (1873) the ideas of Hekekyan Bey, in an extended shape, have been published to the world, as perfectly new to it, by M. Dufeu, member of the Egyptian Institute, and of the Society of Historical Studies in Paris. This work is distinguished from its very title-page (where it speaks to "the *four* Pyramids of Jeezeh") by special ignorance of pyramid facts; and on page 231, where its author maintains the hollow box of the coffer to be merely a form given to the cubit of the Nilometer, he makes *me* a partaker of Mr. Jopling's numbers, though I have always eschewed them; quotes Professor Greaves as though he were a very modern authority; and finally pretends to give a set of measures of his own. Pretends, I say advisedly, for when he puts down every element of the coffer's size to the ten-thousandth of an inch, he cannot be excused either for making several errors amounting to one and two whole inches;* or,

* See *Quarterly Journal of Science* for October, 1873, pages 511 to 515.

much worse, for having failed to discover ruling and original features of the vessel itself, of more importance than many inches, as will presently appear.

The Freemasons on the same.

Freemasonry also, notwithstanding its boastings of secret wisdom fit to scale the skies, seems to lead no nearer to a knowledge of the metrological objects and ideas of the coffer, than anything connected with the idolatrous religion of the ancient Egyptians; and to all that side of the world, there has ever been an impenetrable darkness touching the real nature of the ultimate purposes aimed at by the symbolical, and we may almost say, professionally scientific, design of the Great Pyramid.

Wrote a Grand Secretary of the Freemasons to me, from Cornwall, after my return from Egypt in 1865, "I am going to publish a book of our masons' marks, of all ages and countries; and as we hear that you have been taking some wonderful photographs of the King's Chamber in the Great Pyramid by the magnesium light, I write to know if any of these marks appeared upon either the walls or the coffer?"

"Don't *you* know whether there are, or are not, any there?" I ought to have asked, in the interest of all the world outside the Lodges; but in over-haste to give satisfaction to my correspondent, if possible, I merely inquired,—"What are Freemasons' marks?"

He sent a number of them in a letter, adding that they were unfailing proofs, wherever they were found, of the ancient presence of the thrice-mysterious craft; and that Mr. Layard, having had his attention once duly awakened to them, found them most numerously in the Assyrian buildings excavated by him in Mesopotamia.

But I could only reply, that neither microscopic

examination of the glass photographs, nor eye-examination of the walls of the King's Chamber at the Great Pyramid, would show one of those particular marks. The Freemasons had in so far, on their own showing, had no hand in raising that sacred and pure building, whatever they had been doing in subsequent ages for idolatrous Assyrian kings and their fish-gods or any other.

Yet the photographs showed other marks on the walls of the chamber clearly enough; and amongst these there was one group in particular that *would* appear most conspicuously in every view of the coffer. The walls of the King's Chamber which formed the background of each coffer picture, being not only dark, and red, but also far from the magnesium illuminating light, were generally almost absolute black in the photographs; yet letters cut on these walls by hammer and chisel developed whitish lines of abraded and powdered crystals, which caught enough magnesium light to make themselves visible in the photographs and appear even luminous; and then too, they were seen mysteriously floating in space beyond the coffer, when viewed in the stereoscope. It was just the sort of effect that Freemasons might perhaps have coveted for the glorification of *their* marks, but it was all expended, in the principal instance here, on the mere ordinary Saxon letters, J. W., the initials of some recent visitor.

So *there* was a valuable fact ascertained by negation. There are no Freemasons' marks in the very part of the Great Pyramid where they might have been most expected, had wandering mysticists been allowed any hand in the work; while, even if the trifling little marks sent me by the Grand Secretary *had* been found there, who could have guaranteed that they were not put in long after the building of the monument, like those letters J. W.; by some cousins of that genius, or by

J. W. himself, or perhaps by a certain vulgar Russian-German, near the beginning of the present century, whose name I will not repeat, because he painted the jaw-cracking word on those exquisite walls of polished granite, in letters a foot high, with a tar-brush!

Had the secrets, therefore, of the Great Pyramid been inscribed in mere, little, cut-in writing on those chamber walls by their ancient architect,—as inscription antiquaries so often lament was not done in the orthodox Greek and Roman fashion,—*who* would be able undoubtedly to distinguish the ages of each inscription: and, if the original inscription had not been perhaps in subsequent ages altogether expunged, prove that it *was* the original one; that it was coeval with the building; and that it must be accepted eventually by all mankind, even though its message entails consequences subverting most of the critical philosophy, or philosophical and historical criticism, of modern times?

The Ledge Anomaly of the Coffer.

The Pyramidist scholar, however, most fortunately, is not called on to pin any faith on fleeting inscriptions; trifling little things which many a man in any age may cut in, and many a man in any age may remove or pervert, though none of them should be able either to build up, or to throw down and carry away the Great Pyramid. But when the same Pyramidist scholar advances from grandest facts of masonry (mechanical, and of the Pyramid, not the "Free" falsely so called) to this coffer of the King's Chamber, a loose, almost portable vessel, and necessarily small, some startling difficulties are met with. And yet eventually he may find, that well measured facts joined to advanced theoretical science will enable him to prove satisfactorily to himself, in spite of all obstacles, for what purpose the ancient architect made that vessel, and for what he did not.

How astounded, for instance, was not I, on first visiting the coffer in January, 1865, to find that, though sure enough, that remarkable vessel was still in the King's Chamber—that no art thieves (whether Earls of Belmore or plebeian Belzonis) had carried it off to sell to a distant museum—yet there was actually a ledge for a lid, cut out of, or into, the substance of the top of the sides, of what had been styled proverbially for ages the "lidless box, or open chest, of stone."

Compared with this discovery, it was nothing that the vessel was chipped and chipped again on every possible edge; that the south-eastern corner was broken away by fresh hammer fractures to an extent of eight or ten inches *more* than it was in the days of Colonel Howard-Vyse. But that ledge cut out, when was that introduced?

In the first edition of this book, in 1864, I had ventured to publish a plate of the coffer; and strove, in mere lithography, to make it look as neat, trim, and symmetrical a long and, both originally and intentionally a lidless, box as it is represented in the first-class line engravings on copper of the great French work on Egypt which I copied; and no critic or reviewer breathed a suspicion of there being any error *then*. But as soon as I had gone a pilgrim to the Great Pyramid, I myself was the first to discover the consequences of having once put full trust in the French Academy! I had told the world in 1864, on the credit of that immortal Institute, that the coffer had no ledge for a lid; but in 1867, I not only, as in duty bound, untold that, upon my own observations at the place, but left no sort of doubt by descriptions, measurements, drawings, and photographs, that there was a ledge, and of such and such a shape and size. And when I further found that it had been marked on a small scale in Perring's views of the Pyramids published in 1840, I announced that also,—and *then* were the critics stern and unfor-

giving upon me for what they called "my" erroneous figure of 1864; while they said not a word touching the grander plate from which that figure was copied with all acknowledgment, or their own ignorance until instructed by my second publication.

Yet it would form a very pretty piece of literary disputation, to argue out the date of that ledge on the coffer, from the earliest datum afforded by high modern scientific authority; for that is the Egypto-French Academy, of 1799, which represents no ledge as then existing: or again, to try to arrive at a numerical expression of the limits of respect due to *any dictum* of the French Academy in future, from the degree of divergence between what they published as their own testimony touching the appearance of the coffer at the beginning of this century, and what we may assure ourselves it must really have been then, from what we find it to be now.

The French observed Depth and Height Anomaly also, in the Coffer.

A thoroughgoing essayist would likewise append to the above subject a collateral glance at M. Jomard and his brother Academicians in Egypt, for having further made both the inside depth and outside height of the coffer some three inches too great; although generally professing to measure, and sometimes succeeding, to an accuracy of a hundredth of an inch.

The testing of this "French depth" matter was one of the first coffer measurings that I made, on seeing the vessel in 1865; and the rude answer came out instantly, in whatever way the question was tried, "French Academy's measures of height and depth 3 inches too great;" and when, after some weeks' further acquaintance with the coffer, I took magnesium light and photographic

apparatus into the darkness of the King's Chamber, my measuring-rods (specially prepared for the purpose at the advice of Mr. Joseph Sidebotham, of Manchester), were photographed standing side by side with the coffer, and showed some 3 inches less of height and depth than the once supposed unquestionable measurement of the *savants* of France, then the intellectual ruler of nations.

But might possibly the tops of the sides of the coffer have been in a different state in 1799 to what they are at present? Could they have been then three inches higher than their highest part is now? and could some one since then have feloniously cut *off* three inches from the top of the coffer all round, and have cut *in* the ledge for a lid at the same time?

Perring's views show that the action must have taken place, if at all, before 1837; and from 1799 to 1837 was not prolific in clever granite cutters anywhere, least of all too in Egypt; and even if such men could have managed it outside the Pyramid with the advantage there of plenty of time, air, space, and motion, could they have accomplished it inside the King's Chamber in darkness, heat, want of fresh air, and the banditti-like surveillance of an irrepressible rabble of free and independent Pyramid Arabs?

Besides that, too, the limits of those 3 inches, or 2, or 4, open up a differential impossibility in the Pyramid itself. The doorway of the King's Chamber, 100 inches thick in solid, polished, unyielding granite (ceiling, floor, and walls), is only 42 inches high, and 41·3 broad. The coffer, therefore, of its present height, and without any lid whatever on the top of it, being in that lidless state 41·27 inches high, can only just pass through, with the fraction of an inch to spare. But if it were of M. Jomard's, and the Academy's, and French Government's published height,—viz., 44·77 inches,—just fancy! Why, even if they were all to clap on together,

on one and the same hawser, they could never pull the grand old rigid monolithic granite coffer through a solid granite doorway two and three-quarters inches less in height!

Confession of Error in the First Edition of this Book, and attempt to amend it.

But leaving the origin of such mistakes, and the disinclination in public bodies to confess them afterwards, —to those so quaintly called by our early *savants* "the curious," I will write down with all penitence that there was serious coffer-error in my first edition of "Our Inheritance;" and will endeavour to make up to all whom I then unwittingly misled upon literary information alone, by setting before my readers here what size, shape, and condition I found the coffer in, in 1865, and how the inquiry was conducted. The following is, therefore, an extract from my book, "Life and Work at the Great Pyramid," published in 1867, and now revised, in order to introduce some later observations and corrections, by Dr. Grant, and Mr. Waynman Dixon, C.E.

THE COFFER, MEASURED IN BRITISH INCHES.

MARCH 20—23, 25, 1865.

This vessel, the sole contents of the King's Chamber, and termed, according to various writers, stone box, granite chest, lidless vessel, porphyry vase, black marble sarcophagus, and coffer,—is composed, as to its material, of a darkish variety of red, and possibly syenitic, granite. And there is no difficulty in seeing this; for although the ancient polished sides have long since acquired a deep chocolate hue, there are such numerous chips effected on all the edges in recent years, that the component crystals, quartz, mica, and felspar, may be seen even brilliantly.

The vessel is chipped around, or along, every line and edge of bottom, sides, and top; and at its south-east corner, the extra accumulation of chippings extends to a breaking away of nearly half its height from the top downwards. It is, moreover, tilted up at its south end, by a black jasper pebble, about 1·5 inch high (such pebbles are found abundantly on the desert hills outside and west of the Great Pyramid), recently pushed in underneath the south-west corner. The vessel is therefore in a state of strain, aggravated by the depth to which the vertical sides have

been broken down as above; and great care must be taken in outside measures, not to be misled by the space between some parts of the bottom and the floor.

As for the under surface of the bottom (speculated on by some persons as containing a long inscription), I felt it, near the south end, with my hand; and tried to look under it also, when a piece of magnesium wire was burning there,—without being sensible of any approach to hieroglyphics or engraving. But as to the inside, or upper surface of the bottom, and also the vertical sides of the vessel, both inside and out,—all the ancient surfaces there, are plainly enough polished smooth, and are without any carving, inscription, design, or any intentional line or lines; they are also, all of them, simple, plain, and flat (sensibly to common observation); excepting only the top margin, which is cut into in a manner implying that a sarcophagus lid once fitted on, sliding into its place from the west, and fixable by three steady pins, entering from the lid into holes on that side.

The west side of the coffer is therefore lowered all over its top surface, except at the north and south ends, by the amount of depth of such ledge cut-out, or 1·72 inch; and the other, or east, north, and south sides are, or should be, lowered to the same depth *on their inner edges*, and to a distance from inside to out, of 1·63 inch. But the fulness of this arrangement cannot be seen now, because in some places, both ledge and top of sides are broken away together; and in others, though much of the inner base line of the ledge remains,—thanks to its protected position,—the upper and true surface of the coffer's side has all been chipped away. In fact, it is only over a short length near the north-east corner of the coffer, that the chippers have left any portion of its original top edge. And a cast of that corner recently taken by Mr. Waynman Dixon, shows, as compared with my photograph (and also with the frontispiece to Vol. I. of my "Life and Work"), that a further portion of the side's top-surface, indeed an awfully large conchoidal-shaped slice, has disappeared since 1865.

The whole question, therefore, of the full depth of the coffer, rests on one very small portion of the north-east wall, so to speak, of the coffer; a portion too which becomes smaller and smaller every year that we live.

Only at that north-east corner too, is there an opportunity of measuring the vertical depth between the ancient top surface of a side, and the bottom surface of the *ledge;* and it was, by repeated measure, found by me = from 1·68 to 1·70 and 1·75; say mean = 1·72 inch.

The sides of the ledge depression appeared to me to have been vertical, or without any dovetailing: and the horizontal base breadth of such cut-out,—measuring from within, to, or towards, the "without" of the coffer,—and restoring the sides to their original completeness before the chipping away of the edges,—is,—

On and near	Western portion of Northern side .	=	1·65
„	Middle „ „ .	=	1·62
„	Eastern „ „ .	=	1·73
„	Northern part of Eastern side .	=	1·55
„	Southern „ „ .	*all broken.*	
„	Eastern and Western parts of Southern side	*all broken.*	
	Mean	=	1·63 in.

But this appearance of the coffer's ledge having been *rectangular*, has been, since my visit, successfully shown by Dr. Grant and Mr. W. Dixon to be a mistake. For although everywhere else all the overhangings of an acute ledge have been broken away to beyond the vertical, yet there is a small part left near the north-east corner, which speaks unmistakably to an acute-angled shape: not so acute as that of the sarcophagus of the Second Pyramid, but decidedly and intentionally on the acute side of rectangular.

Along the western side are three fixing-pin holes, 1·2 deep, and 0·84 in diameter, save where they are broken larger, as is chiefly the case with the middle and southern one. The three holes have their centres at the following distances from the north end; viz., 16·0, 45·3, and 75·1 respectively.

It is inconceivable how the French Academicians could have pictured the coffer, as they did, without representing anything of this ledge cut out; unless they looked upon it as a comparatively modern attempt to convert the original pure coffer into a sarcophagus, and which they were therefore bound to overlook.

OUTSIDE OF COFFER: ITS FIGURE.

The planes forming the four external vertical sides of the coffer, which have never yet been questioned by any other measurer, appeared to me to be far from true; excepting the east one, whose errors are under 0·02, or perhaps 0·01; while the north, west, and south sides are so decidedly concave as to have central depressions of 0·3 and 0·5 inches; or more particularly—

At North side, central hollow or depression of coffer's side (measured from a horizontal straight-edge touching the side at either end, and in a horizontal plane), or the quantity of central *depression*, near bottom	=	0·45
Central *depression* near middle of height . .	=	0·20
„ top	=	0·12
Mean . . .	=	0·26 in.
At West side, central *depression*, near bottom .	=	0·35
„ „ „ middle .	=	0·15
„ „ „ top . .	=	0·10
Mean . . .	=	0·20 in.
At South side, central *depression*, near bottom .	=	0·28
„ „ „ middle .	=	0·18
„ „ „ top . .	=	0·10
Mean	=	0·19 in.

Again, when the straight-edge is applied *vertically* to the sides,—east side comes out true, but the others concave—

On North side, the maxima of such vertical depression or *d'*	=	0·20 and 0·28
On West side, *d'*, at South end	=	0·00
„ *d'*, at North end	=	0·20
And on South side, *d'*, at different distances from East to West	=	0·08, 0·12, and 0·04 in.

EXTERNAL MEASURES OF THE COFFER.

The corners and edges of the coffer are so much chipped, that the steel claws I had had prepared for the sliding-rods to adapt them from inside to outside measures, were found not long enough to span these modern fractures and reach the original polished surfaces. A method was therefore adopted, of making up the sides of the coffer with straight-edges projecting beyond it at either end; and then measuring between such straight-edges and on either side, or end, of the coffer.

LENGTH OF COFFER OUTSIDE, MEASURED WITH BAR 100 A.

	1st Measure.	2nd Measure.	3rd Measure.
On East side, near bottom . .	90·5	90·3	90·5
,, 10 inches under top	90·15	..	..
,, above top . .	90·20	..	..
On West side, near bottom . .	89·2	89·2	89·2
,, above top . .	89·95	..	..
,, near top . .	90·05	..	..
Mean length .	90·01	..	..

The above mean, however, represents only the mean length of the edges of the two sides, not of the whole coffer, on account of the concavity of the two external ends; wherefore, if we desire to state the mean length, for the mean of each end surface, we must subtract two-thirds of the mean central concavity, as previously determined; *i.e.* = 0·17 for the north end, and similarly 0·13 for the south end; wherefore, then, the mean length for mean of each end of coffer = 89·71 British inches.
= 89·62 Pyramid inches.

N.B.—An anomaly in the West side, near the bottom.

BREADTH OF COFFER, OUTSIDE.

	1st Measure.	2nd Measure.	3rd Measure.
At North end, near bottom . .	39·05	39·1	39·2
,, near top . .	38·7	..	..
,, over top . .	38·67	..	..
At South end, near bottom . .	38·8	38·7	..
,, near top . .	38·6	..	..
,, over top . .	38·5	..	..
Mean . . .	38·72	..	..
Correction for curvature of West side . . .	·07	..	..
Mean breadth of mean sides	38·65	..	..

Concluded breadth . . = 38·65 British inches.
= 38·61 Pyramid inches.

HEIGHT OF COFFER, OUTSIDE.

Height of coffer outside, eliminating the stone under bottom, and the sarcophagus ledge of 1·72; *i.e.* measuring from coffer-bottom to *extreme* ancient top of sides, is—

At North end, eastern part of it	=	41·3
Same repeated . . .	=	41·3
At North end, north-eastern part of it	=	41·22
At other parts no top left.		
Mean height	=	41·27 British inches.
		41·23 Pyramid inches.

Correction in *capacity* computations for a supposed hollow curvature of under side of bottom; agreeably with three, out of the four, upright sides; and also agreeably with the construction of the under sides of the casing-stones, which rest on their circumferences, on account of a slight hollowing away of their central areas; say . . . = ·10

Concluded capacity-computation height	=	41·17 British inches.
	=	41·13 Pyramid inches.

SIDES, THICKNESS OF.

For this purpose two vertical straight-edges higher than the sides were placed opposite each other, in contact with the inside and outside surfaces of any flank of the coffer, and the distance across was measured over the top edge of the coffer; finding at successive parts of the coffer circumference, bearing from centre—

South-south-west thickness	=	6.0
South „	=	6·0
South-south-east „	=	5·95
East-south-east „	=	5·85
East „	=	5·95
East-north-east „	=	6·10
North-north-east „	=	5·95
North „	=	5·98
North-north-west „	=	6·10
West-north-west „	=	5·95
West „	=	6·10
West-south-west „	=	5·95
Mean thickness of vertical sides	=	5·99 B. in.

The above measures were repeated on March 28th, and proved sensibly true for this method of measurement over the top edge of the coffer; but if calipered lower down, it is probable that a different thickness would have been found there.

BOTTOM OF THE COFFER, THICKNESS OF.

By difference of heights of two straight-edges of equal length, applied, one inside and one outside,—the outside one being further propped up where required by a third straight-edge, inserted under the bottom,—there was found—

Under South-west corner, thickness of bottom .	=	7·0	
„ East side „ „	=	6·6	
„ East-north-east „ „	=	6·87.	
„ East-north-east again „ „	=	6·90	
„ North end „ „	=	6·90	
„ North-north-west „ „	=	6·85	
„ North-north-east „ „	=	6·80	
„ West-north-west „ „	=	7·20	
„ West „ „	=	6·90	
„ South-south-west „ „	=	7·15	
Mean thickness of bottom around the edges (the thickness of bottom in the centre cannot at present be satisfactorily or easily measured) . . .	=	6·92 B. in.	

INTERNAL MEASURES OF THE COFFER.

The inside surfaces of the coffer seem very true and flat over the greater part of their extent; but betray, on examination by straight-edges, a slight convergence at the bottom, towards the centre.

INSIDE LENGTH OF COFFER, BY SLIDER 70.

(Correction + 0·13 added to all the readings for length of this Slider.)

Distance between East and West sides of the North and South ends.	Level at which observations were taken.			
	4 to 6 inches under top.	Middle of height.	6 to 7 above bottom.	0·6 above bottom.
Close to Eastern side .	Broken at S.-E. corner,	78·08	77·93	77·68
At ⅓d breadth from East	78·06	78·06	77·97	77·56
Halfway between E. & W.	78·06	78·08	78·06	77·53
At ⅔ds breadth from East	78·05	78·09	78·06	77·59
Close to West side . .	78·03	78·06	78·01	77·57
Mean at each level	78·05	78·07	78·01	77·59

Mean of the whole, or the inside length of coffer . . . = 77·93 British inches. = 77·85 Pyramid inches.

INSIDE BREADTH OF COFFER.

(By Slider 25, not requiring any correction.)

Distance between North and South end, along the East and West sides.	Level at which observations were taken.				
	Near top.	Near middle.	6 to 7 above bottom.	0·6 above bottom.	0·6 re-measured.
Close to North end .	26·68	26·69	26·65	26·40	26·39
At ⅓d length from N. end	26·60	26·69	27·00	26·72	26·54
Near middle of length .	26·64	26·80	27·10	27·05	27·05
At ⅔ds length from N. end	26·67	26·78	26·77	26·67	26·75
Close to South end .	26·78	26·78	26·63	26·49	26·49
Mean at each level	26·67	26·75	26·83	26·67	..

Mean of the whole, or the inside breadth of coffer . . . = 26·73 British inches. = 26·70 Pyramid inches.

INSIDE DEPTH OF COFFER.

The measure of this element is taken from the inside bottom of the coffer,—which is apparently smooth and flat,—up in the shortest line to the level of the original top-surface of the north, the east, and the south sides; and of the west side also, *presumably*, before it was cut down to the level of the ledge which runs round the inner edges of the north, east, and south sides, and all across the west side's top.

Now, the depth of that ledge was before ascertained = 1·72 inches below the original top; a block of wood was therefore prepared of that thickness, and placed on the west side, and also on the base-surface of the ledge wherever found on the other sides, to support one end of a straight-edge, whose other end rested on some part or parts of the original top of the coffer's sides, which are still visible at and about the north-east corner.

INSIDE DEPTH FROM ORIGINAL TOP OF NORTH, EAST, AND SOUTH SIDES.

(By Slider 25, not requiring any correction.)

Part of Length where observations were taken.	Part of breadth where observations were taken.			
	Near East side.	Near middle.	Near West side.	Mean at each part of length.
0·6 south of inner N. end . .	34·30	34·28	34·26	34·28
3·0 south of inner N. end . .	34·44	34·36	34·35	34·38
5·0 do. do. . .	34·42	34·41	34·28	34·37
10·0 do. do. . .	34·40	34·38	34·28	34·35
24·0 do. do. . .	34·36	34·38	34·26	34·33
Mean at each part of breadth	34·38	34·36	34·29	34·34

General mean, or the inside *depth* of coffer . . . . . = 34·34 British inches. = 34·31 Pyramid inches.

COFFER, FURTHER INSIDE MEASURES OF.

DIAGONALS.

Diagonals inside the north end; from either low corner at bottom, up to a measured height of 30·0 inches, *i.e.* the greatest height quite free from fractures; then—

From low North-east to 30· high North-west = 39·71 British inches,
and from low North-west to 30· high North-east = 39·70 „

Diagonals inside west side; from either corner below, up to a height of 30 inches measured at the sides—

or from low South-west to 30· high North-west = 83·19 British inches,
and from low North-west to 30· high South-west = 83·13 „

CUBICAL DIAGONALS.

From low South-west to 30· high North-east = 87·13 British inches,
„ South-east „ North-west = 87·05 „
„ North-east „ South-west = 87·06 „
„ North-west „ South-east temporarily supplied = 87·11 „

These cubical diagonals give sensibly less than the diagonals computed from the lengths and breadths; on account, apparently, of the extreme points of the corners of the bottom not being perfectly worked out to the exact intersections of the general planes of the entire sides. But they seem abundantly sufficient to prove general rectangularity of figure, in all the main part of the coffer's interior.

The Sarcophagus Theory of the Coffer.

With all this additional information, then, touching the actual size of the coffer, let us take up once again that vexed question of "why of that size?" and on our so doing we must, of course, let the Egyptian sarcophagus theory be heard over again, especially when it has something to say touching shape as well as size.

The inside dimensions of the coffer *being* by our own measures (roughly) 6·5 feet long, 2·2 feet wide, and almost 3 feet deep, are at least long enough and broad enough for a coffin; and if rather deeper than convenient or necessary, I will not object to that, as there is now proved to be a ledge cut into the top of the vessel, and quite suitable for a lid.

As there *is* a ledge, an intention to put on a lid may or must be inferred; but it is still to be proved whether a lid ever was put on, especially for sarcophagus purposes; because, first, with a sarcophagus lid of the ordinary style and thickness fastened into that ledge, the coffer could not have passed through the closely-fitting doorway of the room; it would have been several inches too high. Second, a sarcophagus lid fastened into that ledge would have betokened the accomplishment of the last rites to the dead; and they would have included among all Eastern nations, but more especially the profane Egyptians, the engraving the deceased's name, titles, deeds, and history on the coffer, both inside and out; but there is nothing of the kind there; so the coffer remains still the smooth-sided, vacant, lidless chest of old Al Mamoun Arab tale; quite capable of having been made at any time into a sarcophagus; but never so made or converted, whatever may have been the reason why or wherefore.

Considering, however, the coffer's approximate shape, size, and situation, I am quite ready to allow it to be "a blind sarcophagus;" viz., a deceiving blind to the eyes of the profane Egyptian workmen, as well as a symbol sarcophagus to others, reminding them of death, judgment, and eternity (as well taught by William Simpson, artist); but without thereby interfering one iota with its further more exact objects and intentions.

And what are they?

Only look at some of them, as the vessel tells them off itself in number and measure, and see features thereby which cannot be accidental; features which have never been heard of in any other, or mere, sarcophagus; and which no Egyptologist, not even Lepsius himself, has ever made himself famous by publishing, as his "law of Egyptian sarcophagus construction."

Taking the coffer measures, for instance, as of the

whole vessel before the ledge was cut out, from the previous pages in pyramid inches; then—

	Length.	Breadth.	Depth.	Volume.
Coffer interior =	77·85 ×	26·70 ×	34·31 =	71,317·
Coffer exterior =	89·62 ×	38·61 ×	41·13 =	142,316·

that is, within the limits of accuracy of the modern measures, the volume of the exterior is *double* that of the interior; and the simplest even relation between them is that of *capacity*.

Again, the mean thickness of the sides of the coffer being assumed in pyramid inches 5·952, and of the bottom 6·866, we have (from a formula first prepared by the ingenious Mr. Henry Perigal)—

Coffer's bottom	= 89·62 × 38·61 × 6·866 =	23,758·
Coffer's sides	= 2 (89·62 × 26·70) × 34·31 × 5·952 =	47,508·
		71,266·

or again, we find a *duplicity* of the one quantity against the other; and the only apparent simple relation between the two, and of the sum of both, with the interior of the vessel, is that of *capacity*.

If now then, we may justifiably say, that though the coffer is probably what John Taylor did not think it, viz. a blind sarcophagus and a symbolical coffin, it is also most positively what he did consider it (though by means of mensuration proof which he never lived to see)—viz. a vessel at whose birth the requirements both of, and for, *capacity* measure presided and governed: —then in that case, what is its capacity?

What shall we consider the Capacity of the Coffer proved to be?

Now, for the coffer's length and breadth elements; we can quote plenty of measures, but depth is a weak point; because, as already explained, every particle of

the original top of the sides is cut or broken away, except some little patches near the north-east corner. Those were in place in 1865, but who will guarantee that they are there still, when men *will* hammer that exquisite gift inherited from primeval time, merely in the ignorant notion of sending their friends at home a chip of "Cheops'. coffin"! When the last of these small pieces of the ancient top, which I mapped so carefully in "Life and Work," has disappeared (and Mr. Waynman Dixon's cast shows that some of them are already gone), then comes the deluge among future coffer measures; a veritable chaos of uncertainty as to depth, in the midst of which French academicians might put on their three additional inches again, and upset all the geometrical doublings and equalities which have just been obtained by means of our having still a trace of the true height. But at this point of the discussion there comes in a strange use of the ledge cut out, though it has hitherto been thought of only for a lid and nothing else.

No lid has ever been seen by any historical individual, but every man of the present age may test the truth of the following mechanical adaptation; viz., the ledge, though acute-angled, is cut out of such a base-breadth and depth that a frame made to fit it flush with the ancient top of the sides would, when let down in vertical plane, and diagonally inside the coffer, just form the diagonal of said coffer's interior, and the frame's height at that moment would exactly measure the coffer's depth. Hence the breadth of the ledge, continued across the coffer from west to east, would continue to give us an outstanding test of the coffer's original depth, long after young cadets going out to India, and comfortable shopkeepers, on a "spree" from Cairo, shall have knocked away every particle of the original top of the sides.

In this case also, of course—just as it usually is in

all matters of so-called exact measuring—no two human measures ever agree exactly; and all that finite man can hope for is, to come within moderately close limits. So then must it be with the coffer's cubic contents.

Taking the ledge breadth (from my "Antiquity of Intellectual Man," p. 300) as 34·282 Pyramid inches, then the coffer's cubic contents in cubic Pyramid inches:—

(1) By interior length and breadth, and by depth from ledge-breadth . . . . . = 71,258·
(2) By interior of coffer, by all direct measures . . . = 71,317·
(3) By half the exterior volume directly measured . . . = 71,160·
(4) By sum of bottom and sides directly measured . . . = 71,266·

Here then we have a vessel whose cubic contents are not only something excessively near to 71,250· cubic Pyramid inches, but it was pretty evidently intended to be both of that quantity within some minute fraction, and to carry a check and a witness thereto down through all fair accidents, through all ages, to distant time. While that precise quantity, and the care for that quantity, are so impossible for the Egyptologists to explain on any sarcophagus theory of their own, pure and simple—for it has never been suggested by any one *à priori*, and is not found in any other sarcophagus from one end of Egypt to the other—that we must now strive to ascertain, on methods new to Egyptology, what the Great Pyramid itself may have to add to this, its own preliminary setting forth of "a symbolical sarcophagus, adapted to something further and higher connected with capacity measure."

CHAPTER IX.

DENSITY AND TEMPERATURE.

THOUGH there be no inscriptions, yet is there much teaching on the interior walls of the Great Pyramid; and as the coffer, when taken merely by itself, has proved thus far, too hard a riddle for full interpretation, let us try the teaching of the walls which precede, as well as those which surround it.

Ante-chamber Symbolisms.

In order to enter the Great Pyramid's so-called King's Chamber, we have to pass through the "ante-chamber," very appropriately so called, because it is a little room which *must* be passed through *before* the King's Chamber can be entered or the coffer seen; and in passing through it the attentive eye may note many more complicated forms there, than in any other part of the Great Pyramid. Amongst these *notanda* are certain vertical lines above the southern or further doorway.

Previous travellers have contradicted each other so abundantly about the number of these lines, that I was rather surprised to perceive them instantly to be not only confined to the number four, but these distinct, regular, parallel, extending the whole way evenly from door-top to ceiling, and no less than 2·8 inches deep and 3·8

inches broad each, with six-inch spaces between, and with similar six-inch spaces also between the outer side of each outermost line, and the bounding of the ante-room wall on that side.

Hence the lines were subservient to the spaces, and the whole arrangement appeared to me, not so much a system of *four* lines, as an example of surface divided into *five* portions or spaces.

As the doorway is only 42 inches high, and the dividing lines are drawn down to its (now broken) top, a man of ordinary height standing in the ante-room and looking southward (the direction he desires to go in order to reach the King's Chamber), cannot fail to see this space divided into five. And when he bows his head low, as he must do to pass under the southern doorway of 42 inches, he bends his head submissively under that symbol of division into five, and *should* remember that five is the first and most characteristic of the Pyramid numbers. (See Plate X.)

Travellers describe the Wall-courses of the King's Chamber.

Not for nothing, therefore, was it, as the intelligent traveller may readily believe, that the architect of the Great Pyramid desired to impress that division into 5 upon his, the traveller's, mind, just the last thing before he should bow down previous to passing through the low, solid, doorway, 100 inches thick and 42 high; and after that, rising up in the midst of the King's Chamber beyond, and seeing—what should he see?

According to that usually most correct of travellers, Professor Greaves, *he* says of the King's Chamber that every one may see there "from the top of it descending to the bottom, there are but *six* ranges of stone, all which, being respectively sized to an equal height, very

gracefully in one and the same altitude run round the room."

Well, that is not the accomplishment of a division into five, so let us try an older traveller, Sandys, in 1610. Says he, "A right royal apartment, and so large that eight floors it, eight roofs it; eight stones flagge the ends and sixteen the sides." Worse and worse.

Says Dr. Pocock in 1743, "Six tiers of stones of equal breadth compose the sides;" which M. Fourmont, on the part of Bourbon France, confirms in 1755 by laying down that "the walls are composed of six equal ranges." The still more famous traveller, Dr. Clarke, makes Cambridge in 1801 support Oxford in 1639, by particularising that "there are only six ranges of stone from the floor to the roof;" while, finally, that usually infallible author on Egypt, Mr. Lane, with his relatives the Pooles, seem to set a seal for ever on the mistake by declaring, "Number of courses in the walls of the King's Chamber, six."

What *could* have blinded all these men, and sent them following each other helpless down one and the same too easy rut of simple, ridiculous, error? Dr. Richardson, in 1817, was more original, if error apparently there must be; for he chose a new and hitherto untrod line of it for himself, sententiously writing of the room, "Lined all round with broad flat stones, smooth and highly polished, each stone ascending from the floor to the ceiling." But having once begun this new misdescription, he soon has followers; and we find Lord Lindsay, in 1838, writing, "A noble apartment, cased with enormous slabs of granite 20 feet high" (or more than the whole height of the room); and Sir William R. Wilde and M. R. I. A., in 1837, equally write down, as observed by themselves, "An oblong apartment, the sides of which are formed of enormous

blocks of granite reaching from the floor to the ceiling."

And yet, will it be credited, even by little children, that the walls of this chamber are divided into five horizontal courses, neither more nor less, almost four feet high each; and that these courses are most easy to count, as they must have been undoubtedly most expensive for the architect to construct, because each course runs round and round the room at one and the same height in granite blocks 47 inches high, difficult to get in large numbers so massive and uniform in any quarry; and every course is the same height as every other, except the lowest, which is less than the others by nearly 1-10th part, if measured from the floor, but is the *same* height if measured from the base of its own granite component blocks, which descend in the wall to beneath the floor's level.* (See Plate XI.)

The Pyramid Number of Wall-courses, and of Stones in them.

Neither was I the first person to find out that the courses in the walls of the King's Chamber were five only, for the same thing had been noted by Lord Egmont in 1709, and Dr. Shaw in 1721, and perhaps by some others earlier or later; but no one previously to myself had, so far as I am aware, either fought against odds for the correctness of his observation, or connected the number with both the teaching of the architect in the ante-chamber, and the quinary character of the Pyramid's first arithmetic.

Yet, quinary though it be for some purposes, it is

* Full particulars of my measures of this room in whole and part, and parts compared against whole, are contained in my "Life and Work at the Great Pyramid," vol. ii.; but are too long to introduce here. I have given there also the immediately succeeding measures of a young engineer, sent, I suspect, by a rich man, to trip me up if he could, but confirming my measures both of number and size of courses and room.

decimal for others, as shown here in almost juxtaposition; first, by the tenth part, nearly, taken off the height of the lower course, by the manner of introduction of the floor; and then by the 10×10 number of stones, exactly, of which the walls of this beautiful chamber are apparently composed. This latter circumstance was only recently announced, though on my publication of 1867, by Mr. Flinders Petrie; and does him all the more credit because, when I came to test the statement, there was one joint line, by mistake, too many in the middle course of the south wall in my engraved plate of the chamber, though the printed numbers were correct. Yet as the upper courses, though given by me, are on Mr. Inglis' observations alone—they should certainly be repeated, now that an unexpected importance has attached to them.

The King's Chamber and the Coffer are mutually Commensurable in Pyramid Numbers.

But the tenth part, nearly, taken off the visible height of the lower granite course of the walls; what was that for? Its first effect was to make that course, within the fraction of an inch, the same height as the coffer; and the second was, more exactly, to make the capacity, or cubic contents of that lowest course of the room, so decreased, equal to fifty times the cubic contents of the coffer, already shown to be 71,250· cubic Pyramid inches. Two separate sets of measured numbers in Pyramid inches for the length, breadth, and height, of that lowest course giving as follows, when divided by the coffer's contents,—

$$\frac{412{\cdot}14 \times 206{\cdot}09 \times 41{\cdot}9}{71{,}250} = \frac{3{,}558{,}899\cdot}{71{,}250} = 49{\cdot}95$$

And

$$\frac{412 \times 206 \times 42}{71{,}259\cdot} = \frac{3{,}564{,}624\cdot}{71{,}250\cdot} = 50\cdot03$$

Hence, close as was the connection of the several parts of the coffer by the tie of capacity, equally close is the connection of the coffer with the adjusted course of the granite room in which it stands, and by *capacity* measure also. While, if the multiple before was two, and is 50 now, is not 50 twice 25, or double the number of inches in the cubit of the Great Pyramid, the significant 5×5 ?

Commensurabilities between the King's Chamber and the Structural Masonry Courses of the whole Pyramid.

Neither did the fives and the tens of this chamber, on being examined, end here ; for having been greatly struck outside the monument on contemplating the grandeur of the horizontal courses of masonry of which the whole Pyramid is built, I began next to study them by measure. Not equal to each other are they in their successive heights ; but, whatever height or thickness of stones any one course is begun with, it is kept on at that thickness precisely, right through the whole Pyramid at that level ; though too the area of the horizontal section there may amount to many acres.

To secure this result, in fact just as with the equal height of the granite courses in the King's Chamber walls, but on a far larger scale,—it was plain that immense arrangements must have been instituted with the masons of many quarries ; and such arrangements imply method, mind, and above all, intention. Wherefore, having measured the thickness of every component course of the Great Pyramid, one day in April, 1865, when ascending to the summit, and another day

in descending, I compared and confirmed those figures with my own photographs of the building placed under a compound microscope; and also with similar numbers obtained from still more careful measures by the French Academicians in 1799 and 1800; and then began to sum up the courses' successive thicknesses to give the whole height of any particular number of courses.

On reaching in this manner the 50th course, lo! the total height of that stratum, or 1,690 inches, gave the hypsometrical level of the floor of the King's Chamber as well as it has yet been ascertained directly by all the best authorities. So that the level of the 50th course of the Pyramid, is the level also of that granite. floor, whereon is resting the coffer, a vessel with commensurable capacity proportions between its inside and out, and walls and floor, in a room with 5 courses, composed of 100 stones, and with a capacity proportion of 50 to the 5th of these courses.

The dullest person in existence could hardly but see then, that the so-called, in the dark ages, King's Chamber, should rather have been called the chamber of the standard of 50. Can we also say of 50 Pyramid inches employed in capacity measure?

But what is a length of 50 Pyramid inches in the eye of Nature, and how ought that length to be employed for scientific and general capacity-measure purposes?

Fifty Pyramid inches form the one ten-millionth of the earth's *axis* of rotation; or decidedly the proper fraction to take for capacity measure, when we have already chosen one ten-millionth of the *semi-axis* for linear measure. The reason being, that in measuring distances, say amongst the spheres of heaven, men measure them from centre to centre, and therefore have only to take account of the radii of each; but in dealing

with either their capacity or weight, we must take each sphere in its entirety, or from side to side, that is, by its diameter rather than radius.

More Symbolical Hints from the Ante-chamber.

Such is the answer to the first part of the question; and a hint how to deal with the second part may be gathered from some of the hitherto incomprehensible things in the little ante-chamber to this our grander chamber. Little is the ante-chamber, when it measures only 65·2 inches in utmost breadth from east to west, 116·3 long from north to south, and 149·4 high; but it has a sort of granite wainscot on either side of it, full of detail; and was to me so complicated and troublesome a matter as to occupy three days in measuring. (See Plate X.)

On the east side, this wainscot is only 103·1 inches high, and is flat and level on the top; but on the west side it is 111·8 inches, and has three semi-cylindrical cross hollows of 9 inches radius, cut down into it, and also back through its whole thickness of 8·5 to 11·7 inches to the wall. Each of those cylindrical hollows stands over against a broad, shallow, flat groove 21·6 inches wide, running from top to bottom of the wainscot, with a pilaster-like separation between them; and this groove part of the arrangement is precisely repeated on the east side, within its compass of height.

These three grand, flat, vertical grooves, then, on either side of the narrow ante-chamber, have been pronounced long since by Egyptologists to be a vertically sliding portcullis system for the defence of the door of the King's Chamber. There are no blocks now to slide up and down in these grooves, nor have such things ever been seen there: but the gentlemen point triumphantly to a fourth groove, of a different order, existing to the

north of all the others, indeed near the north beginning of the ante-chamber; and with its portcullis block, they say, still suspended, and ready for work.

The Granite Leaf.

That alleged portcullis block, however, contains many peculiarities which modern Egyptologists have never explained; and as it was first carefully described by Professor Greaves under the appellation of "the granite leaf," we had better keep to that name.

Its groove, instead of being 21·6 inches broad, like the others, is only 17·1 broad; and in place of being like them cut down to, and even several inches into, the floor, terminates 43·7 inches above that basal plane; so that the block, or rather blocks—for it is in two pieces, one above the other—stand on solid stone, and could not be immediately lowered to act as a portcullis if any one desired. Nor would they make a good portcullis if they were to be forcibly pushed, or chiselled down in their vertical plane, seeing that there are 21 inches free lateral space between the leaf and the north entering wall and doorway, where a man might worm himself in, on that face of it; and 57· inches above its utmost top, where several men might clamber over; and where I myself sat on a ladder, day after day, with lamps and measuring-rods, but in respectful silence and absolute solitude, thinking over what it might mean.

The granite leaf is, therefore, even by the few data already given, a something which needs a vast deal more than a simple portcullis notion, to explain it. And so do likewise the three broader empty grooves to the south of it, remarkable with their semi-cylindrical hollows on the west side of the chamber. But it is not any, or every, other notion which will therefore be found to apply.

Thus a military knight and engineer-general had, in 1869, published in more than positive terms a most questionable idea of the descending entrance-passage, together with the ascending passage and Grand Gallery of the Great Pyramid, being a pet plan of the ancient King Cheops for easily visiting his King's Chamber when in progress; viz., by going down the first slope in a truck, whose impetus should be so remarkably economised by ropes and pulleys, as to draw him up the second slope to twice the vertical height he came down from; and the gallant commander could scarcely be restrained from giving orders to the commissioned and non-commissioned officers on the Sinai survey to go over from there and fit up, or rather, as he considered, *restore*, such a system of ropes and trucks inside the Great Pyramid; and what for? Why, to facilitate the legionary visits of modern travellers; the very men who day by day, and year after year, break both the coffer and anything and everything else breakable with their needless and provoking hammers; and become more and more rampagious the larger parties they are allowed to accumulate; "cutting such antics" there, "as make the angels weep."

In the course of last year, however, a civilian engineer, Mr. John Dixon—having returned from Egypt, where, with his brother Mr. Waynman Dixon as resident engineer, he had been building a bridge over the Nile, and successfully exploring at the Great Pyramid also—kindly contributed several Pyramid drawings to the *Graphic* in London.

These drawings, or their descriptions, contained some allusions both to the granite leaf and the three semi-cylindrical hollows on the top of the wainscot of the western side of the ante-chamber. This special information, apparently quite new to the military man, seemed to set his ambitious soul in a blaze, for he

immediately wrote off with enthusiasm to Mr. John Dixon about the truck system; and called presently with a model of it under his arm, asking "if he (Mr. J. D.) did not think that all those ante-chamber arrangements which he had pictured, were just intended to carry out his, the general officer's, ideas of Cheops' pet truck method of going without any exertion up and down the Grand Gallery. Was not too (he asked most triumphantly)—was not the granite leaf fixed across the ante-chamber for fastening the fixed ends of the ropes to; and were not those semi-cylindrical hollows made on purpose to receive the pivots of the big horizontal rollers round which the turns of the running ropes must have passed?"

"No," said the civil engineer firmly, "certainly not: for your running ropes would fray themselves against the lower corners of the granite leaf; the whole would be a bad mechanical arrangement; and then what would you do with the other end of your rollers, when there are no semi-cylindrical hollows to receive them on the east side?"

On hearing which last piece of absolute truth, the military engineer fell backwards as though he had been shot; and was instantly rendered so utterly helpless, that had he been at that moment on the long slope of the Grand Gallery, or indeed of any of the inclined passages of the Great Pyramid, he would—instead of finding them, according to another of his theories, representations of "the angle of rest" and "repose,"—he would, I say, have been involuntarily set sliding down at such a continually accelerated rate, that he would have gone, alas! headlong to some awful degree of physical smash at the bottom, piteous to contemplate.

Others, however, passing and repassing frequently in 1865 through the ante-chamber, on seeing those three grooves, have rather received the impression, in their

more quiet and studious minds, of the three dimensions necessary to express capacity-contents—the three hollow curves too, reminding them of the curved shell of the earth's surface; and the granite leaf with its double block (implying double power to its specific gravity) leading them also to think of the earth's interior, or capacity, contents, which are, when taken in the whole, of almost exactly double the mean density, or specific gravity, of *that* granite.

Earth's Mean Density approximately indicated, but required more exactly.

Here then, from every side—from the coffer, the King's Chamber, the Pyramid courses, and the ante-chamber trappings of stone—all the very, and most scientific, and suitable, items necessary for preparing earth reference capacity and weight measures were gradually cropping up in 1865 A.D., before earnest and attentive study of the actual Pyramid facts, to a quiet onlooker, measuring-rod in hand. But no mere linear measuring-rod can supply the further radical idea required for weight. The something else called for in this instance, in order to be true to the grandeur of the beginning made in the Pyramid system for length, could be no other than the mean density of the whole world, and this quantity is not yet by any means so intimately understood by every one, that it would be generally and instantly recognised the moment it should haply be seen, under some symbolical figure or numerical equivalent, in the Great Pyramid.

Although, too, the earth's mean density has been for long a subject of permanent interest throughout other most important and varied branches of natural philosophy, besides astronomy, and not only in this country, but the whole world over, yet it has been practically, diligently, successfully, studied by hardly any other

nation than ourselves ; and what we have done in the cause has been confined to very late times indeed.

The first special move, always excepting Sir Isaac Newton's most sagacious guess in the absence of any experiment,* seems to have been made by Dr. Maskelyne ; who wrote in 1772 as follows to the Royal Society of London, in the course of a paper urging the propriety of making experiments to measure the precise angle through which a pendulum might be drawn out of the vertical, by the attraction of a mountain mass.

"It will be easily acknowledged," remarked he, "that to find a sensible attraction of a hill from undoubted experiment, would be a matter of no small curiosity ; would greatly illustrate the theory of gravity, and would make the universal gravitation of matter, as it were, palpable to every person, and fit to convince those who will yield their assent to nothing but downright experiment. Nor would its use end here, for it would serve to give us a better idea of the total mass of the earth, and the proportional density of the matter near the surface, compared with the mean density of the whole earth. The result of such an uncommon experiment—which I should hope would prove successful—would doubtless do honour to the nation where it was made, and the society which executed it."

Mountain Determinations of the Earth's Mean Density.

The effect of this representation was, that the society did undertake the experiment ; Mount Schihallion, in

* Sir Isaac's words are :—"Unde cum terra communis suprema quasi duplo gravior sit quam aquâ, et paulo inferius in fodinis quasi triplo vel quadruplo aut etiam quintuplo gravior reperiatur ; versimile est quod copia materiæ totius in terra quasi quintuplo vel sextuplo major sit quam si tota ex aquâ constaret." A rudely correct approach this to the density of the whole earth, but by means of such a decided over-estimate of the mean density of the average materials of "mines or quarries," that it did not carry much conviction with it.

Perthshire, Scotland, was selected as the most appropriate site; Dr. Maskelyne being appointed to make the observations, and Dr. Hutton to calculate the results: which were reported, in 1778, to be, that the mean density of the whole earth was = 4·5; that is, composed of matter $4\frac{1}{2}$ times heavier than water.

This result rather surprised most men at the time; for "common stone," of which they had usually considered the majority of the earth to consist, was known to be only $2\frac{1}{2}$ times the density of water.

They looked, therefore, into the composition of the Schihallion mountain itself, which they had vaguely, as a first approximation, considered to be of "common stone;" and Playfair, the Edinburgh Professor of Natural Philosophy, and an immense friend of Hutton, the fire geologist, discovered certain injections of dense trap; whence he determined the mean specific gravity of the whole of the mountain's minerals to be from 2·64 to 2·81. In proportions, too, which brought up the concluded density of the whole earth, to be 4·8; with some suspicions that it might be still more.

In this surmise the computers were undoubtedly right, for every determination that has been made since then, and by every method, has invariably given greater results. The only experiment quite similar, excepting some results of rather unmanageable extent in India, connected with the Himalayas, was that reported to the Royal Society of London in 1856, by Colonel Sir Henry James, in charge of the Ordnance Survey. He therein describing the observations made by non-commissioned officers of the Royal Sappers and Miners, with their zenith sector, on and against the hill of Arthur's Seat, near Edinburgh; which observations yielded, when put through the necessary computations, as they were most splendidly, by Captain Ross Clarke, R.E., the number 5·316.

Another species of experiment, not far removed in its nature from the above, was tried in 1826 by Mr., now Sir George B. Airy, Astronomer Royal, Dr. Whewell, and the Rev. Richard Sheepshanks, by means of pendulum observations, at the top and bottom of a deep mine in Cornwall; but the method failed. Subsequently, in 1855, the experiment was taken up again by Sir G. B. Airy and his Greenwich assistants, in a mine near Newcastle. They were reinforced by the then new invention of sympathetic electric control between clocks at the top and bottom of the mine, and had much better, though still unexpectedly large, results —the mean density of the earth coming out, 6·565.

Natural Philosophy and Closet Determination of the Earth's Mean Density.

The subject being thus so excessively difficult to obtain a close numerical result upon, even by the best modern astronomy, good service was done to the world in the course of the last century, when the Rev. John Mitchell proposed a different and a direct manner of trying the same experiment, actually between the several parts of one and the same piece of apparatus. He died, indeed, before he himself could try his acute suggestion; but it was taken up after his death by the celebrated Cavendish, and worked very successfully in 1798, with a final result of 5·450. I say successfully, in spite of much unkind criticism which he underwent from those who were more mathematical and less chemical than himself; for he evidently made a great stride towards the truth, improved the existing determination of his day to a large proportional quantity, and no part of the increase which he gave it has had since to be removed.

Nearly forty years after Cavendish's great work, his

experiment was repeated by Professor Reich, of Freyberg, in Saxony, with a result of 5·44; and then came the grander repetition by the late Francis Baily, representing therein the Royal Astronomical Society of London, and, in fact, the British Government and the British nation.

With exquisite care did that well-versed and methodical observer proceed to his task; and the attention of every man of mathematical science in the country was directed towards his operations. Much, indeed, and more than any one then thought, was depending on his labours; for without them the world's knowledge of the mean density of the earth, even up to this present time (1864), would not have been such as to warrant any interpretation of the Great Pyramid standards of weight and capacity.

The well-known mechanical skill of Thomas Bramah was first employed in casting an immense cylinder of lead, pure and dense; and then in producing from it, by the most exact turning in the lathe, two faultless spheres, each 12·1026 inches in diameter, and 380·469 lbs. avoirdupois in weight. These were for the *attracting* balls, to which Mr. Simms added, with all an optician's skill, the smaller balls to be attracted, and the niceties of the "torsion suspension," by which the smallest attractive influence on them was to be made sensible.

This apparatus was erected by Mr. Baily in an isolated room in the garden of his mansion in Tavistock Place; and observations were soon begun with even more than official regularity.

But they did not prosper.

Week after week, and month after month, unceasing measures were recorded; but only to show that some disturbing element was at work, overpowering the attraction of the larger on the smaller balls.

What could it be?

Professor Reich was applied to, and requested to state

how he had contrived to get the much greater degree of accordance with each other that his published observations showed.

"Ah!" he explained, "he had had to reject a large number of measures for extravagant inconsistencies; and he would not have had any presentable results at all, unless he had guarded against variations of *temperature* by putting the whole apparatus into a cellar, and only looking at it with a telescope through a small hole in the door."

Then it was remembered that a very similar plan had been adopted by Cavendish; who had furthermore left this note behind him for his successor's attention—"that even still, or after all the precautions which he did take, minute variations and small exchanges of temperature between the large and small balls were the chief obstacles to full accuracy."

Mr. Baily therefore adopted yet further means to prevent sudden changes of temperature in his observing room; but as he could not prevent them absolutely, he profited by the advice of Professor J. D. Forbes, of Edinburgh, of placing gilded surfaces between the balls; for, though gravitation will pass through anything whatever, radiant heat has extraordinary difficulty in piercing a surface of polished gold.

Immediately that this plan was tried, the anomalies in the measures almost vanished; and then began the most full and complete series of observations as to the effect of gravitation attraction from one set of artificial globes to another, that has ever been made upon the earth.

The full story of them, and all the particulars of every numerical entry, and the whole of the steps of calculation, are to be found in the memoirs of the Royal Astronomical Society, and constitute one of the most interesting volumes* of that important series; besides

* The fourteenth volume.

affording a determination of the mean density of the earth, which will probably be looked on as standard for fifty years from its day, and charged with a probable error of only 0·0038.

The Probable Error Statements in Modern Scientific Work.

Now what does that statement of probable error mean?

It should mean, in the above instance, that the real quantity in nature must infallibly be confined somewhere between the limits of 5·6788 and 5·6712. But, in point of fact, unhappily, it does not mean anything of the kind. It is in reality, nothing but a way that the scientific men have got into, copied chiefly from the German *savants*, of representing a something or other of a very confined and partial character connected with their observations. A something which they cannot exactly describe and do not altogether understand, though they perfectly appreciate that it makes the said observations look a great deal better than they really are.

Thus Baily's earth's mean density was announced as

5·675, probable error ± 0·0038

The Ordnance Survey's Arthur's Seat experiment gave the same earth's mean density as

5·316, probable error ± 0·054

And Sir George B. Airy's mine experiment declared, still the same earth's same mean density, to be,

6·565, probable error ± 0·018

From which mutually conflicting data, it will be seen that modern science, whatever it says about its extreme accuracy to $\frac{1}{300}$ or less, cannot really be certain in this

transcendentally difficult, but infinitely important, physical inquiry respecting the earth's mean density to nearer than about $\frac{1}{6}$th of the whole quantity ; and that is actually five times the amount of error that was recently (to the special scandal of the ladies and gentlemen of the Social Science Association when last in Edinburgh) afflicting all the modern world's knowledge of the sun's mean distance from the earth.

If in that case, the old, old Pyramid sun-distance, though it would have been kicked against and put down with a high hand only fifteen years ago, has been justified by the very latest determinations made in astronomy,—so we may hope, nay, even expect, that the Pyramid earth density will be likewise justified, when modern science improves her processes in that department also ; and shall attack once more the grand subjective problem of the earth, on the same stupendous scale as that on which she is now attacking the chief objective one, at this moment, of all terrestrial science and all mankind.

Earth's Density Number in the Great Pyramid.

Now the Pyramid earth density comes out most simply, on the showing of the parts of the Pyramid itself, from the cubic contents of the coffer in Pyramid inches, divided by the 10th part of 50 inches cubed. Whence, trusting to my measures, it is :—71,250 divided by 12,500 ; the quotient being 5·70 ; a result which modern science may confirm, but cannot overthrow at present, if she ever will.

Of Temperature Corrections, and how effected.

Some further questions, however, this modern science already asks of Pyramidists, in order to ascertain whether,

and how, certain precautions, which she thinks necessary in all her own important work, were taken, and still remain effective, in those primeval operations of the so long sealed up interior of the Great Pyramid.

For instance, if the coffer has to be considered as to its weight contents in water (and water filling is so frequently an operation connecting capacity and weight measures), strict attention is necessary to temperature, an element usually supposed to be only amenable to the thermometers of the last 200 years; yet the smallest errors on the score of uncertainties of temperature (and we may say almost the same for variations of barometric pressure), in the ancient work, would have introduced unnumbered perplexities.

These perplexities, nevertheless, are far from being found in the Great Pyramid's Coffer. Not because the Pyramid architect either had, or left behind, any very superior mercurial thermometers; but because he employed a method overriding thermometers, and beginning now to be found preferable even by the highest science of our own day, its multitudes of thermometers, and barometers too, of every kind, notwithstanding.

Thus the latest conclusions of the best geodesists, in conducting their modern standard-scale experiments, is expressed in the maxim, "have as little to do with *variations* of temperature as possible;" for temperature is an insidious influence whose actions and re-actions men will hardly ever hear the last of, if once they let it begin to move, vary, or be higher in one place than in another, or at one time than another. We have seen too, already, how this feature went close to the annihilation of the Cavendish experiment and its repetitions; and that the only source of safety was, not any attempt by power of fine thermometers to observe the temperature differences, and by the resources of modern mathematics to compute the disturbing effect, and so eliminate

it; but, to cut down the variations of temperature themselves.

Hence that retreating into cellars, and closing of doors, and only looking in through small holes with telescopes. Quite similarly too, in every astronomical observatory, where uniformity of clock-rate is prized, it has been the last, and practically the best, thing to that end yet found out,—that after the clockmaker has done everything which his art can do, in decreasing the disturbing effects which follow changes of temperature, by applying a so-called, and in truth very considerably effective, "temperature compensation pendulum,"—there is always a further improvement that can be effected in the going of the clock, by superadding other contrivances simply to lessen the amount of heat-changes for such pendulum to try its compensating powers upon.

Thus, at the great observatory of Pulkova, near St. Petersburg, where they value an insight into small fractions of a second perhaps more than anywhere else in the wide world, the very able Russian astronomers erected the chief clock of their establishment in the central hall of that building: because in that hall no window was ever opened, and large masses of masonry on every side greatly promoted an equality of temperature both by day and by night. Thereby was their grand standard clock notably strengthened, and enabled to keep a much better rate than a similarly constructed clock (with a so called by the clockmakers "temperature compensating pendulum" of course) placed in one of the outer astronomical observing-rooms; and where the opening of the shutters in the roof for star observation, necessarily admitted air sometimes warm and sometimes cold.

But within the course of the year 1864, I was informed by M. Wagner, then in charge of the time observations at Pulkova under M. Otto Struve, that

their normal clock was then going more uniformly than it had ever done before, or than they believe any other clock in the world is going; and because, from their central hall, windowless though it might be, on the ground-floor of the building, they had recently removed the clock to the "subterraneans" of the observatory, where the natural changes of temperature are smaller still.

It is not, however, quite certain yet, that theirs is the best-going clock in existence, for M. Le Verrier has recently removed the normal clock of the Paris Observatory to the "Caves," which exist there underground at a depth of 95 feet below the surface; and in a triumphant manner he remarked, when mentioning the case to me, "*temperature invariable, constant.*"

Now, at the Royal Observatory, Edinburgh, there have been observations taken for many years of several large and very long-stemmed thermometers, whose bulbs have been let into the rock at various measured depths; and it is found that, notwithstanding the possibly-disturbing effect of rain-water soaking down through fissures, there is such an astonishing power in a mass of stony matter to decrease temperature-variations, that at the surface of the ground—

The mean semi-annual variation of heat amounts to	= 50° Fahr.
At three inches under the surface	= 30° ,,
At three feet under the surface	= 16° ,,
At six feet	= 10° ,,
At twelve feet	= 5° ,,
At twenty-four feet	= 1° ,,

At 95 feet, then, from the surface, in the case of the Paris Observatory, how very slight and innocuous to the most refined observation must be the variation of season-temperature! But how much more slightly affected still, and how admirably suited to a scientific observing-room, must not the King's Chamber in the Great Pyramid be, seeing that it is shielded from the outside

summer heat and winter cold, by a thickness of nowhere less than 180 feet of solid masonry!

There is not, in truth, in any country of Europe, there never has been erected, and it does not look much as if there ever will be erected, by any nation under the sun, a scientific observing-room for closet experiments that can at all be compared in the very leading requisite for such an institution, with the King's Chamber of the Great Pyramid.

When Francis Baily closed those remarkable observations of his on the "*mean density* of the earth," he predicted that they were not likely to be repeated until the slow progress of science in general, and an improved knowledge of the theory of the "torsion pendulum," in particular, should have given the men of a future day some reasonable hope of securing, by renewed experiment, a sensibly more accurate result. But had he been aware of the unique temperature qualifications of that central chamber of the ancient Great Pyramid, where too the mean density of the earth is already represented and turned to account for man in the size of the interior of the granite coffer as compared with the cube of 50 inches,—would he not have been off the very next week to repeat his experiments there: and to have seen with his own eyes, before he died, that mysterious and primal-founded science temple of the south?

Absolute Temperature of the King's Chamber of the Great Pyramid.

All the knowledge and advance, then, of the present day, so far from improving on, or altering with advantage, cannot too much commend, copy, and adhere to, the *uniformity* arrangements for rendering constant the temperature of the Great Pyramid's coffer chamber.

But in that case, the responsibility now falls upon me of showing a something else which it is also required in practice to know,—viz. What is the absolute degree of that so produced, steady, and constant, temperature in the King's Chamber?

There, unfortunately, we lack high-class modern observations continued sufficiently long and under unexceptionable circumstances; but so far as what have been taken may be trusted, the best of them are found to indicate a particular temperature degree which theory assists in confirming, and which possesses otherwise some singular recommendations. In the Pyramid, as before observed, there is a grand tendency for numbers, things, and principles going by "fives;" and this seems carried out even in its temperature, for it may be described as a temperature of one-fifth; that is, one-fifth the distance between the freezing and boiling points of water above the former.

Observed Temperatures at and near the Great Pyramid.

The first grounds for this belief are, that M. Jomard, in the "Description de l'Egypte," gives the observed temperature of the King's Chamber part of the Pyramid as 22° Cent. = 71°6 Fahr.; but this was unnaturally raised by, first, the number of men with torches whom he had with him; second, by the incredible number of large bats which then made certain parts of the Pyramid their home; third, by the ventilating channels not being open or known in his day; and fourth, not improbably by the artificial dryness of the interior: for certain it is, that in the great Joseph Well in the citadel of Cairo, in the same latitude, at the same height, but *with* watery vapour (and perhaps in excess), the same M. Jomard measured the temperature there, and found it 17° Cent. to 18° Cent. = 62°6 Fahr. to 64°4 Fahr.

Hence 68° Fahr. would have been nearly a mean between his two observations ; besides being a probably closer approach to the pure and undefiled original temperature of the King's Chamber of the Great Pyramid under both ventilation, and the other intended normal circumstances of its foundation. And 68° Fahr. is precisely a temperature of one-fifth.

There is more, too, in the temperature numbers resulting for the Pyramid, than the mere accident of the mean temperature of its particular parallel of latitude ; for that quantity would in truth seem to be certainly higher, if observed at, or in, the surface-ground, especially the low valley ground itself, than this pyramidal quantity of one-fifth. Not only for instance did M. Jomard find it so, for he measured 25° Cent. = 77° Fahr. for the lower part of the "well" of the Great Pyramid, and also for several of the tombs in the open plain in the neighbourhood ; but my own observations in 1864-5 on the temperature of wells in and about the city of Cairo (in winter and spring, and at a depth sufficient to give as near an annual average as possible) yielded on a mean of 12 of them 69·9 Fahr. A quantity which is also the identical result for the mean annual atmospheric temperature of the same city, as obtained by the Austrian Meteorological Society from five years of observation.

Hence if the Great Pyramid was devised originally to stand in a temperature of one-fifth, it was necessary that it should be mounted upon just such a hill as that whereon it stands (and more particularly the King's Chamber level of it), in a sensibly cooler stratum of the atmosphere than that of the plains below ; reducing thereby 69°9 to 68° Fahr.

Thirty-seven years too after M. Jomard had measured in the King's Chamber the extra temperature of 71·6 Fahr., (*i.e.*, *extra* according to this subsequent theory), Colonel

Howard Vyse cleared out the two ventilating channels; and reported, without having had any idea that the temperature had been theoretically too high—that instantly, upon the channels being opened, the ventilation re-established itself, and with a feeling to those in the chamber of most agreeable *coolness.*

But no sooner had he left, than the Arabs stopped up the ventilating channels again; while steam-navigation and the overland route poured in day after day, and year after year continually increasing crowds of visitors with their candles and torches and frantic, Red Indian savage acts into the King's Chamber's granite hall; so that in 1865 I found its temperature more deranged than ever, or risen to no less than 75·2 Fahr. On one occasion indeed, it was so much as 75·7 immediately after a large party, from some vulgar steamer, had had their whirling dances over King Cheops' tomb-stone and their ignorant cursing of his ancient name, to the vocal music of passionate shouting and the painful thunder of the coffer being banged, to close upon breaking, with a big stone swung by their Arab helps; while the temperature was only 74° at the same time in the Queen's Chamber below, and 73° at the dry-well mouth lower down still in the Pyramid. Numbers which evidently indicate an abnormal temperature-elevating force at that moment in the King's Chamber: and no wonder; at least to any one who should have looked in upon some of those mad and multitudinous scenes of lurid-lighted revelry, indulged in by many smoking, tobacco-stinking gentlemen, a few ladies, and imp-like Arabs of every degree, black, brown, and grey. Lamentable scenes to be beheld in the present educated age of the world; yet scenes which both disturbed my quiet days of measuring, and photographing by magnesium light, there, at intervals of about every three or four hours; and which the Consuls would

give no assistance in endeavouring to keep down. "Egypt," they said, "in the present day is every man's land, and every one is his own master when he comes out into the desert here. Pharaoh would be pulled from his throne, if he attempted to interfere."

Temperature and Pressure Data for the Coffer's Weight and Capacity Measure.

At the present moment, therefore, the coffer is no more of its right, or original, temperature, than its right and original size, when so much of it has been broken bodily away by the hammering of the representative men of modern society. But the barometric pressure in the chamber happily defies such power of disturbance, and keeps, by the law of the atmosphere over all that region, expressively close to 30·000 Pyramid inches. Wherefore we correct our temperature observations slightly by theory, take the mean observed pressure, and then have quite enough to justify us in this, our first inquiry, for taking as the original coffer and King's Chamber temperature of 4,040 years ago, and also what their temperature would be again were the ventilating channels re-opened, and a strict prohibition issued in Scottish Covenanter phrase, against "promiscuous dancing" by all travellers, whether educated or ignorant, over Cheops' mistaken gravestone,—we have, I say, and may quote, the number 68°0 Fahr.; or the temperature of one-fifth.

Wherefore at that temperature, and the pressure previously mentioned, the coffer's 71,250 cubic Pyramid inches of capacity, filled with pure water, form the grand *weight* standard of the ancient Great Pyramid.

What weight in our reckoning of tons or pounds, that will amount to, and what subdivisions of its grand standard the Pyramid system permits, we may probably

take up with advantage in the third division of our book,—after having devoted one more chapter to examining our foundational Pyramid data of lengths and angles more rigidly than ever; and especially by the method of comparing, through the agency of several recent discoveries, the interior, against the exterior, of this most remarkable, most abused, but already most largely evident Monument of number, weight, and measure, as well as of *some* funereal associations.

CHAPTER X.

CONFIRMATIONS.

IN the several theoretical conclusions arrived at thus far in this second division of our book, the interior measures of the Great Pyramid finally made use of in the research (as those for the size and shape of the coffer) had been taken almost entirely by myself, and generally with more care and at far greater length and fulness of detail than to be found anywhere else. Now when some of those conclusions, ascertained long since (*i.e.* five or six years ago), were quoted very recently in a London drawing-room as deserving attention, the kindly speaker was confronted by a Cambridge mathematician, who rose with authority amongst the guests, and simply remarked, "So this man you tell us of, made his own observations! Then what can his theoretical deductions be worth?" Wherefore the previous speaker was instantly extinguished, or held to be so, by every one present (forgetful that the argument against John Taylor in his day was, that he never observed at all, but only worked from, or upon, the observations of others), and the Great Pyramid was that evening, for the polite society of that drawing-room, handed back to the Egyptologists as nothing but an ordinary Egyptian tomb.

Whether so-called pure mathematicians of College upbringing have reason to be suspicious of each other

in such a case, I know not; but a very different rule of conduct has been for long observed among astronomers. Indeed, the efforts of such men as Francis Baily, Sir John Herschel, Professor De Morgan, and many others of the leading spirits of their time during the last forty years have been largely directed to encourage, and almost oblige, every astronomer in a public observatory to do something more than merely observe; more too than compute his own observations also; for they taught that he should further apply them to theory, or theory to them; and discover, if he could, anything that they were capable, in that combination, of disclosing.

No doubt the observations should first, wherever possible, be published pure and simple; though that costs money, which is not always forthcoming even in Government establishments; and afterwards, or separately, should appear any theoretical *discoveries that either the observer, or any one else may have been able to educe* out of them. But that was exactly what I had done in the case of my Pyramid observations of 1865. For, by immense sacrifices out of a small income on the part of my wife and self, I had published the original observations in 1867 in Vol. II. of my "Life and Work," in as full detail as though it had been both a Government expedition, and its printing paid for out of the national purse. And this self-taxation was especially to satisfy all those intellectualists who might wish to do the computing and theorizing for themselves; while only in Vol. III. of "Life and Work," and subsequently in my "Antiquity of Intellectual Man," did I begin to try what I could make out of this new and extended supply of raw material for testing John Taylor's Pyramid theory.

And yet five years afterwards a stay-at-home mathematician, without pretending that any better observations had been made by any one else, either before

or since, could openly ridicule the possibility of there being any value in my deductions, merely because I had had the honour and expense, the toil and danger, of making the observations as well!

But fortunately, since the date of publication of my volumes in 1867 and '68, several free and independent spirits, often quite unknown to me, have discussed some of the observations contained in them much more minutely than I had done myself; and have made discoveries which had never entered into my head even to conceive of. How happy then shall I not be now to withdraw for a time into my shell as nothing but a mere observer, and let all the theorizing be done by Mr. William Petrie, late a Chemical Engineer; Mr. St. John Vincent Day, Civil Engineer; the Rev. Joseph T. Goodsir; Captain Tracey, R.A.; Mr. James Simpson, Commercial Bank; Mr. W. Flinders Petrie (not yet entered into the battle of life); Mr. Henry Mitchell, Hydrographer, U. S. Coast Survey; the Rev. Alex. Mackay, LL.D., Edinburgh; Charles Casey, Esq., of Carlow; the Rev. F. R. A. Glover, M.A., London, and, though last not least, Professor Hamilton L. Smith (Professor of Astronomy in Hobart College, Geneva, New York, U. S.); the several parties being mentioned here according to the dates of their researches becoming known to me.

The New School of Pyramid Theorists in the King's Chamber.

Of all parts of the Great Pyramid amenable to accurate linear measure, there are none presenting such advantages therefor as the King's Chamber; because it is—1. Equable in temperature; 2. Unvisited by wind, sand, or natural disturbances; 3. Of simple rectangular figure (excepting an infinitesimal angle of convergence,

and a rather larger angle of inclination, observed as yet only by myself and not altogether to my own satisfaction) ; 4. Erected in polished, dense, hard, red granite ; and, 5. It exhibits the longest lines of any part of the Pyramid, both in that hard material, and in a horizontal position with vertical end pieces.

M. Jomard speaks of his English predecessor, Professor Greaves, having inscribed, or cut, the length of his standard foot measure on the walls of that chamber. But I could not find any trace of such a thing ; and rather suspect that Jomard must have been misled by some figurative expression of Greaves's ; who wisely considered, that a printed statement of the measured length of that chamber (so constant in its size from age to age), in *terms* of his foot measure, would be a better record to posterity of what the length of that standard must have been, than any attempt to cut it there and then bodily into the hard granite by smoky candle-light, with imperfect tools, and while Mameluke Mohammedans were looking on with impatience and hatred of everything done by the Christian dog.

The Mensuration Data at the Disposal of the New Theorists.

Certain it is that I could not find any corporeal record of that foot measure in the King's Chamber ; nor can the Heads of Houses in Oxford find Greaves's iron measuring-rod itself, though they have the wooden box for it safe enough. But the libraries of Europe contain innumerable copies of the *book record*, to the effect that the length of the King's Chamber in the Great Pyramid as measured by Greaves, amounted to 34·380 of his feet, *i.e.* 412·56 of his British inches, in 1637.

Now this is a quantity well worthy of remembrance, viz., this 412·56 inches of Greaves: for—

By Col. Howard-Vyse, in 1837, that same chamber length was stated to be . . . . . 411·00
By Mr. Lane, in or near 1838 . . . . . 412·50
By Messrs. Aiton and Inglis in 1865, from . 411·7 to 412·1

and by myself in 1865 it was given as follows, with particular care to reduce my inches to standard British Government inches :—

South side, near floor level, 11th March, first measure	=	412·6
Do., second measure	=	412·58
16th March, first measure	=	412·5
Do. second measure	=	412·7
North side, March 11th, first measure . .	=	412·4
Do. do. second measure . .	=	412·5
Do. do. third measure . .	=	412·5
Mean of south side	=	412·60
Mean of north side	=	412·47
Mean length of both north and south sides .	=	412·54 British inches.
	=	412·13 Pyramid do.
Breadth of King's Chamber near east end, first measure	=	206·4
Do., second measure	=	206·2
Near west end	=	206·3
Mean breadth of east and west ends . . .	=	206·30 British inches.
	=	206·09 Pyramid do.
Height of King's Chamber near north-east angle of room	=	230·8
North side	=	229·7
North-west angle	=	229·2
South-west	=	229·9
South side	=	229·5
South-east angle	=	230·8
North-east angle repeated	=	230·8
The mean here = 230·1, but is certainly smaller than it should be; for so many of the floor stones, from which the heights necessarily had to be measured, were disturbed and to some extent risen up (like the drawing of a tooth), as though in consequence of earthquake disturbance. Hence the true quantity must be much nearer the greater than the smaller limit of the measured heights, and should probably be called . .	=	230·70 British inches.
	=	230·47 Pyramid do.

Diagonals of floor:			
From south-west to north-east corner .	=	462·0	
North-west to south-east	=	461·3	
Mean measured floor diagonal	=	461·65	British inches.
	=	461·19	Pyramid do.
Diagonals of east wall:			
Low north-east to high south-east corner .	=	309·2	
Low south-east to high north-east corner, subtracting 1·6 inches for hole in low south-east corner	=	310·0	
	=	309·6	British inches.
	=	309·3	Pyramid do.
Diagonal of west wall:			
Low south-west, to high north-east, corner	=	310·4	
Subtract 1·0 for a sunken floor-stone south-west	=	1·0	
(The other diagonal not measurable on account of a large and deep hole in floor in north-west corner of chamber, whereby men entering have gone on excavating at some time to under that part of the floor whereon the coffer stands.)			
	=	309·4	British inches.
	=	309·1	Pyramid do.

Mr. James Simpson's Sums of the Squares.

With these measures before him, and paying more attention to those of them taken from rectangular sides than the more difficult practical case of the corners, Mr. James Simpson, adopting what he thought the most probable numbers for length, breadth, and height, computed the several diagonals, and prepared the following theoretical measures of the room in Pyramid inches.

King's Chamber Lines.	Simpson's First Numbers.	Piazzi Smyth's Original Measures.	The latter Measures corrected by Simpson's proportions.
Linear . . Breadth =	206·10	206·09	206·07
Linear . . Height =	230·42	230·47	230·39
Linear . . Length =	412·20	412·13	412·13
Diagonals of End =	309·14		
Diagonals of Floor =	460·84		
Diagonals of Side =	472·22		
Solid diagonal . . . =	515·24		

The differences between Mr. Simpson's adopted linear numbers and my pure measures in the first division, it will be seen amount to not more than ·07 of an inch, or within the error of an average single measure by me, and much within those of some observers; indicating therefore that we may take his numbers as expressing well the true dimensions of the apartment *inter se*, such as the breadth being exactly half of the length, and the height exactly half of the floor diagonal (as discovered also independently by Professor Hamilton L. Smith); if indeed a good conclusive reason can be shown for them; and this is what Mr. Simpson does most effectively in a series of commensurabilities of squares in very Pyramid numbers.

Take, says he, half of the breadth, or 103·05, as a special unit of division; and test and divide therewith each of the above recorded quantities as below; and then, squaring the results, you will have for the—

Breadth . . .	2·000 whose square	=	4
Height . . .	2·236 „	=	5
Length . . .	4·000 „	=	16
Or sum of squares for linear dimensions . .		=	25 a Pyramid number.
For the end diagonal .	3·000 whose square	=	9
Floor do. . . .	4·472 „	=	20
Side do. . . .	4·582 „	=	21
Or sum of squares for part diagonals . .		=	50 a Pyramid number.
Solid diagonal . .	= 5·000 whose square	=	25 a Pyramid number.
And the sum of the three Pyramid numbers .		=	100

And this is in the chamber whose walls, according to Mr. Flinders Petrie's recognition first, are composed of just 100 blocks of well-cut, squared, and even-heighted, though very differently lengthed, granite.

The manner in which the long fractions of some of the simple divisions clear themselves off, on taking the squares, is especially to be noted; and from a further

theoretical consideration of his own (which I trust he will soon be able to publish), Mr. Simpson considers that a more exact expression for the original size and proportions of the room should be in Pyramid inches—

Breadth	= 206·0659
Height	= 230·3886
Length	= 412·1317
Diagonal of end	= 309·0988
Do. floor	= 460·7773
Do. side	= 472·1562
Solid, or cubic diagonal	= 515·1646
And the grand division test of this chamber .	= 103·0329

In so far, these very precise absolute quantities of length are recorded here chiefly to gain their relative proportions more exactly ; and, therefore, when we multiply one of them, the chamber's length (its chief line and the best measured line too of the whole Great Pyramid), by the special Pyramid numbers 5×5, and find it to yield 10303·29, or the same row of ciphers with the decimal point differently placed, as Mr. Simpson's touchstone line of commensurability, we may then ask further whether that larger, absolute quantity of length so implied, has any particular value or meaning outside that King's Chamber wherein it is now found.

Then comes a remarkable answer for any philosophical mathematician to ponder over, and especially as to how it came there in the early age of the Pyramid's foundation, before all history ; viz., that the area of the square base of the Great Pyramid, whose perimeter has already been determined by us to bear in those Pyramid inches a round and even relation to the number of days in a year, is equal to the area of a circle whose diameter $=$ 10303·30 $\pm$ ·01 of the same Pyramid inches. (See Plate III., Equality of Areas, No. 1.) Thus bringing up again, though in a slightly different shape,

that squaring of the circle which was one of the chief objects of the Great Pyramid's ulterior design touching its external figure. And which object seems to have been intimately and most intentionally woven into the very fibres of the Great Pyramid's constitution; for there was no automatic mechanical necessity obliging brute masonry in the hands of unthinking workmen to give the King's Chamber exactly that special size or shape, which would endue it with a definite circle-squaring commensurability to the size of the base of the whole monument in which it is contained.

Linear Relations between the Coffer and the King's Chamber.

But in the King's Chamber we may look to some further values, bearing on *interior* subjects now; and that constant warning from the ante-chamber to expect a "division into five" when we enter the King's Chamber, at once helps us to a connection between its walls (divided into 5 courses), and that peculiar vessel of capacity formation and mensuration, the coffer. For the 5th part of the breadth of the room, or 10th part of the length, is 41·21 Pyramid inches: and the measured height of the coffer (the quantity where the hapless French Academicians, in spite of all their high science, made an error of three whole inches), is shown on page 138 to have been measured by me as 41·23 near its edges; but considered to require some small reduction on account of concavity of the bottom surface, when stating the mean height; or for that purpose to be rather held as 41·13, or somewhere between the two.

The *cubic diagonal* is, however, the most important and governing line that can be drawn in any room, and amounts in the King's Chamber to 515·1646 Pyramid inches; a quantity which, as Mr. James Simpson shows,

connects the King's Chamber at once, on one side with its containing Pyramid, and on the other with its contained coffer vessel. For, multiplied by 10, the cubic diagonal is *exactly* the length of the side of a square equal in area to a right vertical section of the Great Pyramid (see Plate IV. Fig. 3); and on the other, the same cubic diagonal divided by 2 equals practically the sum of the lengths round the coffer's external base; or, in other words, the greatest radius of the King's Chamber, 257·58 Pyramid inches, equals the greatest horizontal circumference of the coffer.*

Capacity Relations between King's Chamber and Coffer.

Now the coffer, the moment we began to examine it on its own actual measures, exhibited on page 143 a marked tendency to duplication of intercommensurable capacities; and so also does the King's Chamber commence with a duplex character in its linear measures, seeing that the length is, with an accuracy of at least a thousandth of the whole, just double the breadth; the breadth is double a certain unit, which performs wonders in detecting commensurabilities; and the floor diagonal is double the height. That height, moreover, has another double character, but in a different way; for you may measure it either from the floor as visible height, or you may measure it from the bottom of the grand and solid granite walls, under the floor, as virtual and symbolic height, and find them then five inches higher than before. This room has therefore, whether we like it or not, yet by fact of masonry, *two heights;* and they

* This equation is not exact, owing chiefly to the strange anomaly in the lower part of the west side of the coffer, shown at p. 137, and deserving further attention at the place. But meanwhile taking the breadth just as given on p. 137 = 38·72 British inches, and the length, if freed from the anomaly, = 90·20 British inches; then (38·72 + 90·20) × 2 = 257·84 British inches = 257·58 Pyramid inches.

will be found on many an occasion to act as two remarkably powerful strings to its bow of symbology.

Thus, at once, if you take the first height, you get Mr. Simpson's commensurabilities by squares; the cubic diagonal duplex relations; and also the capacity commensurability by 50 of the lowest course of the room with the coffer's interior. But if you take the second height, what do you get?

Why, with Mr. Simpson's last numbers, and a round 5 inches for the difference of the two heights, you obtain 19,990,679 cubic Pyramid inches; or, as he has reason to say (the preciseness of the five inches all round the room having still to be measured, and quite admitting of being, as estimated by me alone, and at only one available place, some 0·1 of an inch too small), "you may get absolutely and unquestionably twenty million cubic Pyramid inches; a grandly round number in itself, yet having a duplex aspect in decimal arithmetic, in common with several other features of this chamber of twice 25, and its duplicating coffer." Whence the chamber itself may be considered, not one long chamber of twenty million inch capacity, but rather to be composed of two chambers, each of them of ten million cubic inches capacity, set together; and suggestive, therefore, of the employment for capacity in that united chamber with its coffer treasure, of a linear standard consisting (as actually is the case there) of two Pyramid cubits in length; each of which cubits is the ten-millionth part of the earth's semi-axis of rotation.

This is, in fact, the very idea required to be given by the Pyramid to clench the whole of our coffer capacity measure theory in Chapter IX. It is well, therefore, to know that there is still further confirmation to it from both the Queen's Chamber and the ante-chamber.

Capacity References in the Queen's Chamber.

If the King's Chamber be the chamber of the standard of 50, or of two cubits length, the Queen's Chamber is the chamber of the standard of 25, or one cubit length; for it stands, with its *original* floor, not the present one, on the 25th course of masonry composing the Pyramid; and its one grand architectural feature, the niche in the east wall, symbolises, by its amount of excentric displacement in the room, a length amounting to just one cubit. We might expect then to find, if the theory be true, that one ten millions of cubic inches are indicated by this room's contents, as against the two ten millions of the King's Chamber. And this does appear to be the case. (See Plate IX.)

The room is, indeed, quite a short one, and being furnished with an angular ceiling, is totally unlike the King's Chamber in shape as well as material, which is white limestone, now much encrusted with salt; but Mr. Simpson, extracting my measures of it from "Life and Work," soon perceived the breadth, measured by me at 205·6, to be a reminder at the least, if not a repetition, of the King's Chamber breadth, 206·06 Pyramid inches, but apparently clogged by the saline incrustations. Wherefore altering the other measured numbers similarly (*i.e.* making them about a quarter of an inch, or nearly one eight-hundredth of the whole, longer at each end), he obtained for the length 227·03 in place of 226·5, and for the mean height 213·86 in place of 213·2; the three dimensions then giving for the cubic contents of the chamber 10,004,676 cubic Pyramid inches, or as close as could be expected nowadays from a chamber of soft material, liability to saline deposits, and of extra difficulty to measure exactly. A chamber, however, which Professor Hamilton L. Smith, of New York, keeping chiefly to the hardest and

sharpest parts, has some splendid ideas and magnificent researches upon (soon to appear in *Silliman's Journal*), showing the niche more especially to be a very magazine of the crucial angles of the Pyramid's structure; and the roughnesses of the floor (see Plate IX.), even to have a symbolical meaning in connection with the incommensurables in nature.

The Ante-chamber's Symbolisms.

There was always, nevertheless, more satisfaction to me as a measurer inside the Great Pyramid when dealing with granite, rather than limestone; and this harder material began in the ante-chamber, the little dark room almost in the centre of gravity of the whole mass of this mountain of masonic skill.

The total length of that ante-chamber was by several measures, all recorded in "Life and Work," as follows :—

116·3
116·8
116·2
116·3
116·3
116·3

Mean = 116·37 British inches.
= 116·26 Pyramid inches.

While the length of the *granite* portion alone of the floor is recorded at—

103·6
103·7
102·6
103·2

Mean = 103·28 British inches.
= 103·17 Pyramid inches.

and the height of the granite wainscot on the east side of the chamber is given at 103·1 British, or 103·0 Pyramid, inches; but considered to be intended to be

the same as the other really, and either of them to be best representable by 103·08 Pyramid inches within limits ± 0·05 inch.

On these numbers Captain Tracey, R.A. (now at Gibraltar), was the first to remark, "Why, this granite portion of the ante-chamber floor (thanks to those who have been enabled to distinguish granite from limestone, see Chapter VII. p. 111 to 117), is the length of the unit test of the King's Chamber for discovering commensurabilities, viz. 103·033; and the height of the granite wainscot on the east side must be intended to measure the same."

Now, said he, one of these two equal lengths being placed horizontal, and the other vertical (both of them also coming to, and so enclosing, the same corner), they evidently typify the adjacent sides of a square; the *area* too of that square. But the area of that square of 103·033 in the side (or the length of the granite portion of the floor only, far within the limits of error of the modern measures) is precisely equal to the area of a circle 116·26 in diameter; and 116·26 Pyramid inches is the whole length of the ante-chamber's floor, granite and limestone together. Or, as the Abbé Moigno, in "Les Mondes" for 16th October, more elegantly puts it (having previously called $116{\cdot}26 = 2r$, and $103{\cdot}03 = c$); this remarkable employment of granite and limestone by the ancient Pyramid architect is the method adopted by him of saying, in one common language of mathematical science, from an isolated mountain peak of 4,000 years ago, to all nations in the present educated age of the world, that—

1. $$\pi r^2 = c^2.$$

Who, after this first coincidence of the ante-chamber, says the Abbé, could pretend that the diversity of the materials and their relations, or *differences*, of length

are a simple, brute accident? But here are others not less extraordinary connected with their *absolute* lengths, when measured in the standards and units of the Great Pyramid's scientific theory: and in no others known.

2. $116{\cdot}26 \times \pi = 365{\cdot}24$, the number of days in a year; the number, also, of Pyramid cubits contained in the length of a side of the base of the Great Pyramid.

3. $116{\cdot}26 \times \pi \times 5 \times 5$ (5 is one of the chief Pyramid numbers) $=$ 9131 Pyramid inches; the length of a side of the square base of the Great Pyramid deduced from *all* the measures that have been taken since the happy discovery of the corner sockets by the French Academicians under Napoleon Bonaparte.

4. $116{\cdot}26 \times 50$ (50 is the number of horizontal courses of masonry between the level of the ante-chamber and the base of the whole Pyramid) $=$ 5813 Pyramid inches; the ancient vertical height of the Great Pyramid deduced from a mean of all the measures. And, finally,

5. $103{\cdot}033 \times 50 = 5151{\cdot}65$ Pyramid inches; or is the side of a square of equal area, 1st, to a triangle of the shape and size of the Great Pyramid's vertical meridian section; 2nd, to a circle having the height of the Pyramid for a diameter.

Geometrical Derivation of the Passage Angle.

That same square, of 5151·65 Pyramid inches in the side, is a still further important feature in the design of the Great Pyramid; for, as may be seen more easily than described, from the practical geometry of Plate VII., by placing that square centrically and symmetrically on the centre of the base of the Pyramid, tri-secting its upper semi-diameter, and bi-secting its lower, we obtain the positions of its several chambers and passages; and, above all, by a further reference to

the height of the building, we procure the angle of slope of those passages.

This angle should be, from the construction, 26° 18′ 10″: and my observations found it for the entrance passage, by a multitude of measures with several different instruments, acting on different principles—

	26°	27′	0″
	26°	28′	7″
	26°	25′	20″
Mean	26°	27′	

For the first ascending passage—

	26°	5′	30″
	26°	6′	40″
Mean	26°	6′	

For the Grand Gallery—

	26°	17′	28″
	26°	17′	4″
	26°	17′	53″
Mean	26°	17′	32″

Which three passages, therefore, contain the theoretical 26° 18′ 10″ amongst them; within quite as close limits too as could be expected in so ancient a structure, with many of its limestone masses cracked by the weight of a mountain's superincumbent pressure through long ages; and very much closer than is found when we examine instrumentally into the mensuration errors of most modern buildings.

Inches typified in the Granite Leaf.

A further use for that particular passage angle comes up in the astronomy of the Pyramid's chronology; but relegating just now that subject to a future chapter, let

us conclude this one with reference to a very small matter in size, though great in importance, viz. the granite leaf, standing at the head of, above, and beyond all these passages.

Some objectors to the Pyramid scientific theory have said, "We do not admit the reality of your Pyramid inches with its original builders, when you can only get such inches by subdividing immense lengths of the building by divisors of your own choosing. (Though this is denied.) But show us a single such inch, and then we may believe."

Whereupon Captain Tracey has pointed out that such single inch is actually marked, and in a Pyramid manner on, or rather by means of, the above granite leaf in the ante-chamber; and it comes about thus:

In that small apartment its grand symbol on the south wall is the already mentioned illustration of a division into five: and if the symbol had virtue enough to extend into and dominate some features in the next, or King's Chamber (as in illustrating its now undoubted number of *five* wall courses), why should it not typify something in its own chamber as well? But what is there, in the ante-chamber, divided into five! "The sacred, or the Great Pyramid's own, cubit," answers Captain Tracey; "for here it is so divided in the shape of this *boss* on the granite leaf, just five inches broad. And further, that fifth part of that cubit of the Great Pyramid's symbolical design is divided before our eyes into five again; for the thickness of this remarkable boss is 1-5th of its breadth. So there you have the division of the sacred cubit into 5×5 inches."

This boss on the granite leaf (see Plate X.) is another of my rediscoverings of things which *are* to be seen; for they have been marked, but not sufficiently noted or measured, in that excellent though so unwieldy and seldom consulted folio of enormous plates, "Perring's,"

or rather perhaps to be called "Vyse and Perring's," views of the Pyramids, published in 1840.

Nor was this most unique yet modest boss described and pictured by me with full correctness even in "Life and Work," I having made it much too high, too accurately rectangular at its lowest corner line, and too sharply and neatly defined all round: as I am enabled now to say positively, having been kindly furnished by my friend Mr. Waynman Dixon with a cast of it in Portland cement taken by him in the Great Pyramid last year (1872). The *one* inch thickness however, and *five* inches breadth, being fairly measurable along the best part of the cast-boss for measuring, viz. its steep, though not absolutely rectangular, lower edge,—*they* remain untouched and perfectly suitable for Captain Tracey's analogy, which is further supported as follows: —The boss, a flat bas-relief one inch thick or high *from* the stone, is on the north side of the upper of the two granite stones forming that "granite leaf" which crosses the ante-chamber near its northern end. (Compare Chapter IX., pages 154 to 157.) Excepting the presently broken state of the upper surface of the top stone, evidently a modern mischief, the formation of the whole leaf is regular, rectangular, and symmetrical. Why then is the boss not in the middle between the two sides of the very narrow apartment? (41·21 inches broad).

My measures of 1865, if they can be trusted here, show that the boss is just one inch away on one side of the centre; and as it has been otherwise shown by the niche of the Queen's Chamber, that it was a Great Pyramid method to indicate a small quantity (there a whole cubit) by an *excentricity* to that amount in some far grander architectural feature, we cannot but accept this excentricity of the boss as an additional Pyramid memorial of the very thing which is being called for

by the sceptical just now; viz. one single, little inch memorialized by the builders of the most colossal piece of architecture in the world. All the more decidedly too, when, as Mr. St. John Vincent Day has since then shown, that that very excentric position of the boss has enabled the distance from its centre to the eastern end of the leaf itself in its well-cut groove in the granite wainscot to be, within the limits of mensuration errors, just a whole Pyramid cubit = 25·025 British inches, or something very near to it indeed.* So that we have tied up here the whole cubit, its fifth part and its twenty-fifth part; which, though so small, like the needle in a haystack, yet is it also securely tied up here, for the instruction of all posterity.

And Captain Tracey again shows that the lower stone of the granite leaf (in this ante-chamber, which proves itself to be a veritable synopsis or microcosm of the whole Great Pyramid), that this lower stone, I say, which is fairly dressed, rectangular,† and the one on which the upper

* My measures say, p. 100, vol. ii. of "Life and Work"—

	British inches
Centre of boss to east side of room	= 21·5
P. 98, vol. ii., depth of groove in that wall	= 4·0
Whole distance from centre of boss to east end of granite leaf in its groove	= 25·5
But again, on p. 93, and also p. 95, the grooved breadth of the room is given in British inches at	48·1
	48·0
	48·1
Mean	= 48·067
Half	= 24·034
Add 1 inch of excentricity of the boss from east wall .	+ 1
Whole distance of centre of boss from the inside of its flat groove in granite (a distance which I recommend to future explorers to check for me)	= 25·034

† My ante-chamber measures, as condensed on p. 37 of the 13th vol. of the "Edinburgh Astronomical Obs.:"—

Say, granite leaf, thickness north to south, on east side .	= 15·4
„ „ west side .	= 16·0

stone with its divisions of the cubit rests,—expresses a notable division of the capacity measure of the coffer. For it presents us, within the walls of the ante-chamber, with a fourth part of that coffer vessel; or with the veritable "corn quarter" of old, and which is still the British quarter corn-measure both by name and fact and practical size.

A Representative Antagonist of the Modern Scientific Theory of the Great Pyramid.

But now, after so many confirmations, both large and small, furnished by the Great Pyramid itself (and there are more still, and of a higher class, to appear in our fourth and fifth parts), the reader may possibly be inclined to ask, "Who are the parties who still refuse to allow the force of any of these things; and persist in saying that they see in the Great Pyramid merely a burial monument of those idolatrous Egyptians, who delighted in nothing so much as grovelling worship, and architectural memorialization, of bulls and goats, cats, crocodiles, beetles, and almost every bestial thing?"

One of these unhappy recusants has lately offered himself for description. He is an Oxford man and a clergyman, a country vicar and a chaplain to Royalty; the author too of a large octavo of travel in Egypt, published two years ago and already in a second edition; a book written throughout cleverly, fluently, scholarly, but in an outrageously rationalistic vein of ultra Broad Churchism, even to the extent of holding the Biblical history of man, in all its miraculous features and limits

Height of lower stone	27·5 to 28·0
Breadth east to west, between the open walls . .	$= 41{\cdot}21 \pm x$
,, between the leaf's grooves . .	$= 48{\cdot}05 \pm x$

But they ought now to be repeated by some one else, when so much theoretical importance seems to attach to them.

of chronology, to be utterly false. The religions of Christ and Moses this author perversely maintains to have been in no way differently originated from those of Egypt, Greece, and Rome. They were each and all, with him, merely the product, "the *summa philosophia*," of the wisest men of their time, acting by their human wisdom alone, and composing systems of religion suitable for their own respective ages: as, too, he would have the ablest men amongst us try to do again for these troubled and most unhinged times in which we live; times wanting, he says, a new religion, for that of Christ is no longer effective.

This, then, was the author who, starting for his Egyptian tour at six hours' notice only, tells us that he took no scientific instruments with him; and says, moreover, that he did not want them, as he has methods of philosophical observation overriding all science.

Thus, as to the almost endless series of mathematical and physical problems contained in the Great Pyramid, this vicar-Oxonian merely leant against the monument, with his hands in his pockets, and looking upward along its sides, declared that he got a far better notion of it, than if he had made any number of scientific observations; for he perceived with the greatest certainty then, there, and at once, that in place of there being any truth in all the unique numbers and mysteriously deep scientific things published about it by the Scottish Astronomer Royal,—the whole edifice throughout all its building was nothing but an ordinary development of ordinary human nature in history. The Egyptians, he says, built the Great Pyramid at the time, and in the manner, they did, merely because they could not help it: it was the only way that occurred to them to build it, and there was no thinking spent upon it.

If opposite extremes ever meet, they certainly do so

here: for the said Scottish Astronomer Royal also holds, that the *Egyptians* spent no thought upon the design of the Great Pyramid, and built it without understanding it, and because they could not do otherwise at that time. But that nevertheless a Mighty Intelligence did both think out the plans for it, and compel unwilling and ignorant idolaters, in a primal age of the world, to work mightily both for the future glory of the one true God of Revelation, and to establish lasting prophetic testimony touching a further development, still to take place, of the absolutely Divine Christian Dispensation.

The Astronomer, however, asks no one to take his mere opinion. If the facts which he has to unfold, work no conviction; neither will, nor should, all the words of persuasion that he could possibly utter.

PART III.

NATIONAL WEIGHTS AND MEASURES.

"LET ALL THE NATIONS BE GATHERED TOGETHER, AND LET THE PEOPLE BE ASSEMBLED: WHO AMONG THEM CAN DECLARE THIS, AND SHEW US FORMER THINGS? LET THEM BRING FORTH THEIR WITNESSES, THAT THEY MAY BE JUSTIFIED: OR LET THEM HEAR, AND SAY, IT IS TRUTH."

ISAIAH XLIII. 9.

CHAPTER XI.

BRITISH METROLOGY, PAST AND PRESENT.

WHEN Magna Charta ruled the British land,—and perhaps in thoroughness of spirit and completeness of intention with those immediately concerned that was not very long,—a ray of metrological wisdom and a beam of light from some far-off horizon in the history of the human race, shot momentarily athwart the troubled scene of our national weights and measures.

Those institutions had existed from the earliest times known to our literature, an heirloom among the Anglo-Saxon peoples; and a late first-rate American writer, as well as statesman (John Quincey Adams), equally claiming with ourselves to be descended from that ancient stock, but without any necessary prejudice in favour of the wisdom of modern British Parliaments, has expressed a very firm conviction that the most perfect condition of those weights and measures, even including all that was done for them by modern *savants* under the reign of George IV., was in the earliest known times of Saxon history; and connects itself much more with an ancient Royal residence at Winchester, than a modern one in London or Windsor. It may have been earlier still; and the system had already fallen into such republican, many-headed, confusion in the times of King John, that the Charter, to the joy of all men, said that in future there was only to be one

standard of measure throughout the land ;* while, to render that principle a possible one to carry out in practice, wisdom counselled, and ancient Saxon practice reminded, that grand standards both of length and weight should be immediately constructed, and copies thereof dispatched to all parts of the kingdom.

But what followed ?

That which too uniformly follows when a generous people, roused for a time to the care and assertion of their rights, trust all to the word of unwilling, despotically inclined rulers ; and then relax once more into passive obedience and dull routine.

Those standard measures, if ever made, were lost ; no copies were sent to country districts ; the Magna Charta lawyers were ignorant of the most vital facts (as abundantly evidenced by their verbally ordaining that the quarter was to be the national measure for corn, but leaving the people in ignorance of what measure or weight it was the fourth part) ; † and then came a certain very natural consequence.

Practical weights and measures are not only of interest, but essential importance to all classes of the realm: for, as was well said years ago, all the productions of land and labour, of nature and art, and of every concern and condition of life, are bought, sold, or estimated by

* "Measures are wanted for two distinct objects, the commercial and the scientific. The wants of natural philosophy have grown up within the last two centuries; while so early as Magna Charta it was one of the concessions to the grievances of the subject that there should be one weight and one measure throughout the land," says the late Lord Brougham's chief educational authority; not knowing, however, that the epoch of Magna Charta, instead of being primeval, is very middle-aged indeed, in the real history of British weights and measures.

† A.D. 1215. Magna Charta, Sect. 35 :—

"There shall be but one uniform standard of weights, measures, and manufactures; that for corn shall be the London quarter."

"Magna Charta," says Dr. Kelly, in his "Metrology," 1816, "points out the quarter of London as the only standard for measures and weights of that time, but we are left to guess of what measure or weight it was the quarter part."

them. Hence, weights and measures have been very properly defined as the foundation of justice, the safeguard of property, and the rule of right; while the laws of honour peculiarly abhor any fraud in this respect. Yet withal, says the same authority, it is to the common people, in every country, to whom the business of weighing and measuring is almost exclusively committed. Whence, in part, by evident necessity, it comes that weights and measures are *primarily* affairs of the working classes, of the poor, and those who with their own hands do the daily work of the world; not of the rich, who luxuriously inhale the sweets and tempting quintessence thereof, without vulgar toil; without any racking anxieties so to economise their daily bread as just to be able to make both ends meet. They, *i.e.* the rich, and even the classes between them and the workers, viz., mercantile men, and various employers of labour, can perfectly well afford in their lordly mansions or comfortable counting-houses, to reckon up their gains in terms of any measures, or of any language, whatever under the sun, when balancing their account-books at stated intervals; but the working poor, in their daily, ceaseless, occupations, have neither the education, nor the time, nor the opportunity to deal with more than one language and one set of measures.

And these last, to be fully useful, must come to them, in every item, just as naturally as the mother-tongue is felt to do in after-life; for who is there, unless experienced in practical matters himself, who knows how suddenly and immediately, in many of the constant affairs of the working world, an unexpected exigency occurs; when, without books, or scales, or balances, or compasses, the labouring man, whether sailor or coal-miner, whether agriculturist or engineer, has to look some natural danger in the face; and his only hope of plucking the flower, "safety," from the

event, is in his then and there instantly concluding, without instrumental assistance, without time for serious thought or metrical examination, upon a nearly correct estimate of some measure of weight, or length of space, or strength of material, or angle of slope, before the catastrophe arrives.

The working man, too, must have convenient natural standards also to refer to at certain times, both to correct the estimate of his mere feelings, and keep up as well an outward proof, as an inward ideal, of justice in his dealings with those around him, but in the terms he loves best. So what was the consequence when the restored king and government of A.D. 1215, having got the rule of the country once again into their power, did *not* send the promised standards to every town and village in the land? Why, every town and every village began to make standard measures for themselves, and for their own immediate knots of society, rich men and poor, farmers, artisans, and merchants, in their small and often very isolated provincial communities.

Within a certain range that was tolerable enough; because all these examples *pro tem.* were more or less closely founded on, or were tolerably representative in some way or another of, the original Saxon standards, and were named with names derived from the same effective language; but beyond that range of temporary service,—then began the mediæval confusion worse confounded which has reigned in our national weights and measures ever since. Under the same name, at the same epoch, all sorts of different subdivisions of the same original quantities have been intended in different parts of the country; and, in such various country-side parts, through a long series of years, what astounding names, not unfrequently for the same thing, have not

been invented out of the wealth and depth of the mother tongue !

The late Dr. Young collected as many as would have filled a small dictionary,* and the general progress of the nation was not at that time found free from exceptional results in this direction. For, as civilization progressed, wealth asserted its interests too powerfully ; and lawyers were always attainable, to frame any number of acts of parliament to secure rent and taxes being drawn from the working poor in any and every denomination ; but to prevent their deriving profits from their work, unless a statute standard was rigidly adhered to.

That holding up to view the importance of one grand national standard, was indeed in so far (for it was evidently one-sided) very excellent ; but unfortunately, the powers that were went on framing their acts of parliament without either defining, making, or identifying any such standard. The taking of scientific steps really to do that, seemed to men of the pen, the law, and schools of high mental philosophy, a base mechanic operation, which their ethereal line of studies placed them far above the level of. It was a drudgery they would not submit to ; and even up to the other day (1814), when at last it was impressed on the governing bodies that, in the material matter of weights and measures, there must be material standards, —they appointed a yard, which was to bear a certain proportion to a second's pendulum of a specially named

* The following is an example from one division of his report :—Awm, bag, bale, basket, bat, beatment, billet, bind, bing, boll, bolt, bolting, bottle, bout, box, bucket, bunch, bundle, burden, cabot, cade, canter, caroteel, carriage, cart, cartload, case, cast, cheef, chest, clue, cord, corf, cran, cranock, cut, cyvar, cyvelin, daugh, dish, drop, duffer, &c. &c.

"Mr. Adderley said that in his country there were thirty-six different bushels, and he was informed that in Lancashire there were more than double that number."—"Report of Discussion in the House of Commons, 14th May, 1864."

and legally described scientific order; but what length that pendulum was of in very fact, they did not inquire; for they said, "any expert watchmaker could ascertain that;" and yet up to the present time neither watchmaker nor philosopher, nor government official of any kind or degree, has fully succeeded in that little problem.

So the confusion of weights and measures only grew worse in the kingdom, while other branches of civilization continually progressed. About the year 1700 A.D., the Government, through the Attorney-General, had instituted an accusation against a merchant for cheating the revenue by using false gallons; and he, the merchant, successfully proved that it was the Government's own appointed gallon that he had followed, and that Government did not know what they had been legislating on the subject.*

That was a grievous exposure; but the fault was easily thrown on the poor working men, when a Parliamentary Committee superciliously reported in 1758, that of those uneducated beings, but who had hitherto borne all the toil and burden of the work, only a few of

* "A little after 1700 an information was tried in the Exchequer against one Baxter, for having imported more Alicant wine than he had paid duty for. On the part of the Crown it was contended that the sealed gallon at Guildhall (said to contain 231 cubic inches) was the standard. But the defendant appealed to the law, which required that a standard gallon should be kept at the Treasury; proved that there was such a gallon at the Treasury, containing 282 cubic inches; and established, by the evidence of the oldest persons in the trade, that the butts and hogsheads which came from Spain had always contained the proper number of the real standard gallons. A juror was withdrawn, and the law officers of the Crown took no further proceedings except procuring the above Act ('An Act of 5 Anne, cap. 27, for arresting the further decrease of the gallon below 231 inches'). A better instance of confusion could hardly be imagined; the legal gallon had gradually been diminished more than 50 cubic inches; the merchants in one particular trade continued to import and to pay duty by the real gallon, and were finally called to account by the Attorney-General, who, in common with the rest of the world, had forgotten what a real gallon was, and sued for penalties upon appeal to what was no more a legal standard than the measure in a private shop."—*Penny Cyclopædia.*

them were able heretofore to make proper measures or weights; standards were carelessly made and destroyed as defective, and the unskilfulness of the artificers, joined to the ignorance of those who were to size and check the weights and measures, occasioned all sorts of varieties to be dispersed through the kingdom, which were all deemed legal, yet disagreed.

Other independent-minded persons, however, ventured to report, and perhaps more justly, that another cause of this confusion was "the prodigious number of acts of parliament, whereby the knowledge of weights and measures became every year more and more mysterious." In 1823 it was stated by Dr. Kelly, in his examination before the House of Lords, "that there had been upwards of two hundred laws enacted without success in favour of conformity, and five hundred *various* measures in defiance of those laws." Both sets of acts of parliament, too, were in opposition to that law of the practical nature of things, which ordains that everything in connection with weights and measures shall be done in direct reference to *material* examples thereof.

But, in 1824, a standard yard and a standard pound were at last deposited in the House of Commons; and the Legislature enjoyed the advantage of having a moderately accurate example before them, of the practical thing they were legislating about. This pleasure, however, only lasted about ten years: for in October, 1834, both yard and pound perished in the Great Fire which consumed the two Houses of Parliament.

Then was made another insane attempt to get on without any standards at all; to collect revenue by the threat of a standard, and yet have no standard to refer to. Lawyers, therefore, had it all their own way in this pleasant fiction; and in an act of parliament (5 and 6

William IV. c. 63), which passed both assemblies in the following year, "the standards were referred to as if still in existence, and quoted as authorities to be appealed to on every occasion, although they had been actually destroyed a twelvemonth before, and no other standards submitted in their stead."

Both Houses of Parliament certainly *appeared* to have been wholly ignorant of this actual non-existence of the objects on which they were legislating. But some persons said for them, that they were not, and never had been, entirely dependent on their late legalized parliamentary standards; for Government had an ancient standard of its own, to which extra-conscientious ministers might refer when there was grave occasion.

Curiosity was excited. There had been indeed once two standards in the Exchequer, descended from somewhat historical times (*i.e.* Queen Elizabeth's); one of 45 inches, the other of 36. The former, the more accurate of the two, seems to have been allowed to drop out of sight altogether at some period unknown; and the latter was abused, instead of used, in a degree directly proportionate in latter days to the nation's advance in wealth, the growth of geodesic science amongst learned men, and the increase of general attention to the scientific subject of standards in foreign countries.

For, so far back as 1742, when some inquiries were set on foot by both the Royal Society of London, and the Paris Academy of Sciences, the Exchequer standards were then in a respectable condition; and seemed to be treated with attention and care, by the high officers and clerks of the establishment. But no one had heard of them again for a long interval. And when their habitation was at length revisited in 1835, to see the foundation on which the government of good King William was then legislating, Mr. Baily reports of the then single

standard, and apparently the only one,* "that it was impossible to speak of it too much in derision and contempt. A common kitchen poker, filed at the end in the rudest manner by the most bungling workman, would make as good a standard. It has been broken asunder," he writes, "and the two pieces have been *dove-tailed* together, but so badly that the joint is nearly as loose as a pair of tongs. The date of the fracture I could not ascertain, it having occurred beyond the memory or knowledge of any of the officers at the Exchequer. And yet, till within the last ten years, to the disgrace of this country, copies of this measure have been circulated all over Europe and America, with a parchment document accompanying them (charged with a stamp that costs £3 10*s.*, exclusive of official fees), certifying that they are the true copies of the British *standard*."

These are severe remarks; and partly help to answer the noted difficulty which Dr. Kelly found himself confronted with, after all his historical researches up to his own time; viz., that in England there is nothing that has a greater tendency to grow worse, or, curiously enough, more obstinately resists improvement, than weights and measures. Yet the Exchequer itself has indicated the full truth of Mr. Baily's critique, by publishing the Astronomer Royal's very similar views;

* Since the above was written, an unusually good parliamentary report has appeared, drawn up by Mr. Chisholm, chief clerk in the office of the Comptroller-General of the Exchequer, on "The Exchequer Standards of Weight and Measure;" mentioning a yard rod, a gallon, and two bushels of Henry VII.; a yard measure and an ell, together with pints, quarts, gallons, bushels, and troy and avoirdupois weights of Queen Elizabeth, besides several other weights and measures of the early Norman kings, and not regarded as standards.

Of the above Exchequer standards, so-called, the yard rod of Henry VII. is that which was expressly stated, in 1743, to have been for a long time disused as a standard; the ell rod of Queen Elizabeth is that which also dropped into disuse between 1743 and 1835; while the yard rod of the same queen is that which was reported on by Mr. Baily to the Royal Astronomical Society in 1835, as horrible in workmanship, and with its length shortened by a dovetail.

first, on the error in the general theory of British legislation on the subject of standards, as shown in "the entire apathy on the part of Government towards the matter, whereby it acts only when pressed by popular demands;" and second, the error in the practice of the British Executive, which is, within its functions, not much unlike the above; leading also to such exposures of our chief political statesmen as the following, extracted from Mr. Chisholm's report:—

"In answer to a question upon this subject in the House of Commons, Sir George Grey is reported to have said (see Hansard) that 'the standards (Exchequer) had been examined; some adjustment was found necessary, and measures would be taken to have them verified.' It is probable that the answer of the Home Secretary was imperfectly heard or misapprehended, as no examination, comparison, or adjustment whatever of the Exchequer standards has been made."

Since then, however, some members of her Majesty's Government have advanced in metrological knowledge: a new office has been created for the subject and placed under the care of the same Mr. Chisholm, late chief clerk in the Exchequer, with the title of "Warden of the Standards;" and a gentle current of interest has so decidedly begun to flow towards the subject, that one or two of the oratorical leaders on ordinary political topics have graciously intimated, that when that current shall have become stronger they may then perhaps find it worth their while to utilize its motive power, and in their own way and for their own purposes consider, what can be done for, or with, our British national and hereditary weights and measures.

Too late! too late! for while these politicals were dallying with their national duties, a mine has been sprung beneath their feet. The merchants and manu-

facturers of the country, with a section of the scientific men, chiefly of the electrician and chemical stamp, have burst into the arena, and declare that they cannot wait for the slow improvements of Government. They want, they haste, to be rich. The creed that they almost worship consists in "buying in the cheapest, and selling in the dearest, market," or making money with the utmost speed! * and as they fancy that their operations receive a momentary check in some foreign countries, by the different metrological systems there and here,—so immediately, without weighing the whole case, without allowing the mass of the population to have a voice in that which is *their* affair, which is as ancient and necessary to them, the people, as their very language, and without considering whether, by breaking down the barriers between France and Frenchified countries and ourselves, they may not be raising up other obstacles between ourselves as so altered, and Russia,† America and Australia,—they, these new intruders into the scene, are calling out and demanding that French weights and French measures shall be instantly adopted by law from one end of Great Britain to the other; under pains and penalties, too, of the most compulsory order, and enforced by a new and special description of highly paid officials to be appointed for that sole purpose.

In the midst of such a headlong pursuit of mere

* See Mr. John Taylor's work, "Wealth the Number of the Beast."

† Amongst many other symptoms of strong and youthful vitality, and promise of its future pre-eminence in the affairs of the world, Russia scorns to adopt the French units of measure. Some interested parties recently went to St. Petersburg, trying to persuade its citizens to adopt the French system, on the plea that Belgium, Holland, Sardinia, Tuscany, Spain, Portugal, Greece, Switzerland, and several countries of South America, had already joined it, and that Great Britain *was just going to do so*. But Russia was nothing moved by that, and though all the world was going to submit itself to France, she, Russia, was not; she knew the value of her own hereditary measures, connected at one point with the British system, and she would as soon give up her language as her ancient metrology, adapted to, and loved by, her people.

wealth, as this unprecedented tampering with the prehistoric possessions of our nation, for such a purpose, would be, the poor are unfortunately the first to go to the wall. They may have been somewhat curbed and bridled in past times by kings and barons and Government servants,—but what is that to the oppression of merchants and mill-masters hasting to be rich, and freely sacrificing thereto any patriotic sentiments and historical associations which their "hands" may presume to indulge in?

There is not indeed a completer way than by such a forced introduction of foreign units, for treading out the desire for national independence amongst our poorer classes, the chief material, after all, of our army and navy in war, and main strength in peace; and for telling every man of them, and twenty times a day, whether he is in the field or whether he is in the house, that his convenience and comfort in necessaries are sacrificed to schemings for still more riches to come to those who are already overflowingly rich; and that the poor man's fine traditional aspirations for the perpetuity of the British name, are held subservient amongst his latest rulers to lower and less patriotic ideas of the hour. While even the very "People's House" of the Legislature with their Committee of 1862 arrived, in their own words, unanimously at the Macchiavellian conclusion, "cautiously and steadily to introduce into this country the French metric system, adopting its nomenclature also; at first merely *legalising* its use, and then, after a time, rendering it compulsory:" and never, perhaps, expecting to hear the Nemesian cry raised against them, the cry which, when issuing from the rank and file, has proved the speedy death-knell of a great empire within the last three years—"*Nous sommes trahis*" ("We are betrayed").

The Committee were indeed told, from the reports of

the Astronomer Royal and elsewhere, "that the said forcible introduction of foreign weights and measures into Great Britain would be to the *excessively great inconvenience* of 9,999 persons out of every 10,000 of the population, and the gain to the one person in 10,000 only small; and that any interference of Government for compelling the use of foreign measures in the ordinary retail business of the country would be *intolerable;* that they could not enforce their penal laws in one instance in a thousand, and in that one it would be *insupportably oppressive.*" Yet all the effect that this wise, salutary, and truly charitable information produced on the politico-pretence merchants of peace principles, with Mr. Cobden himself amongst them, was "to look forward to a comprehensive and exact system of inspection, and the establishment of an efficient central department to give force and unity to local action." In fact, to act like a German army in undisputed possession of a foreign country, and put down at all costs amongst the British people any national feelings for historical institutions of their own; for things which, however they may have been meddled with by modern acts of parliament, are still substantially the same as those which the *origines* of the nation received, the nation itself does not know how or where, or exactly when; though they are fully aware that they have possessed them as long as they have ever been a nation at all, or from before the birth of any history amongst us; and they, the mass of the working people, understand the outside world thoroughly, familiarly, intuitively, only in terms of them.

No wonder the *Times* wrote on July 9th, 1863:—"A very great trial is impending over this free and happy country. It is not the loss of our cotton trade, of our colonies, of our prestige, or our maritime supremacy. It is a change that would strike far deeper

and wider than any of these; for there is not a household it would not fill with perplexity, confusion, and shame. From a division in the House of Commons yesterday, it appears that we are seriously threatened with a complete assimilation of all our weights and measures to the French system. Three years are given to unlearn all the tables upon which all our buying and selling, hiring and letting, are now done. Three years are supposed to be amply sufficient for undoing and obliterating the traditions of every trade, the accounts of every concern, the engagements of every contract, and the habits of every individual. But we very much doubt whether the general shopkeepers, who take possession of the corners of our small streets, or the greengrocers, will be able in three years to translate their accounts into Duas, Hectos, Kilos, Myrias, Steres, and Litres, Metres, Millimetres, Centimetres, and the hundred other terms extracted by our ingenious neighbours from Latin or Greek, as may happen to suit their purposes. Is the House of Commons, then, really prepared to see the votes, the reports, the returns of the revenue, the figures of the national debt, all run up in paper francs and actually paid in gold Napoleons?"

The accomplishment, however, of so undesirable a result seems to have been postponed for a time by the Parliamentary proceedings of May 4th, 1864; when Mr. Ewart's bill, after two readings, was withdrawn in deference to another proposal brought up by Mr. Milner Gibson. But as Mr. Cobden professed himself quite unable to see the difference between the two, though allowing there might be some,—and we know already what are the ultimate compulsory intentions of the promoters of the bill,—it is plain that the thin end of the wedge is already introduced to attempt to destroy our British hereditary metrology.

Thus far, nearly, was written in the first edition of this book, published in 1864; but now in 1873-4, what is the state of matters?

Well, their condition is surely most passing strange; for, bill after bill has been brought into Parliament, agitators have been at work throughout the land, defections from the national cause have occurred by the thousand, scientific men have turned coat, and those who a few years ago gave the most splendid testimony that to force foreign measures on the British people would aggravate them to the extent of civil war, those who in an earlier state of society would have died rather than abandon their best opinions and patriotic creeds,—have now been signing propositions on the other side, and even assisting in putting up at the Palace of Westminster, side by side, copies of the British and French standards of length, as though the Government of France ruled already over half of the British people.

Other renegade scientific men, encouraged too by some of the chief scientific societies, have been publishing new text-books in science for, if possible, all the schools and colleges in the empire; wherein, though they still condescend to use the English language, they scorn to be loyal to the English authorized weights and measures; but speak of everything in the heavens above and the earth below in the new French metrical terms, which they seem to have sworn together they will make this country accept, whether it likes it or not.* While in the elementary schools which are now springing up under Government headship and School Board management all over the country, teachers are

* In the letters which have appeared in "Nature," from H.M.S. *Challenger's* scientific expedition, carried on at an expense of not less than £20,000 a year to the British people, those contemned individuals have the distances steamed over by their British ship, by means of British coal, described to them in *kilomètres;* and even a little piece of chalk, brought up by the dredge from the ocean-bottom, is defined for size to British readers by fractional parts of a *mètre.*

urged, induced, encouraged from some secret quarters to take time, with its expected political changes, by anticipation, and teach all the children within their reach at once the French weights and measures; or when they cannot do that, openly in defiance or prostitution of what the schools were established for, at least to have some printed representation of the French system suspended in sight, as though it were soon *going to be* the law of the land.

And yet, notwithstanding all these questionable proceedings, every attempted bill has failed before Parliament; and another bill yet, which is to be brought in this very year (1873) will have to go through the Sisypheian labour of the others, or of beginning the task again where Mr. Ewart's bill of 1864 began, as well as ended.*

How they all came to fail, is almost as deep a mystery, as how and whence the irrepressible and untiring energy to bring them forward again and again, is derived; for though *two* good speeches were delivered against the last bill, what were they to the torrent of declamation on the other side,—claiming, too, to be the side of liberal opinion, of modern science, of political advance, of mercantile wealth, of organized industries, of all civilization, and indeed of everything but—nationality, history, and religion.

Those three ought, of course, to be a powerful trio; in other countries too, as well as our own; but the two latter of them were not invoked in the Parliamentary discussion at all. Indeed, they were apparently not understood by either party as in any way belonging to the subject; so that whatever political ferment has been made hitherto by the metrological question, it is

* At the time of going through the press this event has already occurred; Mr. Benjamin Smith's bill having been withdrawn, and a promise given that Government is to take up the subject next year.

nothing to what is inevitably to come, and all the world over too, when its full importance has been understood; and its profligate treatment at the hands of rulers during the present hour, appreciated by the rising and indignant masses of all civilized nations.

Just now, or up to the present time, therefore, the fight has merely been between the would-be introducers of the new French metric system, and the defenders of the British national system as it is. These latter men will have no change, simply because they dislike all change, and have been getting on after a fashion well enough hitherto; but they cannot expect on those principles to have the victory in future fights always given into their hand: especially when they can neither pretend to prove that the British metrology is everything that it might be to suit the advanced wants of the present high state of civilization and science; nor demonstrate that it is still, all that it once was, for general social purposes in that primeval time when the system was first given as an heirloom to the Saxon race, *before* they came to these islands. This latter position is, indeed, sufficiently indicated from our sketch, meagre though it is, of the political history of British weights and measures from the days of Edgar the Peaceable on his throne of Winchester, down to the present hour. And when throughout that long interval, these most precious units and standards have always been neglected by our chief rulers for the time being, and left without guidance to underlings or interlopers to manipulate almost at pleasure, how could we expect Government, with ever so good intentions, to have either safely preserved, or wisely built up, our metrological traditions?

When Dr. Kelly found reason to remark, that through all our modern history our weights and measures had always been growing worse, rather than

better,—he might well have risen to the idea that at some primeval age they must have been of strange and even surpassing excellence. But it was not given to him, or any scientist in that reign, to perceive the logical bearings of the case so clearly: wherefore weights and measures went on in a doomed course towards a sea of trouble destined to surge over many nations.

Louis Napoleon may have disappeared, a defeated man; but before he fell from power he had engaged the then Prussian king, now German emperor, to abolish the ancient national German measures and establish the new French ones in their stead, when the year 1872 or 1874 should arrive. And now that haughty potentate must either swallow his words, undo much preparatory legislation, and break faith with the metrical men,—or will have, whether in his own, or in his son's time, to enter into contention with the masses of the German people who have raised him to his present throne by their intense Germanism; but never gave him authority to tamper with their hereditary German gifts and possessions; theirs from before the time that they say St. Paul visited them as the Galatians.

"Oh!" but joyfully argue some men, "it would be so gloriously promotive of modern science, for one set only of weights and measures to be used and referred to by the scientific men of all nations." Yet that is only a resuscitation of a cruel fallacy of the middle ages; viz., to try to keep up Latin as a common language among all scientists whatever language their poor fellow-countrymen spoke. A demoralizing and suicidal fallacy; because it was found in practice infinitely more important, patriotic, charitable, for each scientific man to have no secrets, no mysteries from the masses of those poor, but worthy, and often most religiously-minded men around him; and whose friendly encompassing of him in that manner, was the very source of the quiet

and leisure which he enjoyed for his own prosecution of science. Wherefore the first professor who gave a scientific lecture in the vulgar tongue in a German university, was rightly held to have made almost as precious, useful, and fruitful a reform, as that priest who began the system of publicly praying, and reading the Scriptures, in the language of the people.

There is, indeed, *something* to be said for choice, or regulation, of weights and measures coming from the side of science; but the people were in the field before science, and have the first and largest interest in them still. Neither is it in the power of any scientific men, with all their science up to its very latest developments, to invent a truly national set of weights and measures, any more than they can make a national language and a national people.

Before the Flood, according to the Bible, there was no division of mankind into nations; *that* was a divine appointment afterwards, together with the creation of their tongues, the appointment of their bounds, and, there are good reasons for believing, the assignment of their weights and measures. And if that *was* the case, a direct and intentional effort by men to subvert them now entirely, is not likely to succeed, however many scientists put their shoulders to the wheel.

But the French metrical system, in its acts and ambitions, is precisely such an attempt in these days to dethrone the primeval system of weights and measures amongst all nations; and make all mankind speak in future in that new and artificial metrological language, invented only eighty years ago in Paris. And if there is sound reason for believing in the Divine appointment of the ancient systems, this new antagonist to them *ought* to have been ushered in under some very contrary influence.

How, then, was it brought to the light of day?

By the wildest, most bloodthirsty, and most atheistic revolution of a whole nation, that the world has ever seen. And, attempt to conceal it as they may, our present meek-looking but most designing promoters for introducing the French system amongst us (and I hear from Birmingham that there is a lady also among them, loudly petitioning Government for its compulsory establishment, forsooth, over our whole nation)—those meek-looking geniuses, I say, cannot wipe out from the page of history, that, simultaneously with the elevation of the metrical system in Paris, the French nation (as represented there), did for themselves formally abolish Christianity, burn the Bible, declare God to be a non-existence, a mere invention of the priests, and institute a worship of humanity, or of themselves, under the title of the Goddess of Reason; while they also ceased to reckon time by the Christian era, trod on the Sabbath and its week of seven days, and began a new reckoning of time for human history in years of their then new French Republic, and in *decades* of days so as to conform in everything to their own decimal system, rather than to Revelation.

Mere human telling was not enough to remind our British metrical agitators of those fearful things: so they have had them not sounded again only, but repeated too in fact, within the last three years, in blood and fire and blackest of smoke throughout the same city of Paris,—when the Commune, on getting for a time the upper hand, immediately re-established the Republican era as against the Christian, and declared war against every traditional observance and respect of man. While since then, the still more savage and merciless proceedings of the Spanish commune, wherever it has had an opportunity of rising in their cities, shows that the heart of man, unregenerated in Christ, is no whit

better in the present day than at any epoch throughout all antiquity.

Now, perhaps,—and without pursuing any further this historic part of the subject of weights and measures, which, though as old as Cain and Seth, if not Abel also, is by no means yet played out on the stage of time,—it may be given to a favoured, predestined few, to begin to understand, on a figure once used by Dr. Chalmers, what extensive armaments of what two dread opposing spiritual powers may be, without our knowledge, engaging in battle around our little isle, contending there—on this subject, too, as well as many others—for mighty issues through all eternity. So that not for the force of the sparse oratory emitted in defence of British metrology before Parliament, were the bills of the pro-French metrical agitators so often overthrown, but for the sins rather of that high-vaulting system itself; and to prevent a chosen nation, a nation preserved through history thus far by much more than the wisdom of its rulers,—to prevent that nation unheedingly robing itself in the accursed thing; and unknowingly throwing away an institution which it was intended to keep until the accomplishment of the mystery of God touching the human race.

A very close approach to the dangerous cliff was made only a dozen years ago, when the Government's own Standards Commission, not content with the yard in place of the inch being pronounced a new British unit, must also propose to drop the original inch entirely; inventing new names for multiples of 1,000 and 2,000 of their new unit yard, to take the place of the British mile; and subdividing it again as a concrete quantity into a totally unheard-of set of small lengths, such as neither we nor our fathers ever knew, to supersede and obliterate what have hitherto well

served all the smaller, and most of the exact, purposes of Anglo-Saxon life and existence.

But happily the Commissioners' hands were stayed; and one of their number—the highest approach to the ideal of a philosopher since the days of Newton that this country has produced, the late Sir John Herschel (whose remains now repose in Westminster Abbey)—was presently gifted to see, that of all the various length measures now on the statute-book, the inch (which was then in such imminent danger) is by far the most really important, because the true and original unit and source of all the others. This idea too seemed continually to grow in Sir John Herschel's mind. For, through the inch, he perceived that all the British weights and measures might be easily made (once again perhaps) most scientifically earth commensurable; and without the popular value of any of the chief units or standards, or even their names, being interfered with.

That grand principle, too, of earth commensurability, or that there should be a complete and harmonious scale of numerical relations connecting the small units employed by man in his petty constructions on the earth, with the grander units laid out by the Creator in the sky, Sir John Herschel stood up splendidly for: and argued and wrote for the glorious idea really belonging to British metrology, in various parts of the country; but in vain! His colleagues on the Standards Commission could see no beauty nor desirability in that which he esteemed so highly: unless it was those of them who claimed something of the same earth-commensurable principle, though in a less perfect form, for the French metre: and *they* wished to abolish the entire British system. So after doing all that he could to convince, demonstrate, persuade, with the effect only of finding that the majority were determined to sacrifice everything to France, he took the final course for a great

and honest man to take—he gave up what had been an honour to fifty years of his life, his place at the Standards Commission, his prospects of power or influence in Government appointments,—and went out from amongst them all, alone, wounded in spirit and lowered, perhaps, in the eyes of many; but nobly nerved to carry on the battle single-handed, in the open world outside, against the metrical mania of the day: a strange disease, which Sir John Herschel (the equal to whom, not Cambridge herself could show at the greatest of all competitive examinations) deemed not only anti-national, but, in spite of all that is so frequently said for it, not of the highest science either.

This case, I fear, is the one, only, bright example which British science has shown in our day, of a scientist who would suffer in place, in power, and in worldly, social dignity, for opinion; and did so:—a man, therefore, in whom a great nation might trust in any dire emergency; and who, when the last pro-French metrical bill was about to be urged before the House, came to the defence of his country's cause with the following letter to the Editor of the *Times*:—

"SIR,

"As Mr. Ewart's Bill for the compulsory abolition of our whole system of British weights and measures, and the introduction in its place of the French metrical system comes on for its second reading on the 13th proximo, I cannot help thinking that a brief statement of the comparative *de facto* claims of our British units and of the French on abstract scientific grounds may, by its insertion in your pages, tend to disabuse the minds of such, if any, of our legislators who may lie under the impression (I believe a very common one among all classes) that our system is devoid of a natural or rational basis, and as such can advance no *à priori* claim to maintain its ground.

"*De facto*, then, though not *de jure* (*i.e.* by no legal definition existing in the words of an act of parliament, but yet practically verified in our parliamentary standards of length, weight, and capacity as they now exist), our British units refer themselves as well and as naturally to the length of the earth's polar axis as do the French actually existing standards, to that of a quadrant of the meridian passing through Paris, and even in some respects better, while the former basis is in itself a preferable one.

"To show this I shall assume as our British unit of length the imperial

foot; of weight the imperial ounce; and of capacity the imperial half-pint; and shall proceed to state how they stand related to certain prototypes, which I shall call the geometrical ounce, foot, and half-pint; and shall then institute a similar comparison between the French legally authenticated metre, gramme, and litre in common use with their (equally ideal, because nowhere really existing) prototypes supposed to be derived from the Paris meridian quadrant, distinguishing the former as the practical, the latter as the theoretical, French units.

"Conceive the length of the earth's axis as divided into *five* hundred million equal parts or geometrical inches.

"Then we will define:—1. A geometrical foot as twelve such geometrical inches; a geometrical half-pint, as the exact hundredth part of a geometrical cubic foot; and, 3, a geometrical ounce as the weight of one exact thousandth part of a geometrical cubic foot of distilled water, the weighing being performed, as our imperial system prescribes, in air of 62° Fah., under a barometric pressure of 30 inches.

"In like manner the theoretical kilogramme and litre of the French are decimally referred to their theoretical metre on their own peculiar conventions as to the mode of weighing.

"This premised—(1) the imperial foot is to the geometrical in the exact proportion of 999 to 1,000 (nine hundred and ninety-nine to a thousand), a relation numerically so exact that it may be fairly considered as mathematical; and 2 and 3, the imperial half-pint and ounce are, each of them, to its geometrical prototype as 2,600 to 2,601.

"Turn we now to the practical deviations from their theoretical ideals in the case of the French units. Here, again (1), the practical metre is shorter than its theoretical ideal. The proportion is that of 6,400 to 6,401. The approximation is, indeed, closer, but the point of real importance is the extreme numerical simplicity of the relation in our case, more easily borne in mind, and more readily calculated on, in any proposed case. 2 and 3. Any error in the practical value of the metre entails a triple amount of aliquot error on the practical kilogramme and litre, so that, in the cases of these units the proportion between their practical and theoretical values is not that of 6,400 to 6,401, but of 2,133 to 2,134. Here, then, the greater degree of approximation is in our favour; and it is to be observed that in our case this triplication of error does not hold good, since, by a happy accident, our standard pound has been fixed quite independently of our standard yard, and our gallon is defined as 10 lbs. of water.

"I am, Sir, your obedient Servant,
"J. F. W. HERSCHEL.

"COLLINGWOOD, *April 30th*, 1869."

This is very clear so far: but its able author did not go far enough. For while his grand fountain and source of earth-commensurability for the British measures was based, even by him, upon, not the foot, which he ultimately used, but the *inch*, being an evenly earth commensurable measure, and by the particular number of *five* hundred millions of them, yet he afterwards drops out of view both the inch, the five times of so

many parts, and says nothing about his new cubit standard, which he was at that very time proposing for the British nation, and prescribing that it should consist of 5 × 5 of those inches, in place of their present yard of thirty-six inches. Nor does the eminent astronomer attempt to show that either the earth-commensurability or the terrestrial fiveness of the inch was anything more than accidental. At all events, he does not explain how or when, or through what, or by whom, that unit first came about; and though he alludes to English history as far back as any printed acts of parliament may extend, he shows no faith capable of tracing the fortunes of our nation up to those dim periods of primeval story where the Bible is the only book worth consulting.

Perhaps it was well, though, that Sir John Herschel stopped where he did: for time is required to enable men effectually to receive the whole of any very new idea; and he did succeed at least in making *some* able men pause in their mad career of abolishing, as having nothing at all in them, the traditional British standards and units of measure. And had he, the most brilliant representative of modern exact science, gone on further still, and been the propounder of the Great Pyramid source of the wisdom of our ancient measures: that they had been monumentalized there in the Siriad land before history began, but yet in admirable earth and heaven commensurability, and in a manner never known to the profane Egyptians;—the sceptical modern world would hardly have consented to believe, but that the excellences of such a system were Sir John Herschel's own transcendent inventions; and had arisen much more through his brilliant grasp of modern academical science, than by his simple readings in that stone-book of Revelation which stands on the Jeezeh hill, open, though hitherto illegible, to all mankind.

But for John Taylor, who never pretended to be a scientific man, to propound the grand idea;—and for the Scottish Astronomer, with scarce pay enough to exist upon, and only a few old instruments, though in a so-called Royal Observatory, at his hand both for professional work, and to follow up the Great Pyramid clue —was, and is, quite a different matter. Such plan was, indeed, hardly less, than to let the stones of the Great Pyramid themselves cry out to a heedless generation.

But, oh! how effectively they cry for the few who will, and do, give heed to them! Only see how satisfactorily, in our Part I., the Great Pyramid's first and simplest mechanical features have helped us over Sir John Herschel's enormous, and by him never solved, difficulty of explaining why there was more meaning in the unit inch going *five*, rather than any other number of hundred million times into the length of the earth's axis of rotation. Let the reader presently judge, too, how similarly gleaned Pyramid facts will enable us to assign a date, a place, and an origin to the whole system, capable of demanding the respect of all men, scientific and unscientific alike: on a far higher footing, moreover, than anything that can be said for all the works of the philosophers of Greece, the poems of Homer, or the reputed wisdom of the Egyptians themselves.

Be it, however, our first and immediate part to enter somewhat into practical applications; or to set forth in the four ensuing chapters what may be the most probable schemes of subdivision and arrangement of the Great Pyramid's grand standards; to indicate their points of contact with the British and Saxon metrologies; and allude to both their aids to the minds as well as the bodies, and their promotiveness to the fulness of thought as well as the material comforts, of universal intellectual man.

CHAPTER XII.

PYRAMID CAPACITY MEASURE.

THE grand standard of capacity in the Great Pyramid, as already stated, is given by the contents of the granite coffer at the further end of its final and so-called King's Chamber; and this vessel measures, as too it was originally intended that it should, 71,250 cubic Pyramid inches, or something very close thereto.

This whole quantity subdivides itself easily, after the manner of the Pyramid arithmetic and Pyramid construction, as follows:—The two most important steps being, *first*, the division into 4, as typifying the four sides of the base; and *second*, the division into 2,500, or 50 × 50 parts; fifty being the special number of the room, and the number also of the masonry courses of the whole structure on which that chamber, or rather the two chambers of ten million cubic inches each, of which it is composed, rest in their places.

PYRAMID CAPACITY MEASURE.

Division, or number of each denomination contained in the whole coffer.	Intermediate divisions.	Capacity of each denomination in Pyramid cubic inches.	Equivalent Weight in Pyramid pounds of Water.	Name now proposed to be given to each successive portion.
1	0	71,250·	2500·	Coffer.
4	4	17,615·	625·	Quarter.
10	2·5	7,125·	250·	Sack.
25	2·5	2,850·	100·	Bushel.
250	10·	285·	10·	Gallon.
2,500	10·	28·5	1·	Pint.
25,000	10·	2·85	0·1	Wine-glass or fluid ounce
250,000	10·	0·285	0·01	Tea-spoon or fluid drachm
2,500,000	10·	0·0285	0·001	Ten drops.
25,000,000	10·	0·00285	0·0001	Drop.

We begin, therefore, with the large measured and scientific quantity of the coffer; and end with a unit which, in an *approximate* form, as a drop, (*i.e.*, the cubical space occupied by a drop of water falling freely in air at a given Pyramid temperature and pressure), is in every one's hands, and is definable accurately upon the coffer by the stated proportion.

In contrasting this arrangement with the British imperial system, we may see at once that that modern system is merely a measure for large and rude quantities, knowing of nothing smaller than the pint (the gill being merely a later tolerated addition to suit special wants), and rendering it therefore necessary for the apothecaries and druggists to manufacture a sort of fluid and capacity measure for themselves, which they do by starting from the pint and ending in the drop; or, as they term it, with needless addition of dog-latin, a "minim."

This apothecaries' fluid measure was established only in 1836; and we may assume, with Lord Brougham's *Penny Cyclopædia*, that such fluid ounce, when it is an ounce, is an ounce avoirdupois; although it is stated elsewhere, that medical men are never to use anything but troy weight.

This incongruity renders the break between imperial, *i.e.*, the present British, capacity, and apothecaries' capacity, measures peculiarly trying; followed as it is by a break of connection between apothecaries' capacity, and apothecaries' weight, measures also.

In the Pyramid arrangement, however, there is no halting half-way; but, when it is a question of capacity, the scheme goes right through from the biggest bulks ever dealt with in commerce, and through all the measures required by the people further in dealing with coal, corn, wool, potatoes, beer, wine, peas, meal, oil, medicines, photographicals, and chemicals, up to the

smallest quantity ever judged of by capacity measures of specified name; for when once we have arrived by several decimal stages at "drops," no one would ever think of subdividing them further, if they could, in any other manner than by the tens of pure arithmetic again and again.

Next, for the testing of these bulks by weight, the imperial system has only one strikingly even equivalent, viz., the gallon, = 10 lbs. of water weight. But that is accompanied by the double drawback, 1st, that 10 lbs. in weight is not an imperial known weight; and 2nd, that the gallon is not the unit of the imperial system.

The unit of the imperial capacity system is a pint; and it is, moreover, the very important centre of connection between that system for large ordinary quantities, and the apothecaries' system for scientific and medical small quantities. It is, therefore, the point of all others in the scale which should be round and complete, testable also at a moment's notice by an equally round, well-known, and frequently employed standard of weight.

So it was too in the days of the wisdom, wherever that was derived from, of our Saxon forefathers, or the times of instinctive strength of our hereditary traditions; but under the luxurious, and very modern, reign of George IV. that strange tendency to take measures from the poor, and enlarge them more or less for the convenience chiefly of the rich, was rife; so the pint, from having been the unit, as one pound's weight of water, was expanded into the odd quantity of 1 and $\frac{1}{4}$ pounds of the same; while the bigger measure of a gallon, with which the poor man has seldom to deal, was ordained to be the standard capable of being tested by a round sum of 10 lbs., if that could be obtained or made up from other weights.

This petty manœuvring with some of the customary old usages, if not also hereditary rights, of the poor, was

attempted, in the case of the new imperial pint, to be electro-plated with brilliant proverbial mail, by Lord Brougham's and the great "Diffusion of Useful Knowledge Society's" giving out this saying, to be learned by all good subjects in these latter days,—

"A pint of pure water,
Weighs a pound and a quarter."

But, treason or no, I venture to doubt whether every peasant has yet got that distich by heart; and whether he does not rather ruminate in his family circle and about the old hearthstone over the far more ancient and pithier rhyme,—

"A pint's a pound,
All the world round;"

An expression, too, in which there may be vastly more than immediately meets the eye; seeing, as in our above table, that the Pyramid system appears to restore the principle embodied in those two little lines; and may have communicated it, in ages long gone by, to many other countries also: in part, who knows, to prove them, if they could be faithful, *and for how long*, to their ancient covenant.

Almost every one of the Pyramid capacity measures, however, over and above its pint, admits of being tested by a round number of "water-pounds;" and that number is always such a one as we shall presently see equally exists in the Pyramid system of weight measure.

We have, therefore, only to conclude this division of the subject by submitting a table of comparison of each concluded Pyramid capacity vessel, with each similarly named current capacity vessel in Great Britain, through means of the common medium of English cubic inches. Whence it will be seen that, excepting the "coffer," (though even that is hardly altogether unknown to our nation, "chaldron" having been under Anglo-Saxon

rule an expression for, and a description of,* it), there is no need to invent any new names; for, under the existing names, as of pints, gallons, &c., &c., the absolute capacities have often varied much more than here indicated,† and without a tithe of the reason for it.

PYRAMID AND BRITISH CAPACITY MEASURES,
Compared through the temporary medium of English cubic inches, approximately.

Coffer, Pyramid .	= 71,463·750	Four Quarters, Brit.	= 70,982·144
Quarter „ .	= 17,865·938	Quarter „ .	= 17,745·536
Sack „ .	= 7,146·375	Sack „ .	= 6,654·576
Bushel „ .	= 2,858·550	Bushel „ .	= 2,218·192
Gallon „ .	= 285·855	Gallon „ .	= 277·274
Pint „ .	= 28·585	Pint „ .	= 34·659
Ounce or Wine-glass	= 2·858	Ounce, fluid, Apoth.	= 1·733
Dram or Tea-spoon	= ·286	Dram, fluid, Apoth.	= 0·217
Drop, Pyramid .	= ·003	Drop, Apoth. .	= 0·004

INTERNATIONAL APPENDIX TO GREAT PYRAMID CAPACITY MEASURE.

If analogues of the Great Pyramid measures are thus found in the oldest metrology of the Anglo-Saxons presently known, some traces of them can hardly but be discoverable also in the hereditary metrologies of other countries besides our own Great Britain.

Without, then, attaching any particular importance to the results, I append here some of the most striking approaches to coincidence, chiefly gathered from Kelly's *Universal Cambist*, published in 1821. Dr. Kelly having been an author of the most respectable class in commercial and educational science; and one who, though the French metrical system had already appeared on the horizon in his time, yet lived in the full force of the older hereditary metrological systems; systems perverted often exceedingly into provincial variations, but not then begun to be stamped out of existence wholesale, for the benefit of the metre of Paris.

"Quarter" Capacity Corn Measures.

Country or City.	Name of measure.	Contents in English cubic inches.
Ancona . .	Rubbio . . .	17,459·
Malta . . .	Salma . . .	17,678·
Great Pyramid	**Quarter of Coffer**	**17,866·**
Rome . . .	Rubbio . . .	17,970·
Sicily . . .	Salma generale .	16,866·

* See Mr. Taylor's "Great Pyramid," p. 144.

† In or about 1800 it was reported that in Westmoreland the following diverse measures were used:—1st, a *Winchester* bushel; 2nd, a *customary* bushel, equal to three Winchester bushels; 3rd, a *potato* bushel, equal to two Winchester bushels; and, 4th, a *barley* bushel, equal to two and a half Winchester bushels.

"Sack" Capacity Corn Measures.

Country or City.	Name of Measure.	Contents in English cubic inches.
Amsterdam	Mudde	6,788·
Basil	Sack	7,870·
Bolsano	Scheffel	6,657·
Deventer	Mudde	7,049·
Dordrecht	Great Sack	7,638·
Dresden	Scheffel	6,455·
Frankfort	Malter	6,590·
Genoa	Mina	7,367·
Hague	Sack	6,546·
Hamburg	Scheffel	6,426·
Hanau	Malter	6,868·
Pernau	Tonne	7,729·
Prague	Strick	6,516·
Great Pyramid	**Sack**	**7,146·**
Reval	Tonne	7,219·
Turin	Sacco	7,015·
Zwoll	Mudde	6,851·

"Bushel" Capacity Corn Measures.

Country or City.	Name of Measure.	Contents in English cubic inches.
Berlin	Scheffel	3,180·
Calabria	Tomolo	3,119·
Greek (ancient)	Medimnus	2,712·
Hildesheim	Scheffel	3,164·
Königsburg	Scheffel	3,152·
Magdeburg	Scheffel	3,151·
Maranham	Alquiero	2,772·
Mecklenburg	Scheffel	2,591·
Nancy	Carte	2,925·
Naples	Tomolo	3,122·
Nimeguen	Scheffel	2,546·
Parma	Stajo	3,135·
Poland	Korzec	3,120·
Great Pyramid	**"Bushel"**	**2,858·**
St. Maloes	Boisseau	2,697·
Sardinia	Starello	2,988·
Smyrna	Killau	3,132·
Wismar	Scheffel	2,547·

CHAPTER XIII.

PYRAMID WEIGHT MEASURE.

THE weight measure of the Great Pyramid we have to obtain from its King's Chamber coffer also; but, as before intimated, by the introduction of an additional and more difficult idea than mere cubic space; and this idea is, the *mean density* of the whole earth.

Were masses of such matter directly procurable, the best representation of the Pyramid weight standard might have been a rectangular block of that substance, 5·7 times smaller than the coffer's internal capacity, set up beside it in the equal temperature and rarely much disturbed atmospherical pressure of the same chamber.

But as we are not able, in spite of all the wonderful resources of modern science, to delve anything like deep enough to obtain a specimen of this grand unit material which forms the foundation of our globe, we must take the coffer's contents in water as a stepping-stone, but only as that, to reach our desired result.

Thus the coffer's contents of pure water are 71,250 cubic Pyramid inches, which at the temperature of 68° Fahr. would weigh 18,030,100 of our avoirdupois grains; according to the estimate of the British Government that one cubic British inch of distilled water at temperature 62° Fahr. and barometer 30·00 inches, weighs 252·458 grains; the necessary reduction being performed for the different size of the inch and the altered

temperature. Therefore a mass of the earth's mean density material of the size of 12,500 * Pyramid cubic inches, at the standard Pyramid temperature and pressure, weighs in the lump 18,030,100 British avoirdupois grains.

But what are its subdivisions on the Pyramid system? Here we can follow no better plan than that adopted in the capacity branch of metrology; and then we are rewarded by finding, when we come to the most characteristic division of all, viz., that of 50×50, which *should* give us a popular unit to compare with the pint in capacity—we find, I say, that it does give us something which is excessively close to the old Saxon pound; but with this further advantage, of world-wide application in the Pyramid system, and presently to be illustrated in computing weight from measured size, viz., that each such Pyramid pound is equal to the weight of *five* cubic Pyramid inches of the earth's mean density.

Hence our first Pyramid weight table runs thus :—

PYRAMID WEIGHT MEASURE.

Division, or number of each part contained in the weight standard.	Intermediate divisions.	Weight of the part so divided in Pyramid lbs.	Capacity of the parts in Pyramid cubic inches of earth's mean density.	Capacity of part in Pyramid cubic inches of distilled water (T 50° B 30·) of Pyramid.	Name now proposed to be given to each kind of part.
1		2500·	12500·	71250·	Ton.
4	4·	625·	3125·	17815·	Quarter.
10	2·5	250·	1250·	7125·	Wey.
25	2·5	100·	500·	2850·	Cwt.
250	10·	10·	50·	285·	Stone.
2,500	10·	1·	5·	28·5	Pound.
25,000	10·	0·1	0·5	2·85	Ounce.
250,000	10·	0·01	0·05	0·285	Dram.
2,500,000	10·	0·001	0·005	0·0285	Ten-grain.
25,000,000	10·	0·0001	0·0005	0·00285	Grain.

* Derived from 71,250 divided by 5·7.

Having already stated that the Pyramid grand weight standard weighs in British terms, viz., avoirdupois measure, 18,030,100 British grains; we are met, as soon as we begin to compare Pyramid and British weights together in point of fact, with an accusation,—that the Pyramid grains must be very small, if there are 25,000,000 of *them*, to 18,000,000 nearly of the British.

But herein comes to light one of those needless pieces of meddling legislation by our most modern, or Georgian era, political rulers, which so provoked John Quincy Adams and other American writers on Saxon metrology; for whereas the old law of the land was, that the troy pound should be divided into 7,680 grains (and which were very nearly the weight of full and fair grains of well-grown wheat), a later law said that it should be divided into only 5,760 parts or grains so called, but of no known variety of plant employed for breadstuff. Wherefore Cocker, Wingate, and other arithmeticians of that day used to enter in their useful compendiums during the transition period, that 32 real grains or 24 artificial grains made the penny-weight troy; and when that ingenious story was pretty well indoctrinated into their obedient scholars, the notice of the old grains was dropped out altogether, and the new ones remained masters of the situation, with the word "artificial" removed, and as though there had never been any other.

Referred then now, over the heads of these, to the genuine old grains of Saxon metrology (so far as we can trace them back by the usual literary and historical steps, and which is, after all, not so much as a thousand years), the number of 25,000,000 of the Pyramid grains would have been measured then by 24,040,100 of the Saxon grains of that earlier, though not Pyramid epoch, day; but a sufficiently close approach to the

25,000,000, to satisfy any poor man seeking the value of a few grains only.

But the British legal weight measure of modern and historical times has, over and above this item, always been, even within itself and at home, in a dire antagonism between two grand and rival systems; viz., troy and avoirdupois, not to say anything of apothecaries' weight, which is little but the troy, under a different mode of subdivision. General public favour seems at last to have settled upon avoirdupois, as most worthy to be the national weight in future for things in general, and especially things on a large scale; but as it does not go lower than drachms, why then, even though troy weight should be extinguished to-morrow, apothecary's weight will have still to be kept up for dealing with smaller quantities than drachms and the more valuable class of substances. There is, indeed, a legal definition of the number of the large modern "artificial grains" which constitute a pound avoirdupois, viz., 7,000; but as the further avoirdupois subdivisions are into 16 ounces, and these into 16 drachms, we are left there with one such drachm equal to the crushingly awkward quantity to deal with in accounts of 27·34375 grains; and drachms are just the point where science begins to be particular.

Therefore it is that druggists, obliged already to buy wholesale by avoirdupois, have then to dispense retail by troy or apothecary's weight; for these last are the only British weights which enable them to deal easily with grains; and yet these are not real grains, neither for the people, nor in history, nor in science.

The Pyramid weights, therefore, which are on one system only, and go through the whole scale from tons to grains without any break, seem to offer already at this point, an honourable mode of escape to the British nation out of the confusion they have suffered for ages.

No new names are required, many close approaches to the grander standards and units will be remarked, and the proportions of matter under each denomination, as used in the Pyramid and in British nomenclature, are approximately as follows:

PYRAMID AND BRITISH WEIGHT MEASURES,
Compared through the temporary medium of English "artificial" grains.

1 grain Pyramid	=	0.7212	1 grain "real," or old Saxon	=	0·75000
			1 grain new English	=	1·00000
1 drachm Pyramid	=	72·12	1 drachm avoird.	=	27·34375
			1 drachm apoth.	=	60·00000
1 ounce Pyramid	=	721·20	1 oz. avoird.	=	437·5
			1 oz. troy or apoth.	=	480·0
1 pound Pyramid	=	7,212·	1 pound avoird.	=	7,000·
			1 pound, an ancient weight preserved at the Exchequer, but of unknown origin	=	7,1
			1 pound old English and Scotch	=	7,600·
1 stone Pyramid	=	72,120·	1 stone meat	=	56,000·
			1 stone wool	=	98,000·
1 cwt. Pyramid	=	721,200·	1 cwt. avoird.	=	784,000·
1 wey Pyramid	=	1,803,010·	1 wey English	=	1,274,000·
1 ton Pyramid	=	18,030,100·	1 ton avoird.	=	15,680,000·
			1 ton shipping	=	18,816,000·

Specific Gravity.

In no part of metrology more than in weight, is there found so much of the wheel within wheel of natural difficulty, tending, unless well watched and studied, to introduce perverse variations whenever uniformity is attempted; and there are still existing some supporters of the arguments for keeping up both the troy and avoirdupois weight systems amongst us. For the same reasons, too, that those gentlemen believe the complication was first introduced.

And what reasons were they?

When society was in a very primitive, or much more probably, a mediæval degraded, condition, and little but grain was sold, a test for the amount of grain in any particular vessel was, the quantity of water it would hold. But water and grain are of different specific gravities; therefore, if equal bulks were taken, the purchaser got a

very different quantity of what he valued most, than if equal weights were observed; and as some parties were more particular about bulks than weights, and *vice-versâ*, two sets of weights were prepared, with such an amount of difference between them, that a pound of grain in one, occupied the same space as a pound of water in the other.

But in the present day, when all sorts of matters besides bare grain are sold, and almost every one of the thousand and more substances dealt in has a different *specific gravity*, we cannot hope to have as many different systems of weight as there are of such substances; nor, maintaining only one system of capacity measure, to keep up on all possible occasions that appearance of identity between weight and bulk. Hence, for the modern man, the only resource seems to be, to have one capacity, and one weight, measure pure and simple; but to produce the identity required of old for different substances, by *calculation*. Assisting that calculation, too, by some convenient table of specific gravities, wherein the point of coincidence between the two descriptions of measure, or the point where there is no calculation at all from bulks to find weights, shall be in favour of the substance most frequently required to be dealt with; or for those which offer the best average example of all the substances which have in their turn to be either weighed or measured by man.

In the French metric system this point of coincidence is occupied by *water;* and it is intended that the cubic amount of water being measured, that statement shall in itself, with the mere alteration of names, and perhaps of the decimal point, express its weight. Hence, at a recent metrological discussion at the Philosophical Society of Glasgow, a pro-French metrical speaker lauded this quality of his favourite anti-national system; and enlarged upon how convenient it must be for a mer-

chant receiving goods in the docks, out of many vessels from many countries, to go about among the packages with a mere French metre measuring-rod in his hand; and by that obtaining their cubic bulks, thence to know simultaneously their weights also.

"Yes," remarked another speaker, "that would be simple enough if British merchants imported, and exported, and dealt in, nothing but *water*."

Now the pro-French metrical man on this occasion was a large dealer in iron; and had made much fame for himself, and some money too, by improved methods of working the weighty iron plates required for modern armour-clad war vessels. So he was completely overthrown by the above answer; but tried to recover himself and his theory with the professional remark, "Well, but you must allow that the French metrical system is an excellent one for ship-builders computing their displacements by."

"Yes," again answered his merciless opponent, "if ship-builders are never required to deal with salt water; only distilled water; and can keep that always at the uncomfortably cold temperature of water's maximum density, and can also work in a vacuum as to atmospheric air;" for all these are the truly anti-practical plans for any correct weighing to be performed on the boasted French metrical system.

Other speakers then came to the defence of the pro-French metrical iron ship-builder, and urged that a table of specific gravities might be employed when anything else than pure distilled water at a temperature of 39° Fahr. was being measured or weighed; and that when rough commercial results only were required, both temperature and atmospheric pressure might *probably* be neglected.

Let us look each of these sides of the argument straight in the face; for they serve well to contrast

essential and inherent qualities in the French metrical, as against the Pyramid, system of weighing.

The former, having its specific-gravity equality-point at water, while almost all the substances dealt with by art and science (especially the more useful and valuable ones in modern life, such as the metals, minerals, &c.), are heavier, far heavier, than water,—the weights first given out by the French metre rod are always largely in error.

The latter or Pyramid system, on the contrary, having its equality-point at the earth's mean density, or between stones and metals, is much nearer the truth at once and without any specific gravity correction, for things in general, and for precious ones in particular.

Again, the French system which makes the temperature reference close to freezing, or where men can barely exist (and certainly cannot work to advantage), and the atmospheric pressure reference, a vacuum where they cannot exist at all,—must require much larger corrections on the rough measures actually taken in the circumstances of daily life,—than the analogous Pyramid references; which are those of the average temperature and average pressure under which all men upon this earth, do live, move, and work.

Under the French system, indeed, a shopkeeper ought to take account in summer of the large amount of natural expansion of his goods above the ideal temperature of water's maximum density, the wintry 39° Fahr.; and in winter he ought to correct for the artificial temperature which he keeps up by stoves or otherwise. While in both summer and winter he ought to make allowance for the buoyant power of air of the density, more or less, of 30 inches pressure of mercury, on the comparative specific gravities of the material of his weights, and the material of the things weighed; they being true according to his system only in an

absolute vacuum, and that, too, in close proximity to an ice-house.

But under the Pyramid system, and under the British also, the ordinary weighings in the shop under the temperatures and pressures there usually experienced, either in winter or summer, will be never more than microscopically different from weighings performed under the exact and scientific temperature and pressure references of these systems; viz., the mean, very nearly, of what are experienced both in the shops and the general habitations of men, all the wide world over. *But of this more and further, in* Chap. XV.

Weights, then, on the Pyramid system are equally referable, as with the French system, to one given point on both the temperature and pressure scales, when nicety is required. But that given point in the Pyramid case is an easier, pleasanter, and a better known one; while for the rough work of the world, the Pyramid weights are calculable at once from Pyramid linear measure, without any reference to observations of thermometer and barometer at the instant, much more accurately than the French from theirs, under similar circumstances. The Pyramid rules, too, being expressible in the following simple manner:—

For *small* things, ascertain their bulk in cubic inches, divide by 5, and the result is the weight in Pyramid pounds—if the said articles are of the same specific gravity as the earth's average material.

For *large* masses, ascertain their bulk in cubic Pyramid cubits, add $\frac{1}{4}$, and the result is the weight in Pyramid *tons*,—under the same condition of specific gravity.*

* Conversely, the Pyramid weight of a body of earth's mean density being given, to find its Pyramid cubical measure—multiply the pounds weight by 5, and it will give the number of cubical inches: and decrease the tons weight by $\frac{1}{5}$, to find the number of cubic cubits.

But if the matter measured in either case were not of earth's mean density, but, say, ordinary stone, the real weight would be nearer a half, and if of the more common metals, double, the amount given by the above process; the raw number first procured by it, requiring in the case of every different physical substance, to be multiplied by its specific gravity *in terms of that of the earth's.* Hence, such tabular multiplier is 1 when the specific gravity is the same as that of the earth; a fraction of 1 when lighter; and 1 with something added to it, when heavier; as in the following table, prepared from various authorities :—

SPECIFIC GRAVITIES.

Earth's mean density = 1; Temperature = 68° Fahr.; Barometric Pressure = 30·025 British inches.

Cork	·043	Porcelain (china)	·420
White Pine (American)	·072	Glass, crown	·439
Oats (loose as in bushel)	·088	"Common stone"	·442
Larch (Scotland)	·093	Desert sand, near the Sphinx	·454
Lithium	·100	Aluminium	·460
Riga Fir	·105	Red granite (Peterhead)	·464
Barley (loose as in bushel)	·112	Marble (Carrara)	·477
Ether, sulphuric	·129	Red granite, Gt. Pyramid	·479
Wheat (loose as in bushel)	·132	Emerald	·487
Alcohol, pure	·139	Jasper	·494
Pumice-stone	·160	Basalt	·500
Ice	·163	Glass, flint	·527
Butter, tallow, fat	·165	Sapphire	·550
Bees' wax	·169	Diamond	·618
Old Oak	·170	Topaz	·621
Distilled water	·175	Ironstone	·670
Sea water	·180	Sapphire	·701
Blood	·180	Garnet	·720
Heart of oak	·206	Ruby	·750
Cannel coal	·223	Loadstone	·843
Aloes	·239	Silver ore	·997
Chloroform	·267	Arsenic, molten	1·010
White sugar	·282	Chromium	1·04
Bone of an ox	·291	Tungsten	1·07
Magnesium	·310	Tellurium	1·10
Ivory	·321	Litharge	1·10
Brick	·351	Uranium	1·13
Casing stone, Gt. Pyramid	·367	Antimony	1·17
Sulphuric acid, concentrated	·373	Lead ore, black	1·20
Nummulitic limestone, G. P.	·412	Zinc, in its common state	1·21

Tin ore, black	1·22	Mercury, brown cinnabar	1·79
Wolfram	1·25	Silver, virgin	1·84
Zinc, compressed	1·26	Silver, hammered	1·85
Tin, pure, Cornish	1·28	Mercury, precipitated, *per se*	1·91
Iron, cast at Carron	1·28	Lead, molten	2·00
Iron ore, prismatic	1·29	Palladium	2·07
Lead ore, cubic	1·33	Thallium	2·10
Iron, forged into bars	1·36	Mercury, fluent	2·38
Copper, native	1·37	Mercury, congealed	2·75
Manganese	1·40	Gold, not hammered	2·76
Steel, hardened	1·37	Gold, hammered	2·77
Brass, cast, common	1·37	Gold, English standard, 22 carats	3·31
Brass, cast	1·47	Gold, English standard, 24 carats	3·38
Mercury, precipitated, red	1·47	Gold, English standard, hammered	3·40
Cobalt	1·48	Platinum, purified	3·42
Cadmium	1·50	Platinum, hammered	3·57
Brass wire, drawn	1.50	Platinum wire, drawn	3·69
Nickel	1·54	Platinum, compressed	3·87
Copper wire, drawn	1·56	Iridium, compressed	3·90
Bismuth, native	1·58		
Bismuth, molten	1·72		
Silver, native	1·76		

No efficient system, then, of determining weights by linear measure, in the present day can possibly go unaccompanied by its table of specific gravities. And some few of those items at least might worthily be extracted for natural theology texts by every schoolmaster appointed to teach weights and measures,—for what a boundless vista does not specific gravity open up into the realm of nature. And what thankfulness should it not excite in the mind of man towards the Creator, for his free gift of all these endless varieties of elementary matter, wherewith He has of old stocked the earthly abode of man; and thereby made a higher existence possible to him, than to denizens of water alone.

The specific gravity standard of the Pyramid weight measure being the mean density of all the solid, as well as fluid, treasures of the earth,—means thus a great deal in the history of mankind; and there appears to be further an even commensurability of a most interesting order, between the weight of the whole Great Pyramid and the weight of the earth, or in the proportion of

1 to 10^{15}.* A commensurability, too, which may be considered to have been intended; for had the building not been chiefly composed of a stone so much lighter than what is usually known as "common stone," that it has the specific gravity of 0·412 in place of 0·442, the even proportion would not have been obtained,—without indeed altering the *size*, and that would have overthrown other equally, or still more, important commensurabilities. But now, without in the slightest degree interfering with any of its other departments of science and cosmical reference, the Great Pyramid asserts its unexceptionable fitness to be a centre of authority and reference for weight measure also, and to all men, of all nations, living on the whole earth.

INTERNATIONAL APPENDIX TO GREAT PYRAMID WEIGHT MEASURE.

Hereditary Pound Weight Measures.

Country or City.	Name of Weight.	Weight in English Grains.
Aix-la-Chapelle	Pound	7,234
Augsburg	Heavy pound	7,580
"	Light pound	7,295
Basil	Livre, poids de marc	7,555
Berlin	Pound	7,231
Bilboa	Light pound	7,560
Brunswick	Pound	7,206
Canary Islands	Libra	7,104
Cassel	Pound	7,501
Cologne	do.	7,216
Constance	do.	7,285
Corsica	do.	7,566
Dantzic	do.	7,231
Erfurt	do.	7,285
France	Livre, poids de marc	7,555
Frankfort	Pound	7,210
Geneva	Light pound	7,082
Hamburg	Pound	7,476
Hanover	do.	7,511
Königsberg	do.	7,231
Leipsic	do.	7,206
Liége	do.	7,330

* See my "Antiquity of Intellectual Man," pp. 468—475.

INTERNATIONAL APPENDIX (*continued*).

Country or City.	Name of Weight.	Weight in English Grains.
Lubec	Pound	7,480
Lüneburg	do.	7,540
Lyons	Livre, poids de soie	7,088
Madeira	Libra	7,077
Mecca	Rottolo	7,144
Mecklenburg	Pound	7,458
Munster	do.	7,353
Naples	Cantaro piccolo	7,420
Neufchatel	Livre, poids de marc	7,555
Oldenburg	Pound	7,476
Padua	Libbra, peso grosso	7,389
Portugal	Arratel	7,083
Prussia	Pound	7,218
Great Pyramid	**"Pound"**	**7,212**
Rotterdam	Light pound	7,243
St. Gall	do.	7,175
Spain	Libra	7,101
Stettin	Pound	7,219
Stralsund	Old livre	7,460
Strasburg	Livre	7,266
Venice	Libbra, peso grosso	7,363
Ulm	Pound	7,234
Wurtemburg	do.	7,220
Wurzburg	do.	7,362
Zell	do.	7,511
Zurich	Light pound	7,233

The above forty-seven remarkable approximations in many countries to the Pyramid pound, are extracted out of a table of 174 weights of all kinds; and the origin, or centre of diffusion of the 7,212 grains pound, is evidently not to be sought in any of the classical profane nations, the Old Roman pound having been equal to from 4,981 to 5,246 English grains; the Ancient Greek mina, from 5,189 to 6,994 English grains; the Pharaonic Egyptian pound, or mina = 8,304 grains; and the Alexandrian Egyptian mina = 6,886 English grains.

CHAPTER XIV.

LINEAR AND SUPERFICIAL MEASURE.

WE have now arrived at the commercial arrangement of the most important of all the measures of a nation; at that one which requires practically to be attended to first, and which *was* first attended to, and secured with more than sufficient accuracy, as well as with the grandest of suitable and harmonious earth-commensurability in the Great Pyramid; viz., linear, or length, measure.

The unit of this measure, at the Pyramid, is the inch; accurately the $\frac{1}{500,000,000}$th of the earth's axis of rotation; approximately, a thumb-breadth, to any man who has ever lived on the earth during the last four thousand years. In that long interval of anthropological time, what mighty empires, what varied races of men. and what languages too, have passed away from the face of the world! Therefore, of the present words and phrases, laws and customs, which rule in modern society, whether scientific, political or commercial, which of them can expect to continue to control the actions of men for anything like a similar period to this rule of the inch; or for the next forty centuries of years?

A thumb-breadth, then, is no indifferent test-reference to every poor man, for realising when in haste the unit of his measure of length; and keeping up some

identity in his works, with those of his fathers from earliest history, and even before history. Wherefore it is only characteristic of the working men of Newcastle, according to the unintended testimony of Sir William Armstrong before the British Association of 1863, that they have once more practically by their deeds and in their works, pronounced indubitably for the inch (an inch, too, decimally divided), wherever extreme accuracy is concerned.

It was so in our national olden times as well; viz., that the English unit was the inch, and not any of those larger measures, of yards or metres, which the wealthy have been endeavouring to get established of late.

The old Exchequer *standards*, spoken of in 1742, marked E for Queen Elizabeth, and supposed to date from 1580, were, as reported at the time, one a yard, and one an ell; but that did not make either the one, or the other, the *unit* of the country. Where the unit is small, the public standard must inevitably consist of a number of such units strung together; and the incommensurability, except through their component inches, of that pair of measures laid side by side, the yard and the ell, might have reminded men in subsequent times of the true state of the case. But no, the rich men and the lawyers were in power; so the unit of the country during the last century—and until Sir John Herschel ten years ago began to advocate the national, hereditary, and scientific claims as well, of the inch—has been endeavoured to be proclaimed, the huge, and unscientific, or not earth-commensurable, quantity of, a yard.

That the efforts of the ruling classes have long been really directed to this end; and that in making so much, as they have during late years been doing, of the yard, they have intended it as in itself a new unit, and

not as a convenient number of the ancient small inch units arranged together to suit a special purpose of commerce, the following words of the act (June 1824) sufficiently testify.

"The straight line or distance between the centres of the two points in the gold studs in the straight brass rod, now in the custody of the clerk of the House of Commons, whereon the words and figures *standard yard of* 1760 are engraved, shall be, and the same is hereby declared to be, the original and genuine standard of that measure or lineal extension called a yard; and that the same straight line or distance between the said two points in the said gold studs in the said brass rod, the brass being at the temperature of 62° Fahrenheit's thermometer, shall be, and is hereby denominated, the *imperial standard yard*, and shall be, and is hereby declared to be, the *unit*, or only standard measure of extension."

Yet a yard-unit comes, even on the rich people of the country, rather awkwardly; or they are striving at something still greater; for the Astronomical Society's new scale of 1835, as well as of those of Troughton, Sir George Shuckburgh, and others, were oftener of five feet than three. At three, however, it has been eventually settled by the last Parliamentary commission,* and at three feet it will legally remain until some great constitutional exertion be made to rectify it.

During all the time, too, that it has remained there,

* The commission of 1838 had been thorough enough to consider all the following points:—

A, Basis, arbitrary or natural, of the system of standards.
B, Construction of primary standards.
C, Means of restoring the standards.
D, Expediency of preserving one measure, &c., unaltered.
E, Change of scale of weights and measures.
F, Alteration of the land-chain and the mile.
G, Abolition of Troy weight.
H, Introduction of decimal scale.
I, Assimilation to the scale of other countries, &c.

a most artificial and naturally incommensurable quantity with anything grand, noble, sublime,—there never seemed to be the slightest suspicion, until John Taylor announced it from his Great Pyramid studies, and Sir John Herschel followed with scientific confirmations, that each of the 36 inches of which the modern British Government's unit and standard yard is composed, contains within itself all that much desiderated physical applicability and scientific perfection,—when each single British inch is, *almost* exactly, the 1-500,000,000th of the earth's axis of rotation already referred to.

Almost, only, not quite, at this present time; for it requires 1·001 of a modern British inch to make one such true inch of the earth and the Great Pyramid. An extraordinarily close approach, even there, between two measures of length in different ages and different lands; and yet if any one should doubt whether our British inch can really be so close to the ancient and earth-perfect measure, I can only advise him to look to the original documents, and see how narrowly it escaped being much closer; and would have been so too in these days, but that the Government officials somewhere in the "unheroic" eighteenth century allowed the ell-measure, of equal date and authority with the yard, and of a greater number of inches (45 to 36), and therefore, in so far, a more powerful standard,—to drop out of sight.

The modern inch now in vogue amongst us, was derived from the Exchequer yard-standard, through means of Bird's copy in 1760 and other copies, and was therefore intended to be one of the inches of that particular yard; but the inches of the Exchequer ell were rather larger inches, and there were more of them; so that if either standard was rightfully taken as the sole authority for the value of an inch, it should have

been the ell. Now when these standards were very accurately compared by Graham in 1743, before a large deputation of the Royal Society and the Government,* it was found that the Exchequer ell's 45 inches exceeded the quantity of 45 *such* inches as the Exchequer yard contained 36 of, by the space of 0·0494 of an inch. A result, too, which was in the main confirmed by the simultaneous measures of another standard ell at Guildhall, with an excess of 0·0444 of an inch, and the Guildhall yard with the excess of 0·0434 of an inch.

Keeping, however, only to the Exchequer standard ell; and finding that it was not, after all, the Exchequer yard, which was subsequently made (in Bird's copy) the legal standard of the country, that it was compared with, but a previous copy of it, and found in 1743 to be in excess by 0·0075 † of an inch, on the Royal Society's scale,—we must subtract this quantity from the observed excess of the Exchequer ell; and then we get that its 45 inches were equal in terms of the present standard inches of the country, to 45·0419.

But 45 Pyramid inches are equal to 45·045 modern English inches; whence it will be seen, that a Pyramid inch and an early English inch had a closeness to each other that almost surpasses belief, or of 1· to 0·99993: and will cause every well-wisher of his country to see, that the *inch* must be preserved. Not only preserved too, but, if possible, restored to its ancient, or Pyramid value;—when the following table of earth-commensurable lengths (in its now proposed divisions, chosen because appropriate to the Great Pyramid's numbers

* Astronomical Society's Memoirs, vol. ix.

† This is the quantity, or about it, by which the Royal Society's scale and those descended from it exceed the Exchequer yard, by what Mr. Baily calls "a very large quantity;" but he went to eight places of decimals of an inch in his measure, and he does not seem, unfortunately, to have looked at the Exchequer ell at all.

as well as suitable to human use and wont), would become possible to be the British measures in modern times also, and without dislocation to any of the more usual popular factors.

GREAT PYRAMID LENGTH MEASURE.

Division, or number of each part in the grand Length Standard.	Intermediate division.	Length in Pyramid miles.	Length in Pyramid cubits or arms.	Length in Pyramid inches.	Name now proposed to be applied.
1	1000	4·000	10,000,000	250,000,000·	Earth's semi-axis of rotation.
1,000	4·	4·	10,000·	250,000.	League.
4,000	10·	1·	2,500·	62,500·	Mile.
40,000	2·5	0·4	250·	6,250·	Furlong.
100,000	10·	..	100·	2,500·	Acre-side.
1,000,000	10·	..	10·	250·	Rod.
10,000,000	..	..	1·	25·	Cubit or arm.
(20,833,333	25·	..	..	12·	Foot.)
250,000,000	10·	..	..	1·	Inch.
2,500,000,000	10·	..	..	0·1	Tenths.
25,000,000,000	10·	..	..	0·01	Hundredths.
250,000,000,000	..	..	..	0·001	Thousandths.

A small standard, viz., the foot of 12 inches, is left in place; because, although not evenly earth-commensurable, and inappropriate, therefore, for scientific purposes, there is a large vulgar use for it; and it is connected at one end, though not at the other, with the Pyramid system. And if we next compare all the mutually approximating items with the British, we shall have the following table:—

PYRAMID AND BRITISH LINEAR MEASURE,

Compared through the temporary medium of British linear inches.

1 inch Pyramid	= 1·001	1 inch British	= 1·000
1 foot „	= 12·012	1 foot „	= 12·000
1 cubit or arm „	= 25·025	2 foot rule „	= 24·000
1 rod „	= 250·250	1 rod „	= 198·000
1 acre-side „	= 2,502·500	1 acre-side „	= 2,504·525
1 mile „	= 62,562·500	1 mile „	= 63,360·000
1 league „	= 250,250·000	1 league „	= 218,721·600
1 earth's semi-axis of rotation .	= 250,250,000·000	1 earth's semi-axis of rotation .	= 250,250,000·000

The first remark to be expressed on this table, is the very close approach of the acre-side of the Pyramid to that of the British scale. It is a length which does not nominally figure on the usual linear English lists, though it exists through the square measure; and is, without doubt, the most important large measure by far which the whole community possesses; because it is the invariable term in which all the landed property of the country is bought, sold, and "deeded."

As such an all-important quantity to this country, one cannot at all understand how an acre was ever established by Government at such a very awkward proportion in the length of its side, to any of our linear measures; for the fraction which it gives, is rough to a degree: and yet, it will be observed, that the Pyramid principle, hardly altering the real value to any sensible extent, makes it, in its own inches, at once the easy quantity of 2,500; or in arm, *i.e.* cubit, lengths, 100.

Nor does the advantage of the Pyramid principle end here, for the mile contains 2,500, or 50×50, cubit-lengths; and such a *proportion* has recently become so great a favourite with Government, that they have commenced a magnificent survey of Great Britain on precisely this proportion, or 1-2500th of nature.

This is by far a larger scale than either our own, or any other, country has ever been completely surveyed on yet; and infers such an infinity of drawing, copying, and engraving, that it could positively never have been thought of, even in wealthy Great Britain, but for the previous invention, *first* of photography to do all the copying, and *then* of electrotypy to multiply the soft engraved copper plates. Hence the survey on the scale of 1-2500th is a remarkable public work of the present time, and excites some curiosity to know how and why that proportion came to be adopted.

Plainly 1-2500 does not form any portion of the British imperial linear system; and when we are officially told, that the proportion was adopted to allow of the map being on a scale of 25 inches to a mile, or becoming thereby capable of representing an acre by one square inch,—we are quite assured (if the Government is still true to the legal measures of the land), that that is *not* the reason; for the map is not on that scale. It *is* truly of the proportion of 1-2500th of *nature;* but that gives in the British metrology, 25·344 inches to a mile, and 1·018 inches to an acre.

Immense inconvenience, therefore, results to the component members of the British nation, that the grandest and most costly survey of their country which they have ever paid for, and which is now in inevitable progress whether they like it or no,—does not fit in to their existing measures evenly, but carries these annoying fractions along with it.

Yet a single act of parliament adopting the Pyramid measures for the country,—or, we might almost say, restoring the nation's hereditary measures to their proper place,—would cause the map, without any alterations to it, to be at once a map on the scale of 25 legal British inches to the mile, and of one square legal British inch to the acre, without the smallest fraction left over or under; and would substitute truth for falsehood, on every occasion when a Briton has hastily to mention the great national map of his country.

In my first edition, I said that Britons might in hot haste stumble into that slovenly and untruthful error of speaking of 25·344 inches, as being 25·000 inches; but I regret to have to add now, that larger experience shows that they commit themselves equally in their calmer moments as well; for in the *Proceedings of the Royal Society of Edinburgh for the Session* 1872-3, just published,

the learned President Professor, Sir Robert Christison, Bart., M.D. (and great for the introduction of the French metrical system, as well as for more accurate or convenient weights and measures for British pharmacy and chemistry), one therefore who knows what exactness is, yet even he, from his presidential chair and in his inaugural address for the season, could continually speak of, and the Society subsidized by Government, could continually print on page after page, "the 25-inch maps of the Ordnance Survey;" just as though those 25·344-inch Ordnance maps really and truly were on that other scale, in the existing inches of the present law of the land—*as well as* in the inches of the ancient Great Pyramid, in favour of which the very popular President made then no mention.

INTERNATIONAL APPENDIX TO GREAT PYRAMID LINEAR MEASURE.

Hereditary Cubit or "Cloth" Measures.

Country or City.	Name of Linear Measure.	Length in British Inches.
Aix-la-Chapelle	Ell	26·33
Aleppo	Pic	26·66
Alexandria	Pic	26·80
Algiers	Turkish pic	24·53
Ancona	Braccio	25·33
Antwerp	Woollen ell	26·96
Augsburg	Long ell	24·00
Bergamo	Braccio	25·80
Bergen	Ell	24·71
Berlin	Ell	26·25
Betalfagui	Guz	25·00
Bologna	Woollen braccio	25·00
Cairo	Pic	26·80
Candia	Pic	25·11
Copenhagen	Ell	24·71
Cremona	Braccio	24·24
Cyprus	Pic	26·45
Dunkirk	Aune	26·62
Emden	Ell	26·40
Ferrara	Woollen braccio	26·33
do.	Silk braccio	24·75
Leghorn	Braccio	23·98

INTERNATIONAL APPENDIX (*continued*).

Country or City.	Name of Linear Measure.	Length in British Inches.
Leyden	Ell	26·89
Libau	Ell	24·04
Lisbon	Covado	26·70
Lucca	Woollen braccio	23·80
Maestricht	Ell	26·91
Mantua	Braccio	25·00
Mocha	Guz	25·00
Modena	Braccio	24·31
Namur	Ell	26·11
Nancy	Aune	25·18
Nimeguen	Ell	26·11
Nüremburg	Ell	25·95
Osnaburg	Long ell	23·70
Oudenarde	Ell	26·28
Padua	Woollen braccio	26·80
do.	Silk braccio	25·30
Parma	Cloth braccio	25·10
Patra's	Silk pic	25·00
Persia	Guerze	25·00
Poland	Ell	24·30
Prussia	Ell	26·25
Great Pyramid	**"Sacred cubit"**	**25·02**
Ravenna	Braccio	26·46
St. Gall	Cloth ell	24·20
Schaffhausen	Ell	23·74
Scios	Short pic	25·98
Stettin	Ell	25·62
Stutgard	Ell	24·08
Tournay	Ell	24·40
Trent	Cloth ell	26·64
do.	Silk ell	24·09
Trieste	Woollen ell	26·60
do.	Silk ell	25·22
Tunis	Woollen pic	26·50
do.	Silk pic	24·83
Valenciennes	Aune	25·93
Venice	Woollen braccio	26·61
do.	Silk braccio	24·81
Verona	Woollen braccio	25·57
do.	Silk braccio	25·22
Vicenza	Braccio	26·96
Zante	Silk braccio	25·37

Foot Measures.

As shown in our table on page 249, and its subsequent explication, a 12-inch foot standard introduces notable difficulties into the earth-commensurable section of the Great Pyramid arrangement of long measure. And proposals have been before the public for several years, from totally opposite quarters too, requesting Government to enact a 10-inch foot for the future use of the nation.

Such a foot would evidently harmonise at once with every branch of the Pyramid system; but how would it suit the convenience of the working men, for whose purpose mainly the foot seems to have been originally introduced, and is still kept up?

We have already seen in the note on page 27, Chapter III., that the natural or naked foot of man is barely 10·5 inches long, though the shoed and booted foot of civilized man may be twelve inches or more; and indeed, in some parts of Switzerland and Germany, their local metrological tables state that twelve inches make, not a foot, but a "schuh" or shoe. There need be no surprise, therefore, to find, that two separate foot measures have long been known amongst mankind, one of them averaging twelve English inches long, and the other ten, though still almost invariably divided into twelve parts, or small inches of its own: in the foot of the one case, its length was twelve *thumb* breadths, and in the other, twelve *finger* breadths, approximately. The ancient Roman foot (11·62 English inches long nearly) was evidently of the former class; as was likewise the Greek Olympic foot, generally known as the Greek foot *par excellence*, and = 12·11 English inches; though Greece had also another foot standard, termed the Pythic foot, which was only 9·75 English inches long.

But in mediæval and modern, or Saxon, Norman, and British times, humanity seems to have declared itself unmistakeably for the larger foot. So that in Dr. Kelly's list of all the commercial peoples known to Great Britain in 1821 (see his *Universal Cambist*, vol. ii., p. 244), while ten of them have feet ranging between 9·50 and 10·99 English inches, no less than seventy-four are found to have feet whose lengths are comprised somewhere between 11·0 and 13·0 of the same inches.

Hence, if any alterations should be made in future time to earth-commensurate the Pyramid foot, as now imagined = 12·012 English inches, it should rather be in the direction of making it = 12·5, than 10·0, Pyramid inches; and no harm would be done in either case, so long as the value of the inch was not interfered with.

The ancient idolatrous Egyptians of the Pharaonic period do not appear to have had any foot measure; but, for all linear purposes, to have invariably used their well-known profane cubit = 20·7 English inches long; doubling it sometimes as the royal or Karnak cubit, which was then = 41·4 English inches. In subsequent Greek Alexandrian times, those Egyptians both employed, perverted, and mixed up with their own, sundry measures of Greece, and may then have had feet, as well as small cubits = 1·5 foot; but these hybrid and short-lived standards are by no means worth our while now to enquire into, for Alexandria of the Ptolemies, never very ancient, has long since been deservedly dead and buried; while the present Alexandria is a different city, inhabited by a differently descended people, and professing a totally different religion.

Hereditary Inch Measures.

Country or City.	Name of Linear Measure.	Length in British Inches.
Amsterdam	Rhineland foot ÷ 12	1·029
Anspach	Foot ÷ 12	0·977
Augsburg	Foot ÷ 12	0·971
Austria, Vienna	Zoll	1·037
Basil	Foot ÷ 12	0·979
Belgium	Lost its traditions and language too.	
Berlin	Foot ÷ 12	1·016
Berne	Zoll	0·962
Birmah, Rangoon	Paulgaut	1·000
Calemberg	Foot ÷ 12	0·961
Cleves	Foot ÷ 12	0·971
Denmark	Tomme	1·030
Emden	Foot ÷ 12	0·972
France (older system).	Pouce	1·066
France (*système usuel*), interdicted since 1840	Pouce	1·094
France (modern)	Destroyed its traditions	
Hanover	Zoll	0·950
Holland	Lost its traditions	
Insprück	Foot ÷ 12	1·042
Königsberg	Foot ÷ 12	1·009
Leyden	Foot ÷ 12	1·028
Lindau	Long foot ÷ 12	1·033
Lübeck	Zoll	0·950
Lucerne	Schuh ÷ 12	1·030
Middleburg	Foot ÷ 12	0·984
Neufchatel	Foot ÷ 12	0·984
Norway	Tum	0·974
Nüremburg	Foot ÷ 12	0·997
Oldenburg	Foot ÷ 12	0·971
Pisa	Palmo ÷ 12	0·989
Portugal	Pollegada	1·082
Prague	Foot ÷ 12	0·985
Prussia, up to 1872	Zoll	1·030
do. since 1872	Lost its traditions.	
Great Pyramid	**"Inch"**	**1·001**
Rhineland	Foot ÷ 12	1·029
Rome	Foot ÷ 12	0·988
Spain	Pulgada	0·927
Stettin	Rhineland foot ÷ 12	1·029
Strasburg	Land foot ÷ 12	0·968
Sweden	Tum	0·974
Zurich	Zoll	0·984

The above table is prepared chiefly from Dr. Kelly's *Universal Cambist;* but inasmuch as he does not descend below foot measures, and the inches are then deduced by dividing his values for the feet by twelve;—the list is supplemented by positive inches, or their verbal equivalents, as—zoll, pouce, tomme, tum, pollegada, pulgada, &c., as contained in Weale's Woolhouse's "Weights and Measures."

CHAPTER XV.

HEAT AND PRESSURE, ANGLE, MONEY, TIME.

AS already shown, no system of weights and measures can be complete without a reference to heat, and its power of altering the dimensions of all bodies. It would appear too, that, next to the very existence of matter, heat is the most important influence or condition in creation; and, since the rise of the modern science of thermo-dynamics, which looks on heat as a form of motion, the measure of heat is the first step from statics to dynamics, which is the last and truest form of all science.

A "thermometer" is therefore one of the most widely essential of all scientific instruments, and there is probably no modern science which can advance far without its aid; unless indeed assisted by some semi-natural method of securing one constant reference temperature, for all its observations; but which is seldom the case in modern observatories. Yet the thermometer in England, though there so doubly necessary, has been allowed to remain in a most unsatisfactory guise. That is, its scale is generally ridiculed over all continental Europe, as being both inconvenient in practice, and founded in error, in so far as the notion of that worthy man, Mynheer Fahrenheit, touching absolute cold, is seen every winter to be a mistake, whenever his thermometer descends below its carefully-marked zero;

while the all-important point of the freezing of water is left at the not very signal, but certainly rather inconvenient, number of 32°; and the boiling-point at the not more convenient one of 212°.

Many, therefore, have been the demands that we should adopt either the German Reaumur, or the French centigrade, *i.e.*, originally the thermometer of Celsius; in terms of any of which, water freezing marks 0°; and all degrees below that notable point, are negative; above, positive.

The proposed change has, except in a few chemical circles, been strenuously resisted, because—

1st. The anomalous absolute numbers chosen for freezing and boiling on Fahrenheit's scale, do not interfere with the accuracy of thermometers so marked, when due allowance is made for them.

2nd. It has been against the principle of most British scientific men hitherto, in their different weights and measures, to have them showing a natural standard in themselves; but only to have their *proportion* to the said natural standards numerically determined, and then recorded in writing elsewhere.

3rd. This system has been carried out in its integrity in Fahrenheit's thermometer *when* it is written, that 180 even subdivisions shall exist between freezing and boiling; and the commencing number for freezing shall be 32°.

4th. In the fact that the distance between freezing and boiling is divided into 180 parts in Fahrenheit's thermometer, but only 100 in the French thermometer and 80 in the German instrument, eminent advantage is claimed for every-day purposes; even among the chemists too, as well as all other members of the community,—because a greater number of different states of temperature can be quoted in even degrees without reference to fractions of a degree; and—

5th. It is said that the proposed change would be subversive of all ordinary ideas of steady-going individuals as to what the new numbers really meant; because, what honest country gentleman would appreciate in his heart that a temperature of 40°, when a French system should be established amongst us, meant a summer heat of 104° Fahrenheit?

Some of these objections have weight, but others are of doubtful importance; and in all that can be said about the British scientific principle (as established by government) not founding its measures on natural standards direct,—that has not only been well-nigh disestablished by the recent outcry of many noisy members of the commercial, and chemical, parts of the nation for the modern scientifically devised French units; but is proved to be baseless for our nation's early, and more than historic, origin; by reason of the real British length-unit, the inch, having been found, after all, to be an even round fraction of the earth's semi-axis of rotation.

The ultra-scientific and most highly educated upholders too of Fahrenheit, have, in the instance of the best practical zero of temperature, received a notable correction from the poorer classes of our land; the very classes for whom alone all working measures should be primarily arranged; for every gardener, and probably every ploughman who thinks of such things at all, is accustomed in his daily toil to speak of the more *rurally* important and biologically trying cases of temperature, not in terms of Fahrenheit's scale by any means, but as so many "degrees of frost" or "heat."

The practical importance, therefore, of having the British thermometrical zero at the freezing-point of water, is thus incontestably proved, and from the right quarter; while, if it be desirable, as no doubt it is desirable, to have the space from freezing to

boiling divided into a greater number of degrees than either the French or German systems offer,—why then, let the nation take for the space between the two natural water units, not even the 180 of the honest Dutchman, Fahrenheit, but the 250 of the Great Pyramid scale; for by so doing, not only will they reap that one advantage above-mentioned to a still greater extent; but they will suffer less shock, as it were, in their feelings, when talking of summer temperatures, than even if they retained the size of the Fahrenheit degrees, but placed the 0 at freezing; as simply illustrated by the following numbers, giving the same absolute temperatures in terms of five different thermometric scales:—

Fahrenheit.	Modified Fahrenheit.	Centigrade.	Reaumur.	Pyramid.
122°	90°	50°	40°	125°
104°	72°	40°	32°	100°

But now for the finishing off of this last temperature scale, in the manner in which the Pyramid system so often ends with reference to the four sides of its base, and to the first four simple sections of such a Pyramid. Multiply, therefore, the 250° of water-boiling by 4, making 1,000°, and where are we landed?

At that most notable and dividing line of heat, where it causes bodies to begin to give out light; and registered with confidence by the Diffusion of Useful Knowledge Society in vol. ii. of their *Natural Philosophy*, p. 63, under title of "Iron Bright Red in the Dark," as being 752° Fahrenheit, which amounts to 1,000° of the Pyramid precisely. And multiply this 1,000° again by 5, and where are we? At 5,000° of the Pyramid, or that glowing white-hot heat, where the modern chemists

of several nations would place the melting-point of the most dense and refractory of all metals, platinum. Or descend again to —400° Pyramid, and we find a point regarded by some existing chemists as the absolute zero of temperature: though natural philosophers are more inclined to prefer their theoretical base of the air thermometer at —682° Pyramid; but as none of them have yet approached nearer than about half-way thereto, no man among them knows what physical obstacles may lie in the untried portion of their path. And there may not improbably be many.

Thus the French metrical temperature reference was originally intended by its exceedingly scientific authors, admirable for their day, to have been the freezing-point of water; on the arithmetical and mathematical, rather than physical and experimental, conclusion—that they would find water in its densest condition when coldest, or immediately before passing into the state of ice. But lo! when they began to experiment, nature refused to be bound by human ideas, and water was discovered to be of the greatest density at a very sensible distance of heat above freezing, or at 39°·2 Fahrenheit.

When this discovery was once made, able men found in it a most beneficent influence to promote the amenities of human life upon the surface of the earth; seeing that but for the anomalous expansion of water with cold, when the temperature descends below 39°·2 Fahr., our lakes and rivers would freeze at the bottom instead of the top; and would, in fact, accumulate beds of ice below, until in the winter they became entirely solid blocks; which blocks no summer sun would be able to do more than melt a small portion of the surface of, to be inevitably frozen hard again the next cold night, to the destruction of all the fish.

The discovered fact, however, of what really does

take place, when water approaches the freezing-point, had the inconvenience of utterly breaking up the uniformity of the Academy's arrangements for temperature reference in the French metrical system. For the Parisian philosophers still desired to refer some observations to freezing; yet could not but conscientiously admit the superior propriety, at least for all measurements wherein the density of water entered, of employing their newly-corrected temperature of 39°.2 Fahr., rather than their former 32° Fahr.

Accordingly, at page 21 of "Roscoe's Lessons in Chemistry," where the best possible face is put upon French measures for the British nation, we are told that the French unit of weight is a cubic centimetre of water at a temperature of 4° *centigrade*. But at page 147, a table of specific gravities is given, where it is stated that water at the temperature of 0° *centigrade* is to be taken as unity. And no temperature reference at all appears for length measure; perhaps because the author knew that that is just now, for the metre of the Archives, an uncertain quantity somewhere between 6° and 12° C.

Again at pages 361 and 362 extensive tables are formally given of comparisons between the English and French measures of all kinds (descending, where weight is concerned, to the sixth place of decimals of a grain), but no mention at all is made either of temperature or atmospheric pressure for any of them; though the former condition must vary occasionally by 60°, and the latter by the extent of the whole atmosphere.

In fact the too learnedly artificial and bungled character of the French temperature and pressure references is such, that they cannot, in practice, look the light of day, much less that of science, in the face; while they are, above all things, and for other reasons as well, totally unsuitable to the working man. You cannot,

for instance, attempt or pretend to use them in practice, without breaking their most important provisions continually; as well as introducing huge errors, such as the omission or introduction of the whole atmosphere, and all for the purpose of guarding against mere microscopic errors depending on minute and almost totally insensible variations of the atmosphere as it exists about us.

On this unhappy *doctrinaire* French system, strictly, if there should arise a difference of opinion in society, or at a market, as to which is the longer of two measuring-rods, or which is the heavier of two weights, you must carry both of them away from what they were being employed for, and bring the rods down by any possible method to the 6° or 12° C. point, and place the weights by some difficult and expensive contrivance in a vacuum at a temperature of 0° C., or perhaps 4° C. Both of these being out-of-the-way conditions where no one wants to use either rods or weights; and where you may find that their relations to each other (from different *rates* and characters of heat expansibility) are actually and totally different from what they were at any of the degrees of natural temperature, which they were being really and practically used in; and which degrees never differ much from their mean quantity all the year through.

Indeed the extreme narrowness of the range both of temperature and atmospheric pressure, within which all the best, and the most too, of human work is performed, and can only flourish,—has begun at last to excite intelligent and interested attention. Wherefore thus, an able and scientific American author, Mr. Clarence King, holds forth, in his recent book entitled "Mountaineering in Sierra Nevada," California,—on pressure, when he has descended to the inhabited plain country from the high and snowy flanks of Mount Shasta:—

"The heavier air of this lower level soothed us into a pleasant laziness (frame of mind) which lasted over Sunday, resting our strained muscles and opening the heart anew to human and sacred influence. If we are sometimes at pain when realising within what narrow range of *latitude* mankind reaches finer development,—or how short a step it is, from tropical absence of spiritual life, to dull boreal stupidity,—it is added humiliation to experience our still more marked limitation in *altitude*. At fourteen thousand feet, or with 17 only, in place of 30, inches of atmospheric pressure, little is left me but bodily appetite and impression of sense. The habit of scientific observation, which in time becomes one of the involuntary processes, goes on as do heart-beat and breathing; a certain general awe overshadows the mind; but on descending again to lowlands, one after another the whole riches of the human organization come back with delicious freshness."

By what insane impulse then could it have been, that the philosophers of Paris did not accept their position on the earth, under the atmosphere, as given them by God; and instead of thankfully making the delightful mean annual temperature and wholesome mean annual pressure of the atmosphere on and in their abodes, the national references for those features in all matters of their metrology,—they must rush off to a horribly chilling and actually freezing zero; to a theoretical absence of all vital atmosphere; and to a host of physical difficulties which they have not even yet completely overcome or got out of the maze of.

Or by what mere flock-of-sheep impulse of irrationally following, is it, that now our own scientific men, and the meteorologists among them more particularly, having made their own barometrical observations between 50° and 90° in-doors, and having received others from abroad also confined within the same limits of tem-

perature, can think of no other mode of bringing them all to one common point of comparison, than by carrying every one of them right away to the distant and outside freezing-point; and applying for that purpose so large a correction to the numbers read off from each barometer, that the original observer fails to recognise in his computed observations those standard heights of quicksilver which he used to identify in his daily experience with particular conditions of weather, or warnings of approaching storms?

But all these anomalies are so happily corrected by the Great Pyramid system, that its primeval Author must surely have had more real regard for humanity, than all the *savants* and *doctrinaires* of the first French Revolution put together. For the mighty building of old, being founded on the 30th parallel of latitude, is at once in the approximate temperature and very approximate atmospheric pressure of the middle zone of either hemisphere of the earth; and as the iso-barals equally with the iso-thermals, are much broader there, than in any other latitude,—that 30° zone represents the climatic conditions of a larger part of the earth than any other possible zone; and being also the parallel which has in either hemisphere an equal amount of surface between it and the Pole on one side, and between it and the Equator on the other, it cannot help being somewhere very near to a golden mean between the far too hot tropics, and the far too cold arctic and antarctic circles; —while at the same time it receives *more* sunshine, more vivifying influence to man than any other latitude, by reason of its paucity of clouds, combined with the high solar altitude. (See the Maps in my "Equal Surface Projection.")

That paucity of clouds in latitude 30° being largely due to the trade-wind influence, is accompanied by a

barometric pressure which, in that latitude and at the surface of the sea, reaches there its terrestrial *maximum*, rather than *mean* quantity;—but then come into play the elevation both of the King's Chamber in the Great Pyramid, and of the Pyramid on its own hill-top, which correct that small excess of pressure; as likewise does the same elevation fact, the rather too great temperature of Egypt generally, for the Pyramid Standard; that land being situated in one of the *longitudes* rather than *latitudes* of extra development of warmth.*

But this total hypsometrical elevation of 4,297 inches above the sea level, corrects the King's Chamber's level of atmospheric mean temperature, to what,—in the scale of natural temperatures?

To the temperature firstly of one-fifth exactly from freezing to boiling of water; and secondly, to the mean temperature of all the anthropological earth. The *entire* earth has a surface temperature rather lower than one-fifth; but such entire earth includes Polar lands in either hemisphere which are not, and cannot, and never will be, permanently occupied by man. Lands too, which with their long Arctic nights ignore the Pyramid's very first and foundational teaching, or of solar days numbering 365·242 to the length of the year.

There is therefore no more occasion for taking those uninhabitable, and uninhabited, lands' temperatures into account, when deciding on the one temperature to which all living men shall refer their science, their metrology, and their commerce, than for our most learned meteorologists, working in pleasantly warmed rooms, carrying all their barometric observations away to 32° Fahr. actually; while our good friends the Russians—who know what cold is far too well to court it unnecessarily—reduce *their* barometric observations

* See my "Treatise on Equal Surface Projection," 1870.

to 62° Fahr. ; a most praiseworthy approach to the 68° Fahr. of the Great Pyramid, but without any cosmical reason in its special favour.

And on making such very proper Polar exception in our earth-surface enquiry, the mean temperature of all man-inhabited countries appears to be, the very same beneficent and most suitable quantity as that of the Great Pyramid ; whose system of numbers enables us now to express its standard quantity of $\frac{1}{5}$ of temperature, by 50° ; or the very number already made out as specially belonging to the King's Chamber itself, where temperature reference is most required. Hence we are now Pyramidically justified in giving, in the general table on p. 268 (derived as to its items from various modern sources expressed in Fahrenheit and Centigrade), the numbers which would be read off for those phenomena, so important for the progress of civilization and man, upon any well-graduated Pyramid thermometer soon, it is hoped, to be constructed.

Angle.

No sooner has man in the course of his scientific development begun to contemplate the skies, than he feels the necessity of having angular, as well as, or even rather than, linear, measure to refer to for distances ; and the same demand for angular measure is soon afterwards experienced in each of the purely terrestrial sciences as well.

Therefore it was, that the French *savants* of the Revolution attempted to introduce into their decimally-arranged metrical system an *angular* graduation where the quadrant contained 100, and the whole circle 400, degrees. But, after trying it for some years, they had to give it up ; for the influence of "Great Babylon,"

TEMPERATURES IN PYRAMID THERMOMETER DEGREES.

Atmospheric Pressure = 30 inches, except when otherwise stated.

Phenomena.	Number on Scale.	Phenomena.	Number on Scale.
	Degrees.		Degrees.
Platinum melts	5000	Wood spirit boils	166
Wrought iron melts	4000	Potassium melts	158
„ „	3750	Yellow wax melts	155
Steel melts	3500	Greatest observed shade temperature	139
„ „	3250	Stearine melts	138
Cast iron melts	3875	Spermaceti melts	122
„ grey, melts	3130	Summer temperature at Pyramid	100
„ white „	2625	Ether, common, boils	92
Gold, pure, melts	3125	Blood heat	91·5
„ alloyed as in coinage	2950	Butter and lard melt	82
Copper melts	2875		
Silver, pure, melts	2555		
„ „ „	2500		
Bronze melts	2250	**Mean temperature at Pyramid temp.=T $\frac{1}{8}$**	
Sulphur boils	1100	**Mean temperature both of all lands inhabited by man, and of the most suitable degree to man**	**50**
Antimony melts	1080		
Zinc melts	1028		
„ „	900		
Iron visible in the dark	1000		
Mercury boils	882		
„ „	875		
Sulphuric acid, strong, boils	845	Ether boils	28
„ „ „	812	Mean temperature of London	25
Lead melts	815		
Cadmium	788	Low winter temperature at Pyramid	20
Phosphorus boils	725		
Bismuth melts	575	Water freezes	0
Water boils under 20 atmospheres	535	Freezing mixture, snow and salt	—50
„ „ 15 „	500	Sulphuric acid freezes	—87
„ „ 10 „	450	Mercury freezes	—98
„ „ 5 „	381	Greatest Arctic cold experienced	—125
Spirits of turpentine boils	325	Greatest artificial cold, nitrous oxide and carbonic disulphide, *in vacuo*	—350
Acetic acid boils	290		
Sulphur melts	278		
WATER BOILS	250		
Sodium melts	238		
Benzol boils	200	Absolute zero (Miller's Chemistry)	—400
Alcohol, pure, boils	198		
„ „ „	195	Theoretical base of air thermometer, or air occupying no space at all!	—682
Stearic acid melts	174		
White wax melts	170		

which had originally invented, and then fixed on the world, our present sexagesimal system, or 360° to the circle, and 60 minutes to the degree, was too powerful for modern Paris to contend successfully against.

But there could have been no more community of feeling or idea between most idolatrous Babylon and the totally non-idolatrous Great Pyramid in their goniometry, than in their methods of astronomical orientation, which we have already seen were entirely diverse. What system, then, for angle was employed at the Great Pyramid ?

A system apparently of 1,000° to the circle ; 250° to the quadrant.

This conclusion is deduced from the following features at the Pyramid.

(1.) The angle of rise of the Pyramid's flanks, and the angle of descent or ascent of its passages, are both very peculiar angles, characteristic of the Great Pyramid ; and though rough and incommensurable on either the Babylonian, or French, or any known vulgar system, are in a practical way evenly commensurable on the Pyramid system.

PYRAMID FEATURE.	SYSTEM OF ANGLE MEASURES.			
	Babylonian.	French.	Vulgar.	Pyramid.
A whole circumference	360°	400°	32°	1000°
Angle of side with horizon	50° 51′ 14″	57°·62	4°·61	144°·05
Angle of passages .	26° 18′ 10″	29°·23	2°·34	73°·08

2. Whereas the King's Chamber has been in a manner utilized as the chamber of the standard of 50, and the Queen's as that of the standard of 25, and are both of them witnessed to by the number of the Pyramid courses on which they stand, the subterranean

chamber may be considered the chamber of angular measure; and does,* at its centre, view the whole Pyramid side, at an angle of 75° 15′ 1″ Babylonian, but 209° ·03 Pyramid. And though there are now only 202, there are shown to have been in the original finished Pyramid somewhere between 208 and 212 complete masonry courses; or agreeing, within the limits of error of those researches, with the angular result of 209°.

3. And then there follows a useful practical result to Navigation, and its peculiar itinerary measure, the "knot," or nautical, or sea, mile; viz., the length of a mean minute of a degree of latitude.

At present there is much inconvenience from the large difference in length between our land and sea miles; for they measure 63,360· and 72,984· inches respectively.

But, granted that a Pyramid knot shall be 1-25th part of a Pyramid degree,—then the respective lengths of a Pyramid land and a Pyramid sea mile will be the nearly approaching quantities, in inches, of 62,500· and 62,995·.

Money.

The French metrical system included *money;* and its francs, issued accordingly, have deluged the world to such an extent, that when a prize was recently proposed to all nations by the British sovereign, for a certain artistic manufacture to be competed for at the South Kensington Museum of Science and Art, the money value of that prize was publicly advertised in "francs."

Wherefore many inquirers have demanded, "What about money on the Pyramid system?"

* See my "Life and Work," vol. iii. p. 209.

I can only answer them, that I have not been able to find out anything about that subject in the Great Pyramid.

But is that to be wondered at? Only look at any piece of money whatever: whose image and superscription does it bear? That of some earthly Cæsar or other. Therefore is money of the earth, earthy; *i.e.*, in the sense of dust and ashes, human corruption and speedy passing away. But all the Great Pyramid measures hitherto investigated, being evenly commensurable in every case, either with the deep things of this planet world, or the high things of heaven above, are to be considered as impressed rather with a typical effigy of some of the attributes of the creation of God; and we may find their purity, and almost eternity, presently borne testimony to by a closer and more direct link of connection still.

Time.

Time is an admitted subject in every good system of metrology; and yet is it an absolute imponderable; one, too, of which, says the moralist, we take no account but by its loss. And if this be true, how all-important for us to know "how much there is of it;" especially how much still remains, of that finite section already told off by the Eternal, to witness the present manner of dominion, perhaps trial, of men upon the earth.

Just now these questions are above unaided man's intellect: and though the metaphysicians, following up their verbal disquisitions on the infinity of *space*, desire to make out also an absolutely infinite extension of *time*, and that both for time past and time to come,—the researches of the scientists are more to our purpose, for they dwell rather upon the unlimited *divisibility*

of time. Divide it, for instance, into ever such minute portions, and it is time still; and not like the chemical elements of matter, which, after a certain amount of subdivision, exhibit, to the mathematician, their component molecules with totally different properties from what are possessed by larger portions of the substances.

But whether time be long or short, and past, future, or even present, the human senses, unassisted by reference to the material world, are far more liable to error in this, than in any other branch of all metrology. To some men, time slips away almost unheeded, unimproved, too, until the end of life itself comes; while with others, time is regarded as the most precious of all the usable gifts to men. With time and plenty of it, what splendid achievements may be realized; and into a short time, how much *can* be packed away. While the involuntary action of our thinking system, even exceeds the utmost straining of our voluntary efforts in matters of time; so that a single second between sleeping and waking has enabled a man to pass, without desiring it, through the multitudinous experiences of a long and eventful life.

On one side, again, in the study of time, the Natural History sciences give us the sober biological warning, that man, as he exists now, in materially uninterfered-with possession of the earth, is not going to last for ever; for there is a settled length of time for the whole duration of a species, as well as the single life of an individual therein. But on the other side, the too exclusive study of certain of these very sciences has led their out-and-out votaries, in late years, to talk more flippantly of time than of anything else under the sun. A few hundred thousand millions of years accordingly are at one instant created, and at another destroyed, or at another still totally disregarded by some of these gentlemen, accordingly as their theories

of the hour prompt them: and it is only the astronomer who stands up in rigid loyalty to this real creation by God alone, and tells mankind that time, is one only; that it is the chief tester of truth and error; and even down to its minutest subdivisions, it cannot be disregarded. The same eclipse, for instance, of sun by moon, as seen from the same place, cannot occur at two different times, only at one time; and that one epoch is capable of the sharpest definition, even down to a fractional part of a second.

To astronomy therefore only, of the modern sciences, can we reasonably look for some safe guidance in the practical measuring of time.

In the broadest sense, time is said to be measured by the amount of movement of some body moving at an equable rate. And the most equable motion by far, the only motion that has not sensibly varied within the period of human history, is, I might almost say, the favourite, and fundamental, Pyramid phenomenon of, the rotation of the earth upon its axis.

Not that even *that* movement is absolutely uniform through all possible time, in the eye of theory; but that, tested practically in the most rigid manner, or by the determination of the length of a *sidereal* day, no alteration has been perceived either by practical or physical astronomy during the last 2,300 years. The next most equable movement, too, but of far longer period, is a secular consequence of that diurnal rotation, combined with a disturbing element; producing thereby the "precession of the equinoxes;" whose whole cycle is performed in about nine and a half millions of these days, or turnings of the earth upon its own axis before a distant fixed star; and of which grand cycle not more than a sixth part has been performed yet, within all the period of human history.

But though these two phenomena,—the sidereal day, and the precessional period, of the earth, may be the grand storehouses for reference in the regulation of time for high science,—some easy, simple, yet striking modification of each is required for the practical purposes of man in general. And then comes in the evident propriety of using, for the shorter period, a solar, rather than a sidereal, defined day; and in place of the excessively long precessional period, the more moderate one of a year, *i.e.*, the time of the earth's revolution round the sun; though that is a movement experiencing many minute perturbations; and at the present period of development of the universe, is by no means a nearly even multiple of the other movement, whether we define the year by reference to either sidereal *cum* solar, or purely solar, phenomena.

These are points on which it is well worth while to spend a few more words, in order to try to make the case clearer to those of our readers who desire it. Let us begin then with the days.

As the sidereal day is defined, in *apparent* astronomy, to be the interval elapsing between a star leaving the meridian of any place, through the earth's diurnal motion, and returning to it again (+ an excessively small correction for the precessional movement in the interval); so a solar day is the time elapsing between the sun being on the meridian of any one place and returning to it again; and that portion of time is equal to a sidereal day + the amount, measured by the rate of solar motion, that the sun has, in that interval, apparently retrograded among the stars, by the really onward motion of the earth in its ceaseless orbit around that splendid light and heat-dispensing sphere. Hence a solar day is longer than a sidereal one, and in such proportion, that if a

year contain $365\frac{1}{4}$ of the former, it will contain roughly $366\frac{1}{4}$ of the latter.

When absolute diurnal equality is required from day to day, the solar days have to go through a computation formula to reduce them from real solar days (as they may appear to an observer, and therefore also called apparent) to *mean* solar days ; or the successive places that the sun would occupy in the sky if, in place of the earth revolving in an elliptical orbit with a variable velocity, it revolved in a circular orbit with a constant velocity, the time of a whole revolution remaining the same. But as this is only a residual correction, which does not alter the beginning or ending of the year at all, or the beginning or ending of any day sensibly to the mere beholder of the general features of nature,—we may at once contrast the sidereal and the solar days together, as to their relative aptitudes to promote the greatest good of the greatest number of mankind.

Of the beginning of a *sidereal* day, then, hardly more than a dozen persons in the kingdom are aware ; and, as it begins at a different instant of solar time each day (in the course of a year passing through the whole 24 hours), even those few *doctrinaires* can only inform themselves of the event, by looking at their watches under due regulation.

But, of the far more easily distinguishable beginning of a *solar* day, it was thus that a devout, though not sacred or inspired, poet of the Talmud wrote centuries ago ; and he will probably be equally heart-appreciated still by every one :—

" Hast thou seen the beauteous dawn, the rosy harbinger of day ? Its brilliancy proceeds from the dwellings of God : a ray of the eternal, imperishable light, a consolation to man.

" As David, pursued by his foes, passed a dreadful

night of agony in a dreary cleft of Hermon's rock, he sang the most exquisitely plaintive of his psalms :—'My soul is among lions : I lie in the dark pit among the sons of men, whose teeth are spears and arrows, and their tongue a sharp sword. Awake up, my glory, awake lute and harp, I myself will awake right early.'

"Behold! the dawn then broke; heaviness endured for a night, but joy came in the morning. With sparkling eyes 'the hind of the morning,' the soft and rosy twilight, sprang forth, skimmed over hill and dale, bounding from hill-top to hill-top further than one can see; and, like a message of the Deity, addressed the solitary fugitive on the sterile rock: 'Why dost thou complain that help is not near? See how I emerge from the obscurity of the night, and the terrors of darkness yield before the genial ray of cheerful light!'

"David's eye was turned to the brightening hue of the morn. Light is the countenance of the Eternal. He saw the day-dawn arise, followed by the sun in all its matutinal splendour, pouring blessings and happiness over the earth. Confidence and hope returned to his soul, and he entitled his psalm in the Cave of Adullam, 'The roe of the morning, the song of the rosy dawn!'"

If any species of *day*, then, is marked in the Great Pyramid's metrological system, is it likely, after what we have already seen of that building's kindly feelings for man, and its general objects and methods,—is it likely, I say, to be any other than the *solar* day (the mean solar day, too, if it be represented evenly and always by a cubit length)?

And for the same reason, the Pyramid *year* can be no other than the mean solar tropical year; or that which is defined by the sun returning to the same tropic or place of turning in its apparent motion in the sky; bringing on, therefore, the winter and summer, the

typical day and the night of the year, in the same self-evident, powerful, beneficent manner to all mankind. And of the previous mean solar days, in such a solar *tropical* year, there are contained at present, according to modern astronomy,

= 365·242242 + &c.
= 365 days, 5 hours, 48 minutes, 49·7 + &c., seconds;

a length nearly 25 seconds shorter than the similar year in the time of the Great Pyramid. A difference easy to write down on paper, but not practically sensible to men in the ordinary avocations of life. But no one will be asked to decide for either, which kind of day, or which kind of year, exists in the Great Pyramid Metrology,—without documents of contemporary date, and enduring kind in stone, being actually discoverable there.

The next succeeding arrangement, however, of time, in all metrological systems, after days, is not this grand, natural, yet most inconveniently incommensurable, one of a year; but the short, and, by days, perfectly commensurable one of, a week; commensurable, however, not by 5 or by 10, but by the peculiar, and otherwise impressive, number 7.

Indeed, the week of 7 days is something so important in itself, and forms so decided a stage of time whereon tradition conflicts with science, sacred opposes profane, and the Deistic contends with the rationalistic,—that it may be prudent for us to return, in our now ensuing Part IV., to further rigid practical examinations of the Great Pyramid; endeavouring thereby to read off, without prejudice, what that primeval monument has to say, if anything, touching the voluntary, as well as the natural, subdivisions of time for the ruling of the life and work of man while on his trial here.

PART IV.

MORE THAN SCIENCE.

"THUS SAITH THE LORD GOD; I WILL ALSO DESTROY THE IDOLS (OF EGYPT), AND I WILL CAUSE THEIR IMAGES TO CEASE OUT OF NOPH."

EZEKIEL XXX., 13.

CHAPTER XVI.

THE SACRED CUBIT OF THE HEBREWS.

Preliminary Note.

POINTEDLY remarkable as is the assistance already afforded, as in Part III., chapter xiv., to the grand Government survey of Great Britain, now in course of execution, by the most ancient, and almost venerable, 25-inch linear standard of the original and mysterious design of the Great Pyramid,—that standard is likely to be found of further service, and even invested with peculiar power and meaning, in other of our national employments, not merely of the present, but the more important future, of time also.

The reasons for this unexpected resuscitation of one of the oldest metrological institutions of the whole world, are partly scientific, and partly religious.

In *science*, nothing better can be found. For this admirable standard may, as previously indicated, be described as one twenty millionth of the earth's axis, or rather, one ten millionth of the earth's *semi-axis*, of rotation ; and in astronomy distances are usually, indeed almost invariably, given by semi-axes or radii, and not by diameters, of the various globes or orbits concerned.* The distance from the earth to the sun, for instance,

* And certainly never, as in the boasted scientific French system, in terms of the *surface* of any globe whatever.

being much more frequently under discussion, than the space separating the earth's two positions at six month's interval; and it is in such a *radial* form that the general problem is propounded and discussed by all mankind.*

While in *religion*, there is the feature about this one length of Pyramid measure, which cannot fail, when fully apprehended, to constitute a most peculiar source of interest with some of the best minds in the world; viz., that, however it came there, *i.e.*, in the Great Pyramid in the land of Egypt and in times before the calling of Abraham,—it is not only by its length the representative, or equivalent, of the *sacred cubit of the Hebrews*, but it leads us to an understanding of *why* that length was styled amongst *them*, the "*sacred*" cubit; and why *we* may so call it likewise.

Of the Cubits of Ancient Renown.

The mere name of "cubit" mounts up the question at once to the beginning of human affairs, for it is one of the earliest-named measures of which there is any notice. Not indeed that the *word* cubit is ancient in itself; but that it is now the one English word always used by our translators to express whatever measure of length did form the working and practical standard of linear measure to, or for, any and almost every nation in the ancient world. No nation could exist then, any more than now, without having some standard of

* The distances of satellites from their primary planets are almost invariably given by astronomers, in their professional publications, in terms of *radii* of the said primaries; the moon's distance from the earth, for example, in terms of earth radii. But what earth radii? Alas! in equatorial radii which vary with the meridian, and are *not* the radii by which the said distance is generally determined.

In such observations it is almost always the Polar radius which is really employed, in whole or in part, by combining the meridian measures of Pulkova or Greenwich as high northern, and the Cape of Good Hope or Melbourne as far southern, observatories.

linear measure belonging to it; but the standard of one nation was no more the necessary standard of another in a different part of the world and in a different age, than the yard of the British Government, or two-foot rule of the British people, is of the same length, origination, and meaning, as the metre of the French nation, the Rhynland foot, or the Turkish pike. National standards they are, all of them, but every one of a different length from the other.

Hence, under the one name, convenient perhaps for modern times from its shortness, of *cubit*, our translators have heaped together a number of totally different measures of length, conflicting metrological symbolisms, and diverse national distinctions. They have even done worse; for most persons having Latin enough to derive cubit from *cubitus*, the elbow, they measure off 18 inches from their own elbow somewhere to the end of the middle finger, and say, whenever the "cubit" of any time or any nation whatever is mentioned,—*that* was the length of their standard measure.

Yet, though both the cubitus of the Romans and πῆχυς of the Greeks were very close to the length of 18 inches, the standard measures of other and older nations were very different in length.

What names, then, were they called by; or were there different names for different lengths of national standards, in those days?

In Egypt the standard was called, from 2170 B. C. to 100 A. D., according to different modern Egyptologists, "mah," "meh," "mahi," or "mai:" and signified, according to W. Osburn, an excellent interpreter of hieroglyphics, "justified" or "measured off."

Amongst the Assyrians, according to Mr. Fox Talbot and Dr. Norris, their standard measure was generally termed, in the age of Nebuchadnezzar, or 700 B. C., "ammat;" and in more ancient times, "hu."

Among the Hebrews, again, the standard measure was called "ammah."* There is discussion still amongst scholars whether this was the original, or Mosaic Hebrew, word, for the thing to which it is now applied; for some authors maintain that ammah is an Assyrian word, and introduced only by Ezra when he was recopying the Scriptures in Babylon during the captivity. But they cannot prove the case absolutely; and meanwhile, although there *are* some who will have it that the word alludes to "the fore part of the arm"—though too we are assured that the Hebrew standard was of a totally different length from such part of the arm—there are others who maintain that the word rather implies, "the thing which was before *in point of time*," the thing which was "the first, the earliest, the 'mother' measure," and even "the foundation of all measure."

But these disputations of the philologists are not sufficient for what we require now to know; viz., what actually were the *lengths* of the several linear standards of ancient nations, in terms of modern British inches.

Those of Greece and Rome (mediæval, however, rather than ancient, as compared with the times of the Great Pyramid) were, by practical rather than philological inquiry, 18·24 British inches nearly, every one allows.

That of Egypt, a far older land than Greece or Rome, was always longer, and close to 20·7 British inches, by almost equally unanimous and universal testimony.

There has, indeed, been a solitary attempt in modern society, during the last four years, to assert that there was a short cubit, of the same length as the Grecian, or 18·24 British inches, in use, and in great honour and prominence too, in Egypt, for the one purpose of measuring land, as early as the day of the Great Pyramid.

* See "Edinburgh Astronomical Observations," vol. xiii. pp. R 79 to R 82.

And as the author of this assertion is the Director-General of the Ordnance Survey of Great Britain; and as he has been adopted, supported, and followed therein during the last year by the "Warden of the Standards" of our country,—it is necessary for me, a private author only, in metrology, to demonstrate even at some length the total baselessness of the idea. For otherwise these two giants absolutely stop the way, and prevent all further progress in Great Pyramid research.

The Old Egyptian Cubit; and the recent attempt to shorten it.

The mistake,—for actual and absolute mistake it undoubtedly is,—seems to have grown up thus. The Director-General of the Ordnance Survey, after having twice tried and failed in the *Athenæum*, to establish (against my "Life and Work at the Great Pyramid") two *other* reasons for accounting for the length of the base-side of the ancient structure (using a different length with each of them),—at last brought out a *third* length and a *third* theory: this last length being 9,120 British inches, and its accompanying theory, the gratuitous statement that the base side of the building was *intended* to be 500 times the Egyptian "land-cubit." And if you grant, that besides the well-known cubit of old Egypt, 20·7 inches long, there was *also* in existence at the time of the Great Pyramid's foundation *another* cubit, whose length was 18·24 British inches,—evidently 500 times *that* length, does make up 9,120 of the same inches.

But that length on paper, for the Great Pyramid's base-side, was only obtained by most improperly, and even dishonestly, keeping out of view the two largest, and perhaps best, of the *socket* measures of the Pyramid's base-side length; viz., those of the French academicians

in 1800, and Colonel Howard-Vyse in 1837; both of which measured-results the Director-General had before him at the time of producing his new theory, together with my own discussion of them and others. While, as for the same high officer's assertion that there was, besides the ordinary 20·7 inch cubit, also such a thing as a *land-cubit* in ancient Egypt, of the mediæval Grecian length too of 18·24 inches,—that depended on nothing whatever but a most obstinate mistake of the high military officer when reading a passage in Herodotus; which passage, in reality, says nothing of the kind.

Herodotus, that charming relater of history as a pleasant family tale, we must remember, is telling his story to the Greeks; and amongst other particulars of what he saw in Egypt, informs them, of an allowance of land to each of the soldiers there, of so many cubits square; to which account he appends the explanatory remark, evidently for the benefit of his then hearers, the Greeks,—that the *Egyptian cubit is of the same length as that of Samos.*

This is positively all that the Director-General of the Ordnance Survey has to go upon: and it will be observed that there is no allusion in the passage to there being two cubits in use in Egypt; one only is mentioned, and that one cubit is stated to be the same in length, not as the Greek cubit, but as that of Samos.

In fact, there is no case whatever for the great surveying military chief at Southampton; except in so far as he, in addition to the above, chooses roundly to assert, —and his brother giant, the Warden of the Standards, to support him in the assertion,—that the cubit of Samos was just the same as, and meant therefore nothing but, the Greek cubit.

Now, as there is nothing whatever of ancient authority existing in the world, as far as I am aware, touching

the absolute length of the cubit of Samos in the time of Herodotus, 445 B.C. (except that slight verbal comparative notice of his, saying that it was the same as the *Egyptian*, rather than the Greek), we must endeavour to ascertain from him, himself, what *he*, Herodotus, meant, —when *he* explained to a Greek audience in Athens, that the length of the Egyptian cubit was the same as the cubit of Samos. Why, for instance, did he not say that it was the same as the Greek cubit, if he meant the Greek cubit?

By turning to his book "Thalia," 55, we shall find that Herodotus there makes a Lacedæmonian speak of the Samians (in their isle so very close to Asia Minor and so far from Greece) as "foreigners." And again, in "Thalia," 56, he himself characteristically speaks of a siege of Samos by the Lacedæmonian Dorians as "their (the Greeks') first expedition into Asia." "Words," says the Rev. Professor Rawlinson, "which are emphatic. They mark the place which the expedition occupies in the mind of Herodotus. It is an aggression of the Greeks upon *Asia*, and therefore a passage in the history of the great quarrel between Persia and Greece, for all Asia is the king's" (i. 4).*

Samian, then, in the mind and feelings of Herodotus, eminently meant Asiatic or Persian, the antipodes of everything Greek; and it was a rather delicate way of that admirable describer telling his polite Athenian audience, that the cubit of the strange and far-off Egyptians he had been travelling amongst, was of the same length as that of their hated and dreaded foes, the Persians; but without offending their ears by the sound of the detested name. For Samos was but a poor little island, in itself altogether innocent of making

* See also "Edinburgh Astronomical Observations," vol. xiii. p. R 70.

aggressions on such a combination of states as Greece; and since its invasion by the Lacedæmonians, was much better known to Greeks, than the continental and somewhat mysterious country of the Persians themselves.

Now, the Persian cubit, at and about the times of Herodotus, say from 332 B.C. to 600 B.C., according to Dr. Brandis, of Berlin, (whose investigations into the Babylonian measures, weights, and money before Alexander the Great, are original and most valuable), was somewhere between 20·866 and 20·670 British inches.

Don Vincent Queipo, in his "Metrology" (Vol. I., pp. 277–280), makes the same Persian cubit to be 20·670 inches long. M. Oppert establishes the same length for the Babylonian cubit in the times of Darius and Xerxes. Dr. Hincks makes the cubit, equally too, of the Babylonian, Persian, and Assyrian empires, chiefly from cuneiform inscriptions = 21·0 inches. All of them, therefore, within their limits of error, coinciding sufficiently with a mean length of 20·69 inches nearly, for the Persian cubit of and about 500 B.C. And that cubit length, we may be sure, the said Persians established in Samos for as long as they had the upper hand there; seeing that from the same Herodotus we learn (Book VI., ch. 24), that no sooner were the Ionian cities under Histiœus conquered by Artaphernes, than he took the measurement of their whole country in *parasangs* (a Persian measure of length, based on the cubit) and settled thereupon the tributes which they were in future to pay.

Hence the Samian cubit alluded to, was no other than the Persian cubit of the day of Herodotus; and that cubit being of the length of 20·69 British inches by universal, modern research, we may immediately see how close to the truth the Father of History was, in declaring the length of the Egyptian and the Samian, *i.e.*, Persian, cubits to be the same,—when the Egyptian cubit has

been found by all modern Egyptological explorers to be within a few tenths, or even hundredths, of an inch, the very same quantity; or, say for shortness, 20·7 British inches.

Thus Sir Gardner Wilkinson in his "Manners and Customs of the Ancient Egyptians" (Vol. IV. pp. 24—34, third edition, 1847), expressly declares against the idea of there having been intentionally two different-lengthed cubits in Pharaonic Egypt; and gives the following as measures of accidental variations of the one and only Egyptian cubit belonging to any period between 2200 B.C. and 320 B.C. :—

20·47	British	inches.
20·58	„	„
20·62	„	„
20·66	„	„
20·62	„	„
20·75	„	„
20·65	„	„

And other more recent measures by other investigators, some from cubits, and some from ancient monuments where certain parts seemed to have been laid out, so as to be even multiples of 2, 4, or more cubits,—have yielded 20·73 and 20·66 British inches.

In all these cases then, we see indeed inevitable small practical variations, but only of one and the same cubit-length; no approach is manifested to the Greek and Roman length of 18·24 inches; only a drawing together round about a most notable and notorious mean quantity of 20·7 inches; and that tendency too was just as eminently observed in Babylon, Nineveh, and other Mesopotamian cities as in Memphis, Heliopolis or Thebes, on the Nile.

There was thus something equivalent to a grand metrical combination among certain Eastern nations of early times; a combination exceeding in its extent and

duration all the spread and vital powers of language and race, of politics, war and peace amongst them; in a large degree, no doubt, because the metrical matter concerned, was bound up not only with their religions, but with the one primitive foundation of all those idolatrous religions alike.

What then would have thought any of those nations, but more especially the Egyptians (of whose spiritual life we know most), of this recent most uncalled for attempt by an Ordnance Surveying General at Southampton and a Standards administration official at Whitehall, not only to degrade that grand 20·7-inch standard of all the several great empires of the ancient East, but incontinently to cut it down to the petty size of the long subsequent cubit of the "impure Greeks;" as every Egyptian who lived down to their times had the pleasure of terming them. What, too, more especially would have thought the Egyptians, when in their "Dead Book" (the souls' *vade mecum* inserted in the coffin of every subject of Pharaoh),—there appears in black and yellow,—the most distinct ejaculation to be made by such souls when standing before the Judge of the dead; viz., "I have not *shortened* the cubit." And when one of the first sights which "a justified soul" is supposed to behold after passing the terrestrial bounds is, "the god Thoth with the cubit in his hand"? *

I will not even attempt to say what those ancient Egyptians would have thought of our two modern official giants, whose carriages, in trying to stop the way of Great Pyramid research, have done them, the Egyptians, so hateful an injury; for I am horrified to remember the Pharaonic pictures of human souls sent

* See "Seven Homilies," by the Rev. J. T. Goodsir. Appendix, with translation of the "Dead Book," by W. Osburn. Williams and Norgate, 1871.

back from heaven to earth, in the bodies of pigs, for far lighter offences than "shortening the national cubit."

Origination of the Profane Cubit of the East.

A particular length, then, and that something within, probably or even certainly, a tenth of an inch of 20·7 inches, did undoubtedly and intentionally characterise, and for many ages, the ancient cubit both of Egypt and the far distant Babylon, Nineveh, and Persia, together with all the great kingdoms historically arrayed in religion against Israel; and such cubit length was made a *sacred* matter amongst them.

But in what else were their *sacred* ideas, *i.e.*, chiefly of Egypt and Babylon, common or similar?

That very part of the "Dead Book" which enables the Egyptian who has bought it from his priests, to declare in words ready cut and dry for his use, that he is free from that sin (into which the Ordnance Surveyor and the Warden of the Standards have in these latter days tumbled headlong), viz., of *shortening* the cubit,—puts a long string of other declarations into his mouth, protesting him to be also perfectly free from any and every other possible sin, great or small, that was ever heard of. And whether such unhappy being also believed and trusted, as most of them did, in idols of animal-headed gods, of whom there were sometimes more, and sometimes less, in the Egyptian Pantheon, all that—dreadful as it is for human beings with souls to be saved, and special instruction from the Creator—sinks into comparative insignificance before this unblushing assertion of absolute self-righteousness. For *that* principle lasted through all their varying theogonies; and not only shows the innate, settled Cainite direction of their thoughts, but their continual antagonism also to the religion of Abel, and to the whole Revelation doctrine

of the lost condition of man, with the consequent Christian necessity of an atonement by sacrifice and pardon through the blood of a Mediator.

All this doctrine is of course to be found in the Bible, and something of it in Josephus's account of Genesis times also; but where he obtained his further particulars of Cain, and how far they are to be, or should be, trusted, I know not. Yet they are pertinent to the present question, and run thus; viz., that after Cain's expulsion from a more blessed society, and after the *mark* was put upon him, he went on from one wickedness to another until he at last invented "weights and measures:" not so much, apparently, that they were sinful in themselves, but that Cain employed them as instruments of rapacity and oppression: or as, in fact, the officers of the Assyrian king afterwards made use of them in exacting cruel tribute from conquered lands.

In self-defence therefore, implies Josephus, the descendants of righteous Seth, in whose line afterwards came Noah, Shem, Melchisedec, Abraham, and Moses, betook themselves to studying astronomy, with the special approval and help of Almighty God; and when they had perfected those discoveries, they set forth from their own land (which was probably in Mesopotamia), to the land of Siriad (that is the Siriadic, or Dog-star, land of Egypt), and inscribed their discoveries there on two pillars, one of stone and one of brick.

They did not therefore seek either to teach or enforce these things on the Egyptian people whom they found there; they merely recorded their astronomical discoveries in their own way, to their own satisfaction in that land, because it was a more suitable land for that purpose than their own; and they recorded them by means of masonry, most certainly illegible to all unscientific natives around. And what such discoveries in

astronomy could have been, to enable them to have a counter effect to the bad weights and measures of Cain, unless they were connected with a principle of earth and heaven commensurability adapted to a people's measures in length, capacity, and weight, leading their souls therefore, and thereby, to think lovingly, sympathetically, harmoniously, and Abel-like, of God,—it is difficult to conceive.

In fact, according to the *nature* of the things said to be inscribed, the above alluded to *stone* pillar, or monument (which Whiston, wholly ignorant of hieroglyphic interpretation, proposed to identify with a Cainite obelisk of an idolatrous king of Egypt in Thebes during the 19th Dynasty),—can be no other than the Great Pyramid. While the similar *brick* monument, erected by the same Sethite parties (descendants only of Seth through the Flood), must, if ever finished, have gone the way of all the brick pyramids of profane Egypt; viz., subsided into a heap of decaying mould.

But I do not ask any one to *depend* solely, for any one important thing, on Josephus; though, from the large amount of accordance between him and the Bible in numerous other points, it would not be wise to altogether reject a whole argument in all its parts and ramifications, merely because it is found in Josephus and in no other preserved *writing* of olden times. The passage, however, quoted above, does, even when considerably pruned, open up a very suggestive view, of a metrological contrast, entirely agreeable with Biblical characteristics, though depending on microscopic refinements only understood by modern science within the last century. It tells us, I venture to say, of a metrological contrast between Cain and Abel having been carried by some of their descendants through the Flood: and of these parties having been distinguished by the most opposite kinds of weights and measures.

And when we further find by later researches that the anti-Israel, and decidedly Cainite nations, spread abroad even from the Nile to the Euphrates, though often warring vehemently with each other, were yet banded together to employ one and the same cubit length of 20·7 inches, we must look upon that measure as the Cain-invented, Cain-descended, cubit. When, too, we find that that length is totally incongruous to the measures of both the earth and the heavens, and not evenly in any way commensurable thereto, or conforming therewith,—it opens up the most intense anxiety to ascertain whether the cubit of the descendants of Seth, in the line of Abraham, and representative of the cause of righteous Abel, had any of the admirable earth-commensurability and nature harmonious properties which have been discovered in the standards of the Great Pyramid.

The Sacred Cubit of the Hebrews.

And here, alas for the Church of England! from the time of Bishop Cumberland of Peterborough, down to the Bible dictionaries of Kitto and Smith, the annotated Bibles of the Government printers, and the maps of Jerusalem prepared for the Palestine Exploration Association by the Ordnance Survey establishment at Southampton. For all these supposed unquestionable authorities merely indicate, lazily, ignorantly (both as Christians and scientists), "The Hebrew measures are impossible to find out by the mere words of the Bible, so we go to the (Cainite) Egyptians: and take, and give you, *their* (self-righteous, God-defying) measures as representing (the Inspired sacredness of) the Hebrew!" And such numbers of inches too as these blinded men give, under that guise, are more often derived from mediæval or Grecianised, but still idolatrous, Egypt, than the Egypt of her most ancient, or even Exodus, day.

In this dilemma of the flock's desertion, or misleading, by its proper shepherds, how thankful should we be, that it pleased God to raise up the spirit of Newton amongst us; and enabled him to make it one of the most important discoveries of his riper years—though the opposition of the Church of England has caused it to remain unread almost to the present day,—that while there undoubtedly was in ancient times a cubit of 20·7 inches nearly, characterising the nations of Egypt, Assyria, Babylonia, and Phœnicia, and which cubit Newton calls unhesitatingly "the profane cubit;" there was another which he equally unhesitatingly speaks of as the *sacred* cubit; and shows that it was decidedly longer than the above, and most earnestly preserved, treasured up, and obeyed, among some very limited branches of the house of Shem. The exact date of its promulgation Newton does not attempt to fix, but alludes to the certain fact of its having become the "proper and principal cubit" of the Israelites, *long before they went down to Egypt.**

Now the precise size of this remarkable cubit, and which seems eventually to have remained in the sole possession of the Hebrews, and to have been, after the Egyptian captivity, employed by them for sacred, Biblically sacred, purposes only, Sir Isaac Newton attempts to ascertain in various modes thus :—

1. By notices from Talmudists and Josephus in terms of Greek cubits, which on calculation give, as limits, something between 31·24 and 24·30 British inches.†

2. From Talmudists by proportion of the human body, giving as limits, from 27·94 to 23·28 British inches.

3. From Josephus's description of the pillars of the temple, between 27·16 and 23·28 British inches.

* See "Sir Isaac Newton's Dissertation on Cubits," reprinted in vol. ii. of my "Life and Work at the Great Pyramid."

† On the mean determination by many authors that 1 Attic foot = 12·15 British inches; and one Roman uncia = 0·97 British inches.

4. By Talmudists and "all Jews'" idea of a Sabbath day's journey between 27·16 and 23·28 British inches.

5. By Talmudists' and Josephus's accounts of the steps to the Inner Court, between 26·19 and 23·28 British inches.

6. By many Chaldaic and Hebrew proportions to the cubit of Memphis, giving 24·83 British inches. And,

7. From a statement by Mersennus, as to the length of a supposed copy of the *sacred* cubit of the Hebrews, secretly preserved amongst them, concluded = 24·91 British inches.

Now in all these seven methods any one may observe that that heathen length of Egypt and Babylon, viz., 20·7 inches, has no standing-place whatever; neither beside the single determinations, nor within the widest limits of the double determinations. What *is* indicated by the numbers, appears to be,—either 24 inches with a large fraction added to it, or 25 inches with a small fraction, or something between the two; and if we say 25 inches with an uncertainty of a tenth of an inch either way, depending on the rudeness of the references, we shall probably be borne out by every one who examines Sir Isaac Newton's original paper ably, carefully, and without prejudice.

Most triumphantly, then, ended Sir Isaac Newton's researches, in showing that the cubit, or rather the linear standard, of that peculiar people who were religiously representative of Abel, was absolutely and totally different, in the radical and governing feature of length, from the cubit, or linear standard of all the unhappily numerous and powerful empires representing Cain, in the ancient world. And there he stopped. But now, with the new ideas opened up by John Taylor from his researches, literary though they were only, at the Great Pyramid, we find that a length of 25·025 British inches, or a length abundantly within the limits

of the conclusions to be drawn from Sir Isaac Newton's numbers for the Hebrew sacred cubit,—is not only earth commensurable, but earth commensurable, and nature harmonious, according to Sir John Herschel, in the best conceivable manner; or with the earth's astronomical axis of rotation. So accurately, too, and in so difficult a subject, that as we have already shown in the first part of this book, no such conclusion could have been intentionally arrived at by any race or nation of men in the early age when the Great Pyramid was founded,—without their being favoured by some superhuman and supranatural, that is, Divine, assistance.

That the Hebrew race *would* have received such assistance from the Almighty, if they really needed it, no true believer in the Bible will doubt for a moment. And now when we find, and shall afterwards be able to confirm from other sources, that they had the very thing amongst them which, as the highest modern science testifies, could only have been a supranatural gift in that age, the further question is answered, as soon as it arises,—viz., whether the gift may really after all have come to them in the manner indicated by Josephus; *i.e.*, through primeval Divine assistance accorded to Seth, as represented in his earlier descendants; and that it was granted to them, not merely to improve them in astronomy, but also to strengthen them against the religiously opposed descendants of Cain.

Now the Egyptians were Cainites, not only from what has already been shown from their own "Dead Book," but from Biblical history indicating that they had, like Cain, refused the sin-offering lying at the door, and had scornfully banded themselves together to consider the Divinely-appointed means of reconciliation "an abomination unto them." * Therefore, when Israel was in Egypt, Abel and Cain typically met once again, and

* John Taylor's "Great Pyramid," p. 217.

we all know with what results of cruelty within the power of Cain to inflict. We also know in a parallel manner, by metrological research, that that Mizraite edition of Cain held then, and continued to hold through all his national existence, to his 20·7 inch standard measure; while, through Sir Isaac Newton the astounding information first came, that the Hebraite Abel at the same time likewise kept true, through all his persecutions, to his oppositely derived, Seth-descended, 25·025 inch, better standard.

These two opposing standards, therefore, clashed together in Egypt, B.C. 1500, and God gave the victory in the end to Abel's.

But they met together again, as Sir Isaac Newton himself points out, *after* the Exodus, and even in the very presence of the Tabernacle in the wilderness; for the Israelites *would* employ the Egyptian cubit of 20·7 inches long for many of their ordinary purposes; though Moses was always most precise, and apparently successful, in seeing that in their *sacred* work they employed only their *sacred* cubit, *i.e.*, "the cubit of the Lord their God;" viz., the earth-axis commensurable cubit of 25·025 inches long.

The Mixed Presence of the Two Cubits, Sacred and Profane.

But it may be asked, Why did the Israelites continue to employ two cubits? If, as Sir Isaac Newton states, they brought their own sacred cubit, which they had possessed of old, down with them into Egypt, preserved it when there, and took it out with them again, —why was that one not enough for all their purposes?

The first answer to this question is by Sir Isaac himself.

"They, the Hebrews, brought," says he, "their own

sacred measure to Egypt with them; but living for above two hundred years (four hundred according to some chronologists) under the dominion of the Egyptians, and undergoing a hard service under them, especially in *building, where the measures came daily under consideration*, they must necessarily learn the Egyptian cubit."

The second answer is, "Did the Israelites succeed in freeing themselves at the Exodus from every other taint and sin of the Cainite people they had been sojourning amongst? Nay, indeed, were they free from the sins of many innate, born, and predestined Cainites among themselves? Search the Scriptures, and the answer comes up too plainly.

It was not, apparently, the purpose of God to create even his chosen people absolutely immaculate; or to make it impossible for them to sin, even if they should try. Therefore was it that temptations to evil (though in a measure only) were left to prove them; and amongst other forms of seduction, the insidious Cainite 20·7-inch cubit, as well as the true cubit of Abel of the 25·025-inch length.

Now, exactly as these two cubits were contending with each other, and either ensnaring or saving men's souls in the very camp of the Israelites ruled by Moses, so is it still in that wondrous erection in Egypt, the Great Pyramid, to this day.

Sir Isaac Newton showed from the measures of Professor Greaves in 1638, that various minor parts of the Great Pyramid were laid out in terms of the 20·7 inch cubit of Memphis, *i.e.*, the Cainite cubit sacred to Egypt but profane to the Israelites; and I, having gone over some parts of the Pyramid, measuring-rod in hand, have testified, in Vol. II. p. 340 of my "Life and Work," that Sir Isaac Newton is there perfectly correct; and the instances may partly have been brought about by

the necessity, even of a Seth-descended architect of the Great Pyramid, employing the idolatrous natives of Egypt with their one and only cubit familiar to them, as his working masons and mere hodmen in the great work whose ultimate object and purpose they were perfectly ignorant of, and would have opposed if they had known.

But that does not destroy, nay, it rather rivets attention to, the grander Pyramid fact which had escaped the understanding of all mankind until after the days of John Taylor; (escaped them, too, though it was prominently in their midst, and with nothing to hide it from any one, even from the beginning of history); viz., that if you subdivide the base-side length of the Great Pyramid by the number of days in a year, you obtain, by such application of an astronomical time-measure,—the sacred Hebrew, earth-commensurable, *anti*-Cainite cubit, and find that Sethite rod to be a ruling feature of the ultimate design of the whole vast fabric.

The Sacred in Time, as well as Space.

Now this conjunct employment in the Pyramid, of sacred measures of length and true measures of time, is all the more noticeable, because during their national slavery to the hardest of taskmasters, the Israelites got inevitably into the way of using, for secular purposes, something else besides the profane measures of length of the Egyptians; for they adopted their imperfect mode of measuring time as well, or of telling off the days, first by lunar, and then by reputed solar months.

Yet of all the Mosaic institutions, nothing is better appreciated, in our country at least, than that Moses contended gloriously with his countrymen for the *non*-Egyptian time-measure of, a week of six days, followed by a Sabbath of rest; and that he so contended because

such a time-measure was an original ordinance, not of man, but of the Lord his God, and to be observed by the faithful and God-fearing of mankind for ever and ever.

Has the Great Pyramid, then (Sethite as we may call it now, though not Mosaic), any allusions to that most distinguishing time-measure of Revelation, the week, as it is in the Bible?

Alas! how little do we yet know of the Great Pyramid: and how much there is still to learn. To learn indeed; but not from our many modern Egyptologists, as they proudly call themselves. For surely by this time we should have acquired a wholesome fear of those who, instead of studying the Great Pyramid from a truly religious and Christian, or any, point of view, have rushed headlong into a Cainite desire to know more about the sanctified bulls and cats, crocodiles and ibises, snake and beetle gods, and all the other unholy holies of that impure Egyptian nation;—a people answering more closely than any other to St. Paul's description of the ancient world; as composed of those, who are without excuse,—because that, "when (in primeval and patriarchal times) they knew God, they glorified Him not as God, neither were thankful; but became vain in their imaginations, and changed the glory of the incorruptible God into an image made like to corruptible man, and to birds and four-footed beasts and creeping things. A people who changed the truth of God into a lie, and worshipped and served the creature more than the Creator, who is blessed for ever. Amen."

To those, then, who are happily freed, but not by human learning, from this dreadful hankering of modern Egyptological scholars, and keepers of Egyptian museum galleries, to become wise in old idolatry,—how grandly rise in noble aspirations, the thoughts of any fair, honest mind, on merely beholding the external mass of the

Great Pyramid! For thus writes a recent traveller, a plain and simple style of working-man almost, but with the higher feelings which spring from Christian education and the improving sentiments which labour of head and hand, in company with his brother men in an appointed path, irresistibly teaches,—thus he writes, (without, however, as might too probably be expected in a stranger, unfurnished with any scientific instruments of measure, sufficiently distinguishing the Great Pyramid from the other pyramids, its copies without souls, or minds either, in the immediate neighbourhood) :—

"To view them merely as gigantic monuments is a novelty productive of impressions of sublime grandeur, of which words fail to convey any accurate conception; but when they are viewed in connection with the history of the human race, as older than the oldest records, and marked with the antiquity of those ages long gone by, when the earliest of the patriarchs entered Egypt, the mind becomes absorbed, and I felt as though I could have lain, not for hours only, but even for nights and days, indulging in the sight of the greatest of these pyramids." "With the Hebrews, to look back beyond the time of Abraham, was deemed a glimpse of eternity; and the passage, "Before Abraham was I AM," is at once presented to the mind in connection with this view. Yet even in Abraham's time, it is supposed that these pyramids were works of venerable antiquity."*

True, most true; and in the Great Pyramid we have found enshrined, established in the solid architecture, but yet unseen from those pre-Abrahamic, down to these latter days, that identical sacred, earth-commensurable, measure of space, which, according to Sir Isaac Newton, the leaders of the Hebrew race had received *long before they went down to Egypt.*

* "Notes on Egypt," by T. Sopwith, Esq., C.E., privately printed.

Is it possible, then, let us fear not to ask again, that any allusion to the earliest *written* Divine command, the measuring of time by a sabbatical week of seven days, may be found in that grandest, and most purely Sethite, of stone records also?

Search may be made; but even the best of us should pray in the course of it, to be guarded against being led away by mere coincidences, by mistaken observations, and even intended stumbling-blocks and rocks of offence: for surely things exist in the Great Pyramid very much as they do in the world outside, and even as they did in the sacred camp of the Tabernacle under Mount Sinai itself,—to try us, and prove whether our faith be correct as well as strong.

CHAPTER XVII.

"TIME MEASURES IN THE GREAT PYRAMID."

ON this important question there is but one mode of inquiry, viz., attention to the measures of the whole and its parts; coupled with the quality of the work concerned, and followed by the theory, whatever that may ultimately prove to be, which explains the greatest number of facts.

Now one *time*-measure has already been indicated in the circumstance that the sacred, Hebrew, or pyramid cubit is of such a length that it measures the base-side of the Great Pyramid by the number of days, and fractions of a day, in a year; while another, includes a practical demonstration of our modern leap-year arrangement in the exhibition of the four sides, or years, which make up a cycle of years complete to a day; or, as the symbolism of the ante-chamber indicates, *almost* a day; for, of the four grand grooves there, of which three are hollow, and the fourth only, filled, that fourth one is not equal in breadth to the other three. (See Plate X.)

But a still grander time-measure is obtained by viewing the whole Pyramid's base periphery in the light of its equivalent circle, struck with a radius equal to the vertical height of the Pyramid; which, by its sun-distance commensurability, symbolises the sun in the centre of that circle; for then the interval of twenty-four solar hours, or the time elapsing between the sun apparently

leaving the meridian of any place and returning to it again, by virtue of the rotation of the earth on its axis before the sun, *i.e.*, a mean solar day,—is measured off on that circle's circumference by 100 pyramid inches evenly.

French Savants on the Passages of the Great Pyramid.

But if the time symbolism of the exterior of the Pyramid is thus clear and simple enough, that of the interior presents many difficulties.

The entrance passage has indeed already been elsewhere shown to be connected with the meridian transit of a circum-polar star; but why did the builders make both that passage and the first ascending passage so excessively low, that a man can hardly pass through them, even crawling on his hands and knees; and another, the Grand Gallery, so astonishingly high, that the blazing torches of Arab guides seldom suffice, in its mere darkness rendered somewhat visible, to show the ceiling to wondering visitors!

No approach to a sufficient answer to these questions has yet been given anywhere; and all that violent, and apparently unreasonable, contrast of heights, remains the most mysterious thing in its origin, at the same time that, in its existence, it is one of the best ascertained facts about the whole Great Pyramid.

The French Academicians, even in their day, enlarged much and learnedly on the circumstance; but could neither solve that nor many other points, about both the Grand Gallery and the smaller passages. Almost in despair at last, but the despair of an honest and well-read man, unashamed to confess the truth that such a case was too difficult for him, —M. Jomard exclaims at p. 198, "Description de l'Egypte," "Everything is mysterious, I repeat it, in the

construction and distribution of the monument; the passages, oblique, horizontal, sharply bended, of different dimensions!" And again, at p. 207 of "Antiquités, Mémoires," "We are not at all enlightened either upon the origin, or the employment, the utility, or any motive whatever, for the gallery and various passages of the Great Pyramid; but do we know anything more either about the well, or much rather about the 28 square holes or cavities worked with skill along the sides of the high ascending gallery?"

Professor Greaves describes the Passages of the Great Pyramid.

Where so many great men have failed, we must proceed with caution indeed; and commencing therefore at the beginning, with what has been known to, and confessed by, most travellers for ages, I will, at present, merely call attention to the extraordinary pains that were taken by the original builders with the structure of all these passages.

Even with the first, or entrance passage, the most used and abused of the whole, both in mediæval and modern times,—yet the regularity and beauty of its fabric composed of whiter, more compact, and homogeneous stone than is to be seen anywhere else, and in enormous blocks admirably worked, seems to have been ever the admiration of all beholders. Professor Greaves, in 1638, exclaims (with almost a Tennysonian feeling of the romantic belonging rather to 1860), on beholding this passage some 3,800 years after its builders had been laid in the dust, and their spirits had returned to God who gave them, "the structure of it hath been the labour of an exquisite hand."

Yes, truly; but to bring back the "tender grace of a day so very long since dead," and receive a clear intel-

lectual explanation of wherefore these things came to pass,—how vain it would be merely to sigh, and ever so anxiously wait, for—

> "The touch of that vanish'd hand,
> And the sound of a voice that is still."

Nor does the Savilian professor abandon himself to vain regrets; but goes on methodically to describe the mechanical elements of the excellence which he had noted; such as, "the smoothness and evenness of the work," "the close knitting of the joints," and the accuracy with which the exact breadth of 3·463 of the English foot,* is kept up through a length of 92·5 feet. But when Greaves comes soon afterwards over against a portion of that rough fragment of a side-passage forced in barbarous times of spoliation by Caliph Al Mamoun, he correctly describes that as "a place somewhat larger, and of a pretty height, but lying incomposed; an obscure and broken place, the length 89 feet, the breadth and height various, and not worth consideration." And again, "by whomsoever (among the moderns) it was constructed, is not worth the inquiry; nor does the place merit the describing; but that I was unwilling to pretermit anything, being only an habitation for bats, and those so ugly and of so large a size, exceeding a foot in length, that I have not elsewhere seen the like."† (See Plate VIII.)

* Equivalent to 41·51 pyramid inches, my measures in 1865 having given for extremes 41·58 and 41·46, and the mean of all, 41·49 of the same inches; or differing from my astronomical predecessor, after two centuries, by only $\frac{1}{2000}$th of the whole.

† Murtedi, an Arabian author, says, "As big as black eagles." Professor Greaves evidently did not recognise in 1638, neither indeed did Dr. Clarke in 1800, that this "incomposed hole" was really the rough passage of forced entrance made by the early Arabian Caliph; and it required Colonel Howard-Vyse's clearing away of the rubbish mound outside, in 1837, to prove the fact, by exhibiting the outer end of the hole as well. But the very circumstance of Professor Greaves not being acquainted with these latter day facts, makes his correct description of the interior all the more creditable to him.

When, on the contrary, the same Professor Greaves, by aid of that yawning hiatus in the masonry to the west of the portcullis, got round and above that granite block obstruction between the entrance, and first ascending, passages proper, and reached this latter work of the ancient builders,—a passage of the same breadth, nearly as the entrance or descending passage,—he then resumes his more graceful imagery, and writes: "The pavement of this rises with a gentle acclivity, consisting of smooth and impolished marble (limestone), and, where not smeared with filth, appearing of a white alabaster (cream) colour; the sides and roof, as Titus Livius Burretinus, a Venetian, an ingenious young man, who accompanied me thither, observed, were of impolished stone, not so hard and compact as that of the pavement, but more soft and tender." And I, in my turn, have now, 285 years after King Charles the First's professor of astronomy left the Pyramid, to report, as an apparent consequence of that tender softness described by him, that the upper part of the walls, and more especially the roof of much of this passage, have exfoliated or decayed to the extent of a foot or more in many places,—while the floor, on the other hand, has rather hardened to the feet (usually naked feet, though) of Arabs, and exhibits a peculiar change of the limestone actually verging upon the consistence of flint, yet keeping nearly true still to the ancient test marks of the floor level on either side wall.

And then when he arrives in the far freer and more elevated space of the second ascending passage, or the *Grand Gallery*, the fine old Oxford professor, who well knew what architectural beauties were, speaks of *it* as "a very stately piece of work, and not inferiour either in respect of the curiosity of art, or richness of materials, to the most sumptuous and magnificent buildings." And again, "this gallery or corridor, or whatsoever else I may call it, is built of white and polished marble (lime-

stone), the which is very evenly cut in spacious squares or tables. Of such materials as is the pavement, such is the roof, and such are the side walls that flank it; the coagmentation or knitting of the joints is so close, that they are scarce discernible to a curious eye; and that which adds grace to the whole structure, though it makes the passage the more slippery and difficult, is the acclivity and rising of the ascent. The height of this gallery is 26 (more nearly 28) feet; the breadth 6·870 feet, of which 3·435 feet are to be allowed for the way in the midst, which is set and bounded on both sides with two banks (like benches) of sleek and polished stone; each of these hath 1·717 of a foot in breadth, and as much in depth."*

"Upon the top of these benches, near the angle where they close and join with the wall, are little spaces cut in right-angled parallel figures, set on each side opposite one another, *intended, no question, for some other end than ornament.*"

"In the casting and ranging of the marbles (lime-stone), in both the side walls, there is one piece of architecture in my judgment very graceful, and that is that all the courses or ranges, which are but seven (so great are these stones), do set and flag over one another about three inches; the bottom of the uppermost course overflagging the top of the next, and so in order the rest as they descend."

In the edition of Greaves's works by Dr. Birch in 1737, from which I quote, there is an attempt to represent these things graphically, by the book being "adorned with sculptures," and "illustrated with cuts

* By my measures in 1865, in pyramid inches, and taking a mean of all the variations caused by the tile-setting of the stones forming the ceiling or roof, the vertical height between sloping floor, and parallel sloping roof, was = 339·2, and the computed transverse height = 304·1, the whole breadth being 82·2; the lower breadth between the ramps = 42·0; and the ramps themselves 20·07 broad, and 20·96 high in the transverse, or shortest, direction.

by a curious hand;" and in the great French work some efforts in a high class of design are engraved in line, to represent perspective views looking both upward and downward in the Grand Gallery; but they are all of them to some extent failures. The circumstances are above the scope of orthodox pictures by reason of the narrow breadth, the lofty vaulting height, and the very peculiar sloping angle of the long floor; a floor, when one looks from its north end southward, ascending, and ascending through the darkness apparently for ever; and with such steepness, that no artist's view of it, painted on a vertical plane, could ever hope to represent more than a small part of that floor, rising upward through the whole canvas and going out at the top. While on looking northward from the south end of the gallery, you lose the floor instantly, and see on the level of your eyes in the distance, part of the steeply descending ceiling; descending, too, still further and going out at the bottom of the picture, if your means of illumination extend so far. (See Plate XII.) Otherwise, it is the solemn overlappings of the high dark walls, passing you by on either side, to draw together in dim and unknown perspective beyond, which encase you in on every hand; but all on an uneasy slant, speaking of toil in one direction, danger in another, and a mountain of strength for a prison house, if so required, everywhere.

Modern Measures of the Passages.

In the first edition of this book, I was positively puzzled to make out, let alone the mysterious Grand Gallery, the simple sizes of the smaller passages; and erred considerably in choosing among the conflicting testimonies of former travellers. But a four months' residence on the spot, most completely settled all that class

of difficulties; and enables me now to speak confidently thus:—Although there are some pieces of horizontal passage in the Great Pyramid, their length is as nothing compared to the length of the *inclined* passages. The angle of inclination in a vertical plane of these passages is 26° 18′ nearly, being the same whether the passages are ascending or descending (within errors of construction amounting to 1-120th of the whole); and the transverse size, that is, breadth and height, excepting only the utterly diverse Grand Gallery, being also the same; or at least, having certainly been so, before the abrading and exfoliating of the more "soft and tender" of the stones began. Confining myself, however, to well-preserved portions of the ancient surface, and just now to the entrance-passage alone, I obtained the following measures for its breadth and height.

ENTRANCE PASSAGE.

Breadth and transverse height as measured in 1865.

Place where the measure was made referred to the floor-joints.	Breadth from east to west.		Transverse height.		Notes.
	Near bottom of walls.	Near top of walls.	East side of passage.	West side of passage.	
	Brit. ins.				
4th joint from north end of passage . .	41·61	41·63	47·27	47·24	The peculiar little holes of rough decayed surface avoided.
7th do. . . .	41·51	41·41	47·30	47·23	
8th do. . . .	41·59	41·50	...	...	Supposed to be Professor Greaves's place of measure, which gave him 41·56 of his English inches.
11th do. . . .	41·59	41·51	47·32	47·30	
15th do. . . .	41·59	41·46	47·18	47·16	Broken holes in this part of the floor from 12 to 18 inches deep.
21st do. . . .	41·46	Chipped	47·14	47·28	The top of wall measured, was what was indicated by the plane of the roof produced.

The manner in which these numbers run, will indicate to any practical man the degree of opportunity which the Great Pyramid still presents for respectable accuracy of measure, by those who will trouble themselves to seek out the best-preserved parts, and endeavour to do them justice. But what is the meaning of the word *height* in the above table being qualified as "transverse height"?

These Pyramid passages being all of them inclined, have two sorts or kinds of height; 1, *transverse height*, or the shortest distance between floor and ceiling, and which was the easier kind of height to measure accurately with the sliding scales which I had had constructed for the purpose; and, 2, *vertical height*, or height in the direction of a plumb-line, and the more usual, indeed almost the universal, mode of measuring heights in masonry structures elsewhere.

Now, putting all the observations together, I deduced 47·24 Pyramid inches to be the transverse height of the entrance passage; and computing from thence with the observed angle of inclination the vertical height, that came out 52·76 of the same inches. But the sum of those two heights, or the height taken up and down, $= 100$ inches: which length, as elsewhere shown, is the general Pyramid linear representation of a day of 24 hours. And the mean of the two heights, or the height taken one way only, and impartially to the middle point between them, $= 50$ inches: which quantity is, therefore, the general Pyramid linear representation of only half a day. In which case let us ask, what the entrance passage has to do with half, rather than a whole, day?

Astronomy of the Entrance Passage.

If you descend at night a certain distance down the sloping floor of the entrance passage, and then turn

round and look upwards and towards the north, to its open mouth, you will see any large star whose distance is 3° 42′ nearly from the Pole, if it should chance to be crossing the meridian at that moment in the lower part of its daily circle :—always supposing that there is at this present time a star at that distance, bright enough to be easily seen by the naked eye ; and indeed there is such a one very nearly in the required position, viz., δ Ursæ minoris, 3° 24′ from the Polar point.

But that star was not always there ; being carried on and on through an immense celestial round at the rate of about 12 degrees nearly, for every thousand years, by that grand mechanism of the earth and the heavens called amongst astronomers the precession of the equinoxes ;—the most important too of all celestial phenomena for fixing the exact chronology of the earlier periods of man upon earth. It was Sir John Herschel who, in answer to a letter from Colonel Howard-Vyse on his return from his immortal Pyramid explorations in Egypt, in 1837-8, first laid down the application of that essential astronomical law with regard to the Great Pyramid. And, indeed, he did more ; for, assuming *the prevailing idea of his then time*, that the Great Pyramid's foundation was somewhere about 4,000 years ago, he searched the starry heavens, as moving under the influence of precession, and found that, for all the last 5,000 years, only one notable star had been at the required Polar distance, so as to look exactly down the descending entrance-passage of the Great Pyramid at its —the star's—lower meridian culmination ; and that star—*a* Draconis by modern name—was in that critical position somewhere about 2160 B.C. That date therefore made up with 1838 (and excluding for the time four possibly unrecorded years at the beginning of our era), 3,998 years ago as the epoch of the passage angle being laid, to suit a chronological phenomenon of ex-

cellent astronomical kind, and peculiar to the Pyramid builders' day.

This near agreement of general Egyptological theory, as it was in London in 1840 A. D., with the result of computations by modern astronomy when adapted to measures of still existing facts at the Great Pyramid, seemed to take the English world by a storm of admiration; and every one allowed, for a while, that the whole affair was quite settled. But, alas! those were simple, innocent days under good King William and the quiet Queen Adelaide. The up-springing of German theology in this country, and the demands of natural-history science overleaping itself, and calling out everywhere for long dates, were scarcely begun; and the only opposition then ventured was from certain literary Egyptologists, who protested that the astronomy of Sir John Herschel's paper was only an accidental coincidence with the passage-angle; because said passage, having been made, *as they knew*, merely to slide a sarcophagus down to its resting-place, and having been filled up choke full to its mouth, after that was done, with solid blocks of stone, it could not have been used as an observatory by astronomers.

The first answer to this Egyptologic protest, was easy enough. Sir John Herschel had not said that the passage was intended to serve as a permanent observatory; but that its cream-white, stone-lined, long tube seemed to *memorialize* a particular phenomenon of the day when it was being built, and of that day only; a record, therefore, by *memorial* astronomy (whatever other practical use the passage may, or may not, have served), of a special sidereal fact, to become increasingly important in distant ages for the purpose of chronology.

That explanation holds perfectly true still. But with regard to the other part of the question, as to whether Sir John Herschel's astronomical conclusion

is still to be held as confirming, and confirmed by, the date arrived at by the very latest studies of the Egyptologists among the uncertain documents of profane and idolatrous Egypt (generally too, long subsequent to the Great Pyramid's foundation); alas! what a change had passed over London society by the time that it had come to be my turn to go out to the Great Pyramid in 1864, and print upon it in 1867, 8, and 9!

Then to talk of 4,000 years ago for the Great Pyramid's date of foundation! All Egyptologists of any pretension had learned to scorn such a petty conception; and had begun to assert entirely new epochs, ranging anywhere between 5,200 and 6,600 years ago. Whereupon, one-half at least of Sir John Herschel's hitherto applauded grounds of confirmation, for his astronomical date of the Great Pyramid, fell to pieces at once; and he was left, with his astronomy alone, in enormous opposition to, and violent discrepance from, instead of singular agreement with, the idol-studying Egyptologists of our universities and museums.

Moreover, as soon as I came to extend Sir John Herschel's computations, it appeared that when the star *a* Draconis, had in a manner chanced to come to that passage-angle distance from the Pole in about 2160 B.C., —it was from a nearer, instead of a further, polar distance which the star had previously occupied. In which case, the said star must have been at some still earlier age at the passage-angle distance once again. Indeed, instead of merely approaching the precession circle from the outside, it had passed through a small segment of it, and so made a double appulse; but the star's first occasion of being at the Pyramid passage angle distance from the Pole was earlier still, and had taken place somewhere about 3440 B.C.

Here then was a most divided duty: 3440 B.C. might satisfy some of the Neologians among our too

learned Egyptologists of the last ten years, though certainly not all. But then, what case could be made out, independently of all Egyptology of the profane order, for choosing 3440 B.C., as better than 2160 B.C., or *vice versâ?* There were no astronomical reasons then known applying to one occasion, more than the other; Colonel Howard-Vyse was dead; Sir John Herschel remained silent; a noisy military man would persist that Sir John now agreed with him in maintaining that the peculiar passage-angle was chosen for easy sarcophagus sliding alone; and the astronomical world, whatever the reason why, would give the subject no attention.

The Great Pyramid's Use of a Polar Star.

But there was happily more in the ancient Great Pyramid than any one had suspected, and it began to manifest itself thus,—

Did not the very entrance passage, chiefly concerned in the affair, speak by its 50, in place of 100, inch height, to a half, and not a whole day; or a 12-hour interval for some purpose unknown? And did not the axis of the passage point, not to the one, central pole of the sky, where, if visible at all, the upper and lower culmination of any close polar star would be equally seen, but to a region of lower culmination only?

This was indeed the fact; and no one had yet asked, "Why did the builders memorialize, out of the two meridian passages of their circumpolar star in every 24 hours, only the lower, less visible, less important culmination of the two?" Neither had any one yet inquired, "What did any reasonable man, whether of the Pyramid, or any other, day intend or mean, if *time* was his object, by observing the transit, whether above or below the Pole, of a *close circumpolar* star; and of that kind of star only?"

Why! such a star moves so slowly, by reason of the very small size of its daily circle in the sky, that the instant of its passing the meridian is difficult to observe and decide on even with modern telescopic power; and no observer in his senses, in any existing observatory, when seeking to obtain the time, would observe the transit of a circumpolar star for anything else than *to get the direction of the meridian to adjust his instrument by.* But having done that, he would then turn said instrument round in the vertical plane of the meridian so ascertained and observe an equatorial, or at least a zodiacal, star: such star moving diurnally at great speed through the sky, by reason of its large circle extending through the heavens above, and the heavens below, the earth. And then such astronomer would obtain the time with proper accuracy and eminent certainty.

Now to myself, who have been an astronomical transit observer for a great part of my life, it immediately occurred, that the narrow entrance-passage of the Great Pyramid directed up northward, looked very like a polar pointer; while the grand gallery rising up southwards at an opposite angle, and with its high walls scored with long and broad bands, looked amazingly like a reminder of the equatorial zone; though being a closed-in passage it could be only for memorial, and not at all for observing, astronomy. And as in the meanwhile my daily apprentice work in 1865 to the original builders, by measuring every joint of the stones wherewith they had constructed the Pyramid's interior, had inevitably led me to see, that wherever there was any size, shape, or position executed in superior workmanship and better quality of stone, there was a reason for it,—why then I ventured to argue thus,—

The ancient architect's reason why the entrance-passage points to the *lower* or less important culmination only of its polar star, α Draconis, is because a more

important star was at the same moment 12 hours distant from it; and therefore at its upper culmination, or crossing the meridian above the Pole; and for chronological purposes such more important star must be a zodiacal, if not absolutely an equatorial, one. Was there then at either the date 3440 B.C., or the later 2160 B.C. (at each of which dates, but at no other for 25,000 years, *a* Draconis was, when crossing the meridian each day below the Pole, equally at the entrance-passage angle of height), was there any notable zodiacal or equatorial star in the general southern direction of the grand gallery, rather than in the northern one of the entrance-passage, and crossing the meridian at that moment high in mid-heaven there?

Now here was a question put by the Pyramid's actual construction, and to be answered by astronomy alone; or without any of the Egyptologists, with all their lore of false gods and animal idolatry, having anything to do with it.

The answer too might have come out, either that there was no signal zodiacal star in such a position at either date; or there might have been such stars at both dates, and then no discrimination could have been effected. But the answer that did come out was, that no such star existed at the circumpolar star's lower transit of 3440 B.C., but that there was one most eminently and exactly in position at the 2160 B.C., or rather 2170 B.C., circumpolar transit; and that well-fitting zodiacal star was η Tauri. (See Plates XIV., XV.)

The Pleiades Year.

Now η Tauri is not a very large or bright star in itself, but then it is the centre of a group of stars more bound up with human history, hopes, and feelings than any other throughout the sky, viz., the Pleiades; and

there have been traditions for long, whence arising I know not, that the seven overlappings of the grand gallery, so impressively described by Professor Greaves, had *something* to do with the Pleiades, those proverbially *seven* stars of the primeval world, though already reduced to six (*i.e.*, six visible to the ordinary naked eye), so early as the time of the Latin poet Virgil.

Here then is what those overlappings had to do; viz., to symbolize the Pleiades in the memorial, not observing, astronomy of the Pyramid in an earlier day than Virgil's; for the Pleiades evidently were, *de facto*, the superior, equatorial, or time, star to be taken in concert with the inferior transit of the circumpolar *a* Draconis on the opposite side of the sky. And how well they performed their part, and how capable they were of it, appeared from this further result of calculation, that when they, the Pleiades, crossed the meridian at midnight above the Pole, while *a* Draconis was crossing below the Pole, for the second cosmical occasion, *at the particular distance from the Pole indicated by the entrance-passage*,—that night was the evening, or autumnal, beginning of the primeval year, and *because* the Pleiades were then at 0^h right ascension, or in the celestial meridian of the equinoctial point. Or again, they were by the same fact at the commencement of that grand celestial cycle of the precession of the equinoxes, wherein and whereby they are destined, in apparent movement, to progress onward and onward at the rate of a little more than 3 seconds of time in a year, until after not less than 25,827 years they return to the same position again.

This grand quantity, or peculiar celestial cycle, is further Pyramidically defined by, amongst other intentional features, the length of the diagonals of the base, which so eminently lay out the whole Great Pyramid's position; when their sum is reckoned up in *inches*, at the rate of a Pyramid inch to a year.

In the little portion of history which is all that modern astronomy can claim to have flourished in, the following are some of the principal determinations of this period of the precession of the equinoxes :—

By Tycho Brahe	= 25,816	years.
„ Ricciolus	= 25,920	„
„ Cassini	= 24,800	„
„ Bradley	= 25,740	„
„ Bessel	= 25,868	„

No one whatever amongst men, from his own, or school, knowledge knew anything about such a phenomenon until Hipparchus, some 1,900 years after the Great Pyramid's foundation, had a glimpse of the fact; —and yet it had been ruling the heavens for ages, and was recorded in Jeezeh's ancient structure.

Virgil, 200 years later still than Hipparchus, just as might be expected of a poet, was greater in tradition than astronomical observation; and when he uses the phrase,* that it is "the constellation of the white Bull with the golden horns, which opens the year," many of our own scientific commentators have wondered what Roman Virgil could mean, by claiming as a phenomenon for his own day, that which the precession of the Equinoxes had caused to cease to be true 2,000 years before his time, and had given to *Aries* instead.

No profane philosopher or academic observer of any country in the world is known to have lived at the epoch when that Virgilian phrase about Taurus *was* true. How and wherefore then came such an appearance of the heavens, true only in the Pyramid's age, to become fixed in the minds of the Romans, and Etruscans too, not themselves much given to observing science of any kind, for twenty centuries? How also came it about, according to the documents collected with so much rare skill and research (and partially published

* Candidus auratis aperit cum cornibus annum Taurus.

many years ago) by Mr. R. G. Haliburton, of Halifax, Nova Scotia, that amongst the *origines* of almost all nations, and among many unaltered savage tribes still, such as Australians, Fijians, Mexicans, and many others (peoples never reached by the Romans), a similar beginning of the year to that described by Virgil is still perpetuated; the Pleiades, or the star group chiefly characterising the constellation of the Bull, being annually appealed to; and in Australia, most strange to say, by precisely the Pyramid method, in so far that the natives there begin their year on the night when "they see most of the Pleiades;" otherwise, when they continue to see them all the night through, from their rising at sunset to their setting at sunrise; and that must be when they, the Pleiades, cross the meridian at midnight.

But, just as the Romans stuck to those stars in themselves alone, and saw not that they had left the fiducial test of the equinoctial point by 30°,—so the Australians stick to them still, implicitly, not seeing that the same point is now 54° removed from them; and that the Pleiades stars themselves, from the effect of 4,000 years of precession, never *now* rise high in those southern skies. But that is a test, in so far, of *when* those peoples first received *that* system of sidereal chronology to hold, which is only found in all its completeness, and with testimony as to the date of its beginning, and fitness then for all inhabited lands, laid up in the Great Pyramid building. (See Plates XV. and XVI.)

Transcendentalisms of the Great Pyramid Astronomy.

Now the only source from whence one uniform system of sidereal chronology, and which, though endued with a change in respect to the seasons, yet changes so slowly year by year and generation after generation as to

require 25,000 years before it passes through all the seasons,—the only source, I say, from whence it could have emanated in that early age of the world, and been impressed upon the origines of all races of mankind, is, was, and can only be, Divine inspiration. Not the infallible Divine power in itself: that would have created stars for such purpose alone; and then they would have been absolutely perfect for such end: but Divine inspiration accorded to more or less fallible men.

Here, accordingly, what we are called upon to observe, may rather remind one of that which Josephus records of the descendants of Seth, viz., that they studied astronomy of themselves first, though eventually under the approval of, and with some peculiar assistance from, the Almighty. The Sethites then, as men, only sought to make the best use, and turn to the most practical account, whatever was already created and existing in the sky, in the shape of stars suitable for observation:—and which stars we shall find, in the present day, on pushing both observation and calculations to the extreme of modern science, were by no means in themselves absolutely perfect. The orbs of heaven had indeed been created long before the foundation of the Great Pyramid, and doubtless for many other purposes than defining the Pleiades year to mankind upon earth. But, take those stars 4,000 years ago, as they had been already set in motion by the Divine power æons on æons of ages before the Pyramid day,—and you will find that they did, at that epoch, come quite near enough to form an excellent practical chronological system of the kind indicated; and no better mode of utilizing those actual phenomena of the starry sky, nor any better choice among the stars, ever has been imagined since then, in any country of the world.

Thus, to moderate observation (and with far greater accuracy than the annals of profane history of mankind

have been kept to), all these hereinafter following features may be said, in *ordinary* terms, to obtain ;—

1. The Great Pyramid is astronomically oriented in its sides ; and its passages are in the plane of the meridian.
2. The entrance-passage points 3° 42′ vertically below the Pole of the sky.
3. In the year 2170 B.C. α Draconis was 3° 42′ from the Pole of the sky, and therefore looked right down the axis of the entrance-passage, when at its lowest culmination.
4. When α Draconis was so looking down the entrance-passage, η Tauri, the chief star in the Pleiades group, was crossing the local terrestrial meridian, at a point high up in the sky, near the equator, and simultaneously with the celestial meridian of the vernal equinox.
5. That whole stellar combination had not taken place for 25,000 years previously, and will not take place again for 25,000 years subsequently. It has not consequently repeated itself yet in all the history of the human race, as the Sothiac cycle, the Phœnix cycle and other chronological inventions of the profane Egyptian priests, long after the Pyramid day, have done again and again, to the lamentable confusion of dates in the Pagan world.

But if the calculations on which the above Pyramid results are founded, shall be pushed to much greater refinement, or to portions of space invisible to the naked eye,—it then appears that (1) the Pole-star, when it was 3° 42′ from the Pole, (2) the equatorial star opposite to it, and (3) the celestial meridian of the equinox, were not all of them on the Pyramid's meri-

dian, below and above the Pole, *precisely* at the same instant, either in the year 2170 B.C., or in any other year; and this from failure of the physical stars to be mathematically accurate.

But *our* present difficulty is not by any means entirely confined to the stars, in their places, not being as exact as if they had been created originally for no other than the above purpose; for there are hindrances also to modern astronomy, in precisely realizing everything that has taken place in Nature during the last 4,000 years. Two astronomers, for instance, using the same data, may compute back the place of a given star 4,000 years ago from its present place, and they shall agree to a second in the result; but it does not therefore follow that the star was as precisely there at that time, as though a contemporary chronologist had observed it then; for proper motion, and variations of proper motion, may exist, quite unknown to the short period of surveillance over the stars yet enjoyed by modern astronomy, and totally overturning the physical accuracy of the calculations. Some of the quantities, too, of the celestial mechanics concerned, such as the precise amount of the very precession of the equinoxes itself, may have been erroneously assumed, and never can be ascertained perfectly by man. The numerical values of such quantities do, in fact, vary at the same time between one astronomer and another (unless both were brought up in the same school), and also from one generation to another of astronomers at different times; just as most of the living directors of Observatories are disputing at this present moment as to what is the precise distance of the earth from the sun; and all of them differ, even by a large total quantity, from what all their brethren, and themselves too, used to hold only twenty years ago.

After, therefore, doing my best with the Pyramid star calculations, and publishing my result, together with a

repetition of Sir John Herschel's, so far as it went, I advertised, after a manner, in the name of science, for help from other astronomers,—in the way of each of them computing the whole of the quantities with the data he now thinks best, and also with the data most approved in the astronomical world of his youth, as well as with the quantities thought correct at the end of the last century.

But none of them have ventured to expose to modern society the weaknesses of their favourite science, multiplied by 4,000 years; and I should have been left without anything whatever to show from other modern quarters, but for the kindness of Dr. Brünnow, Astronomer-Royal for Ireland, who, kindly and without needing any second asking, performed the first part of my request: that is, with the quantities which he now thinks should be adopted as correct, he most ably, and by special methods of astronomy which no one in all the world understands better than himself, computed the following numbers:—

(1) α Draconis was for the first time at the distance of 3° 41′ 50″ from the Pole in the year . . . = 3443 B.C.
(2) It was at the least distance from the Pole, or 0° 3′ 25″, in the year . . . . . = 2790 „
(3) It was for the second time at the distance of 3° 41′ 42″ from the Pole in the year . . . . . = 2136 „
(4) η Tauri (Alcyone of the Pleiades) was in the same right ascension as the equinoctial point in the year when it crossed the meridian above the Pole, 3° 47′ north of the Equator, with α Draconis crossing below the Pole, nearly, but not exactly, at the same instant, and 3° 3′ from the Polar point. = 2248 „
(5) α Draconis and η Tauri were exactly opposite to each other, so that one of them could be on the meridian above the Pole, and the other on the meridian below the Pole, at the same absolute instant, only at the date of . . . . . = 1574 „
but when all the other data diverged largely.

We have now to deal with the three last dates. Of these three, the two first evidently include between them my own previous mean quantity of 2170 B.C.;

but the third differs extravagantly. Nevertheless, the visible effect in the sky of that one apparently very large difference in absolute *date*, is merely this, according to Dr. Brünnow's computation; viz., that when η Tauri, or the Pleiades, were crossing the meridian above the Pole, at my Pyramid date of 2170 B.C., α Draconis was not doing the same thing, *exactly* beneath the Pole, at the same instant; for the star was then at the distance of 0° 17′ *west* of the meridian. But it would have been doing the same thing perfectly, according to an entrance-passage observation of it, if the northern end of that passage had been made to trend 17′ westward, still keeping to its observed angular height in the vertical plane; viz., 26° 18′.

Whereupon comes the question whether,—granting temporarily that Dr. Brünnow's excellent calculations in modern astronomy replace everything that has happened in Nature during the last 4,000 years,—whether that 17′ of the Pole-star's *west* distance from the meridian was a thing of moment;—and if so, is this the first occasion on which it has been discovered?

Seventeen minutes of space, or less than the thousandth part of the azimuthal scale, is but a small quantity for any one to appreciate in all the round of the blue expanse, without instruments; and the first effort of Greek astronomy 1,800 years after the Pyramid was built, is reported to have been the discovery that the Pole-star of that day, then 6 degrees from the Pole, was not as *they*, the Greeks, had previously held, *exactly* on the Pole.

Greek and other profane nations, then, had been in the habit of overlooking, long, long after the epoch of the Pyramid, an error twenty times as great as this which is charged on the Great Pyramid astronomy by the science of precision which has now been elaborated amongst men after a lapse of 4,000 years.

And yet it was not all error either, on the part of the Great Pyramid. For here we should take account of the result of my observations in 1865, when I succeeded in comparing the directions of both the outside of the Pyramid, the axis of the entrance-passage, and the axis of the azimuth trenches* separately and successively with the Polar star. These observations were made with a powerful altitude-azimuth instrument, reading off its angles with micrometer-microscopes to tenths of seconds; and the results were, that everything trended at its north end towards the *west*,—the azimuth trenches by 19 minutes, the socket-sides of the base by 5 minutes, and the axis of the entrance passage by more nearly 4 minutes and a half.

What *could* all these features have been laid out for with this slight tendency to west of north? was a question which I frequently pondered over at the Great Pyramid, and sometimes even accused the earth's surface of having shifted with respect to its axis of rotation during 4,000 years. But now the true explanation would appear to be, that the Seth-descended architect, knowing perfectly well the want of exact correspondence between his polar and equatorial stars (though they were the best in the sky), had so adjusted in a minute degree the position of the Great Pyramid when building it, as to reduce any error in his Pleiades system of chronology, arising out of the stellar discrepance, to a *minimum*. Whence the fact of the *western* divergence of the north pointing of the entrance-passage as detected by the modern astronomy observations in 1865, combined with the computation in 1871,—becomes the most convincing practical proof of intention, and not accident, having guided all these time-arrangements at the Great Pyramid.

* See "Life and Work," vol. ii. pp. 185 to 196.

CHAPTER XVIII.

MOSES AND THE WISDOM OF THE EGYPTIANS.

IN the circles of those very learned men in modern society who go on continually studying the idolatrous contents of the Egyptian galleries in the British, and other, museums (and are known as hierologists, hieroglyphiologists, Egyptologists, anti-Biblical archæologists, &c.), are found the doughtiest of those champions who are so ready in these days to insist, that "whereas Genesis was written by Moses, and Moses was for many years of his life a priest among the Egyptians, who were a wealthy and civilized nation when the progenitors of the Israelites were still merely wandering shepherds, always on the verge of starvation; while moreover, according to the New Testament itself (Acts vii. 22), Moses was learned in all the wisdom of the Egyptians," —that therefore Moses must have copied all the best things he has put into Genesis, and his other books also, from those deeply wise instructors he had lived with for forty years, viz., the Egyptian priests.

On this question, much defence of the Divine inspiration, *versus* the Egyptian education, of the responsible author of the Pentateuch has been written in the world, from the literary side; but not always with so much special point as might have been done from the mechanical, or rather the scientific, point of view.

Mere literature, for instance, is nonplussed at once

by the hierologists when they contend with positivism, by methods where classic book-learning is powerless, for a civilized Egypt during 13,000 years and more; some of them even mounting up to 300,000 years, and declaring that they are just as firmly convinced of its history so obtained (and therefore of the gradual human growth, and natural progressive development of all that knowledge, utilized at last so happily by Moses) as of any event in *English* history under the reigns of the Stuarts. These men also allege points of community between the laws of Moses and those of ancient Egypt; which laws they say he must have read, because they were actually written and in books long before his time, together with a vast amount of literature, including even novels, and something very like the story of Joseph, in the highly-polished society flourishing, according to them from time truly immemorial, on the quiet banks of the Nile.

The refuge here (and in so far, a very proper one) of the Biblical literary men, seems to be chiefly, that those tremendous hierologist and Egyptologist dates have never been proved to the satisfaction of others than the dangerous, if not *soi-disant*, hierologists themselves; while, as for the points of community, or rather, merely similar complexion, between the Egyptian and the Mosaic laws, they exist only in certain subsidiary forms required for social order and political independence; and are such as a common human nature, with a like geographical position, chronological epoch, and traditional information from Babel, would have infallibly produced, more or less, amongst any set of people endowed with brains, and some little desire to amend their position in the world. And then there comes also, to every real believer in the fundamental doctrine of Christianity, this further and grander result, flowing from a philosophical investiga-

tion of the two systems as wholes ; viz., that the real essence of the Mosaic law is as totally distinct from that of the Egyptian, as any two antagonisms in the world of man can possibly be. For while they are both founded on, and for, religion,—the Egyptian system bases on Cainite assertions and re-assertions of self-righteousness, and a multitude of gods, half animal and half man—some of them, too, not a little obscene (to an extent which makes us wonder at several modern European governments reproducing their portraits one after the other in costly folios and large-sized plates, for the information of the public of the present day),—who is there, of those who have felt the saving grace of Christ's sacrifice, who cannot see, as the ruling principle in Moses, the most magnificent, and particular, rebellion against all that would-be power of man in the high places of the earth ; and a grand assertion both of the one, true, and only living God, the Creator of all things, and the sinfulness of man in *His* sight ?

The holy zeal, too, of Moses, and his earnest self-sacrificing for the cause of God, and his anxiety to show Him at once accessible by prayer, through an appointed method of *sin-offering* and *mediation* to every one both rich and poor, are the liveliest contrasts that can well be imagined to the sordid routine of an Egyptian priesthood, placing itself immovably, for its own gain, between the people and their gods, such as they were.

Of the Number Five.

But the most decided overthrow of the modern hierologists comes involuntarily from themselves, when they attempt to handle the mechanical part of the question ; for, to a great extent, what they, the hierologists, have long been contending for, and have succeeded at last in proving,—is precisely that which

enables us to say most positively that a cubit measuring-rod of the Mosaic, and Newton-proved, length of 25 Pyramid inches, and which has such extraordinary scientific value in its earth-axis commensurability, and was made so much of by Moses in the Tabernacle of the Wilderness,—was no part or parcel of the wisdom of the profane Egyptians during any portion of their historical career; and could not, therefore, have been learned or borrowed from them by any one.

And though the best ethnological theory of the Egyptians be that which makes them, not Ethiopians descending the Nile from the interior of Africa, nor Indian Aryans migrating by sea from Bombay, but Asiatics and Caucasians entering by the Isthmus of Suez into Lower Egypt, and ascending the course of the river —there seems no reason whatever to conclude that *they* had *previously*, wherever their previous existence had been passed, either received or adopted that peculiar measure of 25 inches, which Sir Isaac Newton considers the *Israelites* possessed, long before *their* going down into Egypt.

Not only, too, may it be further said, from this cubit-measure side of the question, that recent researches have proved the astonishing vitality of standards of measure through enormous intervals of time; and that an involuntary change of a people's standard from the Egyptian 20·7 to the Hebrew and Pyramid 25·0 inches, or *vice versâ*, was never yet seen in the history of the world; but it may be argued, that the ancient Egyptians, whatever faults they may have had, were both politically and socially a most conservative, methodical, and orderly people, with an immense taste for mechanics, and a marvellous appreciation of measure; so that they would be the last nation in the world, let alone their religious ideas on the topic, to lose or mistake their hereditary standards. In fact, one of the chief accusa-

tions which a late French writer brings against those ancient Egyptians is, that they had no genius, no invention; that they were only dull plodders at routine work; and, besides never having had a great poet or a great warrior, they were actually so low in the scale of humanity, as never to have had a revolutionist of any kind or degree amongst them.

We may therefore with perfect safety, and hierologists' support too, regard the length of 20·7 inches as the veritable and admitted hereditary measure of all Pharaonic Egyptians; and the one which, if they had been copied from by any other nation or mere individual, would have been the length imitated and faithfully reproduced.

Moses, consequently, in making the distinguished use which he did, not of that length of 20·7, but of the very different length of 25 inches, was decidedly not taking anything out of the known wisdom-book of the Egyptians; or anything which their amount and species of learning would have enabled them intentionally to arrive at and perceive the cosmical virtues of.

And not only so, too; for if, with the absolute length of the Pyramid standard, Moses adopted its Pyramidic sub-division also into 5×5 parts, he was adopting something which was particularly hateful to the Egyptians. Why it was so, does not appear; but Sir Gardner Wilkinson speaks of 5 as being the "evil number" in Modern Egypt* still; it is marked by 0 on their watches; and 5×5, or anything made up of 5, would seem to have been always repulsive there.

Particularly galling, therefore, to the old Egyptians it must have been to have seen the Israelites, when they escaped from bondage and went out of the country "with an high hand," itself a symbol of 5,—especially

* Murray's 1864 "Handbook for Egypt," p. 142.

galling to their spirits to see their late slaves go up, marshalled by "5 in a rank," out of the land of Egypt; for so is the literal translation of the word expressed "harnessed," in Exodus xiii. 18 of the English Bible.

The whole of that affair must, no doubt, have been hateful, as well as disastrous, to the Egyptians; and they indulged themselves afterwards in some very contemptuous phrases about it. They said, for instance, as appears from the relics of Manetho,* handed down to us from various authors, that some persons, under a renegade priest of Heliopolis named "Moyses," had been thrust out of Egypt by the king; and they were a very abominable set indeed, for not only were they all lepers and unclean, but their number is given as the very evil one of 250,000, or $5 \times 50{,}000$.

Their real number is given by the Bible as something very different from this, as well as their state; but it was a mode of blackening them to the Egyptians for Egyptian purposes in more ways than one; and similarly, when the "Hyksos," or "Shepherd Kings,"† also much abominated by the Egyptians, established themselves in Avaris, in a remarkably inconvenient manner to Egyptian polity, they were described as men "of an ignoble race," and in number also "250,000."

Of the Book of Job.

But Moses had none of this unwise and anti-Pyramid hatred of 5 and times of 5; and though his first arrangement of years was the Sabbatical one of a "week of years," his next, and by far the most important one, the grand standard, in fact, of sacred time, was the jubilee of 5×10 years; a number which, with the

* "Penny Cyclopædia," p. 118.
† Gliddon's "Ancient Egypt," p. 63.

similar arrangement of days for the feast of Pentecost, brings up again the number of inches frequently referred to as an important standard in the King's Chamber and the passages of the Great Pyramid.

It is also worthy of note, that the whole of the sacred law was arranged on a system of five books; five, too, expressly so called in the "Pentateuch;" and this overshadowing of Israel, in this place, by the number 5, seems even to have had some special intention in it. For when the best critics have pronounced so decidedly as they have done, and on completely other grounds, that the Book of Job was either completely written, or finally put into its present shape, by Moses, and by no one else, in spite of some modern theories,—yet cannot find the smallest reason for its anomalous position in the Bible, far away from all the other books of the same inspired writer,—it may be suggested that one reason was, to prevent the unity and proportions of the five books of the "Pentateuch," as a system and symbol of 5, being interfered with.

Each of the books of the "Pentateuch" depends on the other; or, at least, Deuteronomy refers to Exodus, Leviticus, and Numbers, and they refer to Genesis; but not one of them refers to Job, and Job does not refer to any of them.

Yet surely the Bible itself would have been incomplete without the Book of Job, and all its lessons of supreme piety, humility, and wisdom. In the "Pentateuch," somewhat fettered to a particular purpose, the full genius of Moses and the whole of the wisdom he was privileged to receive from on high, had not their full range; but in the Book of Job there came an opportunity, which was not lost or slighted, of alluding more clearly to the immortality of the soul, and the necessity of a divine redemption.

Again, to return to more moderate subjects, it was

not till lately that any one scientifically understood, and thoroughly appreciated, the full tenor of some of the concluding passages of that remarkable book. In Job xxxviii., the Lord, "with whom is terrible majesty," proceeds to answer Job out of the whirlwind; confounding him in a moment with the grandeur of elemental phenomena, the form and size of the earth, the laws of solids and fluids, of light and darkness, of sea and air, of clouds, sunshine, rain, frost, and lightning; the series of wonders is appalling, their magnitude and duration verging on the infinite. But then, though softened by a gradation of truest descriptions of the tender herb springing forth all the wide world over,—there had seemed, to every exact scientist's ideas, something like a descent from sublimity, in the Biblical account coming down to, and concluding with, a description of two or three particular animals.

What the Egyptian wisdom, with its infantile knowledge of physical science and cosmical relations would have said to that, is hardly worth a serious inquiry; but this is what modern wisdom in the scientific age of the earth has involuntarily illustrated very lately, or in the last-published number of one of those large book-sized Reviews, which undertake to show existing intellectual society, through the medium of the ablest writers, whatever the best minds have been producing within the latest few months of time.

The author reviewed on the occasion alluded to, treated of the new science of thermo-dynamics; showing that heat is a form of motion; and, from that simple beginning, enumerating the laws of the earth's atmosphere, and the medium filling space; calculating the store of useful mechanical and chemical work still in the world; predicting the duration of sun, moon, and all material things; and then boasting, quite in the profane Egyptian manner, that now that this new prin-

ciple in natural philosophy—*i.e.*, mere solar radiation, computed by a particular formula—is proved to be the one principle which supports everything we see,—that it may be said to "create the muscle and build the brain of man; to be heard in the roar of the lion, and the song of birds; is seen in the gliding of the serpent," &c., &c.

Whereupon comes down the reviewer, with a higher philosophy and more religious truth, regretting that the author does not see that, to whatever extent he can compute some few changes in the form of mere dead matter, or inorganic elements,—extending though they may through space,—he has not made the smallest approach to accounting for a single organic phænomenon: the mystery of life is left wholly untouched by him; so is any attempt, even, at an explanation of how fibre is joined to fibre in the animal structure; and infinitely more, wise Job's idea, "how wisdom is put into the inner parts," and by what means the different created beings take up their appointed characters in life's varied drama.

In fact, the best and latest of modern science has here represented the difficulties of nature for man to explain, to be culminating, precisely in the manner they were described to do, in the sacred Book of Job 4,000 years ago.

Moses, then, in that inimitable work, instead of copying anything from the profane Egyptians of his day, was rather anticipating the march of science in the Christian ages of the world. And when we further find that in other important things, he was likewise going directly against the standards of the Egyptians, but coincidently with those of the Kosmos of God and the Great Pyramid; of those inner parts, too, of the Great Pyramid which the Egyptians knew nothing about, and which he, Moses, *as a man*, could never have seen—when we

meet with all these telling circumstances, and so many parallel features between the inspired writings and the Great Pyramid *versus* all Egypt, it certainly would appear that we must be coming close to the Biblical source of the wisdom of that mighty fabric.

Yet there are some additional points of contact between the Great Pyramid and Mosaic metrological systems, which it will be well worth our while to study in their detail, before venturing to proceed further with the grand question of the whole.

Of the Sacred Ark of the Covenant.

The length of the Great Pyramid's cubit having been 25·025 British inches cannot, I presume, now be resisted; and to all minds capable of grasping the subject, Sir Isaac Newton's testimony for the Mosaic cubit having also been close to that length, is probably equally conclusive; yet at the same time, these able minds may desire to hear, if there is any further direct Biblical evidence for that end, over and above what Sir Isaac Newton adduced in his invaluable Dissertation? Now something of this sort there does appear to be in the Pentateuch's account of the Ark of the Covenant, the most sacred feature of the whole of the Tabernacle's arrangement under Moses.

That Ark was kept in the Holiest of Holies, occupied its chief place of honour, and was never to be looked on by any but the High Priest alone, even during a journey. Near it was placed an ephah measure; and immediately outside its compartment, as Michaelis has shown, were various other standards of measure; though no metrological purpose, that I am aware of, has been hitherto assigned to the Ark itself.

As its original name, "*arca*," implies, the Ark was a box or chest; and its first-stated purpose as such was,

to hold the Divine autograph of the law written on stone.

This Ark-box, then, made of shittim, or acacia, wood, was further lidless, so far as anything attached to it was concerned; though a crown of gold was afterwards added round about the rim, and a separate or loose lid was made for it of pure gold, called the mercy-seat. The actual seat, however—said to be occasionally occupied as a throne, by an expression of the Divine presence—was not that lid, but was formed by the wings of two angels, constructed in gold at either end of the lid; which lid, at such time, together with the Ark below, then formed the *footstool.**

With the lower part only of this arrangement, or the Ark itself, have we now to do; and the Ark, on its loose lid of gold being removed, was merely a box—a lidless, rectangular, rectilinear box, made of a hard and tough wood common to the hills of Sinai.

Now in so far, there was nothing new or peculiar in this arrangement of Moses; for of boxes there was an abundance in the world, even in the very temples of Egypt, when time had waxed so late in human history as 1500 B.C. In fact, those very purposes of "rapacity," in subservience to which Josephus relates that Cain invented weights and measures, would seem to require that he should have made big and strong chests, as treasuries wherein to keep the fruits of his spoliation and oppression; as well as the stone strongholds, banks, or "oers," of which more presently, for the custody of the said chests.

The only feature, therefore, of distinctive importance

* "The lid, or cover of the ark was of the same length and breadth, and made of the purest gold. Over it, at the two extremities, were two cherubim, with their four faces turned towards each other, and inclined a little towards the lid (otherwise called the mercy-seat). Their wings, which were spread out over the top of the ark, formed the throne of God, the King of Israel, while the ark itself was the footstool." (Exodus xxv. 10—22; xxxvii. 1—9.)—Kitto's "Bible Cyclopædia," p. 214.

which we need expect to find in the particular box constructed by Moses for a sacred purpose, should be something akin to that which distinguished his sacred cubit, from the profane cubit of the Egyptians : mere measuring sticks, both of them ; and yet one, not only of a different length to the other, but implying by that difference a commensurability with the Divinely grand in nature, far too difficult for man to have discovered for himself in that age. Now the size of that Ark-box of Moses is given in Holy Scripture as being, 2·5 cubits long, and 1·5 cubits broad, and 1·5 high ; which measures being reduced to Pyramid inches, on Sir Isaac Newton's and our own, evolution of the sacred cubit of Moses, $= 62{\cdot}5 \times 37{\cdot}5 \times 37{\cdot}5$ of those inches.

But was this outside measure or inside measure ? for that must make a very material difference in the cubical result.

Outside measure, without a doubt, and for the two following reasons :—

1st. Because the vertical component is spoken of as height, and not depth.

2nd. Because the lower lid of gold, or the mercy-seat, being made only of the *same* stated length and breadth as the Ark itself, it would have stood insecure, and run a chance of tumbling down to the bottom of the box, if that length and breadth had signified the top of the box's inside, and not its outside, area.

Hence, with the true length of the sacred cubit (obtained after so many ages of error), and the above understanding how to apply it, we may now approach the cubical contents of the Ark. We are not, indeed, informed in Scripture what was the thickness of the sides, and therefore do not know exactly how much to subtract from the outside, to give the inside dimensions ; but the outside having been given, and the material stated, the limits within which such thickness

must be found, are left very narrow indeed. Let the thickness, for instance, be assumed 1·8 Pyramid inches; then the length, breadth, and depth will be reduced from an outside of 62·5 × 37·5 × 37·5 to an inside of 58·9 × 33·9 × 35·7; which gives 71,282 cubic inches for the capacity contents of this open box without a lid.

Or, if we consider the sides and ends 1·75 inch thick, and the bottom 2 inches,—also very fair proportions in carpentry for such a sized box in such a quality of wood,—then its inside measure would be 59·0 × 34·0 × 35·5; which yield for the cubical contents 71,213 cubic Pyramid inches.

Thus, in any mode almost of practically constructing the Ark-box, on both the name and number data given by the Bible, and the Hebrew cubit value first approached by Sir Isaac Newton, we cannot avoid bringing out a cubical capacity result almost identical with that of a still older box, known for several centuries past to moderns as a lidless box, but never known at all to the ancient Egyptians; viz., the coffer in the King's Chamber of the Great Pyramid.

Wherefore, with that coffer's cubic capacity, the Ark of the Covenant immediately acquires all the commensurabilities of that coffer's interior with the capacity and mean density of the earth as a whole: a something both utterly distinguishing it from any profane Egyptian box yet measured; and most appropriate to the Scripture-stated use of the Ark under circumstances of Divine presence, as a *footstool;* agreeably with the words of the Lord in Isaiah and Acts, "the earth is my footstool."

Of Solomon's Molten Sea.

Such, then, looked at in the light of science, 3,300 years after its day of construction, must have been the

sacred Ark of the Covenant built according to the inspiration commands received by Moses, *after* he had left Egypt for ever;—and that was the Ark which subsequently overthrew the idol gods of the Philistines, and was a source of safety to Israel on many and many a national occasion. Yet what eventually became of it, or what was its latter end, Scripture does not inform us. The Eastern Churches have their traditions, but I do not care to occupy time over *them.* And this only further piece of solid information has been made out by the metrological researches of John Taylor and others in recent years; viz., that within narrow limits of uncertainty, the brazen lavers of Solomon's Temple were also of the same cubic capacity as the coffer in the Great Pyramid; and measured, on the Hebrew system, 40 baths, or 4 homers. Those lavers, then, through the coffer, were—what no human science could have intentionally made them in that day—earth commensurable.

But there was a still larger capacity vessel in the same Temple of Solomon; was it also, earth commensurable, and harmonious with the world of God's creation?

This vessel, by name the "Molten Sea," was grandly cast in bronze, though of a shape and size which has defied all essayists hitherto to agree upon. Even in the Bible, something of what is there said about it, is stated variously in different books thereof; as that in Kings, the cubic contents are given as 2,000 baths, while in Chronicles they are set down as 3,000. The latter account being but fragmentary, I adhere to the former; and then find, according to the simple statement in baths, that the "Molten Sea" would have contained the contents of a laver 50 times; or a Pyramid number at once.

Next we are told (1 Kings vii. 23—26) that the "molten sea" "was ten cubits from the one brim

to the other; it was round all about, and his height was five cubits; and a line of thirty cubits did compass it round about; and it was an hand-breadth thick."

The first point here, is to realise the shape. Some good men have imagined it cylindrical; some of a swelling caldron form; but the greater numbers, a hemispherical shape; and this, perhaps, is most agreeable (1) to the phrase "round all about," (2) to its diameter being twice its height, and (3) to the traditionary testimony of Josephus that it *was* hemispherical.

This point settled, are the measures inside, or outside? By the rule established for the Ark, the breadth and *height* are outside, of course; but in that case, what is the meaning of a circle of 10 cubits in diameter, having a circumference of 30 cubits? That is a total impossibility; and wholly against the chief part of the teaching of the Great Pyramid itself, which proves in various ways that the circumference of a circle having 10 for diameter cannot be less than 31·4159, &c.

In this dilemma, I venture to conclude (especially as here an indication of the thickness of the vessel is given, viz., at a hand-breadth) that the inside circumference was alluded to.

Take, then, a hemisphere with an inside circumference of 30 Pyramid cubits, its diameter would be 238·73 Pyramid inches, giving, with an outside diameter of ten cubits, nearly 5·5 inches for the thickness (or a space which the hand of a strong man spread out would easily cross). The cubic contents, then, of such internal hemisphere will be 3,562,070 Pyramid cubic inches; and divided by the Pyramid number 50, give 71,241 of the same cubic inches; *i.e.*, within a seven-thousandth part of the same, as either the Ark of the Covenant or the coffer of the Great Pyramid.

But why did Solomon go to such pains and expense in making the "molten sea" so very much larger than

his already large brazen vessels, the lavers ; and larger too, by the exact multiple of 50 ?

No profane Egyptian would have chosen that number, as we have already seen ; but in the Great Pyramid, planned certainly by a Seth-descended, Abel-following, God-inspired, man, and by no Cainite Egyptian,—the lower course of the King's Chamber has been so adjusted in height, by the removal from sight of its lower 5 inches, that the cubic contents of that lower course amount, as already shown at p. 150, to 50 times the coffer's contents ; or, as we now see, were exactly equal to the contents of Solomon's molten sea ; unless we should rather say that Solomon's molten sea was made to be equal to the lower adjusted course of the King's Chamber of the Great Pyramid.

Yet if we have been already obliged to conclude that Moses, though he lived long in Egypt, could never have been inside the Great Pyramid, and had, therefore, no opportunity of humanly copying the cubic contents of the coffer; vastly more certain may we be that King Solomon was never inside the Pyramid either, or in a position to note the exact amount of cubic contents of the lower course of the coffer's containing chamber.

Whence, then, came the metrological ideas common to three individuals in three different ages ; and involving reference to deep cosmical attributes of the earth, understood by the best and highest of human learning at none of those times ? And the answer can hardly be other, than that the God of Israel, who liveth for ever, equally inspired to this end the Seth-descended architect of the Great Pyramid, the prophet Moses, and King Solomon.

Of Stone Sanctuaries and Pyramids.

So far, for the vessels contained in the several sanctuaries, whether Pyramid, Tabernacle, or Temple.

But something now requires to be said, touching these sanctuaries themselves; and chiefly on account of the new light thrown on them by Mr. Henry Tompkins.*

The chief instrument with which he *voluntarily* works, is indeed linguistic only, and therefore rather outside my methods of procedure; but *involuntarily* he brings to bear certain necessary business features essential to the very existence of any, and every, community of men, whether large or small. All such, for instance, must have amongst them, in whatever age they live or have lived, something approaching to a safe, or treasure-stronghold; even, and perhaps much more so, if they be a community of robbers, rather than of peaceful men.

Now the first builder of such a safe, according to this new author, was Cain; and Moses told us of it long ago, though bad translations have hid the fact from our eyes, by speaking rather of "the city" which Cain built in the land of Nod. Yet Moses only said an "oer," meaning thereby, some chambered tumulus of earth and stones, which one man might possibly, or even easily, have built single-handed; and might then with full right "call it after his son's name." Such an "oer" was rude probably, yet exactly adapted to serve both as a stronghold and strong room, or a necessary practical addition to what Josephus tells us of Cain, at that very period of his life too, when "he invented weights and measures, and used them only for the purposes of rapacity and oppression."

Hence every few Cainites might well have an "oer" amongst them, but not "a city;" and in freeing us from this latter word, where Moses wrote "oer," Mr. Tompkins

* "The Pyramids and the Pentateuch," by Henry Tompkins, of 2, Augusta Place, Lansdowne Road, Clapham Road, London, Oct. 22, 1873.

seems to have done excellent service; though when he proceeds further, to call every "oer" a Pyramid, he wanders from the provable stone facts.

The word Pyramid (by sound of course, rather than by letter) is not read in any of the Pharaonic hieroglyphics, nor proved to have been known earlier than the visit of Herodotus to Egypt in 445 B.C. There too, it was applied to a particular form of the "oer" seen nowhere else; and the progress of mathematics since then has still more strictly confined its application. Hence, when we read in Genesis of the rebellious and Cain-following men, after the flood, uniting together to build "a city and a tower whose top may reach unto heaven," according to King James's translators,—and when Mr. T. tells us rather to read, "Let us build a Pyramid, and one of great extent, whose top," &c.,—let it be our part to endeavour to ascertain mechanically what *was* built.

Nor is this very difficult; for though Babel's old structure may long since have been buried in the soft alluvial earth of its foundations, yet the researches of Layard, Botta, Loftus, and others in Mesopotamia, all unite in showing, that the buildings which served the purposes of "oers" next in order of time to Babel, in that part of the world, were invariably oblong, elevated, terraced temples, and not to be called pyramids in any degree.

Similarly too the chambered tumuli of the Lydians, Etruscans, Pelasgi, and many other early people, were all of them "oers," and many of them treasury "oers" too, but not one of them a pyramid. In Egypt only did the "oers" become truly pyramidal; and though in that land, their primitive Cainite purpose of strongholds for treasure rapaciously acquired, was gradually overshadowed by sepulchral service, yet they were not

always wholly merged therein, whatever the modern Egyptologists choose oracularly to declare.*

To the intense Cainites, that all Egyptians were, some form of "oer" was most necessary in their early national life; and though they did perhaps begin in two or three small examples with chambered tumuli, or Babel terraces, or even round towers,† the captivating example of the Great Pyramid soon led them off into that shape alone; and they put *its* mark so effectually on themselves, that the really Sethite character of the Great Pyramid was lost to general view among newly pyramidised Cainite "oers."

And yet to a deeper insight there was, even in the mere putting together of the material, the most essentially different character in the one Great Pyramid original, and all its supposed copies.

The Egyptians, for instance, according to Dr. Lepsius's *law* of their Pyramid building (pages 76 and 77), proceeded in exactly the same *exogenous* manner as all Cainites with their chambered tumuli; *i.e.*, beginning with a chamber centre, and extending the structure around and above, more or less, as opportunity offered or accident determined at last.

But the Great Pyramid, as testified through the whole of this book, and by the accounts of Herodotus also, was commenced on the opposite, or *endogenous* method; viz., by the laying out of a long previously settled plan, and building up within that outline only.

* Besides the many early local traditions, which must have *some* foundation, of treasure having been deposited in the Egyptian Pyramids by kings who lived close before, or after, the flood,—Colonel Howard-Vyse and Mr. Perring (on pp. 45, 46 of the former's 3rd vol. of "Pyramids of Gizeh"), give an account of a chamber in the Great Terraced, and rather oblong, Pyramid of Saccara, closed by a granite stopper of four tons weight, and declared by them to have been "a treasury," "a secure and secret treasury," and one that had certainly "never been put to tombic use."

† The round-towers standing beside Christian churches in Ireland are an architectural picture of Cain and Abel over again.

While, therefore, the Cainite Egyptian Pyramids were "Epimethean," or speaking to one hasty act and too late thought *afterwards*,—the Great Pyramid was essentially Promethean, or the result of careful act following upon *previous* wise and provident thought.

The former, even according to classic tradition, brought infinity of ills on all humanity; but the latter told mysteriously, from far earlier ages, of one who voluntarily sacrificed himself in order that he might (in antagonism to the false gods of heathen idolatry), bring down sacred fire, or regeneration life, from heaven to men.

But of this primeval phase of the Promethean myth, long before the Greeks polluted its purity and truth in deference to all their own obscene rout of gods and goddesses of Olympus,* we shall have still more positive evidence, on studying more advanced features of construction found only in the Great Pyramid.

* See "Seven Homilies on Ethnic Inspiration," by the Rev. Joseph Taylor Goodsir; and "The Religions of the World," by William Osburn.

CHAPTER XIX.

MECHANICAL DATA.

Air Channels.

FROM time to time in the modern history of the Great Pyramid, faults have been found, or improvements suggested, or difficulties raised with regard to its construction; and, where such remarks have been the produce of able minds, it is well for instruction's sake, in the present day, to turn back to their very words. Also, if such criticisms have, since they were uttered, been answered by further discoveries at the Pyramid, to note *how* they have been answered.

A case in point is offered by the conversation of Dr. Harvey, the learned discoverer of the circulation of the blood, with Professor Greaves, in or about 1640. The doctor, unable to leave his patients in this country, had revolved at home in his truly capacious mind, and from his own peculiar scientific point of view, one of the descriptions given to him by the great Eastern traveller of that day, and had seen a difficulty which had not struck *him*.

To one so well versed in biological phænomena (though living long before the day of a knowledge of oxygen, or the nature of gases, or, indeed, any sort of scientific chemistry), it seemed strange to Dr. Harvey, "how several persons could have continued so many hours in

the pyramid and live. For," said he, "seeing that we never breathe the same air twice, but still new air is required to a new inspiration (the *succus alibilis* of it being spent in every expiration), it could not be, but by long breathing, we should have spent the aliment of that small stock of air within the Pyramid, and have been stifled; unless there were some secret tunnels conveying it to the top of the Pyramid, whereby it might pass out, and make way for fresh air to come in at the entrance below."

Now that was a remark full of wisdom in every way, and if duly received and respected, might have led to invaluable discoveries at an early period,—but Professor Greaves, a good linguist, and with eminent dexterity at solving algebraic equations, unfortunately could not see the vital importance of Dr. Harvey's *succus alibilis* mixed up in common air; neither had he considered very accurately the motion of aeriform fluids, when he thought that both the old air might so easily go out, and new air as easily come in, by one and the same lower entrance passage, of small bore and crooked, almost "trapped," in the course of its length; and finally he was certain, as one who had been at the Pyramid, and was therefore not to be lightly contradicted, that, "as for any *tubuli*, or little tunnels, to let out the fuliginous air at the top of the Pyramid, *none could be discovered within or without.*"

To this Dr. Harvey replied most discreetly, "They might be so small, as that they could not be easily discovered, and yet might be sufficient to make way for the air, being a thin and subtile body."

But poor Professor Greaves on this occasion would not listen to such homely reason, and only answered confutingly, he himself having chronicled his own words, that, "The less they, the *tubuli*, were, the sooner they would be obstructed with those tempests of sand, to

which those deserts are frequently exposed ;" and with these and similar positivisms he obliged the stay-at-home medical doctor, in a phrase of that day, and which may then have been classic and aristocratic English with all the elder dons of Oxford, "To shut up all."*

Yet what would Professor Greaves have thought, if he could have known before he died, that 200 years after his remarkable conversation with the discoverer of the most important anatomical and physiological fact even yet known to science,—Colonel Howard-Vyse would actually have proved the existence of, and found, two such *tubuli*, leading to the upper parts of the Great Pyramid : and formed for no other purpose than that which Dr. Harvey had indicated, *i.e.*, to serve as ventilating channels : and that he, Professor Greaves, had himself actually seen their lower extremities in the walls of the King's Chamber ; and proved the fact, by inditing the following almost photographic likeness of them :—

"The ingenious reader will excuse my curiosity,† if, before I conclude my description of this Pyramid, I pretermit not anything within, of how light a consequence soever. This made me take notice of two inlets or spaces, in the south and north sides of the chamber, just opposite to one another ; that on the north was in breadth 0·700 of the English foot, and in height 0·400, evenly cut, and running in a straight line six feet and further, into the thickness of the wall. That on the south is larger, and somewhat round, not so long as the former, and, by blackness within, it seems to have been the receptacle for the burning of lamps."

Upon which he indulges in a classical speculation upon "the eternal lamps, such as have been found in

* Page 161, vol. i., of "Greaves," by Birch.

† The exact meaning of this word has altered greatly within the last two hundred years.

Tulliola's tomb in Italy;" and regrets (in so far, just like a mediæval scholar, rather than a modern physicist), actually regrets to think how much better Pliny might have filled his pages, if he had described therein the composition of one of those lamps of "noble invention," rather than occupied them with lesser matters of natural phænomena.

But the blackness adverted to at the Pyramid, would seem to have been caused mainly by the fires which were occasionally made in the hole, since Caliph Al Mamoun's time, by Arabs with an inquisitive turn of mind, and merely for the chance expectation of seeing what would come of it. During the two following centuries, also, the fashion grew up for each visitor and tourist to conclude his sight-seeing of the Great Pyramid, by firing his pistols into these holes.

What for?

Even the decorous Dane, Captain Norden, who wrote in 1740 to explain how young men going out to the Great Pyramid "should join in a company with their seniors, that, by the discourses they hear on the road, they may be more emulous to observe everything in a better manner, and make more exact remarks;"—even he, the worthy countryman of the learned Arabian traveller, Niebuhr, explains,—"when you are in the saloon (the King's Chamber) you commonly make some discharges of a pistol, *to give yourself the pleasure of hearing a noise that resembles thunder;* and then, as there is no hope of discovering more than what others have already remarked, you resume the way by which you came, and return in the same manner, as well as with the same difficulty."

Innumerable persons, therefore, besides Professor Greaves, had portions of the air-channel system in their hands; but, through not respecting sufficiently the *design* of the Great Pyramid, and the *duty* of using

the best of their own intellect, they went away no wiser than they came, and the realizing at last of the best ventilated, or rather ventilatable, room in the world remained to another age.

Ceiling of King's Chamber.

Again, certain early authors of a critically mechanical turn, looked up at the ceiling of the King's Chamber, roofed with horizontal beams of granite blocks, and expressed their thoughts in the manner of a judgment and condemnation, that "those beams had a vast weight to bear" (all the weight of the upper two-thirds of the Pyramid above them); and, with some allusion to the "arch," and no knowledge of any of the numerical and physical symbolisms required in this chamber, they rather hinted "that *they* could have made a better disposition of the material."

It has been supposed that the boastful legend inscribed by King Asychis on his pyramid of brick at Dashoor, one thousand years after the building of the Great Pyramid, referred to the invention or earliest construction of arches in brick:—"Compare not me with the Pyramids built of stone, which I as far excel as Amun doth the other gods. For striking the bottom of the lake with long poles, and gathering the mud which stuck to them, men made these bricks, and formed me in this manner."

Contemporary science applauded that invention, and thought it perfect; but contemporary science, even up to the present hour, is always marvellously well pleased with its last and latest performance, however imperfect the next generation may find it to have been; and in the case before us, 4,000 years have reduced nearly all the brick pyramids to rubbish: giving us reason for thanks, that *that* scientific improvement was not invented

early enough to have been adopted in the Great Pyramid. By itself no doubt the arch was good, and a brick arch stronger than a brick beam; but neither a brick arch, nor an arch of little stones, has stood so long as a beam of solid granite in circumstances similar to those of the King's Chamber.

If the roof of that chamber *had* at any time fallen in, and crushed the coffer below, which it was meant to preserve,—then all the scientific critics might have started up with reason, to propose a more durable mode of roofing; but in presence of that roof's perfect performance of its duty, for a longer period than any other human building has lasted, it was strange, to say the least of it, that such a readiness to find fault and proffer advice should have been manifested; for, as M. Jomard most admirably expresses it, "under this view of the perfect state and condition of the whole room, the architects have eminently attained the end which they proposed to themselves more than 3,000 years ago."

"Ah! but if they have only saved themselves by the skin of their teeth," urges another writer unabashed; "if they have been indebted to happy chance for a result, of which the precise contrary might have at any moment befallen them!" Well, that is an objection which would have been perhaps excusable in Professor Greaves' day, when men knew nothing of what the means for strength employed by the architects were; or even, whether they had had their attention directed to the importance of the point. But ever since the discovery in 1763 of Davison's Chamber (so called, but really only a hollow in the masonry not intended to be trod by the foot of man),—the learned must have seen, that some of the requirements of the case had been skilfully entered into by the builders; though no person had any idea, until Colonel Howard-Vyse made his celebrated explorations in 1837, of the still further measures of extraordinary

completeness with which this scientific mechanical object had been carried out; a completeness so striking, that we have never heard since then, of any more complaints or fears for the safety of the ceiling.

Plate XI. gives an idea of the arrangement adopted. Besides the large, and pyramidally typical, number of five hollow, closed spaces or *pseudo*-chambers, one over the other, and the topmost one roofed with opposed sloping plates,—it will be observed that the upper surface of every set of long horizontal blocks, in place of being formed into a flat floor, is left rough and unfinished.

This is a feature, the truth of which, and perhaps the importance also, entirely escaped the French *savants* of 1800, even in such limited part of the whole scheme as they had before them; whence it came, that they represented the floor-surface of Davison's *pseudo*-chamber or hollow, as absolutely level, and also parallel to the King's Chamber true ceiling below, in the otherwise beautiful and microscopically finished engravings of their great work!

Yet, had the Pyramid architect so prepared and cut away the upper original surface of each set of horizontal granite beams, he would have notably weakened their strength, and not have done good to any one; for as those hollows of construction were, with one problematical exception indicated in the plate, built up solid all round about, and therefore not intended to be entered, it signified not in the least whether their floors were even or uneven to any degree.

The whole arrangement was indeed a similar exhibition of mechanical genius, looking for efficiency rather than show, to that one described by Professor Rigaud in an early transit-instrument of the Oxford Observatory; where the artist optician had left, for strength's sake, the rough, original skin on the outside surface of the brass,

though he had planed the under surface true, wherever a joint had to be made, or a bearing secured. But in the Pyramid, there was ultimate symbology also.

Modern Promiscuous Quarrying.

Then again, no one seems hitherto to have had any respect, and that because no understanding, of why the mass of solid masonry was so overwhelmingly large, compared with the hollow portion of the Pyramid; the latter being only about 1-2000th of the former.

Firmness of construction, they thought, would have been given by a far less amount of solid substance; wherefore, and for that mere fancy, bred of their own brain alone, feeling sure that there must be many chambers still undiscovered, they immediately began ruthlessly boring and cruelly blasting here, there, and everywhere into the exquisitely-arranged, squared, limestone blocks, and to a depth often of a great many feet, merely to see what blind chance might possibly lead them to. Forgetful, also, of a really very sage piece of advice, said by an Arab tradition, shaming Herodotus, to have been engraved on the ancient casing stone surface of the Pyramid by its unknown architect: "I have built them, and whoever considers himself powerful may try to destroy them. Let him, however, reflect that to destroy is easier than to build."

Had Mehemet Ali been inclined to intellectual tyranny, what sport to him to have had up before his judgment-seat each of these quarrying geniuses, and made them render forth, if they could, a presentable reason, based on Pyramid knowledge, for the dark hope that was within them, as to why they *should* have met with success by making a hole in the particular direction they did. And if they could not give such a reason clearly and convincingly, order them to put back every

stone they had pulled out, precisely as it was before; a more than sufficient occupation for the remaining term of their natural lives.*

Who too, among Egyptologists, would escape such a judgment? Not even the excellent Sir Gardner Wilkinson; who, when describing the Queen's Chamber in the Great Pyramid, says with the most inimitable calmness, and without a pang on his conscience for the mischief he had done to so precious a work, "I excavated in vain below in quest of a sepulchral pit." † And a pretty pit, indeed, I found he had made of it, when I visited the place in 1865!

The Key-signs of the Great Pyramid's Architect.

Yet infinitely more blameable were those before him, who made similar, but yet more destructive, excavations,

* Connected with this view, the following is given from the Arabian author, Abd Allatif, who wrote more than five hundred years since, and who, in times of boasting and romance, described his own exploits in such modest terms, but terrible truth, as this:—"When I again visited the Pyramids, I entered this passage with several people, but having penetrated about two-thirds into the interior, and *having through fear completely lost my senses*, I returned half dead."

A bad explorer, then, but an unflinching historian, Abd Allatif relates in the latter capacity:—

"When Malic Alaziz Othman Ben Youssuf succeeded his father, he was prevailed on by some persons of his court—people totally devoid of sense and judgment—to attempt the demolition of the Pyramids. He accordingly sent miners and quarrymen, under the superintendence of some of the officers and emirs of his court, with orders to destroy the red pyramid, which is the best of the three. They encamped near it, collected labourers from all parts of the country at a vast expense, and endeavoured, with great assiduity for eight months, to execute the commission with which they were entrusted, removing each day, with great difficulty, *one* or *two* such stones. At length, having exhausted all their pecuniary resources, their resolution grew proportionally weaker as their labour and difficulties increased, and they were at last obliged to give up the undertaking as hopeless. While they were still engaged in the work, observing one day the extreme labour it required to remove one of the blocks, I asked an overseer, who was superintending the operation, whether, if a thousand pieces of gold was offered to him, he would undertake to replace the block in its original position: he answered, that it he were to be given many times that sum, he could not do so."—Col. Howard Vyse's second vol. of "Pyramids of Gizeh."

† Murray's "Handbook for Egypt," p. 167.

with the absurd idea of finding a passage leading to the Sphinx! As if there was any community in science or religion, feeling or age, between the built Great Pyramid and the carved stock or stone called the Great Sphinx.

As if, too, I may add, there was anything of original importance in the Great Pyramid's structure which had not had both a proper and a regular access prepared to it, requiring no smashing with sledge-hammers or cannon-balls, when the proper time should arrive, to open it up to view and use.

The passages lined, or rather built, with blocks of whiter stone different from the bulk of the masonry, and leading thereby right on to the ultimate point required through the whole mountainous mass of the building, are a case directly in point; and are admitted by, and known now to, every one, even including the Egyptologists. But there are more minute features also, not so generally known; yet showing equal design and intention, in these very Pyramid passages.

Thus every one has been told how Caliph Al Mamoun, after blasting his way through the solid fabric for six weeks, was just about to give up the research when he heard a stone fall in a hollow space close on one side; and breaking his way in that direction, he presently found himself in the entrance-passage; and the stone which had fallen at that precise instant, was a prism-shaped block that had been anciently inserted in the ceiling. There it had for ages formed a merely ordinary part thereof, and yet was covering all the time the butt-end of the granite portcullis at the bottom of the first ascending passage, now at last exposed to view.

Would that first ascending passage, then, never have been discovered, if that faithless, perhaps timeous, block had not fallen out, whether in Al Mamoun's or any other day? Let the following facts indicate.

When measuring the cross joints in the floor of the

entrance-passage in 1865, I went on chronicling their angles, each one proving to be very nearly at right angles to the axis, until suddenly one came which was *diagonal*, another, and that was diagonal too ; but after that, the rectangular position was resumed. Further, the stone material carrying these diagonal joints was harder and better than elsewhere in the floor, so as to have saved that part from the monstrous excavations elsewhere perpetrated by some moderns. Why then did the builders change the rectangular joint angle at that point, and execute such unusual angle as they chose in place of it, in a better material of stone than elsewhere ; and yet with so little desire to call general attention to it, that they made the joints fine and close to that degree that they had escaped the attention of all men until 1865 A.D. ?

The answer came from the diagonal joints themselves, on discovering that the stone between them was opposite to the butt-end of the portcullis of first ascending passage, or to the hole whence the prismatic stone of concealment through 3,000 years had dropped out almost before Al Mamoun's eyes. Here, therefore, was a secret sign, in the pavement of the entrance-passage, appreciable only to a careful eye and a measurement by angle, but made in such hard material that it was evidently intended to last to the end of human time with the Great Pyramid, and *has* done so thus far.

Had, then, that ceiling-stone never dropped out at all, still the day might have come when the right men at last, duly instructed, would have entered the passage, understood that floor sign, and, removing the ceiling-stone opposite to it, would have laid bare the beginning of the whole train of those subaerial features of construction which are the Great Pyramid's most distinctive glory, and exist in no other Pyramid in Egypt or the world.

Uses of the Queen's Chamber.

But if in this simple manner of a small trap-door in the ceiling of the descending entrance-passage, the *ascending* system of the Great Pyramid was so long concealed, there was once in that ascending system, viz., at or just inside the lower end of the grand gallery, and in the floor thereof,—a more extensive trap-door, which concealed the access to the Queen's Chamber and the horizontal passage leading to it.

At present, when the traveller enters the north end of the grand gallery from the first ascending passage, he is delighted to meet with a level floor ; but following that southward, he finds that it leads presently, not to the farther end of the grand gallery, but to a hole under a steep escarpment of its floor close by ; in fact, to the beginning of the low horizontal passage leading to the Queen's Chamber. (See Plates VIII., XII., and XIII.) The floor of the grand gallery itself is inclined at the typical angle of 26° 18′ (my measures by three different methods, with far more powerful instruments than ever taken inside the Great Pyramid before, made it 26° 17′ 37″); and runs, from the lowest north end right up to the great step at the south termination of the gallery, in one continued slope, except for the interruption caused by the absolute removal of a portion of the floor near the north end, to allow of that sub-floor horizontal passage to the Queen's Chamber being approached on a level. But there are traces still visible in the masonry on either side of that hole in the gallery's floor, well interpreted, first by Mr. Perring, and more recently by Mr. Waynman Dixon, engineers both ; showing, that a neatly-laid and joist-supported flooring, nine inches thick, did once exist over that hole, completing thereby the whole long slope of the grand gallery's floor ; and in that case entirely

concealing and utterly shutting up all approach to, or knowledge touching the very existence of, the Queen's Chamber.

Who amongst mediæval men pulled away that concealing floor, removed its supporting cross-beams, and pushed on into the Queen's Chamber, is not known now, any more than why it was so concealed by the original builders. Mr. Perring imagined that the chamber must have been used as a store-room during the building of the Pyramid, for the big blocks of stone which were, at the finishing, slided down into the first ascending passage until, from the portcullis at its lower end, that passage was full up to its very top; and the workmen then escaped by the deep well and its subterranean communication with the entrance-passage.

Quite willing am I to allow to the honest working engineer, that such a store-room purpose may have been served: but was that all that the place was intended for? And if so, to what end are all the following features; features too, which are much more certain than that use; for the features exist still, and can be seen every day, but who witnessed the use?

1. The central axis of the niche in the east wall (and that niche this Queen's Chamber's only architectural adornment) is removed southward from the centre thereof by one scientific Pyramid, or sacred Hebrew, cubit length. (See Plate IX.)

2. The top of the niche is one similar Pyramid, and sacred Hebrew, cubit broad.*

3. The height of the niche, multiplied by that grandly fundamental quantity in the Great Pyramid, π, and that multiplied by the Pyramid number $10 =$ the

* 25·3 inches in each case by measure, in place of 25·025; but the measures very rough.

height of the Great Pyramid; or $185 \times \pi \times 10 = 5812$ in place of 5813.*

4. The height of the niche, less the height of its inner species of long shelf, equals similarly the half of the base-side length of the Great Pyramid; or $185 - 39{\cdot}6 \times 10\ \pi = 4568$, in place of 4566 inches.†

5. The height of the north and south walls of the Queen's Chamber measured = 182·22 Pyramid inches ± 1 inch, and assumed 182·62, give—

(1) $\frac{182{\cdot}62 \times 10}{2} = 9131$ = length of Great Pyramid's base-side in P. in.

(2) $182{\cdot}62 \times 2 = 365{\cdot}24$ = solar days in solar tropical year.

6. The breadth of the Queen's Chamber measured = 205·6, assumed 205·0, gives—

182·62 : 205 :: 205 : 230·1 = height of King's Chamber from floor to ceiling.

7. The square root of 10 times the height of the north or south walls, divided by the height of the niche = π; or,

$$\pi = \sqrt{\frac{182{\cdot}62 \times 10}{185}}$$

All the above theorems, save the two first, are the discoveries of Professor Hamilton L. Smith (of Hobart College, Geneva, New York), who, without having been to Egypt, and without any other Pyramid measures than those contained in "Life and Work," has, by successfully interpreting them, constituted himself in a most unexceptionable manner the citizen-king of the Queen's Chamber.

A fuller account of his researches has appeared in the November number of the American *Journal of*

* The height of the niche uncertain, by the measures, between 185 and 186 inches.

† The shelf's height is, by the very rough measures, between 38 and 40 inches.

Science and Art; which number, too, at the time I write (Dec. 1873) seems to have reached London, but not Edinburgh. And I must beg my readers to refer to his very paper for themselves; for, while the said London journals merely and most miserably say of the memoir, "Professor H. L. Smith finds that the arrangements of the Queen's Chamber were scientific,"—he wrote to me positively and particularly some time ago, that *his* conclusive arrangement of the whole of what he had discovered took the form of the two horns of a dilemma, on either of which he left the opponents of the sacred and scientific theory of the Great Pyramid to impale themselves, as they preferred.

"Either," said he, "there is proof in that chamber of supranatural inspiration granted to the architect; or—

"That primeval official possessed, without inspiration, in an age of absolute scientific ignorance, 4,000 years ago, scientific knowledge equal to, if not surpassing, that of the present highly-developed state of science in the modern world."

This is so radically different a state of things to what is implied in the London journals, that, in the absence still of his own printed paper, I refer to some of Professor H. L. Smith's private letters of last summer; and would direct attention to the remarkable number of characteristic angles which he has discovered in this chamber, and all of them well within the limits of some of my measurements; a few of them running thus :—

Casing-stone angle, again and again . .	=	51° 51′
Latitude	=	30°
Co-latitude	=	60°
Upper culmination of α Draconis .	=	33° 41′
Lower culmination of α Draconis .	=	26° 22′
Upper culmination of η Tauri . .	=	4° 21′ North of Equator.

Newly-discovered Air-channels in Queen's Chamber.

Now here we have seen a whole series of connections between the actually existing measurable facts of the Queen's Chamber, and scientific portions of the ultimate, and originally secret, design of the Great Pyramid; a design utterly unknown to the ancient Egyptians, and alien to everything that belonged to them and their "wisdom," such as it was; *teste* the Egyptologists themselves;—features, too, all of them entirely unnecessary to a mere store-room for stone blocks, or to a chamber for holding a simple sarcophagus. Therefore, although some of the early travellers have spoken fearfully of "the grave-like and noisome odour of this room, causing them to beat a rapid retreat," the room must have acquired that odious character from modern vilifying, rather than ancient construction; for what its builders put into it, as we see above, is not of a nature to experience any fleshly corruption.

Indeed, in its ancient planning, the Queen's Chamber would appear to have been, still further, *intended some day* to be ventilated. For the chief item of latest discovery at the Great Pyramid, is that one which was made last winter by Mr. Waynman Dixon, in company with his friend Dr. Grant, and with the assistance of one of his English workmen from the bridge he was then erecting over the Nile; and is to the effect, that this Queen's Chamber has two ventilating channels in its north and south walls, nearly similar to those in the King's Chamber.

Perceiving a crack in the south wall of the Queen's Chamber, which allowed him at one place to push in a wire to a most unconscionable length, Mr. W. Dixon set his carpenter man-of-all-work, by name Bill Grundy, to jump a hole with hammer and iron chisel at that place. So to work the faithful fellow went, and with a

will which soon began to make a way into the soft stone, when lo! after a very few strokes, flop went the chisel right through, into somewhere or other. So the party broke away the stone round about the chisel hole, and then found a rectangular, horizontal tube about 9 by 8 inches in breadth and height, going back 7 feet into the wall, and then rising at an angle of about 32°.

Next, measuring off a similar position on the north wall, Mr. Dixon set the invaluable Bill Grundy to work there again with his hammer and iron chisel; and again, after a few strokes, flop went the said chisel through, into somewhere; which somewhere was presently found to be a horizontal pipe or channel like the other, and rising at a similar angle, but in an opposite direction, at a distance of 7 feet from the chamber.

Fires were then made inside the tubes or channels; but although at the southern one the smoke went away, its exit was not discoverable on the outside of the Pyramid. Something else, however, was discovered inside the channels, viz., a little bronze grapnel hook; a portion of cedar-like wood, which might have been its handle; and a grey granite or green-stone ball, which, from its weight, 8,325 grains, as weighed by me in November, 1872, must evidently have been one of the profane Egyptian *mina* weight balls, long since valued by Sir Gardner Wilkinson at 8,304 grains.*

These relics approached so nearly in character to the

* A month after I had made the above measure and deduction, and communicated them to Mr. John Dixon, who had kindly sent me the articles to examine, the ball was weighed by the Warden of the Standards, found to be 8324·97 grains (see his paper in *Nature*, Dec. 26, 1872); whence it is also concluded that the stone may have been an old Egyptian mina weight. A closeness of agreement, especially in the weight, which is remarkable, if the Warden of the Standards had not heard of my previous measuring and conclusion, and which he certainly does not allude to.

Thin flakes of a very white mortar, exuded from the joints of the channels, were also found; and on being recently analysed by Dr. William Wallace, of Glasgow, were proved to be composed not of *carbonate*, as generally used in Europe, but *sulphate*, of lime; or what is popularly known as "plaster-of-Paris" in this country.

ordinary nick-nackets of most men's archæology, that they excited quite a *furore* of interest, for a time, in general antiquarian circles; but nothing more has come of them. The ball and the hook are supposed to have been dropped down the channels unintentionally by some of the mason's labourers or boys at the passages' upper ends, when the place of those ends was still open and accessible; but the things thus strangely found, belong merely to the forced labourers, the hodmen, of profane Egypt; not to the architect and head administrator of the scientific and inspired design.

An Unexplained Feature in the Queen's Chamber's Air-channels.

Something of the mysterious, however, still remains touching Mr. Waynman Dixon's air-channels of the Queen's Chamber.

When their inner ends, or ports, were proved to have been separated from the air of said chamber merely by a thin plate of soft limestone (so easily pierced by Bill Grundy's chisel), every one leaped to the conclusion that they had originally been in use, but had been stopped up by some mediæval interloper with a paltry stone patch. But this was not the case; for Mr. Dixon has successfully proved that there was no jointing, and that the thin plate was a "left," and a very skilfully and symmetrically left, part of the grand block composing that portion of the wall.

That block, therefore, had had the air-channel tube (9 × 8 inches) sculptured into it, neatly and beautifully as far as it went, but that distance was not quite through the whole block by a mere finger's breadth. The whole air-channel, save that little unmade bit, was in place; but could never have been used. Not, too, that it had been tried, found inconvenient, and was then stopped

up by the original builders; for they would in that case either have filled the port with a long plug, or would have replaced the whole block carrying the inner end of the channel, with another block quite solid.

But the arrangement which these builders left behind them was one which, if simply described according to the facts which have already occurred in history, was this; viz., that after the chamber has been for long ages ill-treated and maligned by the idle and ignorant of civilized peoples,—it should yet be possible for a well-informed man to enter, and, by little more than pressure with his fingers on a particular part of the wall, establish (if the upper ends have in the meanwhile remained intact), a complete system of ventilation by means of air-channels, extending through solid masonry on either side no less than 300 feet in thickness.

Scheme of the Masonry in First Ascending Passage.

Besides making this strange discovery, in concert with his friend Dr. Grant, of Cairo, Mr. Waynman Dixon performed a great work in *the first ascending passage* of the Great Pyramid.

My examination of that passage in 1865, was confined to little more than its angle and floor length; partly on account of the bewildering varieties of the jointing, as they appeared on a cursory examination. But Mr. Waynman Dixon, in 1872, applying himself long and steadily to this special task, and mapping down everything measurable, presently perceived a most admirable order pervading the apparent disorder, and tending also to good masonic construction. For the chief discovery was, that at stated intervals the blocks forming separately the walls, floor, and ceiling of the passage, were replaced by great transverse plates of

stone, with the passage bore cut clean through them, so as to form walls, floor, and ceiling, all in one piece.

As an engineer he admired this masonry. But he had not perceived, until I was recently able to point it out to him, on his own careful measures, that the intervals of passage-length at which these remarkable stone *plates* were introduced, were no other than *breadths of the King's Chamber.*

The first interval, indeed, at the top of the passage was a double one, and therefore equalled the *length* of the King's Chamber ; but then followed five plates, with that chamber's breadth, or 206 inches, between every pair of similar surfaces ; and after that, or in the lower part of the passage, near the granite plugs, the plates were contiguous.

This unexpected illustration of the builders working by measure, and in terms of that one chamber which is now confessed to be the focus of the whole scientific design, but which was not then built into fact, may be taken as a proof of the *Promethean*, or forethought, character of the whole of the Great Pyramid building. And it may justify me, I hope, before my readers, in concluding this chapter, intended to be of mere mechanical details, with some further references to structural connections, bearing on deep physical results, between the said King's Chamber, and its one contained treasure,—the coffer.

Relations of King's Chamber to Coffer.

That coffer being loose on the King's Chamber floor, without either niche or socket prepared for its reception or fixation, there was much fear expressed only a few years ago, that it might not be the original coffer, or sarcophagus, intended for the Great Pyramid by its architect.

Yet never has theoretic fear been more abundantly quieted by actual discoveries of solid facts.

Some of these discoveries have been already stated in Part II., but others have come to light since then, chiefly through the researches, quite independently of each other, of Professor Hamilton L. Smith, and Mr. James Simpson; and may be stated thus:—

1. The coffer belongs essentially to the King's Chamber, because it is π shaped (first ascertained by Mr. St. John V. Day), and after the same manner nearly, though in a different plane, as that chamber which is also of π proportions. For while height of coffer = radius of a circle, whose circumference is of the same length as the coffer's extreme outer boundary; so the King's Chamber half breadth (made so much use of in obtaining the equations of the "sums of the squares"), is radius to a circle, whose circumference = the periphery of either north or south wall of King's Chamber with their full height, or measured from their own granite bases five inches beneath the floor.

2. The coffer belongs to the King's Chamber, because its cubic contents are $\frac{1}{10}$ of the chamber's lower course contents; and the chamber is also on the 50th masonry course of the whole Pyramid.

3. The coffer further belongs to the King's Chamber, because its height is $\frac{1}{8}$ (Pyramid number) of the chamber's breadth, and $\frac{1}{10}$ (Pyramid number), of its length; and its height squared = $\frac{1}{80}$ (Pyramid number) of the area of the chamber.*

4. The coffer still further belongs to the King's Chamber, because the outside periphery of the coffer's base is equal to half the most important line that can

* The measured height of the coffer, as already given, lies between 41·23 and 41·13, and the breadth and length of the chamber are respectively 206·07, and 412·13 Pyramid inches, to within less than the tenth of an inch, which will enable any one to compute how near the above stated proportions came.

be drawn in the room, viz., its solid diagonal; for the half of this is 257·58 inches, and the coffer's base periphery by measure is 257·24, but with an anomaly in the measure of the west side (see p. 137), which being corrected would bring it up more nearly to 257·50.

5. Again, the coffer belongs to the King's Chamber, because all three of its dimensions, external, are given by the half of the chamber's magistral radius (*i.e.*, the half of its solid diagonal), 128·79 inches, when typically divided, or thus :—

$$\frac{128\cdot79}{10} \times \pi = 40\cdot996 = \text{central height of coffer} = 41\cdot13 - x$$

$$\frac{128\cdot79}{10} \times 3 = 38\cdot637 = \text{breadth of coffer outside} = 38\cdot61$$

$$\frac{128\cdot79}{10} \times 7 = 90\cdot154 = \text{length of coffer outside} = 89\cdot92^*$$

Of which multipliers, while π is evidently *the* Pyramid number, 3 and 7 are very important coadjutors to it.†

6. The coffer was not necessarily intended for nothing but a coffin, as the Egyptologists assert, merely *because* it is long enough for a man to lie down in; for the above is one of its many consistent, numerical and scientific features, which demand its actual full length; and another still is shown by Professor Hamilton L. Smith thus :—

Let the number of inch-days in a year, or 365·24 inches = 360°; then

Coffer's inside width measured = 26·73 in. = 26° 18′ = angle of Pyramid passages.
" depth " = 34·34 in. = 33° 48′ = upper culmination of *a* Draconis.
" length " = 77·93 in. = 76° 48′ = Summit angle of Pyramid nearly.

* But 90·09, on the removal of the anomaly from the west foot, already mentioned.

† See a paper by William Petrie, in my "Life and Work," vol. iii., p. 602.

Whereupon, and with reference to previously noted commensurabilities, Professor H. L. Smith remarks, very happily, if this stone box was intended for nothing but a coffin, what a nice kind of a coffin it must have been; and are there any of our modern mathematicians who would undertake to give the dimensions of such another coffin, combining as many scientific data; especially too, in order to make it a parallel case in everything,—scientific data not yet known to mankind, but to be known 4,000 years hence?

7. Lastly, of the coffer's cubic contents, its most important element as a vessel of capacity.

I have already published, as the result of my direct measures taken in combination with the earliest commensurabilities which I had discovered in 1868, the following quantities:—

71,178
71,292
71,317
71,160
71,266
71,258

But all the last three of these should probably be slightly increased for that anomaly in the measure of the lower west side of the coffer (see p. 118 vol. ii. of "Life and Work,") which has just been brought into more evident existence by the light of some of Mr. James Simpson's more recent commensurabilities; and he now adds the following results of coffer-contents from his own calculations:—

A	First wall course of King's Chamber $\div 50$ . . .	$= 71{,}470$
B	The same when height is made to correspond to π proportion	$= 71{,}421$
C	Outside contents of coffer deduced from cubic semi-diagonal of King's Chamber, and $\div 2$	$= 71{,}400$
D	From the same, made to correspond to π	$= 71{,}388$
E	Square of inside breadth (measured $= 26{\cdot}703$) $\times 10$.	$= 71{,}307$
F	Product of interior measures	$= 71{,}318$
G	Solid diagonal of Queen's Chamber $\times 200$ . . .	$= 71{,}394$
H	United length of the 8 arris lines of the Great Pyramid .	$= 71{,}276$

The mean of all the quantities, first and last, being near 71,310; and the resulting figure for the earth's mean density, on the principle mentioned in Part II., being 5·705. And Mr. James Simpson further adds, that whereas the cube-root of 71,310 = 41·468 and the cube-root of the earth's bulk in cubic Pyramid inches* ÷ 10^7 (the cubit into earth's semi-axis of rotation number) = 40·389, these numbers include the height of the coffer between them. Whereupon, dividing the height of the King's Chamber 230·4247 by the earth-bulk derived quantity of 40·389,—there comes out as the number, which we may assume in symbology to represent the earth's mean density, 5·70511; *i.e.*, confirming the previously arrived at 5·705 so far as it goes.

Earth's Density, closely approximated to.

Now these corrections by Mr. Simpson of my earlier 5·70, I venture to regard as of the utmost practical importance: for if the Pyramid weights and measures had to be re-enacted by ourselves for national use, we should require to know most accurately either the contents of the coffer, or the mean density of the earth, or both.

But the poor coffer is now so broken by mischief-mongers (more broken too in 1873 than it was in 1865 A.D.) that no improved measures will in future be obtainable from it, over those which have already been procured; and the earth's mean density is too difficult a subject for modern science to deal with to the requisite accuracy.

From the Great Pyramid, I had deduced for that

* Computed very carefully by Mr. Petrie for the ellipsoidal earth, and corrected for the terr-aqueous level, a refinement not yet adopted even in the best geodesy of the day, at 65 | 892,118 | 000,000 | 000,000 | 000,000 Pyramid cubic inches. (See my "Antiquity of Intellectual Man," p. 472.)

earth feature, in 1867, the quantity 5·70 : expressly saying that it might be considered certain to ·01 of unity; and that it certainly was not so small as 5·69, nor so large as 5·71 ; and now behold, after Mr. James Simpson, with admirable skill and quite unknown to me, has made all the correction he can through his further discoveries of Pyramid data, his efforts do not alter the final quantity beyond 5·706.

And what has modern science to compare against

5·700, and

5·706.

She has two results; her two last, and in so far they should be her best. One of them is by Sir George Airy, Astronomer-Royal, representing the Greenwich Observatory and all the men and money power of the mighty British Admiralty; and the other is by Captain Ross Clarke, R.E., C.B., under the superintendence of General Sir Henry James, R.E., representing the Ordnance Survey, and all the men and money power of the equally mighty British Army War Office; and these two great national efforts of modern times stand thus,—

6·565, and

5·316.

Well, these two quantities evidently include a long way between them all the Pyramid results; but are so absurdly far, one from the other, that they not only do not serve to test the Pyramid's accuracy, much less to replace it in any very practical question, but they may assist too well in showing some Joseph Hume *redivivus*, that much money of our country has been expended over and over again in getting *bad* results in science.

They may also succeed in salutarily proving, at least to *some* modern science so-called, and in the words of my venerable friend, Rev. F. R. A. Glover,—

"That Science of every kind is after, and not before, God (Job xxxviii. 4, 5, 6): and, that the right use of all Science is, to make the human mind capable of appreciating God,—the God of Revelation—God of the Dispersion—God of the Exodus—God of Calvary—The God due to come,—and *not* by it to attempt to dethrone Him." (Isaiah xxix. 14; 1 Cor. i. 19).

CHAPTER XX.

SACRED, AND PROPHETIC, TIME.

THERE was once a well-supported piece of special flooring in the Grand Gallery, near its northern end, concealing from view the horizontal passage leading to the Queen's Chamber. Just so much indeed was stated in the last chapter; but there was also a manner of performing the work peculiar to the Great Pyramid, and that still remains for due description, assisted by Plates VIII., XII., XIII.

Thus the supporting beams or joists, as shown by the holes for them on either side, within and below the level of the ramps, were 5 in number; a Pyramid 5, too, inasmuch as one of them was larger and thicker than the other four. But more noteworthy is the height of the Grand Gallery's permanent stone floor at the inner or southern end of the hole in it, and where that floor's long slope coming down from the south is suddenly cut off; or descends vertically to a lower level, to allow of a flat approach, from the north beginning of the Grand Gallery to the Queen's Chamber's horizontal passage end.

That steep escarpment of the Grand Gallery's floor, looks almost like a little cliff, being, together with the dark passage mouth it overhangs, 86·25 inches high to any one standing on the level area in front of it.* But that area is 6 inches higher, nearly, than the very begin-

* "Life and Work," vol. ii., pp. 70 and 71; also for height, p. 59.

ning of the Grand Gallery ;* and the escarpment itself is under-estimated by the amount of 9 inches, which depth has been removed for a short distance to allow of the overlapping of the special floor which once covered the hole. The entire height, therefore, of the frontal cliff for symbolical purposes is not much short of 101·25 inches ; and this quantity, though in rough approximation only, stands before us here very much in the guise of the leading Pyramid symbol for a day : viz., 100 inches.

But is there anything at this point concerning a day ?

If of days at all, it should be of seven days, seeing that the feature of the Grand Gallery most usually attractive to travellers, next after its commanding height, is, the seven overlappings of its walls.

Now the Pyramid's entrance-passage has already been shown to have something to do with days ; and the inclined passage which enters the north end of the Grand Gallery is very similar in size to it, being by measure 53·2 inches high vertically. The passage, however, which exits from the south end of the Grand Gallery, is only 43·6 inches high vertically ; and as we cannot use either one or other exclusively in referring to the Grand Gallery between them, we have to take the mean of the two, or 48·4 ; and then find, that that quantity goes seven times, exactly to a hundredth, into 339·2, which is the vertical height of the Grand Gallery at a mean of 15 points in its whole length ; specially measured too with a grand 3 to 400 inch slider measuring-rod, presented to me for this very purpose by Andrew Coventry, Esq., of Edinburgh, in 1864.†

Now this result may, or it may not, be intended in

* "Life and Work," vol. ii. p. 61.

† See "Life and Work," vol. ii. pp. 84—86. Former travellers' measures of the height of the Grand Gallery vary from 270 to "about 600" inches, and are given without detail. The inclined floor length being by my measures 1881 Pyramid inches, the angle 26° 17′ 37″, and the horizontal length computed 1686·4 Pyramid inches, Mr. James Simpson has

this part of the Pyramid to assist in typifying 7 days (more strictly 7 half-days taken twice over); and is of only subsidiary importance in itself; because 7 days merely, is a pagan mystical number which any one might hit upon, and without its having anything to do with the sabbatical week of Scripture: for that was an institution which, though including or spanning over 7 days in its entirety, was far more noteable for commemorating 6 working days and one day of rest with a totally distinct character, and a special ordination by inspired command to be held sacred to God the Creator of all.

The Biblical Week.

We have not, therefore, yet found anything in the Great Pyramid touching, in any clearly discriminative manner, on the week of the Bible. But if we now follow along that level passage with the hundred inch day symbol overhanging its entrance, viz., the horizontal passage leading to the Queen's Chamber,—the last part of that passage is found to be one half nearly greater in depth than the rest; and the length of that deeper part is one-seventh of the whole length of the floor from the beginning of the Grand Gallery up to the Queen's Chamber wall itself.* This looks like a beginning of a sabbatical week symbolism; and while the passage, of necessity, ends by debouching into the Queen's Chamber, its seventh deeper portion, which has a length of 215·9 inches, is found to be roughly a mean between the

pointed out that the typical fifth part thereof = 337·3 Pyramid inches: a close approach to the 339·2 measured, seeing that the variations, in places, amounted to anything between 333·9 and 346·0, by reason chiefly of the tilt of each of the long roof-stones to the general shape of the whole roof.

* See "Life and Work," vol. ii. pp. 55, 61. The whole distance = 1517·9, and the smaller distance with the lower plan level = 215·9 Pyramid inches, with an inch of possible error.

length and breadth (226·5 and 206) of the floor of that chamber on the same deeper level.*

In that chamber behold we a fair, white stone, apartment, exquisitely built originally (except as to its present floor, which, for some reason or other, is rough, and composed of mere untrimmed building blocks); but with this special and overriding feature accompanying and distinguishing it from the other Great Pyramid chambers; viz., that by reason of its having for ceiling a double inclined slope, the whole room may be said to have *seven* sides; of which seven, the floor, which has not had a tool lifted up against it within the building (though the others, of more finished character, had), is decidedly larger than all the rest in area.

Those other sides, however, are not quite equal and similar amongst themselves, unless reductions are made, founded on some features which do exist, marked into the walls;† but whose full signification has yet to be accurately made out. It may be better, therefore, at present, to conclude this part of the argument for the sabbatical week of Scripture being indicated in this chamber, from Mr. James Simpson's sums of the squares, and which are given by the chief proportions of the room to a higher, though not an absolute, degree of certainty.

Taking the room, then, with an artificial ceiling, assumed in plan just beneath the angular beginnings of the roof (or at the greatest height to leave the apartment with six sides, such as ordinary rooms possess), the sums of the squares of its radius into every dimension amount to 60; or, says Mr. Simpson, to 6 working days of 10 each. But next take the major height, or that central and superior height which effec-

* Salt incrustations prevent very accurate measures in this room, but the 206· width is almost a reproduction of the King's Chamber breadth; which feature would have been lost, if the Chamber had been made 216· square in plan.

† "Life and Work," vol. iii. pp. 229—232.

tively gives the room its seventh side, and the sum of the square there, and there alone, is 7;* or typical of the divinely-ordained day of rest; and without interfering with what has already been ascertained for this chamber's indicating the π proportion of the Pyramid, its angles, its absolute size, and the length of the Sacred Cubit.

Grand Gallery's Cubical Commensurabilities.

Let us now return from this Queen's Chamber, so called (which to ordinary corporeal research is a *cul de sac*), and we shall find a certain amount of connection between it and the Grand Gallery. Only a small amount, but of a somewhat similar kind to what there is between a week and a year; inasmuch as both of them are measures of time, though the week does not march along evenly and decimally with the year in questions of history and the chronological fixation of events.

In this manner, then, while the Queen's Chamber, with its cubit-defining niche, contains cubic inches to the typical number for that cubit of ten-millionth earth-reference—the Grand Gallery contains 36 millions

* Mr. Simpson's sums of the squares are not quite so cogent in the Queen's as the King's Chamber, already given in chapter x.; and his radius length for it, 92·17 inches, is not so well proved. The proportions, however, which are more certain than the absolute lengths, run thus:—

Height, divided by radius of chamber . .	= 2·	square	= 4
Breadth	= 2·2361	„	= 5
Length	= 2·4495	„	= 6
Sums of the squares			= 15
Diagonal of end	= 3·	„	= 9
Diagonal of side	= 3·1623	„	= 10
Diagonal of floor	= 3·3166	„	= 11
Sums of the squares			= 30
Solid diagonal	= 3·8730	„	= 15
Sums of the squares of all the dimensions, except the major, or gable, or central height of the chamber .			= 60
Major, or gable, or central height . . .	= 2·6458	„	= 7

of cubic inches: or one million to every one of the 36 inclined stones forming its long sloping roof.

The number of these Grand Gallery roof-stones had been given in 1837 at 31 by Colonel Howard-Vyse, and at 30 by the great French work, so that I was a little disconcerted in 1865 at finding them 36. But as these authors gave no particulars, and as I took much pains (duly described in "Life and Work," Vol. II., pp. 86—88), there can be very little doubt about the larger number. And in 1872, Mr. Simpson seems to confirm it as an intentional feature of the architect, by finding the round number of one million cubic inches to be repeated just 36 times in the contents of the whole Grand Gallery, carefully computed for every overlapping.*

The Ramps, and the Well's Upper Mouth.

Let us next attend to the ramps, or inclined stone benches on either side of the Grand Gallery's floor, running from the very north end right up to the great transverse step which forms the south end thereof. They are alluded to so conflictingly in the great French work, as containing sometimes 26, and sometimes 28 holes, that I recorded, in "Life and Work," several sets of measures of various kinds, to set this very simple point beyond all dispute.

If the ramps are supposed to include the great stone step at their upper or southern end—and which stone step has an almost similar kind of hole at either inner corner —then there are actually and positively 28 holes, clear and distinct, along the eastern wall of the Gallery (27 in the ramp itself, and 1 on the step); and there are as many along the western wall; for though the lowest and

* Mr. Simpson has a further speculation on the apparently 50-inch length of each roof-stone; but the lengths having struck me at the place as irregular, I did not attempt to measure them.

northernmost hole is not very clear, that is merely from part of the ramp which held it having been broken away. Of these 28, too, on either side, 25, viz., all except the lowest two, and upper one, are distinguished by a piece of stone 13 inches broad and 18 high, being let into the wall vertically and immediately over them; while certain of them are crossed by another piece, giving them a faint approach to an oblique cruciform aspect.

Something may come of that, in the hands of future explorers; but meanwhile we have to notice another feature, and a most important one, already established or brought to light by the removal of part of the ramp-stone in the lower north-west corner of the Grand Gallery; for the removal of that mass just there, long ago disclosed a constructional secret of the original builders; viz., the upper end,—or rather a small and low outlet leading to the upper end,—of a very deep and solemn kind of shaft, usually called "the well," in the annals of early Pyramid exploration.

At those times nothing was known of the Pyramid's entrance-passage further down than its junction with Caliph Al-Mamoun's forced hole and the entry to the first ascending passage. Therefore, when men ventured to look into the well mouth from the north-western corner of the Grand Gallery, at, or near, the broken ramp-stone as above, they found themselves not far from overhanging a dark and dismal abyss, no one knew how deep or where leading to.

What Caliph Al-Mamoun and his immediate followers thought of it, is not recorded; but soon after his time, "the well" begins to figure in Arab accounts, as an open pit of preternatural depth and fearful qualities. A party of twenty men, from the Faioum district, was once formed to investigate the mystery, but was frightened by one of their number falling down the aperture such a terrible distance, that he was said to have been three

hours in the act, uttering horrible cries all the time; and he was never heard of again except in an apocryphal manner, and as having become an enchanted being.

Again, a Sultan of Cairo, of impatient character, and determined to know all the secrets of the Great Pyramid in his own day, elected to blow it up by filling this same well with gunpowder: and only relinquished the design on being assured by his Italian architect, that the explosion of so vast a quantity of powder would endanger the safety of all the buildings in Cairo.

Again, at a later age, the Cambridge traveller, Dr. Clarke, visited the place with a large military party, and on throwing a stone down the well, and hearing it end by splashing, as they all considered, in water,—he called impressive attention to the faithfulness of classic authors, for had not Pliny mentioned that there was a water-well in the Great Pyramid, 80 cubits deep; and here it was, if not before their eyes, at least within range of their fallacious ears.

Again, in 1818, Signor Caviglia cleared out the entrance-passage of the Great Pyramid throughout the whole distance right down to the deep subterranean chamber; and lo, near the bottom of it, on the western side, was a low door-way leading into a dark passage: by pushing into which and following its lead, and clambering in the darkness higher and higher and yet higher, or 170 feet vertical altogether, he at length found himself at the well mouth, and entering the lower north-west corner of the Grand Gallery. Very thirsty, too, as well as hot and tired was he, for not a particle of water existed in any portion of the so-called well; the whole of which, including the lower end of the entrance-passage and the subterranean chamber, is far above the level of the Nile inundation, the only source of water in that scorched and almost rainless land.

Again, in 1830 and 1837, came in the age of explora-

tions, *i.e.*, Egyptological and builders' explorations with Sir Gardner Wilkinson, Colonel Howard-Vyse, and Mr. Perring. For they set forth, as already indicated, that the ancient workmen who had filled up with stone plugs the first ascending passage, must have afterwards escaped by this long and deep well-like hole, or vertical shaft, to the lower part of the entrance-passage, and so attained to the outward air once again.

The Missing Ramp-stone.

Perhaps they did. But in that case let us ask, "in what state would they have left the ramp-stone over the well's mouth?"

Certainly not blown from within outwards, as if by uncontrollable explosive force, breaking off part of the wall with it, and leaving the hole's mouth exposed; for that would have defeated their whole object. They would, on the contrary, have contrived a temporary support for the stone when in a position impending over the hole, partly in the floor and partly in the wall; or a support such, that when the last man had come away, the prop would be easily withdrawn, and the stone would fall neatly into a seat already cut for it and cemented round the edges with freshly-applied lime to make the work permanent and secure. For then such stone would be flush with the rest of the ramp, and would utterly conceal from any one who should ever enter the Grand Gallery by the regular method of the first ascending passage, that there was any well-mouth whatever behind the surface of the ramp. (See Plate XIII.)

The original builders, then, were not those who knocked out, from within on the well side, that now lost, ramp-stone, and exposed the inlet to the well mouth as it is presently seen, near the north-west corner of the Grand Gallery. Neither was Al-Mamoun the

party, for no one could have done it except by entering the well from the very bottommost depths of the subterranean region; and he, the son of Caliph Haroun Al-Raschid, and all his crew, did not descend further down the entrance-passage than merely to the level of his own forced hole, which is not subterranean at all. Nor is the credit claimed for any of his Arab successors, who rather allude to the well as an already existing feature in their earliest time, and one they did not understand; in large part, too, because they had only seen, and only knew of, the upper end of it in the north-west corner of the Grand Gallery floor.

Who then did do it?

Who indeed! For the whole band of Egyptological writers we have mentioned, appear to be convinced that ages before Caliph Al-Mamoun made his way by blundering and smashing, long ages too before Mohammed was born, and rather at and about the period of Judah being carried captive to Babylon,—the Egyptians themselves had entered the Great Pyramid by cunning art and tolerable understanding of its mere methods of construction, and had closed it again when they left.

Either some fanatics of the late dynasties of Ethiopic intruders, or the following Persian conquerors, are considered to have been those spoilers and sealers-up again: and not only of the Great, and all the other Pyramids too, but of every royal tomb throughout Egypt in whatever style of architecture it may have been built, whether subterranean or subaerial. The spoilers also and at the same time of those far more repulsive tombs and bigger sarcophagi, the profanely sacred ones of the deified Egyptian bull Apis; recently brought once more to the notice of man by Mariette Bey's too successful excavations of ancient idolatries.

Precisely who those men were, as Colonel Howard-Vyse well remarks, who committed that first spoiling

"will now never be known;" but that the royal tombs were spoiled, and that both early Mohammedan and later Christian explorers throughout both Upper, and Lower, Egypt, equally found nothing but emptied sarcophagi, is positive matter of fact. By the aid, too, of features still existing, it can be mechanically demonstrated how those far earlier men may, in the case of the Great Pyramid, have descended to the subterranean depths of its entrance-passage, entered the bottom of the well, ascended the said well to its mouth, knocked out part of the closing ramp, ascended the then clear and open Grand Gallery, entered the King's Chamber, made what changes they could there; and then, descending again the same way, closed all the passages behind them so effectually that no one else ever attempted to follow their steps, until after a lapse of 2,000 years, or close within our own times.

Of the Sacred, touching the Great Pyramid.

That is the end then of the first use which the Great Pyramid's Grand Gallery, deep well, but not a water-well, and entrance-passage served. But that was evidently not all which those features were intended for.

In the course of the summer of 1872, in a correspondence with Mr. Charles Casey, of Pollerton Castle, Carlow (then preparing his work "Philitis"*), that straightforward and vigorous thinker considered himself called on to tell me, that while he had followed and adopted all that I had attempted to explain as to the metrology of the Great Pyramid being of more than human scientific perfection for the age in which it was produced,—yet to call it therefore Divinely inspired or sacred, seemed to him to be either too much, or too little. It might have

* "Philitis: A Disquisition." By Charles Casey, Esq. Published by Carson Brothers, Grafton Street, Dublin. 1872.

been sufficient in a previous day, but not in these times in which we live; for with rationalism continually extending on every side, the only vital question left in religion, the only question really, efficiently, sacred, is "What think ye of Christ? Whose son is he?" The question to which we must all of us, sooner or later, come at last.

"Now," said Mr. Casey, "unless the Great Pyramid can be shown to be Messianic, as well as fraught with superhuman science and design, its 'sacred' claim is a thing with no blood in it; it is nothing but mere sounding brass and a tinkling cymbal. That idea seized me the other night," said he, "when I was thinking on my bed, and took me with such a giant's grip that I have never been able to get quit of it since."

You are not the first Pyramidist man, I was obliged to reply, to whom the same idea has been vouchsafed; for it has long formed a matter of frequent and earnest discussion among several of them: but they have not published on it yet, thinking the necessary preliminary part of the subject, or the Pyramid's attestation to superhuman scientific abilities for its age, not yet brought up to the required degree of exactness to command the respect of, and induce assent from, sceptically-minded men.

At the time I wrote to Mr. Casey, the uncertainties of the base-side measure of the Great Pyramid, by modern surveyors, were simply horrible; the best of them both erring to any extent between 9,100 and 9,170 inches, and laying the fault thereof upon the Pyramid. At that time, therefore, the only solution of the difficulty seemed to be, to beseech some superlatively rich men to expend of their spare thousands, first in clearing the four base-sides of the Great Pyramid from their impracticable hills of rubbish, and then in measuring between the terminal points with proper accuracy. And there, at those rich

men's luxurious doors, the matter stood; and had stood uncared for by them or treated with base contumely for seven long years, until at last the Pyramid's purpose could wait no longer. So, partly in 1872, and still more signally in July, 1873, it passed them all by; and in revealing the reason why the King's Chamber was made in measured length 412·132 Pyramid inches, has shown both the true base-side length and the vertical height of the structure, its π theory and the inch and cubit metrological system, to a degree of accuracy * too, combined with certainty of intention, which leaves nothing more to desire; and makes Great Pyramid studies quite independent henceforth of all those rich men and their long wasted or squandered or unused riches, confided to them for some better purpose. They had had, in this Pyramid cause, such an opportunity of doing high, pure, and noble good to all the ages, as wealth had never enjoyed before, since the foundation of the world; but the opportunity has from this time departed from them for ever. Wherefore the least that can be said is in terms of James v. 1—3, "Go to now, ye rich men, weep and howl for your miseries that shall come upon you. Your riches are corrupted, and your garments are moth-eaten. Your gold and silver is cankered; and the rust of them shall be a witness against you." But mankind may well rejoice, for the flood-gates of the Great Pyramid's sacred history, or the last pages of what it has to tell,—and has had to tell ever since the beginning of human life and story,—are henceforth open to all.

The Sacred pronounced to be Messianic.

It was in 1865 that a letter reached me at the Great Pyramid, transmitted, with some high recommendations

* Some 700 times more accurate than the previous measures on the ground. (See forward, chap. xxv.)

of its author, by that most upright, knightly man the late Mr. Kenmure Maitland, Sheriff Clerk of the county of Edinburgh. "He is a young ship-builder," said he, "a son of a ship-builder, an accomplished draughtsman, and I hear that he lately turned out, from his own design, one of the most perfect ships that ever left Leith Docks: from his childhood upwards he has been an intense student of whatever could be procured concerning the Great Pyramid; and though his family surname is now Menzies, he has reasons for believing it to have been originally Manasseh."

This Israelite, then, but no Jew, it was, who first, to my knowledge, broke ground in the Messianic symbolisms of the Great Pyramid, so intensified subsequently by Mr. Casey: and, after long feeling his way in a humble and prayerful spirit,* at length unhesitatingly declared that the immense superiority in height of the grand gallery over every other passage in the Great Pyramid, arose from its representing the Christian Dispensation, while the passages typified only human-devised religions, human histories, or little else.

From the north beginning of the Grand Gallery floor, said Robert Menzies, there, in southward procession, begin the years of the Saviour's earthly life, expressed at the rate of a Pyramid inch to a year. Three-and-thirty inch-years therefore, or thereabout, bring us right

* "—— that most mysterious edifice, the Great Pyramid, which has been a puzzle to all ages. It is a very serious view indeed which I entertain of its purpose, and not one to be approached in a spirit of levity. I have endeavoured, largely led by a careful perusal of Mr. Taylor's book, and your own upon the subject, to follow out much further than you do, the Scriptural allusions to the Great Pyramid, with a result which appears, slightly as I have dipped into it, truly astonishing. Extreme caution is requisite in Biblical research, for, as Peter says, 'No scripture is of private interpretation.' I have humbly and prayerfully endeavoured to avoid anything which may be misconstrued, and if my humble remarks are of any assistance to you in the elucidation of this grand and holy mystery, I shall be truly glad.

(Signed) "ROBERT MENZIES.

"SEA COT, LEITH, *February 25th*, 1865."

over against the mouth of the well, the type of His death, and His glorious resurrection too; while the long, lofty Grand Gallery shows the dominating rule in the world of the blessed religion which He established thereby, over-spanned above by the 36 stones of His months of ministry on earth, and defined by the floor-length in inches, as to its exact period. The Bible fully studied, shows that He intended that first Dispensation to last only for a time; a time too which may terminate very much sooner than most men expect, and shown by the southern wall *impending*.

Whereupon I went straight to the south wall of the Grand Gallery, and found that it *was* impending; by the quantity too, if that interests any one, of about 1°; while the Coventry clinometer I was measuring with, was capable of showing 10″;* and *where* Mr. Menzies could have got that piece of information from, I cannot imagine; for the *north* wall is not impending: he, too, was never at the Great Pyramid, and I have not seen the double circumstance chronicled elsewhere. The first ascending passage, moreover, he explained as representing the Mosaic Dispensation. I measured it and found it to be, from the north beginning of the Grand Gallery, the natal year of Christ, to its junction with the roof of the entrance passage northward and below, or to some period in the life of Moses, 1,483 Pyramid inches: and when produced across that passage, so as to touch its floor, 1,542 inches.†

* See "Life and Work," vol. ii. p. 90.

† The Rev. W. B. Galloway, M.A., Vicar of St. Mark's, Regent's Park, in his "Egypt's Record of Time to the Exodus of Israel," after deeply studying the question, more from Alexandrian Greek than Egyptian profane, sources, makes the date of the Exodus 1540 B.C.; see his p. 371. And at p. 429 he arrives at the conclusion, that the birth of our Saviour was actually in the course of our reckoned year B.C. 1, and needs only a fraction of a year to make the dates A.D., as usually given, truly continuous with the patriarchal.

The Floor Roll of Human Religious History.

But the chief line of human history with Robert Menzies was the floor of the entrance-passage. Beginning at its upper and northern end, it starts at the rate of a Pyramid inch to a year, from the Dispersion of mankind, or from the period when men declined any longer to live the patriarchal life of Divine instruction, and insisted on going off upon their own inventions; when they immediately began to experience that universal "*facilis descensus Averni*" of all idolaters; and which is so sensibly represented to the very life or death, in the long-continued descent of the entrance-passage of the Great Pyramid, more than 4,000 inch-years long, until it ends in the symbol of the bottomless pit, a chamber deep in the rock, well finished as to its ceiling and top of its walls, but without any attempt at a floor.

One escape, indeed, there was in that long and mournful history of human decline; but for a few only, when the Exodus took place in the first-ascending passage, which leads on into the Grand Gallery; showing Hebraism ending in its original prophetic destination —Christianity. But another escape was also eventually provided, to prevent any immortal soul being necessarily lost in the bottomless pit; for before reaching that dismal abyss, there is a possible entrance, though it may be by a strait and narrow way, to the one and only gate of salvation through the death of Christ —viz., the well representing his descent into Hades: not the bottomless pit of idolaters and the wicked at the lowest point to which the entrance-passage subterraneously descends, but a natural grotto rather than artificial chamber in the course of the well's further progress to the other place; while the stone which once covered that well's upper mouth is blown out-

wards into the Grand Gallery with excessive force (and was once so thrown out, and is now annihilated), carrying part of the wall with it, and indicating how totally unable was the grave to hold Him beyond the appointed time.

That sounds fair and looks promising enough, so far, said Mr. Casey; but it is not enough yet to be the turning-point with me, when interests so immense are at stake. We must have more than that, and something not less convincing than a proof of this order. Measuring along the passages backward from the north beginning of the Grand Gallery, you find the Exodus at either 1483 or 1542 B.C., and the dispersion of mankind in 2528 B.C., up at the beginning of the entrance-passage. Now you have already published, years ago, that you have computed the date of building of the Great Pyramid, by modern astronomy, based on the Pyramid's own star-pointings, and have found it 2170 B.C. That date, according to this new theory, must be three or four hundred inches down inside the top or mouth of the entrance-passage. Is there then any *mark* at that point? for I feel sure that the builder, if really inspired from on High, would have known how many years were to elapse between his great mechanical work in the beginning of the world, and the one central act of creation in the birth of the Divine Son; and he would have marked it there as the most positive and invaluable proof that he could give, of the truly Divine inspiration under which the building had been planned and executed?

The Crucial Test.

Now it had never occurred to me before to confront the sacred and scientific theories in this manner; the idea was Mr. Casey's entirely. But if any trial was ever

to be considered a crucial one, surely it was this. So away I went to my original notes to satisfy him; and beginning at the north end of the Grand Gallery, counted and summed up the length of every stone backward all down the first ascending passage, then across the entrance-passage to its floor, then up its floor-plane towards its mouth, and soon saw that the 2,170 B.C. would fall very near a most singular portion of the passage—viz., a place where two adjacent wall-joints, similarly too on either side of the passage, were *vertical*, or nearly so; while every other wall-joint both above and below was *rectangular* to the length of the passage, and therefore largely *inclined* to the vertical.

This double joint fact, in itself most easy to see, though not, I believe, recorded before 1865, has frequently since then been speculated on by various persons as possibly pointing to some still undiscovered chamber; just as the diagonal joints in the floor at a lower level, are now clearly seen to point to the upper ascending passage and all that it leads to. But while no such fourth chamber has yet been discovered, and no Egyptologist attempts to give any explanation of the anomalous joints, they seemed from their upright position,—at least to one who believed from theory that they were very near, and shortly before, the Great Pyramid's date of building, —to have something representative of *setting up*, or preparations for the erecting of a building. And we are told by Herodotus, that many preliminary years *were* consumed in preparing the stones and subterraneous excavations of the Great Pyramid; while Dr. Lepsius assures us, in modern times, with all the lights, whatever they may be, of the Egyptologists, that preliminary preparation was never practised by any chance, in any case whatever, of all ordinary Egyptian pyramid building. For their work was *Epi-methean* only, or from hand to

mouth, year by year, and each year in itself and by itself only.

Neither of these *quasi*-vertical joints, however, would exactly suit the 2170 B.C. date; they were both of them too early. But on the surface of the stone following the last of them, and containing the 2,170 distance within its length, *there* was a more unique marking still. Something it was, more retiring, more difficult to discover, and yet commending itself still more when discovered, though not having the slightest approach to either letter of language, or form of drawing, and certainly not to any species of idolatry.

This mark was a line, nothing more, ruled on the stone, from top to bottom of the passage wall, at right angles to its floor. Such a line as might be ruled with a blunt steel instrument, but by a master-hand for power, evenness, straightness, and still more eminently for rectangularity to the passage axis. I had made myself a large square at the Pyramid in 1865, a wooden square well trussed and nearly the whole height of the wall, and therewith tested the error of rectangularity of every masonry joint therein; and in every case had found some very sensible quantity of such error; but on coming to the ruled line, I could find no certainly sensible error there. If I suspected it occasionally, a reversal of the square then and there proved that heat or strain had caused some temporary twist in my instrument's wooden frame; but it could positively and permanently accuse the ancient line on the stone, of nothing wrong.*

There was one such line on either wall, the west and the east, of the passage; and the two lines seemed to be pretty accurately opposite each other; while the two pair of *quasi*-vertical joints were not exactly so;

* See "Life and Work," vol. ii. p. 29.

and the other joints in the walls pretended to, and generally had, no correspondence whatever. All things, therefore, both in symmetry, beauty of truth, and correctness of position, culminated in favour of these two thin lines; viz., the one anciently ruled line on the west wall, and the similarly ruled line on the east wall; and I looked at them with still more interest afterwards, when there appeared good reason to consider them the work of the very same hand that laid out, in *Promethean* manner, the entire proportions of the whole Great Pyramid. For when Messrs. Aiton and Inglis excavated and (with my assistance) laid bare the south-west socket of the Great Pyramid in April, 1865,—there, upon the fair white flattened face of the said socket rock, while three sides were formed by raised edges of stone, the fourth and outer side was defined simply by a line; but a line ruled apparently by the very same hand and selfsame tool which had also drawn these other truthful lines in the entrance-passage.

Yet though I had admired these lines so much,—witness the pages of "Life and Work," published in 1867,—I had never thought of them before in connection with possible indications of date, or, indeed, of anything else, by virtue of their precise and absolute *place;* and hence it was, that when Mr. Casey required in 1872 to know exactly where, on the floor, the line on either side touched that plane (measured, too, not from the top of the entrance-passage comparatively close by on the north, but from the beginning of the Grand Gallery far away to the south), there was no ready prepared record to say. That is, nothing more than the readings of the masonry joints next above and below the spot, together with a mere memorandum that the ruled line was within "a few inches" of one of them. Every intervening measure by joints between the two extremes, and over scores of joints, had

been procured, printed, and published to the world in 1867; but just the last item required, merely the small distance from the nearest joint to the drawn line, was wanting. (See Plate XVII.)

So I wrote out to my friend Mr. Waynman Dixon, C.E., then (1872) actively engaged in erecting his brother's bridge over the Nile, near Cairo, requesting him to have the goodness to make and send me careful measures of the distance, whatever he should find it to be, of the fine line on either passage wall at the Pyramid, from the nearest one of the two *quasi*-vertical joints; not giving him any idea what the measure was wanted for, but only asking him to be very precise, clear, and accurate. And so he was; taking out also as companion and duplicate measurer his friend Dr. Grant, of Cairo; and their doubly attested figures were sent to me on diagrams, where they were written into their places, in a manner which left no room for any misunderstanding.

With this piece of difference measure thus happily obtained at so late a date, I set to work again on my older joint measures of the whole distance; and was almost appalled when, on applying the above difference, the east side gave forth 2170·5, and the west side 2170·4 Pyramid inches.

"This testimony satisfies me and fills me with thankfulness and joy," wrote Mr. Casey; while I, never expecting to have measured so closely as that, along either side of those lengthy, dark and sloping Pyramid passages (where the measuring-rods, if not tightly held by hand to the floor, have a knack of slipping away and shooting down to the bottom), I, not understanding how such apparently close agreement came about, and knowing that it was not my desert,—can only conclude this chapter with a condensed,

small-type representation of the figure work involved in bringing out the results; results more laboriously, and also, perhaps, more rigidly, impartially, and unexceptionally gained, than can well be imagined by any one else without going through some *conspectus* of the many details.

THE RULED LINES IN THE ENTRANCE PASSAGE OF THE GREAT PYRAMID,

TESTED FOR THEIR DISTANCE FROM THE NORTH BEGINNING OF THE GRAND GALLERY, AND FOR THE CRITICAL NUMBER 2170.

The measures of these lines from the nearest masonry joint, were kindly sent to me by Mr. Waynman Dixon, from Egypt, with attestations by his friend, Dr. Grant, of Cairo, on August 19, 1872, thus:—

"*East Wall—Entrance Passage.*

"Distance of Ruled Line from masonry wall joint north of it,
at the top of the wall . . = 13·25 British in.
at the bottom of the wall. . = 4·37 „

"*West Wall—Entrance Passage.*

"Distance of Ruled Line from masonry wall joint north of it,
at the top of the wall . . = 17·80 British in.
at the bottom of the wall . . = 7·55 „

"The above distances were measured by Mr. Waynman Dixon, C.E., and checked by Dr. Grant," and were accompanied by drawings showing that the lines were assumed to be rectangular (which they are) to the length of the passage, while the masonry joints they were referred to were nearly vertical, and were the southernmost members of a pair of such *quasi*-vertical joints on either wall.

Examination for Accuracy.

The above measures are generally agreeable to my own approximate indication of the position of the lines, though I was rather surprised to find by Mr. Dixon's numbers, that the line on the west wall is farther from its reference joint, than that on the east wall is from its reference joint there, by so large an amount as nearly 4 inches.

It became therefore prudent, before embarking in any speculation on the whole return, to make an independent inquiry into the degree of accuracy of Mr. Dixon's measures, in *one* feature at least, where they admitted of that wholesome scientific discipline.

Accordingly, if we subtract, in the case of each wall separately, Mr. Dixon's lower difference reading from the upper, we attain a difference of the differences, East = 8·88 inches, and West = 10·25 inches. And on the assumption of the *lines* being rectangular to the length of the passage, these residual quantities show how much the *joints* deviate from

rectangularity towards verticality, as measured along the top of the wall; or they form the shortest side of a plane triangle, of which the longest side is the *quasi*-vertical joint, and the medium side the transverse height of the wall, equivalent to the length of the ruled line.

Now the shortest side of that triangle I did in a manner measure in 1865; for in pp. 29 and 30 of vol. ii. of "Life and Work," the deviation of each of the said *quasi*-vertical joints (from rectangularity towards verticality) is stated as being, or amounting to, at the top of the wall,—1st, by an approximate method:—

The east *quasi*-vertical joint . . . = 8 ± *x* inches,
And the west ,, . . . = 9 ± *x* inches.

2nd, by a more accurate method:—

The east *quasi*-vertical joint . . . . = 9·1 inches,
And the west ,, ... = 10·4 inches;

while the line ruled on the east wall deviated from rectangularity by only 0·04 inch, and that on the west wall by less than 0·01 of an inch.

Now Mr. Dixon's numbers for the same two joints' deviations being—

For the east *quasi*-vertical joint . . . = 8·88 inches,
And for the west ,, . . . = 10·25 inches,

they come between my two pairs of quantities, and closer to that pair of them which was previously stated to be by the more accurate method. The result of examination is therefore highly gratifying, and shows that we may certainly depend on Mr. Dixon's measures, say, to the tenth of an inch, at least; and that is no more than the fortieth part of the apparently anomalous difference of his absolute distances of each line from its nearest joint at the bottom of its own wall.

That difference, then, of the absolute distances must be a real quantity at the Pyramid; and the line on the west wall must be actually 4 inches or so further from the joint there, than that one on the east wall is from the joint there. Wherefore much may perhaps depend at last on what effect such large difference may have, in modifying the final result on a certain whole quantity which has now, after a repose of several years, been suddenly required, in order to furnish a test for a new hypothesis.

Trial of Mr. Casey's Hypothesis.

Mr. Casey had thus far simply announced, that to fulfil certain important theoretical ends, the passage floor distance in the Great Pyramid (measured from the north end of the Grand Gallery, down the floor of the first ascending, and up the floor of the entrance-passage, to where that floor is at last touched on either side by the lower ends of these two anciently ruled wall lines) should amount to 2,170 Pyramid inches, neither more nor less within the probable errors of measurement.

At present I need only state that the north end of the Grand Gallery is a very well preserved and sharply defined plane; a good starting-point therefore for measures; and that, excepting some rather troublesome, but by no means impossible, features at the junction of the two passages, the whole distance is plain, clear, and perfectly amenable to modern measure.

Indeed every inch of the way (excepting only the small piece now supplied by Mr. Dixon) has been, at one time or another, measured by me, and its chief portion even two or three times over, and on either

side of the passages, with results too which have been published before the world for five years. The numerical facts therefore are, so far, very firm; and if the measures, as originally taken, have as yet only been presented anywhere piecemeal, and with numbers increasing in two different series from north to south, in place of, as now required, in one long accumulation from south to north—that is an additional guarantee that the measures taken in 1865 could not have been influenced by any desire to bring out the result of Mr. Casey's hypothesis in 1872.

We proceed therefore to the first portion of the whole distance now demanded, viz., from the north end of the Grand Gallery, down the floor of the first ascending passage, until that floor produced cuts the opposing floor of the entrance-passage. This portion we may call A.

The elements for the length A are given in "Life and Work," vol. ii., in the shape,—

1st. Of the floor distances, in British inches, joint by joint, from a specified joint near the lower end, up to the terminal joint at the upper or southern end of the first ascending passage, and they have been measured twice over by me on either side of the passage.

2nd. The portcullis length, from that lower specified joint downwards to the still lower butt-end of portcullis, measured only once, and on the east side of the passage only.

3rd. The distance from that lower butt-end, slantingly across the entrance-passage to *its* floor, in the direction of the opposing floor of the first ascending passage produced downwards, and given here in three portions, each of which has been measured on either side of the passage.

The following Table contains all these distances required for A, and they are finally reduced from British, to Pyramid, inches in the two right-hand columns.

TABLE I.

FLOOR-JOINT *distances from north beginning of Grand Gallery, towards lower end of first ascending passage; or complements of the numbers in third columns of pages* 48 *and* 49 *of "Life and Work," vol. ii.*

NUMBER OF FLOOR-JOINT.	INDIVIDUAL MEASURES IN BRITISH INCHES.		SUMMATIONS IN BRITISH INCHES.		SUMMATIONS IN PYRAMID INCHES.	
	East side.	West side.	East side 1291·2 — distance.	West side 1291·1 — distance.	East side.	West side.
Starting joint of first ascending passage of Great Pyramid; at the top or upper end of that passage, near the Grand Gallery . . 0	...	...	0·2	0·1	0·2	0·1
1	...	...	58·0	57·6	57·9	57·5
2	...	...	119·3	...	119·2	...
3	...	...	177·8	176·6	177·6	176·4
4	...	...	208·5	207·4	208·3	207·2
5	...	...	257·3	255·7	257·0	255·4
6	...	...	290·8	...	290·5	...
7	...	...	343·8	341·9	343·5	341·6
8	...	...	384·8	383·4	384·4	383·0
9	...	...	416·5	413·6	416·1	413·2

TABLE I. (*continued*).

NUMBER OF FLOOR-JOINT.	INDIVIDUAL MEASURES IN BRITISH INCHES.		SUMMATIONS IN BRITISH INCHES.		SUMMATIONS IN PYRAMID INCHES.	
	East side.	West side.	East side 1291·2 — distance.	West side 1291·1 — distance.	East side.	West side.
10	...	...	465·5	463·6	465·0	463·1
11	...	...	502·9	500·1	502·4	499·6
12	...	...	537·6	537·1	537·1	536·6
13	...	...	590·7	589·3	590·1	588·7
14	...	...	623·7	622·1	623·1	621·5
15	...	...	...	660·1	...	659·4
16	...	...	691·4	689·4	690·7	688·7
17	...	...	746·7	745·8	746·0	745·1
18	...	...	796·9	795·2	796·1	794·4
19	...	...	829·2	828·0	829·4	827·2
20	...	...	891·7	890·0	890·8	889·1
21	...	...	941·7	931·5	940·8	930·6
22	...	...	991·4	981·5	990·4	980·5
23	...	...	1044·7	1036·5	1043·7	1035·5
24	...	...	1094·7	1087·5	1093·6	1086·4
25	...	...	...	1124·5	...	1123·4
Lower part of first ascending passage, near the Portcullis . . 26	...	...	1168·7	1161·3	1167·5	1160·1
27	...	...	1209·6	1199·8	1208·4	1198·6
28	...	...	1246·0	1242·0	1244·8	1240·8
29	...	...	1291·2	1291·1	1289·9	1289·8
SPECIAL ADDITIONS.						
Portcullis length (see p. 54 of vol. ii. of "L. and W.") . . .	178·8	(178·8)*	1470·0	1469·9	1468·5	1468·4
To roof of entrance-passage, or *c f* (see p. 41, vol. ii. of "L. and W.") . . .	14·2	14·1	1484·2	1484·0	1482·7	1482·5
To axis of entrance-passage; or the quantity *f i* . .	29·8	30·0	1514·0	1514·0	1512·5	1512·5
To floor of entrance-passage; in direction of the first ascending passage produced downwards, or *i l* . .	29·8	30·0	1543·8	1544·0	1542·3	1542·5
Whole distance from north beginning of Grand Gallery, down the floor of first ascending passage produced downwards to touch the floor of descending entrance-passage; or the quantity **A**, in pyramid inches					1542·3	1542·5

* Not directly measured, only inferred, on this western side of the Passage.

We next take up the remaining portion of the whole quantity required for Mr. Casey's hypothesis, or the distance from the intersection plane of the floors of the two passages, up the entrance-passage's floor northward; to where that floor is touched on either side by the bottoms of the two ruled wall lines: a portion we shall call B.

But this portion B we must necessarily compute in two steps; first, in Table II., setting forth the readings of all the *floor joints* of the entrance-passage on the floor, the supposed sheet of, or for, historic record; and second, in Table III., setting forth first for the east side, and then for the west side, the readings of every *wall joint*, on the floor's above described record plane; this will be the B which we are in search of; and will have A added to it in the two last columns, so as there to present the quantity A + B, for the wall-joints in the entrance-passage.

Finally, to the wall-joint reading A + B, for the particular joint measured from by Mr. Waynman Dixon, we must apply his measured difference of the lower end of the ruled line therefrom.

TABLE II.

FLOOR-JOINT *distances from contact plane in Descending Entrance Passage, upwards and northwards to its upper north end, or beginning.*

NUMBER OF FLOOR-JOINT.		SUMMATIONS IN					
		BRITISH INCHES.				PYRAMID INCHES.	
		East side.		West side.		East side.	West side.
The starting-point being not a joint, but the contact plane with the floor of first ascending passage produced downwards, or line "*l*" on p. 42, vol. ii., of "L. & W."		987·2 — distance. (See p. 42, vol. ii., "L. & W.")	+ 1543·8	985·6 — distance. (See p. 42, vol. ii., "L. & W.")	+ 1544·0	Whole distance from north beginning of Grand Gallery.	Whole distance from north beginning of Grand Gallery.
Starting-line . "*l*"		0·0	1543·8	0·0	1544·0	1542·3	1542·5
Joint from "*l*" low down in entrance-passage .	1	46·8	1590·6	46·5	1590·5	1589·0	1588·9
	2	82·0	1625·8	81·7	1625·7	1624·2	1624·1
	3	106·6	1650·4	106·5	1650·5	1648·7	1648·8
	4	146·6	1690·4	146·5	1690·5	1688·7	1688·8
	5	195·2	1739·0	195·0	1739·0	1737·3	1737·3
	6	231·6	1775·4	231·5	1775·5	1773·6	1773·8
	7	284·4	1828·2	283·1	1827·1	1826·4	1825·3
	8	335·3	1879·1	334·5	1878·5	1877·2	1876·7
	9	375·7	1919·5	374·0	1918·0	1917·6	1916·1
	10	414·5	1958·3	410·1	1954·1	1956·4	1952·1
	11	467·5	2011·3	463·2	2007·2	2009·3	2005·2
	12	526·7	2070·5	525·7	2069·7	2068·5	2067·6
	13	578·5	2122·3	578·1	2122·1	2120·2	2120·0
The line on the wall is due somewhere between these two floor-joints.							
	14	644·7	2188·5	644·3	2188·3	2186·3	2184·0
	15	703·6	2247·4	703·5	2247·5	2245·2	2245·3
	16	772·0	2315·8	769·2	2313·2	2313·5	2310·9
	17	827·0	2370·8	824·6	2368·6	2368·4	2366·3
Near beginning or upper, or north end of the entrance-passage .	18	885·0	2428·8	883·5	2427·5	2426·4	2425·1
	19	932·6	2476·4	931·5	2475·5	2474·0	2473·0
	20	987·2	2531·0	985·6	2529·6	2528·5	2527·1

N.B.—Had Mr. Waynman Dixon measured the lower end of the ruled lines from a *floor*-joint, we should now have been in a position, with this table, to have obtained for each ruled line the ultimate reading required. But his measure of a difference being from a *wall*-joint, we must now prepare a further tabular representation of the readings, on the floor-plane, of each of the *wall*-joints, and this for either wall separately; or thus :—

TABLE III.

WALL-JOINT *distances at their lower ends; or where they touch the floor in the* ENTRANCE PASSAGE; *reckoned from that* FLOOR'S *contact plane with the floor of first ascending passage (produced downwards), and proceeding upwards to the upper or north end of Entrance Passage.*

EAST WALL (BY ITSELF).
Floor's contact plane 987·2 British inches from its beginning at north end.
(See page 42, vol. ii., of "Life and Work.")

Number of Wall-joint, referring only to the bottom thereof.	Distance south from basement beginning. (See p. 24, vol. ii.)	Inverse distance, or distance from contact plane, north.	The same + 1543·8; or whole distance from the north beginning of Grand Gallery = A + B.	
			British Ins.	Pyramid Inches.
1st wall-joint, above, or north of floor's contact plane	957·8	29·4	1573·2	1571·6
2 " " "	917·0	70·2	1614·0	1612·4
3 " " "	854·2	133·0	1676·8	1675·1
4 " " "	821·3	165·9	1709·7	1708·0
5 " " "	761·3	225·9	1769·7	1767·9
6 " " "	717·1	270·1	1813·9	1812·1
7 " " "	658·9	328·3	1872·1	1870·2
8 " " "	605·1	382·1	1925·9	1924·0
9 " " "	537·1	450·1	1993·9	1991·9
10 " " "	501·0	486·2	2030·0	2028·0
11 " " "	442·2	545·0	2088·8	2086·7
12 " " "	387·3	599·9	2143·7	2141·6
The wall line due somewhere here.				
13 ! Approximately vertical .	353·9	633·3	2177·1	2174·9
14 ! Approximately vertical .	290·0	697·2	2241·0	2238·8
15, half-height	219·2	768·0	2311·8	2309·5
16, half-height	150·4	836·8	2380·6	2378·2
17, half-height	110·2	877·0	2420·8	2418·4
North beginning of basement sheet of entrance-passage .	0·0	987·2	2531·0	2528·5

WEST WALL (BY ITSELF).
Floor contact plane 985·6 British inches from basement beginning.
(See page 42, vol. ii., of "Life and Work.")

Number of Wall-joint, &c., &c.	Distance south from basement beginning. (See p. 21, vol. ii., "L. & W.")	Inverse distance, or distance from contact plane, north.	The same + 1544·0; or whole distance from the north beginning of Grand Gallery = A + B.	
			British Ins.	Pyramid Inches.
1st wall-joint, above, or north of floor's contact plane .	981·1	4·5	1548·5	1547·0
2 " " "	931·5	54·1	1598·1	1596·5
3 " " "	871·1	114·5	1658·5	1656·8
4 " " "	842·0	143·6	1687·6	1685·9
5 " " "	801·5	184·1	1728·1	1726·4
6 " " "	766·9	218·7	1762·7	1760·9
7 " " "	740·4	245·2	1789·2	1787·4
8 " " "	681·3	304·3	1848·3	1846·5
9 " " "	639·1	346·5	1890·5	1888·6
10 " " "	562·1	423·5	1967·5	1965·5
11 " " "	527·1	458·5	2002·5	2000·5
12 " " "	482·1	503·5	2047·5	2045·5
13 " " "	427·1	558·5	2102·5	2100·4
14 " " "	391·7	593·9	2137·9	2135·8
The wall line due somewhere here.				
15 ! approximately vertical .	349·4	636·2	2180·2	2178·0
16 ! approximately vertical .	289·8	695·8	2239·8	2237·6
17, half-height	207·6	778·0	2322·0	2319·7
18, half-height	152·6	833·0	2377·0	2374·6
19, half-height	110·0	875·6	2419·6	2417·2
North beginning of basement sheet of entrance-passage .	0·0	985·6	2529·6	2527·1

The absolute place, then, on the *floor's* scroll of history, in terms of our A + B, of the base of that wall-joint from which Mr. Dixon measured the ruled line, is on the

East side . . . . . = 2174·9 Pyramid in.
And on the west side . . . . = 2178·0 "

And Mr. Dixon's measured difference at the base amounting to—

On the east side . . . . . = 4·4 inches.
And on the west side . . . . = 7·6 "

And the signs of these quantities being negative, or showing that they are to be subtracted, we have for the absolute readings or dates of the two ruled lines, in terms of the strictest requirements of Mr. Casey's hypothesis—

On the east side . . . . . = 2170·5 Pyramid inches.
And on the west side . . . . = 2170·4

Or exhibiting an agreement with the hypothesis to less than $\frac{1}{50000}$th part of the whole; and one side agreeing with the other to within $\frac{1}{200000}$th of the whole.

This is a much closer degree of approach than I had expected my measures were capable of, or still think they deserve; and I should have had some scruple in publishing the case, had not the whole of the data been so perfectly impossible to have been knowingly influenced at the time they were made, printed, and published.

But I must leave it to the candid reader to say, whether the rest of this book's contents tend to raise that one case of agreement above or below simple coincidence only.

PART V.

INEVITABLE CONCLUSIONS.

"HOW SAY YE UNTO PHARAOH, I—THE SON OF THE WISE, THE SON OF ANCIENT KINGS?

"WHERE ARE THEY? WHERE ARE THY WISE MEN? AND LET THEM TELL THEE NOW, AND LET THEM KNOW WHAT THE LORD OF HOSTS HATH PURPOSED UPON EGYPT."—ISAIAH XIX., 11, 12.

CHAPTER XXI

HIEROLOGISTS AND CHRONOLOGISTS.

NO land has been so variously treated in chronology as the valley of Egypt; for even if the early mysticisms of so-called divine kings during 36,500 years be exploded, there are equally extraordinary modern theories. By some of the rationalistic writers on, and inventors of, history, for instance, in latter times, the earliest Egyptian kings have been pushed forward far above all monumental dates up to 10,000, 20,000, and even 300,000 years ago; with the accompanying statement, too, that even at that remote epoch there were no signs of any gradual emergence out of a primitive savage condition, but only of an already highly organised and well-governed community, which must therefore on the human hypothesis, have commenced to run its civilized course an infinite length of time previously.

More recently still, not only have geologists claimed to have discovered proofs (in fragments of pottery dug up at a great depth in the alluvial deposit of the Nile) of an existence of first-rate human manufactures there during more than 13,000 consecutive years; but there are many very worthy men who still attach much importance to the computations made, astronomically, from certain configurations of the ecliptic and equator in the celebrated zodiacs of the Nilotic temples of Dendera, Esneh, and E' Dayr.

The first class of authors mentioned, in a great measure, either stand or fall with the two latter; and upon the proofs, more or less material, which they have been supposed to offer in confirmation of their theories.

Now, of the geological evidence, it has lately been argued by the acute Professor Balfour Stewart, of Owen's College, Manchester, that a solid mass of any substance of notable size, has an effective tendency to work its way downwards through a bed of finely-divided particles of both similar, and extraneous, matter; wherefore it is no positive proof, ages after a big bone, or piece of pottery, or flint hammer of comparatively large dimensions, was deposited on a certain soil, that it should be of the same date as the smaller particles of the stratum it is subsequently found in; for it may have worked its way downwards while these particles were still mobile.

This law its author illustrated in the case of celts immersed in finely-divided silex powder; and if it is true at all, it must be especially applicable to the later Egyptian geology. For there, all the valley is not only composed of the so-called slime of the Nile (microscopically fine particles of granite, porphyry, limestone, and the other rocks washed and rolled over by the mighty river in its long course from the equator), but is visited every year by the inundation; which may be regarded as a grand tide of a secular order, producing amongst the slime's small component particles the same sort of lively quicksand effect, but in a superior degree, which is witnessed on the Goodwin Sands, whenever an ordinary periodical, or only twelve-hour, tide rises there.

The geological evidence, then, for a very long chronology, under such circumstances, is specious in the extreme; while the supposed astronomical, is considerably worse; having even had a decided refutation given to its very essence, through means of recent

hieroglyphical readings, and in this way. The painted Egyptian zodiacs already alluded to, no matter how grossly they caricatured the positions of the stars, had been fondly considered, by those who sought a high antiquity for Egypt, to have been invariably constructed so as to represent something in the heavens as seen in their own day; and if they were found to have made a very badly drawn equator crossing the ecliptic, equally murdered, 180° from its present position, that was taken as a proof that the ceiling, or the walls containing those things must have been sculptured when the equator did cross the ecliptic in that longitude; *i.e.*, 12,900 years ago, according to the now known rate of the precession of the equinoxes in good Newtonian astronomy.

But this is plainly no scientific proof; for any stone-mason can at any time, if you give him an order so to do, and a pattern to go by, carve you a zodiac with the equator crossing the ecliptic in any constellation whatever; and with vastly more scientific accuracy of detail than any of those profane Egyptian temple pictures have yet been accused of.

There was never, therefore, any real stability in the groundwork for those pseudo-astronomically computed chronologies; while during the last thirty years the whole of such false growth has been felled to the ground, by the successive discoveries of the new hierologists, Young, Champollion, and their followers; who have proved incontestably, by interpreting the hieroglyphic inscriptions mixed up with the pictures, that the zodiac temples were the latest of all the Egyptian monuments; that they dated only from the time of the late Ptolemies, and even some of the Roman emperors; and were the work of house-painters rather than astronomers.

Had hieroglyphic study, therefore, done nothing else than demolish the absurd antiquity given, on mistaken

grounds, to the astronomico-idolatrous Egyptian temples of late date, it would have deserved well of mankind; but it has done more than that, though perhaps not quite so much, nor always quite so well, as its ardent students have claimed for it.

Egyptian Hieroglyphics versus Greek Scholarship.

Commenced by the discovery of the Rosetta stone in 1802; vivified by Young and Champollion about 1820; and, since then, most ably developed by Rosellini, Gardner Wilkinson, Birch, Osburn, Lepsius, Poole, De Saulcey, De Rougé, Brugsch, Mariette, and many others,—hieroglyphical interpretation has rendered the nineteenth century vastly more intimately acquainted with the home life of early Egypt, than any century has been since the times of actual Apis and Osiris worshipping by the Egyptians themselves.

The sudden ability thus acquired, to read the writings of a people who departed all visible life nearly two thousand years ago, infused at the time extraordinary enthusiasm into all the hieroglyphic students; who congratulated each other, and ancient Egypt too, unceasingly, on the treasure-house of human wisdom which they had so successfully opened up.

"Dark," said they—

> "Dark has been thy night,
> Oh, Egypt! but the flame
> Of new-born *science* gilds thine ancient name."

And how does *that* science gild it? Not by having set forth any grand philosophy or estimable literature; for such things are so very far from existing in the hieroglyphics, that at last the late Sir George Cornewall

Lewis, impatient of the Egyptological boastings, and judging of what had been produced, from his favourite stand-point of *Greek* authors,—both condemned all the Mizraisms which had up to that time been interpreted; and concluded from their sample, that there is nothing worthy of being known remaining to be interpreted in all the rest of the hieroglyphics of the reputedly *wise* land of Egypt.

So if there *is* anything worth gilding at all, it is perhaps rather to be looked for in chronology than literature; for the Egyptians were, of all men, the record keepers of the early world: not only perpetually erecting monuments, but inscribing them all over with their clearly-cut-out hieroglyphic inscriptions; while the dry climate of their country has preserved even to these times almost whatever they chose to inscribe, large or small.

Yet after years of study, our great Egyptologic and hieroglyphic scholars are agreed on nothing chronological, except something like the order of precedence, or comparative succession, of old Egyptian kings, and dynasties of kings;—for when they come to give the absolute dates of any of the reigns, they differ among themselves by 1,000, 2,000, 3,000 or more years with the utmost facility, just as they choose to consider the literary dynasties of Manetho more or less successive, rather than coexistent, in different cities or provinces of ancient Egypt.

But while Manetho, though an Egyptian priest, was not contemporary with the most critical times he alludes to (having lived under the Macedonian subjugation of his country, and his work having only come down to us in fragmentary quotations in late monkish authors), certain good Greek scholars amongst ourselves (men who would have been thoroughly approved of by Sir G. C. Lewis), have, after studying the purely Alexandrian

writers most deeply and extensively, and at those historic periods when they declare hieroglyphics were still intimately and generally understood in that land,—they have, I repeat, raised the standard of opposition against the modern *soi-disant* Egyptologists, or Champollionist interpreters of the monumental inscriptions; and oppose both the order, and absolute dates, as well as the names for the early Egyptian kings and chief events, as usually given by those gentlemen.*

Of the whole merits of this grand contest, neither is this book the place, nor myself the author, wherein and by whom, it should be discussed. But there are certain of the results, from either side, which cannot be passed by, in connection with our proper Great Pyramid subject.

Differential Chronology of the Egyptologists.

When the Egyptologists, for instance, confess, as they have done most distinctly even within the last year, that they know, amongst all their profane monuments of Old Egypt, not a single one capable of expressing, or giving, in its inscription *an absolute date*, while *we* have seen abundantly from what is already set forth in this book, that the Great Pyramid does assign its absolute date most distinctly, and more and more distinctly the higher science it is examined by,—evidently an invaluable type of separation has been ascertained between the one Christianly sacred monument in Egypt on one hand, and, on the other, the whole herd of that land's profane monuments, the only research-ground which our modern Egyptologists seem to care for.

* See "Egypt's Record of Time to the Exodus of Israel," critically investigated by the Rev. W. B. Galloway, M.A., Vicar of St. Mark's, Regent's Park, London.

Again, while the leading principle, and very sheet-anchor, of the best Egyptological-chronologists is, to seek out and confide in "*monuments;*" to consider nothing fixed in Egyptian history or fact, unless there is a monument to show, and that monument contemporary, or nearly so, with the facts to which it relates, —they allow faithfully that they know of no monuments whatever, earlier by more than a very few years, even if by so much, than the Great Pyramid.

Dr. Lepsius is very clear on this point. In his "Letters from Egypt," he wrote from the tombs before the Great Pyramid in 1843 :—"Nor have I yet found a single cartouche that can be safely assigned to a period previous to the fourth dynasty. The builders of the Great Pyramid seem to assert their right to form the commencement of monumental history, even if it be clear that they were not the first builders and monumental writers." And again, he says, "The Pyramid of Cheops, to which the first link of our whole monumental history is fastened immovably, not only for Egyptian, but for universal history." And in his great work of illustrations, the "Denkmaeler" of subsequent years, the Doctor adheres to the above view, and opens that immense chronological series with the Great Pyramid.

Hence we may dismiss entirely all the 300,000 years of civilised life in Egypt before the Great Pyramid, as rashly asserted by a late rationalistic writer, because he has no "monuments" to show for that long period. But for such period as the Egyptologists do bring up monuments; viz., from the Great Pyramid downwards, almost without a break,—there we can hardly but pay some attention to their schemes of the differential chronologic history of Egypt, and which they place variously thus :—

BEGINNING OF EACH DYNASTY OF ANCIENT EGYPT, ACCORDING TO VARIOUS EGYPTOLOGICAL SCHOLARS, GUIDED PARTLY BY MANETHO, WHOSE OWN BOOK THEY HAVE NOT; AND PARTLY BY THE MONUMENTS, WHICH THEY CONFESS DO NOT GIVE ABSOLUTE DATES.

Number of Dynasty.	Date according to the Average of				Prevailing architecture at the Dates.
	Lesueur, Mariette, Renan, &c.	Lepsius, Bunsen, Fergusson, &c.	Lane, Wilkinson, Rawlinson, &c.	William Osburn.	
	B.C.	B.C.	B.C.	B.C.	
1	5735	3892	2700	2429	Memphian
2	5472	3639	2480	2420	Pyramid
3	5170	3338	2670	2329	Builders?
4	4956	3124	2440	2228	The Great
5	4472	2840	2440	..	Pyramid.
6	..	2744	2200	2107	Memphian Rock-Tomb,
7	..	2592	1800	..	and smaller
8	..	2522	1800	..	Pyramid,
9	..	2674	2200	2107	Builders.
10	..	2565	..	1959	
11	3435	2423	2200	2107	
12	..	2380	2028	..	
13	..	2136	1920	..	
14	..	2167	2080	..	
15	..	2101	2080	1900	
16	..	1842	1800	1900	
17	..	1684	1776	..	Theban
18	..	1591	1520	1674	Palace-Temple and Rock-
19	1314	1443	1324	1394	Tomb Builders.
20	..	1269	1232	1314	

Now when a scientific pyramidist, on the other hand, or from his point of view and sources of information, confines himself to stating relatively that the Great Pyramid was erected in the times of the "Fourth Dynasty,"—he is evidently in accord with all the Egyptologists of every order and degree; but when he further defines that it was erected at the absolute date of 2170 B.C., he is in accord with one only of the whole

of them, viz., William Osburn, for he makes the fourth dynasty to extend from 2228 to 2108 B.C.

On finding this solitary case of agreement, in the course of 1866, I immediately obtained a copy of that author's two-volume work, "Monumental History of Egypt;" and was so well satisfied with the vigour and originality of his mind, his linguistic power, and his conscientious labours, that I sought out every other work that he had written; and was eventually rewarded with a long correspondence with himself; and found him a man who, though he did not please his fellow-Egyptologists, yet seemed worthy to be regarded as the king of them all. Partly, too, by the light of his writings, reading Lepsius and Howard-Vyse over again, I am now enabled to give the following comparative, but still only approximate, view of the Great Pyramid among the other pyramids of Egypt, and in probable date, as well as shape, size, and position. (*See* Table.)

The Great Sphinx.

And now it may be remarked by anxious readers, that though I have said so much about the Great Pyramid, and something touching almost every other pyramid in Egypt also,—I have said nothing about the Sphinx.

That was just what the Reviewers wrote against Professor Greaves after the publication of his Pyramidographia, 230 years ago. Though indeed one of his querists presently answers himself, by supposing, that the Professor must have found at the place, that the said Sphinx had in reality no connection with the Great Pyramid.

Exceedingly right, too, was the critic in that supposition; for not only has the oval of a king, one thousand years and several dynasties later than the date of the Great Pyramid, been found unexceptionably upon the Sphinx,—but that monster, an idol in itself,

with symptoms typifying the lowest mental organization, positively reeks with anti-Great Pyramid idolatry throughout its substance; for when the fragments or component masses of its colossal stone beard were discovered in the sand excavations of 1817, it was perceived that all the internally joining surfaces of the blocks had been figured full of the animal-headed gods of the most profane Egypt.

Strange therefore that Dean Stanley's professional eye should have seen in so soul-repulsive a creature, "with," as he himself further and more objectively describes, "its vast projecting wig, its great ears, the red colour still visible on its cheeks, and the immense projection of the whole lower part of its face,"—an *appropriate* guardian to the Sethite, and most anti-Cainite, Great Pyramid, whose pure and perfect surface of blameless stone, eschews every thought of idolatry and sin.

The Recent Discovery about the Sphinx.

But the reign of the Great Sphinx over the souls of some men, is not over yet.

Long since I had remarked that there is no agreement possible between the Great Sphinx and the Great Pyramid. Those who admire the one, cannot appreciate the other.

As a rule, it is Frenchmen and Roman Catholics (though there are happily brilliant exceptions amongst them), who get up the most outrageous enthusiasm for the Sphinx; and it was given to one of these lately, in the person of the eminent Mariette Bey, to set the whole world agog (for a time) with a supposed monumental proof that the Sphinx, instead of belonging, as hitherto so generally supposed, to the 11th or 15th Dynasty, was far older than the Great Pyramid in the 4th Dynasty; and was in fact so ancient, that it had be-

come an object of dilapidated, but revered, antiquity in the times of King Cheops himself, who immortalised his name, in his very primeval day, by repairing it.

The latest description of this case by Mariette Bey himself, is at p. 211 of the fourth edition of his Catalogue of the Museum of Egyptian Antiquities at Boulak.

No. 581 is there spoken of as "a fragmentary stone, which may be *supposed* to have formed once part of a wall, of a certain building, or temple, some problematical ruins only of which have been found near one of the small pyramids on the east side of the Great Pyramid." The stone is abundantly inscribed with little hieroglyphics; "in good preservation but of *mediocre style*," euphuistically puts in Mariette Bey,—but, "*more like scratches than anything else*," writes my plain-speaking friend, Dr. Grant of Cairo.

This circumstance of bad, or of no, style, or of an idle modern scribble in place of a serious piece of deep and well-performed ancient sculpture, which carries great weight with it in monumental research,—is not represented in the version of the inscription given with honour (and with well-cut hieroglyphic types from other models) by Dr. Birch in the last volume of Bunsen's "Egypt's Place in History." For the Doctor prints good, thick-set, well-formed, hieroglyphics, looks only to one possible interpretation *of them*, and adopts that with positivism. No wonder either, in some respects; for a great day it must have been for the idolatries of old Egypt and its latter day, not worshippers, only sympathetic admirers, when Mariette Bey first published his discovery of this astonishing inscription. There is good news in it for almost every one of the Mizraite false gods; so that all profanely devout readers may learn with thrilling interest that the images of the hawk of Horus and the ibis of Thoth, in that problematical temple, of which this single stone may be

supposed to have once formed a part, were of wood gilt; the boat of the "three times beautiful Isis" was in gilt wood with incrustations of jewels; that the principal statue of Isis was in gold and silver; the statue of Nephthys in bronze gilt, and &c., &c., as to many other ordinary idols; but surpassing words of admiration and adoration were added touching the Great Sphinx of Horem-Kou, the biggest idol of all, and declared to be situated just to the south of the "Temple of Isis, the Ruler of the Great Pyramid."

On showing this version of the inscription to Mr. Osburn, he instantly pronounced it to be an anachronism; it had, he said, nothing to do *contemporaneously* with Cheops, or the 4th Dynasty either; it was merely a rigmarole by certain revivifiers of the ancient Egyptian idolatry, with additions, under the late 26th Dynasty.

But William Osburn was a firm believer in the Divine inspiration of the Bible, and the rebellious human origin of the Egyptian gods; that they had been invented, as very refuges of lies, in slavish fear of, but determined Cainite opposition to, the God of Heaven, whose supranatural acts in the Deluge and Dispersion were then recent and overwhelming to the human mind, rendering atheism in that day perfectly impossible to even the least reasonable being. Wherefore the most fargone of the modern Egyptological scholars utterly refused to attend to *his*, Osburn's, condemnation of Mariette's wonderful stone; and preferred to go on trusting themselves entirely to its reputed statements for the implied profane nature of "the Great Pyramid, ruled over by Isis," though no symptoms of either Isis, or any other, profanity had been found there; and though the ancient Great Pyramid is still an existency in the world, vocal with knowledge and wisdom, while the later invention of "Isis" has already faded away

from the Egyptian land like a summer cloud or the morning dew.

At last, however, one of their own number has informed upon his fellow Egyptologists; and he is the best and ablest man amongst them too; viz., the German Brugsch Bey; equally on the spot with Mariette Bey, and said to be "a more learned hieroglyphic scholar." For thus writes the trusty Dr. Grant from Cairo, date June 3rd, 1873, "I have been learning much from Brugsch Bey lately, and he tells me that Mariette's stone *bears a lie on the face of it*—that the style of sculpture is not very ancient, and that the whole inscription is simply a legend that has been scratched upon it at a late date, and that it cannot be quoted as an authority on any of the points mentioned in it."

So now the Sphinx, with its body pierced through and through with long iron rods by Colonel Howard-Vyse, and found to contain nothing; and its nose knocked off by a mediæval Mohammedan dervish to prevent its both ensnaring his countrymen by idolatrous beauty, and leading them to inquire too curiously (as Moses warned the Israelites against their attempting to do, on entering Canaan),—"now *how* did the people of this land worship their gods?" and with its actual size a mere molecule at the very base of the hill, of whose summit the Great Pyramid is the pure and unexceptionable crown—need not be referred to again by any Christian man looking for instruction from the Rock of Ages alone.

CHAPTER XXII.

THE SHEPHERD KINGS.

IN the Third Pyramid of Jeezeh—admired by the sadly Egyptological Baron Bunsen, on account of its expensive red-granite casing, far above the Great Pyramid and all *its* intellectual excellencies — Colonel Howard-Vyse found, not only the genuine sepulchral sarcophagus, together with parts of the inscribed coffin-board, but—a portion of a mummy as well.

In that case, of what or of whom was such fragment the mummy?

"Of King Mencheres," insisted every Egyptologist, "for he it was who built the third Pyramid some 60 years after the Great one had been erected." Whereupon the remains were transmitted with honour to the British Museum; and the learned Baron, in his "Egypt's Place in History," has an eloquent eulogium on the "pious" king whose ancient remains, if removed at last out of their old mausoleum, are now vastly safer in the distant isle of the Queen-ruled empire, whose free institutions preserve her liberty and prosperity for ever.

But here William Osburn (whom Bunsen never liked) steps in with the wholesome reminder, that none of the mummies of the Old Empire have come down to our age: their bodies, fragrant for a while with spices and myrrh, sooner or later returned, dust to dust; and a little of such dark matter at the bottom of sarcophagi,

is all that has yet been discovered in any of the tombs of the earliest period. It was reserved, says he, to the over-clever Egyptians of the New Empire, when Thebes rose above Memphis, to discover the too efficacious method of embalming with natron—a method which has enabled the bodies of that later period to last down to our times; and has thereby put it into the power of fanatic Mohammedans to treat Pharaonic corpses with every contumely, male and female, old and young, rich and poor, dragged out of all their decent cerements, to be exposed in these latter days on the dunghill, or broken up for fuel.

Wherefore the parts of a body found in pretty tough preservation by Colonel Vyse in the Third Pyramid, could not have belonged to either King Mencheres or any of his subjects; or to any genuine Egyptian so early as the fourth dynasty. But presently this further discovery was made, that the cloth in which the remains were wrapped up, was not composed of the proverbial linen of ancient Egypt, but of sheep's wool,—a textile material which was a religious abomination to all Pharaonic Egyptians.

Then wrote certain scholars, quickly framing up a theory to suit the occasion, "Both King Mencheres and all the other Jeezeh Pyramid builders must have been, not Egyptians, but of that ancient and most mysterious class of invaders of, or immigrants into, ancient Egypt, the Hyksos or Shepherd Kings."

How little is positively known of *them*, may appear from one modern author, who writes,—

"When investigating the early history of the world, the Hyksos cross our path like a mighty shadow; advancing from native seats to which it baffled the geography of antiquity to assign a position, covering for a season the shores of the Mediterranean and the banks of the Nile with the terror of their arms and the renown

of their conquests, and at length vanishing with a mystery equal to that of their first appearance."

While the learned Dr. Hincks writes, "Later investigations have rather increased than removed my difficulties; and, as a matter of argument, it would be indifferent to me to sustain, that *the Hyksos once occupied Lower Egypt;* or that *they were never there at all.*"

But Dr. Hincks was perhaps more of an Assyrian, than an Egyptian, scholar; and the pure Egyptologists have no doubt whatever about a period of Hyksos' rule in Egypt just before the time of the Israelites' captivity, and perhaps including a part of it. They consider, indeed, that there is still monumentally visible the most decided separation between the Old and New Empires of Ancient Egypt, caused altogether by the domination of those whom they call the "Shepherds;" for they drop the aggrandizing word of "Kings," as needless, when talking of those who, if there at all, ruled on the banks of the Nile with a rod of iron through three successive dynasties, viz., the 15th, 16th, and 17th; and caused an almost total blank or perversion for that period in the architectural history, as well as much modification in the religion, of all the Lower and Middle country.

Of the precise nature of that change and the origin of the party bringing it about, William Osburn has some special ideas, which, with more space at command, we might do well to inquire into: though now, as the limits of this book are drawing to a close, and as he agrees with all the other Egyptologists as to what dynasties such party occupied, viz., the 15th, 16th, and 17th,—we may rest assured that all men of those dynasties, whether they were native or foreign shepherds, lived far too late in the world's history to have had any hand in building the Jeezeh Pyramids under the much earlier fourth dynasty.

Hence the Shepherds that Colonel Vyse alludes to

(on the strength of the woollen-wrapt body from the Third Pyramid), if ever really existing, must have been, in order to have helped to build the Pyramids, of a period belonging to the said very early fourth dynasty; and were therefore totally different, in time and fact, from the later Shepherds so well known to Egyptologists.

That these *later*, or 15th, 16th, and 17th dynasty, Shepherds did not build the Jeezeh, or indeed any of the Egyptian, Pyramids, does not by itself overthrow the whole theory, or possibility of there having been an *earlier*, and quite distinct, Shepherd invasion, or temporary rule of Hyksos in Lower Egypt, and perhaps even during the 4th, or chief Pyramid-building dynasty; for pastoral tribes existed in the East from the earliest times, and were much endued with tendencies to western emigration. But whether they really did enter Egypt in force, during the 4th dynasty, must be settled on direct evidence of its own. Such evidence, indeed, the worthy Colonel *thought* he had obtained; though now we may see clearly that his reasoning was founded too much on the piece of flannel, and too little on the whole of the grand masonried facts of the Great Pyramid and their purity from all idolatry; whereupon he soon loses himself in illogical conclusions; arguing in a preconceived circle, thus—

"It has been assumed (in my, Vyse's, opinion satisfactorily) by Bryant, that these mighty Shepherds (his supposed Pyramid builders in the 4th dynasty) were the descendants of Ham, expelled, on account of apostacy and rebellion, from Babel, from Egypt, and from Palestine; and who afterwards, under the name of Cyclopes, Pelasgi, Phœnices, &c., were pursued by Divine vengeance, and successively driven from every settled habitation—from Greece, from Tyre, and from Carthage, even to the distant regions of America, where traces of their buildings, and, it has been supposed, of

their costume, as represented in Egyptian sculpture, have been discovered. These tribes seem formerly to have been living instances of Divine retribution, as the dispersed Jews are at present. They appear to have been at last entirely destroyed; but their wanderings and misfortunes have been recorded by the everliving genius of the two greatest poets in the Greek and Latin languages; and the Pyramids remain, enduring yet silent monuments of the matchless grandeur of this extraordinary people, of the certainty of Divine justice, and of the truth of Revelation."

But while it is perfectly impossible that such sinful men could have been the genuine authors of all the pure and holy features we have found in the Great Pyramid,—or that Hamitic Cainites would have found any difficulty in amalgamating with the Mizraite Egyptians,—it is most satisfactory to know that the mere piece of woollen cloth found in the Third Pyramid can be explained in a much easier manner than by going up, in the teeth of masonried facts, to the primeval antiquity of the world; or thus—"The remains found by Colonel Vyse were those of a mediæval Arab, who, having died at Caliph Al Mamoun's breaking into the Third Pyramid, was straightway wrapped up in his own burnouse, and thrust down the entrance-passage for his burial, when the Mohammedan workmen came away and closed the place up, as it turned out, for 1,000 years. And if the poor man's bones are so well preserved as to have allowed of their safe transport to London, it is on account of the short time they have been sepultured, compared with anything belonging to the real Fourth Dynasty and the building of its Pyramids."

Of Primeval Shemite Shepherds.

That simple explanation, therefore, completely settles the value of the mistaken lumber on the shelves at the

British Museum; but leaves us still with a historical question on our hands, as to whether there were, after all, any Hyksos or Shepherd Kings from the East, descendants too of Shem, rather than Ham (for of Hamites there were always enough and to spare, keepers of their own sheep too, in the persons of the Egyptians themselves), in Egypt during the fourth dynasty?

Some strangers from the eastern direction were indeed continually filtering into Lower Egypt through the Isthmus of Suez, the natural channel of immigration in all ages from Asia, and the path by which the Egyptians themselves had originally come. But it is our more particular business now to ascertain, if possible, whether during the period of that particular 4th dynasty, say from 2300 to 2100 B.C. (or an age previous to the calling of Abraham), there were any remarkable eastern men in position of lordly rule, power, or notoriety in the Egyptian land: and whether they either had, in the general estimation of all men, anything to do with the building of the Great Pyramid; or were likely to have been able to furnish any part of its design, as manifested by modern science; or had an interest in preserving its religiously pure character, in the midst of an age and a nation given up to the worst forms of idolatry.

What then does history say to the point?

History is scanty enough, every one will allow, for times before Abraham; and though something may be occasionally made out for even those dates in such a land as Egypt, it is to be gained, even there, only by a conflict with difficulties. There is actually a dispute, for instance, between the Egyptologists on one side, and Alexandrian classics on the other, whether there was ever a fourth dynasty at all. We must, therefore, when everything is disputed or disputable, interrogate either party very closely.

Egyptologic Details of Early Kings.

To begin with the Egyptologists; the literary foundations for what they assert, are confined to Manetho (270 B.C.), or to what has come down to us of his own writings in fragments of authors 300 or 400 years later ; and whose words may be conveniently examined in the volume of "Fragments," by Isaac Preston Cory, of Caius College, Cambridge (1832 A.D.)

There then, most undoubtedly, a fourth dynasty is mentioned; but it begins with a puzzling statement ; for while the third dynasty is simply said to be composed of so many Memphite kings, and the fifth dynasty of so many Elephantine kings, this fourth dynasty is stated to be composed of "eight Memphite kings of *a different race.*"

This is a curious statement, and I do not know what it means ; but the list proceeds as follows for the kings concerned :—

(1) Soris reigned 29 years.
(2) Suphis reigned 63 years. He built the largest Pyramid; which Herodotus says was constructed by Cheops. He was arrogant towards the gods, and wrote the sacred book ; which is regarded by the Egyptians as a work of great importance.
(3) Suphis II. reigned 66 years.
(4) Mencheres 63 years.
(5) Rhatœses 25 years.
(6) Bicheres 22 years.
(7) Sebercheres 7 years.
(8) Thampthis 9 years.
Altogether 284 years.

This literary foundation, the Egyptologists further contend that they can confirm in all its main particulars from the monuments, by finding, even in the Great Pyramid itself, evidently alluded to by Manetho, rude original quarry-marks with two royal names which they interpret Shofo and Noumshofo, and declare to be the two Suphises mentioned above ; while they find the further royal name of Mencheres in the third Pyramid,

notoriously a later construction than both the Great and Second Pyramids; which Second Pyramid is elsewhere attributed to Suphis II., as the Great one is here to Suphis I.

But the rest of the sentence attached to the name of the first Suphis is a difficulty which the Egyptologists cannot altogether master. They can understand, for instance, easily enough, that he either built the Great Pyramid, or reigned while it was being built; but what was his "arrogance towards the gods?" and what were the contents of "his sacred book?"

Of all these things the Egyptologists knew nothing from contemporary monuments; although they can adduce abundant proof therefrom, that Mencheres of the Third Pyramid was an out-and-out idolater of the Egyptians. That was the "piety" which Baron Bunsen praised; while Osburn, though he condemned rather than praised, so far allowed what the other Egyptologists founded upon, that he shows, at much length, King Mencheres to have been, not indeed the original inventor and theotechnist of animal and other gods for his countrymen,—but the greatest codifier in all history of those things. He, Mencheres, was the establisher, too, of a priesthood for those things' continual service; and was an extender of the mythological system into new and mysterious ramifications; the very man, in fact, who put Misraite idolatry into that ensnaring form and artistical condition with Isis, Osiris, Horus, Typhon, Nepthys, and all the rest of his inventions, in addition to the older Apis, Mnevis, and the Mendesian goat, that it became the grand national and lasting system of his country,—monopolising the souls of all Egyptians for two thousand years, and even then dying hard.

Mencheres was, in point of fact, in and for the land of the Nile, just what the too eloquent author of

"Juventus Mundi," with such longing admiration amounting almost to ill-concealed envy, describes Homer to have been for the Greeks in the same line —viz., in "theotechny." Worldly success in which ethereal art or elevated occupation, as it is according to *him*, but much more probably an abomination before God,—the English Prime Minister (unhappily not seeing it in that light) declares to be a far more noble, more satisfying pinnacle for human ambition, than any amount of excellence whatever either in poetry or prose, civil administration, or even military glory.

But of Shofo, the hieroglyphists can pick up but little, if anything, positively of that kind of information. The worship, indeed, of bulls and goats had been already set up in Egypt during the previous dynasty, so that he found it in force on succeeding to the throne; and it perhaps went on during his reign until such time as he is reported on one hand to have become "arrogant towards the gods," and on the other to have closed their temples and stopped their public worship, as we shall now see detailed on turning to the *Classic* authorities.

Classic Names for Early Egyptian Kings.

Amongst all *these* authors, indeed—*i.e.*, men who either were Greeks or followed the Greeks and did not know Egyptian—whether with Herodotus in 445 B.C., Eratosthenes 236 B.C., Diodorus Siculus 60 B.C., and Strabo 0 B.C., there is no fourth dynasty at all: nor, for that matter, any allusion to any dynasty or arrangement by dynasties whatever. While the chronological order of the kings by name, is at one point altogether dislocated from its sequence in the Manethoan dynasties; the kings' names of the very early fourth dynasty of the Egyptologists, being, with the classics, placed *after*

those which are found in the comparatively late nineteenth dynasty of the same Egyptologists.

Sir Gardner Wilkinson * explains this terrible anachronism for Herodotus (and if for him, for all his copying fellow-countrymen and successors at the same time), by suggesting that he (Herodotus) was furnished by the Egyptian priests with two separate lists of kings' names ; and as they read out to him (through his interpreter, he not understanding Egyptian) the later one first (and he put them all down in faith as he heard them in one long row), he, of course, got the old Memphite sovereigns coming in *after* the more modern Thebans. The priests began with the Theban kings of the 19th dynasty, because they were fresh in their memory ; and they remembered well the glorious times of their priestly order under those reigns, whereof, too, they told the innocent Halicarnassian a variety of pleasant, gossiping tales ; and only when that stock was ended, did they touch, very unwillingly, on the Memphite kings, chiefly of the fourth dynasty, and the hard times the priests had had under *them.*

Some such explanation, too, of the dislocated chronology of the *Greek* history of Egypt, must apparently be the true one ; for the whole philosophy of architecture, as elaborated on ten thousand examples by James Fergusson, makes it as impossible historically and mechanically for the Pyramids of Lower Egypt to have followed the palace-temples and sculpture of Upper Egypt,—as historically and socially it is utterly impossible, that after Thebes had once risen to supreme power in Egypt, the rulers there would have allowed by far the chief work of their age to be executed on the borders of their kingdom in the "provinces," or near the then ancient, decaying and conquered city of

* See note to p. 199 of Rawlinson's "Herodotus," vol. ii.

Memphis. As well might we expect the British Parliament to give its largest grants for the year to Edinburgh, instead of London; and men will have to wait until the whole river of history passes by, and runs itself absolutely dry, before we see such a phenomenon as that; although too Scotland was never fairly conquered.

Setting aside, then, agreeably with Sir Gardner Wilkinson and *all the Egyptologists*, this one large fault or mistaken order of a group of the Egyptian kings in Greek and classic authors,—from Herodotus in 445 B.C. to the Rev. Mr. Galloway and Mr. Samuel Sharpe, in 1869 A.D.,—as simply and altogether a book-mistake of theirs, we shall find in the smaller details, subsequent to the dislocation, much agreement. As, for instance, in the names of the three successive kings of the three chief and successive Pyramids of Jeezeh; which kings' names are always given in their proper, or, both monumental, hieroglyphic, and Manethoan sequence to each other; though the scholars have certainly agreed to accept a remarkable variety of names as meaning the same word or man; as thus—

NAMES OF THE BUILDERS OF THE THREE LARGEST PYRAMIDS OF JEEZEH ACCORDING TO VARIOUS AUTHORITIES.

Authorities.	Of the Great Pyramid.	Of the Second Pyramid.	Of the Third Pyramid.
Herodotus.	Cheops.	Chephren.	Mycerinus.
Manetho.	Suphis I.	Suphis II.	Mencheres.
Eratosthenes.	Saophis Comastes, or Chematistes.	Saophis II.	Mescheres Heliodotus.
Diodorus Siculus.	Chembres.	Cephren.	Mycerinus.
Modern Egyptologists	Shofo. Shufu. Koufou.	Nou-Shofo. Noum-Shufu. Shafre.	Menkere. Menkerre.

The Lives of the Kings.

But what, after all, is there in a name? It is the character of each individual king of many names, which we require; and especially if there be anything in it, which may indicate whether that royal personage could have built the Great Pyramid.

There the conversational style of Herodotus (the oldest existing author in the world, it is said, next to Moses), dipping deep into the feelings of men, will serve us better than the bald rigidity of hieroglyphic inscriptions; though, as Herodotus gathered up everything without sifting it, and as between the purposed falsities of what the Egyptian priests often related to him, in a language which he did not understand and his interpreters did not faithfully translate to him,—it is little more than the involuntary evidence, under cross-examination, that can be trusted. Here, however, as a beginning, are his own simple statements.

(124) "Cheops," according to the Egyptian priests,* "on ascending the throne, plunged into all manner of wickedness. He closed the temples, and forbade the Egyptians to offer sacrifice, compelling them instead to labour one and all in his service; viz., in building the Great Pyramid."

(128) "Cheops reigned fifty years; and was succeeded by his brother Chephren, who imitated the conduct of his predecessor, built a pyramid—but smaller than his brother's—and reigned fifty-six years. Thus, during 106 years the temples were shut and never opened."

(129) "After Chephren, Mycerinus, son of Cheops, ascended the throne. He reopened the temples, and allowed the people to resume the practice of sacrifice. He, too, left a pyramid, but much inferior in size to his father's. It is built, for half of its height, of the stone of Ethiopia;" *i.e.*, expensive red granite.

(136) "After Mycerinus, Asychis ascended the throne. He built the eastern gateway of the Temple of Vulcan (Phtha); and being desirous of eclipsing all his predecessors on the throne, left as a monument of his reign a pyramid of brick."

Now here we have four successive kings, each of whom erected a Pyramid; and the last of them entered

* Ch. 124, p. 199, of Rawlinson's Translation of Herodotus, vol. ii. See also a very salutary note, No. 9, on p. 205, by Sir G. Wilkinson.

into the work no less enthusiastically than the first. Therefore it could not have been Pyramid-building in itself, or as known to, and understood by, the natives, which had the discriminating effect of causing the two last kings to be approved, and the two first to be hated, by all Egyptians to the terrible and intense degree described by successive classic authors. This difference of estimation must have risen from some difference of proceeding in either pair of kings; and such an opposite manner is religiously found in this circumstance, that the two first kings closed the temples, and stopped the worship of the bulls, cats, goats, beetles, and other Egyptian gods; while the two last kings re-opened those temples, enlarged them, beautified them, and re-established the soul-degrading theotechnic inventions of Egypt in greater splendour than ever: though, too, they were the very idols which the Lord declares "He will destroy, and cause their images to cease out of Noph."

The Right Man at last.

But there is more than this to be gathered from the classic records; for there comes up amongst them a something suggestive, even to the extent of a ray of positive light, upon that very question which, even to Diodorus Siculus, was so much more important than who were the kings who ordered, viz., who were the architects who designed or built, the Pyramids; for Herodotus further states:—

"(128) The Egyptians so detest the memory of these (the two first) kings (Cheops and Chephren), that they do not much like even to mention their names. Hence, they commonly call the Pyramids (the Great and the Second) after Philition (or Philitis), a shepherd who at that time fed his flocks about the place."

Seldom has a more important piece of truth been unintentionally issued in a few words. Sir Gardner

Wilkinson, in his note to that passage,* allows at once the Hyksos, or Shepherd-princely, character and standing of a stranger who could be so distinguished in connection with the greatest of the monuments of Egypt; and is only anxious to guard his readers as to the particular personage alluded to, having really lived in the early fourth dynasty, and not having been one of those later, better known, but totally different individuals who figured as the Shepherd Kings in the 15th, 16th, and 17th dynasties. While Mr. Rawlinson, in another note on the same page, seems equally ready to allow,—not only that Philitis was a Shepherd prince from Palestine, and perhaps of Philistine descent,—but so powerful and domineering, that it may be traditions of *his* oppressions in that *earlier* age, which mixed up afterwards in the minds of later Egyptians with the evils inflicted on their country by the subsequent shepherds of the better-known dynasties; and lent so much fear to their religious hate of "Shepherd" times and that name.

If this theory of Mr. Rawlinson's be correct, we may learn something further of the Great Pyramid's fourth dynasty Shepherd—Prince Philitis—by attending to what Manetho has written of the subsequent Shepherds; and especially by eliminating therefrom, certain features which cannot by any possibility be true of those men such as they were in that later day. For thus wrote the Sebennyte priest:†—

"We had formerly a king whose name was Timeus. In his time it came to pass, I know not how, that God was displeased with us: and there came up from the East, in a strange manner, men of an ignoble race, who had the confidence to invade our country, and easily subdued it by their power without a battle."

This, it will be observed, is a very peculiar phrase;

* P. 207, vol. ii., of Rawlinson's "Herodotus."
† Cory's "Fragments," p. 169.

and lends much colour to the suggestion that Philitis was enabled to exert a certain amount of control over King Shofo and his Egyptian people, not by the vulgar method of military conquest, but by some supernatural influence over their minds.

"All this invading nation," Manetho goes on to say, "was styled Hycsos, that is, Shepherd Kings; for the first syllable, Hyc, in the sacred dialect denotes a king; and Sos signifies a shepherd, but this only according to the vulgar tongue; and of these is compounded the term Hycsos: some say they were Arabians."

Yet if they were Arabians, why did they not return to Arabia, when they afterwards, "to the number of not less than 240,000, quitted Egypt by capitulation, with all their families and effects?" And went—where to? "To Judæa, and built there," says Manetho, "a city of sufficient size to contain this multitude of men, and named it Jerusalem." *

Now here is surely a most important tale, if anything written in books by ancient authors is worthy of any modern attention. For, making all due allowance for some of the references, and much of the expressed hate and abuse being due to the more modern and largely native † Egyptian shepherds of the 15th to the 17th dynasties (and who, according to W. Osburn, were chiefly conquered and oppressed within the bounds of Lower Egypt by invasions of Thebans and fanatic Ethiopians), we have as much as testifies to the earlier and truer Shepherd Prince Philitis, after having long controlled King Shofo during the very time that the Great Pyramid was building,—to that Prince Philitis, I say, then leaving the country with a high hand, or by special agreement, with all his people and flocks,—proceeding to Judæa, and building there a city which he

* Cory's "Fragments," p. 173.

† According to William Osburn in his "Monumental History."

named Jerusalem ; and which must have at once taken a high standing among the primeval cities of the earth, if he made it large enough to contain not less than 240,000 persons.

Of the Early Life of Melchizedek.

Now the man who did that, after assisting at the foundation of the Great Pyramid in 2170 B.C., must have been a contemporary nearly of, but rather older than, the Patriarch Abraham, according to the best Biblical chronology. Or he must have been, as to age, standing, country, and even title, very nearly such a one as that grandly mysterious kingly character to whom even Abraham offered the tenth of the spoils, viz., Melchizedek ; further called King of Salem, which some consider to have been Jeru-salem.

The Bible does not, indeed, directly mention Melchizedek's ever having been sent into Egypt on any special mission ; the grandest of missions, if then to erect, or procure the erection of, a prophetical monument which was only to be understood in the latter days of the world ; but was destined then to prove the Inspiration origin and Messianic character of its design to both religious and irreligious. But the Bible does not describe anything of the earlier life of Melchizedek ; though it has allusions elsewhere which may possibly indicate a grand occasion in the life of one, concerning whom so very little is said, though by whom so much must have been done, in the course of his long, heaven-approved, and gloriously-terminating career.

In Deuteronomy, ch. ii., for instance, there appears something of the kind ; when Moses, encouraging the Israelites to be of good heart in their march, under Divine favour, out of Egypt into Palestine,—mentions two other and long preceding occasions on which God

had shown similar favour to other peoples, and they were established successfully in consequence.

First, "the children of Esau;" and afterwards, "the Caphtorims which came forth out of Caphtor." Or, as alluded to again, long after the times of the Exodus (in Amos ix. 7), "have not I (the Lord) brought up Israel out of Egypt and the Philistines from Caphtor?"

This Caphtor alluded to on both occasions, is generally considered to mean Egypt, the Pyramid region, too, of Lower Egypt; and although in the one instance, the people are spoken of as Caphtorim, that may imply not necessarily native Egyptians, but men who had been sojourning in that country for a season; even as the testimony of Herodotus infers that Philitis (a name looked on by some as implying a Philistian descent or country), with his flocks and herdsmen (appropriately then called Philistines in Caphtor), had been doing during all the thirty years occupied in the preparations for, and then the building up of, the Great Pyramid.

In short, the Biblical evidence touching this mighty and most unique monument of sacred and prophetic purport, is deserving of more intimate and peculiar study than we have yet bestowed upon it.

CHAPTER XXIII.

SUPERIOR TESTIMONY.

Biblical Views of Metrology in General.

VIEWING the Great Pyramid first of all as a monument of metrology alone, that subject has been shown from Scripture by many writers (as Michaelis, in Germany; Paucton, in France; and more recently, John Taylor, in England) to have been deemed worthy of Divine attention, or providence, for the good of man; such instructions as the following having been issued through the approved medium of inspired men honoured with the commands of Revelation, viz. :—

"Ye shall do no unrighteousness in judgment, in meteyard, in weight, or in measure.

"Just balances, just weights, a just ephah, and a just hin, shall ye have: I am the Lord your God, which brought you out of the land of Egypt.

"Therefore shall ye observe all my statutes, and all my judgments, and do them: I am the Lord."—*Leviticus* xix. 35—37.

"But thou shalt have a perfect and just weight, a perfect and just measure shalt thou have: that thy days may be lengthened in the land which the Lord thy God giveth thee."—*Deuteronomy* xxv. 15.

"A false balance is abomination to the Lord: but a just weight is his delight."—*Proverbs* xi. 1.

"A just weight and balance are the Lord's: all the weights of the bag are his work."—*Proverbs* xvi. 11.

"Thus saith the Lord God; Let it suffice you, O princes of Israel: remove violence and spoil, and execute judgment and justice, take away your exactions from my people, saith the Lord God.

"Ye shall have just balances, and a just ephah, and a just bath.

"The ephah and the bath shall be of one measure, that the bath may contain the tenth part of an homer, and the ephah the tenth part of an homer: the measure thereof shall be after the homer."—*Ezekiel* xlv. 9—11.

This was a department of the Holy Service which King David had appointed, in his days, a portion of the Levites to attend to ;* and his son Solomon established the grand standards of measure in the noblest proportions :† while Moses had been, in his still earlier day, exceedingly particular in all his metrological institutions, and impressive in his method of carrying them out;‡ his chief standard measures being, as already shown, the earth and heaven founded standards of the Great Pyramid itself ; if they were not also those which had been elaborated (according to Josephus) by Seth and his descendants in opposition to the bad inventions of Cain, and under the direct approval of the Almighty.

With the structure of the Pyramid building, indeed, in its main design and ultimate purposes (though never so distinctly or categorically alluded to in Scripture, as thereby to give men any excuse for turning aside to it, like a broken bow, for any kind of spiritual worship), the inspired writers of both the Old and New Testaments have evinced a very considerable acquaintance. And not dry knowledge only ; for those men, "gifted with thoughts above their thoughts," have shown an amount of feeling, only to be explained by a holy consciousness of the part which the monument is one day to serve, in manifesting forth in modes adapted to these and the approaching times, the original and ineffable inspiration of Scripture,—as well as the practical reasons for expecting the return of our Lord to an undoubted personal reign for a miraculous season over the entire earth.

* 1 Chronicles xxiii. 29.

† 1 Kings vii. 29 ; and 2 Chronicles iv. 5.

‡ See John David Michaelis, of Gottingen, "On the Plans which Moses took for the Regulation of Weights and Measures ;" at pp. 454—470 of vol. ii. of his "Hebrew Weights and Measures." See also my "Life and Work," pp. 498—507 of vol. iii.

Old Testament Witnesses to the Great Pyramid.

So well, too, were the mechanical steps for the foundation of the Great Pyramid understood (these steps being the heavy preliminary works of preparation and subterranean masonry described by Herodotus as having characterised the Great Pyramid, and declared by Lepsius to have been eschewed in every other pyramid erected altogether by, and for, Cainite Egyptian idolaters),—so well, I say, were these features understood by the inspired writers, that the mysterious things of Nature, visible to, but not easily apprehended by, men in the early ages, were occasionally described in terms of these more exact features of the Great Pyramid.

Thus, when we read in Job xxxviii., marginally corrected, that the Lord answered the patriarch out of the whirlwind, demanding with power,—

"Where wast thou when I laid the foundations of the earth? declare, if thou knowest understanding.
"Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it?
"Whereupon are the sockets thereof made to sink? or who laid the corner-stone thereof;
"When the morning stars sang together, and all the sons of God shouted for joy?"

—it is quite plain (since at least John Taylor first pointed it out; for to him we owe almost entirely this branch of the subject) that if the creation of the earth is here alluded to, it is described under a type of something else, and not as the earth really was created; or both as we know it by modern science to be, and as it was described in chap. xxvi. of the same book of Job, in the following words:—

"He stretcheth out the north over the empty place, and hangeth the earth upon nothing."

The earliest of the first quoted descriptions might apply to the building of any ordinary house; but as

successive practical features are enumerated, the building of a stone pyramid by careful measure, and in the Promethean, and forethought, manner of the Great Pyramid, on a previously prepared platform of rock, is the only known work that will fully correspond.

The stretching of the line *upon* it, is more applicable to the inclined surface of a pyramid with an angle to the horizon of 51° 51′, than to the vertical walls of any ordinary house; and—after the pointed and most apposite question, "Canst thou bind the sweet influence of Pleiades?"—the further Divine interrogation, —"Knowest thou the ordinances of the heavens? Canst thou set the dominion thereof in the earth?"—has been happily explained very lately by the Rev. F. R. A. Glover. For he shows it to be, the Great Pyramid's chronological use of the grand celestial cycle of the precession of the equinoxes, taken in connection with a particular polar distance and meridian transit of the circumpolar star *a* Draconis; the memorial of which stellar position, "dominant in the earth," is exhibited by the lower portion of the entrance-passage of the Great Pyramid, set backwards and downwards into, and deep, deep into, the solid rock of the hill, in precisely such a direction as to suit the critical position of that star under the influence of precession at the very epoch of the Pyramid's foundation.

But what was meant by "the sockets thereof being made to sink,"—might have been uncertain, had it not been for the researches of the French *savants* at the Great Pyramid in 1800; for they described, without reference to this sentence, the remarkable sockets which had been formed in the previously levelled area of rock on which this Pyramid stands; and (with the assistance of the more modern investigations in 1865) the manner in which each of the lower four corner-stones of the Pyramid were fitted into these prepared hollows in the

rock,—causing them to become at once the fiducial points from which all measurers have, ever since then, stretched their measuring-lines on the building.

Four of the five corner-stones of the Pyramid are thus indicated as of Scriptural notice ; while the fifth, which is in fact of an entirely diverse character and greater importance, being not one of the foundations, but the topmost portion of the whole building, is alluded to in Job separately ; more gloriously ; and even as being the finishing and crowning portion of the whole intended work. For when that topmost corner-stone, emphatically called "*the* corner-stone," was finally placed,—it is said that the act was greeted by "the morning stars singing together, and all the sons of God shouting for joy."

The Biblical interpretation of the passages here alluded to is, of course, "the faithful and the true converts ;" "as many as are led by the Spirit of God, they are the sons of God." And all such who were present at the time, rejoiced in seeing the completion of the Great Pyramid with a joy far exceeding what the erection of any ordinary building, however palatial, might have been expected to give them ; for their cry, when the *head-stone* of this one "great mountain was brought out with shoutings," took the exquisite form of "Grace, grace unto it !"* And if they so cried, and it is so reported in the Holy Bible, was it not because they recognised that that stone had been appointed by Divine wisdom, and in the mystery of God's primeval proceedings towards man, to recall some essential ideas connected with the one central point about which all Scripture revolves ; viz., the Son of God, His incarnation and sacrifice for the salvation of man. But of this we shall be instructed more clearly in the New Testament.

* Zech. iv. 7.

New Testament Allusions to the Great Pyramid.

From a practical worker like St. Paul, we have even a most methodical illustration, in the use which he makes of certain constructive differences between the four lower corner-stones, and the single corner-stone above; constructive differences which, if applicable to any other building at all, are only fully applicable to the wonderful Great Pyramid; for his words are—

"Ye are fellow-citizens of the saints, and of the household of God; and are built upon the *foundation* of the apostles and prophets, Jesus Christ himself being the *chief corner-stone, in whom the whole building, fitly framed together, groweth unto an holy temple in the Lord.*"*

This fitly framing of the whole building as it grows from a broad base upwards into one corner-stone above, and which is called the chief, the upper, corner-stone,—was shown by John Taylor to be an unmistakeable allusion to the Great Pyramid; and this same noble figurative employment of that particular topmost stone, viz., its representation of the Messiah, and His crowning the scheme of the redemption of man,—is one frequently employed in Holy Scripture; as in Psalm cxviii. 22; in the Gospels, and the Epistles.† The stone is there alluded to, not only as the chief corner-stone, "elect and precious," made "the *head* of the corner" (which is only perfectly and pre-eminently true of the topmost angle of a pyramid), but as having been for a long time "disallowed by the builders," and existing only as "a stone of stumbling and a rock of offence to them."‡

* Ephes. ii. 19. See also J. Taylor's "Great Pyramid," pp. 208—243.

† Matt. xxi. 42; Mark xii. 10; Luke xx. 17; Acts iv. 11; 1 Peter ii. 4.

‡ In the important theological work by the Rev. John Harrison, D.D., "Whose are the Fathers," there is, at pp. 163—172, a very able representation of the special exigences of mere ecclesiasticism in the narrow,

The simile is easily and perfectly applicable to our Saviour's appearance on earth ; yet evidently, from the very principle of all such figurative allusions, a something bearing on the nature of the figure made use of, must, Mr. Taylor urged, have been existing on the earth before ; or it would never have been employed.

Now we know that the Great Pyramid did stand on its desert hill before any of the inspired authors wrote; and also, that they seem to have been spiritually conversant with many principles of its construction, although they were not visitors to the land of Egypt ; and it is they who allude to some notorious objections by the builders against the head corner-stone, while their work was in progress.

What were these ?

The stones required for building the Great Pyramid were evidently, from the quarry-marks and instructions to the masons still legible upon some of them, prepared at the quarries according to the architect's orders a long time beforehand. For the vast majority, too, of stones, nothing but one unvarying figure, rather flattish and chiefly rectangular, was required. But amongst them, and different therefrom, one was ordered which did not chime in with any of the Egyptian building notions, certainly not of their temples, tombs, or palaces. For, in place of being cubic, or with nearly parallel sides and rectangular corners, this single stone was all acutely angled, all sharp points ; so that turn it over on any side as it lay on the ground, one sharp corner was always sticking up in the air ; as, too, could not but be the case when the stone was a sort of model pyramid

albeit learned, view which ecclesiastics take of all these texts, and all this long line of symbology founded in all architecture and all history. For the one point to and for which everything else is there made to exist, is, the phrase used by our Lord to Peter (Matt. xvi. 18) ; and what advantage the Roman Catholic Church has, or has not, though it is denied by Protestants that it has any, over other Christian churches, in consequence of it.

in itself, with five sides, five corners, and sixteen distinct angles.*

Such a stone was of course "a stone of stumbling and a rock of offence"† to builders whose heads did not understand, and hearts did not appreciate, the work they were engaged upon. It was to them "the terrible crystal;"‡ the pointed stone "on which whosoever shall fall, shall be broken;" and so huge a stone as a coping for the vast structure of the whole Great Pyramid, that "on whomsoever it shall fall, it will grind him to powder."§

Yet when once this unique, five-cornered, and many-angled stone was raised up to its intended place on the summit of the Great Pyramid, the propriety of its figure must have appeared evident to every impartial beholder; though the Egyptian workmen, as may be gathered from Herodotus, forcibly prevented from breaking out into open opposition, yet went on concealing sinful hatred in their hearts; and did—after the deaths of Cheops and Chephren, and after the Shepherd-Prince Philitis had left the country—return with renewed vehemence to their bestial idolatry under Mencheres, "like dogs to their vomit or the sow that was washed to her wallowing in the mire."‖

For such determined resisters of grace was surely prepared, in their very midst, that type of the bottomless pit, the subterranean chamber in the Great Pyramid, yawning to receive them:—

"For they are all delivered unto death, to the nether parts of the earth, in the midst of the children of men, with them that go down to the pit."

"This is Pharaoh and all his multitude, saith the Lord God."—Ezek. xxxi. 14 and 18.

But again, and now for the instruction of backsliding Israel, this prophetic and historic monument—

* John Taylor's "Great Pyramid," pp. 262—275.
† 1 Peter ii. 8. ‡ Ezekiel i. 22. § Matt. xxi. ‖ 2 Peter ii. 22.

which, like Melchizedek, had no predecessor, was without architectural parentage or descent, and yet took rank at once as the greatest of all architecture up to the present time,—this more than historic monument, I say, seems to speak to us in the words of the only wise Architect :—

"I have declared the former things from the beginning; and they went forth out of my mouth, and I shewed them; *I did them suddenly*, and they came to pass."

"I have even from the beginning declared it to thee; before it came to pass I shewed it to thee; lest thou shouldest say, Mine idol hath done them, and my graven image and my molten image, hath commanded them."—Isa. xlviii. 3 and 5.

Never, then, was there any building so perfect as the Great Pyramid in fulfilling both the earliest words of the Lord given by Inspiration, and also the New Testament types of the Messiah. And if the Great Pyramid is not mentioned in so clear a manner in the New Testament, that all men may instantly see it, whether by name, or figure, that may arise from—as circumstances still to be related will indicate—its being connected with the Second and future, rather than with that First and past, Coming of Christ, which the New Testament was mainly to chronicle and expound.

CHAPTER XXIV.

PREPARATIONS FOR UNIVERSAL METROLOGY.

THOUGH everything else may fail to convince some minds that our nation is born to noblest heritages; that the Biblical history of mankind (no matter what protoplasm philosophers on one side, and believers in German linguistic theories on the other, may choose to aver) is a living and material reality; and that, too, not only for what has already come to pass in history touching the favoured family of the Hebrews, but also for the working out of the prophecies still remaining to be accomplished respecting the two opposed, and distinctive, branches of that people; viz., the Israelites of the captivity of the Samarian Kingdom of Israel on the one hand, and the Jews of the destruction of, and dispersion from, Jerusalem under Titus, on the other;—though everything else, I add, may fail to convince some minds, that our nation may reasonably consider itself to a large extent descended from the former (though they were lost to the view of mankind 2,500 years ago), and owes its present unexampled prosperity and power to the special favour of God, far above its own intrinsic deserts (and should bow in humility and adoration accordingly),—the most convincing proof, I say, of these things to some minds may be,—to note certain recent episodes of our national history; and to mark what disasters might well have

befallen us according to the ruling of our statesmen for the time being, whether on one side of politics or the other,—yet how the nation was preserved, and even strengthened, notwithstanding.

Shall our public ministers then continue in their erring courses in order that the nation may abundantly prosper?—God forbid; that were to tempt God. And though the whole science of statesmanship may be far too mysteriously deep and difficult for any one man to presume to point out to another where the whole duty of a Prime Minister lies,—yet there is one rather neglected department of that officer's duty, wherein the very nature of the case allows of clear and simple mathematical views, capable of all men's understanding, being introduced; and this subject is the Great Pyramid's special one of metrology: a national as well as sacred matter too, though not yet studied from that side of the question by any British minister.

A worthy science, indeed, long ill treated and despised of almost all men, is metrology; and yet there cannot be the shadow of a doubt, that we are now on the eve of movements of the whole human race in connection with it; all educated communities *beginning* now to acknowledge it to be a marvellous power with germs of political influence of the highest order; specially adapted, too, for the working out of some of the grandest developments of the future. Every nation until now has had its own *hereditary* system of weights and measures; curiously intertwined no doubt with those of other nations in their distant primeval origins, vulgarized perhaps and even largely debased in times of mediæval darkness, as well as pestiferously meddled with and complicated by the doctrinaires of new-born modern and o'ervaulting schools,—but still there was hitherto something more or less national to every nation in its metrology, as in its language; and serving the

same purposes as the diversity of tongues in keeping up the heaven-appointed institution of *nations;*—the chief characteristic of all mankind from the days of the dispersion; unknown before that event, but never for one moment ceasing since then. What, therefore, is likely to be the result of man seeking in these days, by mean of his own devices, to undermine that institution of *nations*, and even endeavouring to quench it off the face of God's earth?

Whatever the result, the action to produce it has already begun; and the first weapon ordained to be used, and the first breach to be made in the barriers of national distinctions, is that of weights and measures. So that, without probably having distinctly contemplated the issue, yet most of the existing civilized nations have for years past been tending, not to go forward, but to bring all men back to the old, old state they were in when they attempted to build the Tower of Babel; and from which nothing drove them then, but a supra-natural manifestation of the power of God.

Progress of the Communistic French Metre.

Several centuries ago, and even less, there were nearly a hundred varieties of linear standards in use through Europe, but one of them after another has latterly dropped out of view, until it was reported at the French Exposition of 1867, that only thirteen could then be discovered; and since that epoch, all save three or four of them, are said to have practically perished, and the metre to be gaining adherents from even their votaries, every day.*

"There has therefore," says the *pro*-French metric President Barnard, "been large progress made toward

* "The Metrical System," by President Barnard, Columbia College, U.S., 1872.

uniformity, and the most important steps, and the most significant steps, are those which have been taken within our own century!"—"No man not totally regardless of the history of the past, and not absolutely blind to what is taking place under his own eye in the present, can possibly pretend to believe that the world is to be for ever without a uniform system of weights and measures; we cannot suppose that the progress already indicated is going to be arrested at the point at which it has now reached!"—"Of the two systems, therefore, just now indicated as the systems between which the world must choose, unless in regard to this matter it shall henceforth stand still for ever,—one or the other must sooner or later prevail!!" And he considers that of these two, the British yard and the French metre, the latter is certain to triumph in the end.

This result has by no means come about altogether spontaneously, or through unseen and only natural influences; the mind of man has had much to do with it, and it has been the one polar point to which French ambition has alone been steady and true during the last eighty years; always working for it whether sleeping or waking: whether in war or peace, always endeavouring to throw the net of her metrical system of weights and measures over other nations as well as her own people; and though not without some Imperial ambition to chain many conquered nations to the chariot wheels of France, yet with the far deeper Communistic feeling of converting all the nations of the earth into one great people, speaking one language and using but one weight and one measure, and that of human, as directly opposed to Divine, origination.

France had been consistent in her own case; she had begun, at her first Revolution, by slaughtering off all the accessible individuals of her reigning family; who, as such, were the very type and symbol to the

French people of their being a *nation*, one amongst many nations; or of their living under that post-Babel institution. Having then, at that dreadful close of the last century, killed off, as far as she then could, all her royal family, her priests also, and openly abrogated belief in the God of Scripture, she (France) could, at that time, of all nations consistently, and with show of demonstrable reason, become the champion of the metric, or anti-nation-existence metrological system; a system since then everywhere secretly adopted by the Socialists, Internationalists, Communists in all countries; and, strange to say, by certain scientific men also, in some cases claiming, in others scorning, to be reputed Christians.

The task of spreading this nationally suicidal scheme over all the nations of the world, might seem at first quite Quixotic; and would be, but for schemes and forces in the destiny of man, which man knows little or nothing about, until they have accomplished their ends and left him to rue their effects. So that it is owing at least as much to those unseen influences as to the direct action of any visible Frenchman, that the French metric system has been going forward during the last few years of history at a continually accelerated rate; and that one country after another has been persuaded to adopt it, until suddenly it has been found, to our exceeding astonishment and practical isolation, that almost every nation in Europe, and many peoples in Asia, Africa, and America, have already been converted.

France herself, strange to say, has not profited by the system either in war or peace. In war she has been lately defeated with greater overthrows than even the Persian empire of old; and the fighting faculty has abandoned her soldiers almost as completely as it did the Babylonians towards the calamitous end of their once powerful independence, or the grandsons of the soldiers

of Alexander the Great, when the Romans slaughtered them in battle with the utmost ease; while in peace, France's commercial transactions, though continually being "re-organized" on metrical science, remain far below those of Great Britain. Yet still she (France) calls upon all nations, and so many of these nations answer her call with delight, and madly encourage each other, to clothe themselves with this latter-day invention of hers; which, if successful, must, in so far as it goes, tend to decrease the nationality, if not to hasten on the final disappearance, of every nation adopting it.

Only three years ago there was published by a committee of Columbia College, United States, an excellent little book entitled the "Metric System." Drawn up chiefly by their Professor of the higher mathematics (Charles Davies), and approved by those then in power,—this work demonstrated unsparingly the artificial character of the French metrical system, the innumerable patches which it required in practice to make it hold water at all, the errors of its science, its inapplicability to the ordinary affairs of the mass of human kind; and concluded with reprinting the celebrated report on weights and measures by John Quincey Adams: which report, after indulging in the utmost oratorical vehemence for saying whatever could be said as a partisan for either side of the question successively, concludes with recommending all good United States men to have as little as possible to do with the French standards; but to feel hopefully confident that the inevitable development of the world's history would, sooner or later, bring up some far better system for the future happiness and prosperity of mankind.

But three short years have so accelerated the growth of French metric influence, or the predestined metrological temptation and trial of the whole world,—that all the parties to that first book upon the Metre seem now to

have vanished out of existence; and a new work, with the same title but totally opposite principles, was produced last year, to order of new governors, by the new President (Barnard) of the same college. An enormous issue of this last book is now being thrown off for distribution gratuitously far and wide, and (as our extracts from it have already indicated) it is ecstatically in favour of the French metric system being adopted by all Americans with the utmost possible speed. And when that is brought about, the author declares that Britain, Russia, and the Scandinavian countries will be the only known dissentients among educated peoples.

Scandinavia, however, it is asserted, has already been exhibiting some leanings towards the metric system; Russia is in the hands of her German officials, who are all now metric men, both at home and abroad; and Britain herself, who has hitherto successfully resisted private Bills in the House of Commons in favour of French metricalism, is told at last that there shall be a Government Bill next year. If that be carried, Russia and Scandinavia are expected immediately to yield; and all the nations of the world will then have passed through the great French mill, whose whirling stones will never cease to grind, until, excepting only those sealed by God, "it has caused all, both small and great, rich and poor, free and bond, to receive a mark in their right hand or in their foreheads; and that no man might buy or sell, save he that had the mark, or the name of the beast, or the number of his name." (Rev. xiii. 16, 17.)

Preparations made by the British Government.

Meanwhile, what have the ministers of Great Britain been doing either to fend off this dire calamity, or to embrace and make the most of this happy invention,

whichever of the two they may deem it to be? In parliamentary bills, nothing at all: and in private study, there is reason to fear, as little. Our Prime Minister's last work on the old, old subject of the poems of Homer, came out almost simultaneously with the announcement from Paris of twenty nations being about to meet there in fraternal union and international congress on their growing metric system; and since then, cruelly reminding of Nero playing his lyre while Rome was burning, the same eloquent orator has written on the superior glory of that man who invented a fiddle, over him who achieved the modern locomotive, the support of millions on millions of mankind!

Perhaps it was better for the British country that *that* minister should have been so employed; for he might have done worse than merely let us drift on under other guidance than his. But things cannot and will not, stop there: this view, the pro-French metric champion, President Barnard, makes very plain. We may indeed thus far have been saved from a pit of evil vastly more profound than appears on the surface; but politically we have not as yet reached any haven of metrological safety; no soundings are touched; no secure principles for anchoring to, reached; and no arguments of sufficient power to stand before the specious insinuations of French metrical agitators have yet been uttered in the House of Commons. We have our ancient national measures still, but with all their mediæval and modern imperfections on their head; and the attacks, open and concealed, of the metrical party upon them on that account, are unceasing. That party, moreover, has gained over the School Board Commission; the new office of the Warden of the Standards has been gorgeously supplied with expensive apparatus for French *vacuum* weighing and measuring; and men who ought to have died rather than give up their

opinions of a dozen years ago, have swallowed them all, and join now in recommending the total denationalization of our ancient metrology.

How long will our plastic rulers, accustomed to take demagogic pressure from without, in place of principle, knowledge, and understanding, stand firm against such agitation?

The very anxiety of President Barnard and the metricalists to bring on the final struggle as between the French metre and the English yard, shows that they have good reason to know that there is weakness in the supporters of the latter. Some involuntary throbbing, moreover, in the pulse of humanity is now telling all nations, with deeper truth than any philosophy can, that these are the last times of this dispensation; and that we are now or never to decide a long, long, future. "If the work was to be done over again," writes President Barnard, with an admirable sense of justice, "the French metric system ought to adopt, and doubtless would adopt, not their superficial earth measure the metre, but the Pyramid axial reference of the cubit, on account of its immense superiority in science.* But it is not to be done over again," he says, "and never can or will be; we must choose the metrical system as it is now or not at all; it has already been taken up by half mankind, and no able system of human invention will ever have such a chance of universal adoption; while no system that cannot and will not become universal, is to be tolerated for a moment. Now the British yard, or its third part, the foot," adds the President, "being only the measure of one nation, will always be

* This acknowledgment of President Barnard, at pp. 93 and 94 of his book, does him immense honour, he being an out-and-out pro-metre man; and it is of all the more weight that he gives an abler discussion of the present condition of the earth-size and shape question by modern geodesic measure, in all its most scientific ramifications, than has ever yet been seen in print, in a readable form.

resisted by the majority of nations,—therefore the metre must in the end gain the day."

The Stone prepared without Hands.

But is the final contest only between the metre and the British yard or foot? The anti-metric men in the House of Commons have hitherto succeeded in establishing nothing against the idea; and President Barnard says, both that it is so, and that all the wealth and numbers of mankind throughout all the world are divided on these two sides only. He does, indeed, allow in one place that there is a phantom of a third side, viz., the Great Pyramid metrology; but declares that that, having only a religious foundation, will never accumulate any large party about it.*

Since the days of Sennacherib defying the God of Israel, was there ever a speech more likely to call forth proof, in its own good time, that the arm of the Lord is not shortened? We see in Scotland already what the belief, that it is the Lord who appointed the chronological institution of the week, will do to make that one time-measure binding on a whole nation; and will the men of that land not also adhere to any such other weights and measures in the future, as they shall

* The exact words are, at p. 56:—"And one who, like Professor Piazzi Smyth, bases his metrological theories on religious grounds, and prefers the Pyramid inch as his standard, as a matter of conscience, is not likely to concentrate around him a very powerful party of opposition."

Here everything in the way of linear standards for the Pyramid system is made by President Barnard to rest on the inch; and he intensifies that accusation at p. 73 by writing:—"C. Piazzi Smyth almost fanatically attaches himself to the inch, a measure which he believes with implicit faith to have been divinely given to Cheops, builder of the Great Pyramid, and again to Moses in the wilderness; and in what he, no doubt, regards as the great work of his life, he uses no other term to express the largest dimensions." I can only therefore refer my readers to all that I have written in this book, as well as others, upon the grand standard of the Pyramid, and the only one certainly common to it and Moses, being the *cubit*.

come in time to understand were likewise appointed from the same Divine source?

President Barnard, in stating the conquests of the French metrical system at the utmost, bows involuntarily to the religious element; by the act of stating, not merely that the metre has been adopted by 160,000,000 men, but by that number of civilized people "in Christian lands." Yet in that case, if those inhabitants are truly Christian, will not they all, as well as Britons, delight to obey in the end, whatever shall be proved to have been appointed by Christ in the beginning of the world? Especially if in evident anticipation of present and future times; viz., of "the last days, when scoffers are to appear, walking after their own lusts and saying, Where is the promise of His Coming (Christ's Second Coming as a King)? for since the fathers fell asleep, all things continue as they were from the beginning of creation."

The Parties to the Final Contest.

It is, indeed, most curiously but intimately, between the French metre and the Messianic Great Pyramid cubit, that the final contest must come; for the present British weights and measures, as established by recent parliamentary laws only, are evidently doomed to fall.

Now the metric and the Pyramid systems, though on every other point utterly opposed, are yet in this one feature, perfectly similar to each other; viz., that they both tend to break down the post-Babel separation of men into nations, and combine them all into one grand government: but then, how is this principle carried out, by whom, for whom, and to what ends, in either case?

The French metric system, though it is not a hundred years old, is wanted by its promoters to override everything else in the world, of whatever age, and whatever origin. All nations are to bow down to it; and though

it is found, as it has been at every essential point, full of scientific blunders, and teeming with sacrifices of the comforts and conveniences of the poor and many, to the mere crotchets of a few doctrinaires in the upper classes, —it is never to be altered, never improved on, never replaced in its rule over all mankind by anything else of similar human invention;—no, not though the present order of human life, national distinctions excepted, goes on upon this earth, as the human prophets of the system say it will, for so very many hundreds of thousands of millions of years that the physical earth itself will have grown out of shape and size to that degree, as to become totally unfit to serve as a standard of reference for the mighty metre, the grand symbol of human rule in man, for man, and by man himself alone. Wherefore President Barnard already, in concert with other metricalists, though introducing the metre to the world, first of all as a scientific earth-measure, yet finally allows that they do not care whether it is, or is not, of that character; for they intend, by-and-by, to shut out all commensurable reference to the heavens above and the earth below; and simply adopt, within a closed chamber, a particular bar of metal made by man, as the grand metrological term in which all men,—of many nations originally, but soon, they think, to be swept together into one vast commune,—shall live and move and have any understanding of material things.

The Great Pyramid system, on the other hand, is the oldest metrological system in the history of the world; has its traces extensively among European peoples; and is next to perfect in all those scientific points where the French system fails. It is moreover full of benevolence and compassion for the poor and needy, besides teaching that their anguish and woes will last but a few years more; for then, agreeably with the Scriptures, Christ himself will again descend from heaven, this time with

angels and archangels accompanying, and will give to man at last that perfect and righteous government which man alone is incapable of; and so shall the Saviour reign over all nations brought under his one heavenly sceptre, until that Millennial termination arrives, when time shall be no more; and the mystery of God with regard to the human race will be accomplished.

Human, versus *Divine, Ultimate Rule.*

Even within the moderate bounds of only one nation, and for a short space of time, how totally insufficient is the best human government, to check the evils of humankind!

With all England's present wealth and science, or notwithstanding it all, pauperism is increasing in the land; rich men are richer, but poor men are more numerous and more hopelessly poor, and chiefly in the great cities; for there, in truth, the distressed, the miserable, the sick, the vicious, the under-educated, the persecuted and the persecutors of society, multiply beyond the rate of all government, all philanthropy, to procure any permanent relief or hope of amendment. A good *country* landlord may perhaps be able to supervise, help, and befriend to some limited extent every person in his little provincial community of men of humble ambition and simple life; but in the large towns, whence the great wonders of modern civilization emerge—there, in precise proportion as the towns are large, and a few of the inhabitants rich beyond all measure—there the houses of the dregs of the population, and the progressive debasement of humanity are beyond belief, and go on increasing every day;—recalling with awe the denunciations of Scripture against those who join house to house beyond human power of controlling results.*

* "The truth is that our wealthy and upper classes do not fully realize the manifold dangers to society arising in the overcrowded dwellings of

But, throw all nations into one vast community or family of the human kind, as the universal adoption of the French metrical system would be the beginning of,—and then, no matter whether the movement had been made *sicker* (Scotticè for surer) by the First French Revolution plan of decapitating all members of royal families, and whether socialistic communes had been established in more or fewer lands,—the scales for doing

the poor. They see only the wonderful advances made every day in whatever can add to the comforts, conveniences, pleasures, and luxuries of their own living. They never dream that their wealth, splendour, and pride, is surrounded by a cordon of squalor, demoralization, disease, and crime."

"The higher classes are slow to realise the fact, that in all our large centres of population there is an ever-increasing amount of poverty, immorality, and disease."

"From statistical returns in London, bearing on the condition of St. Giles's, it appears that there were in one district 600 families, and of these 570 severally occupied but one room each. In another, of 700 families, 550 occupied but one room each. In another district, out of 500 families, 450 occupied one room each. In one of these rooms, 12 feet by 13 feet, by 7½ feet high, eight persons lived. In another room, 13 feet by 5 feet, by 6½ feet high, five children and their parents lived."

"In Manchester small houses are packed together as closely as possible, and in them are stowed away an enormous amount of the poorer part of the population. Six persons in one room,—only one room to live in, sleep in, and in which to transact all the avocations of life."

"In Liverpool, 26,000 houses are occupied by families in single rooms, or a third of the whole population exists under these unsatisfactory conditions,—producing disease, immorality, pauperism, and crime; truth and honesty are, to human beings so debased, mere names."

"Our railway extensions, street improvements, the erection of new houses, public and other buildings, rendered necessary by our ever-increasing prosperity, act with the force of a screw, forcing decent families to quit comfortable houses, and in many cases they have no alternative but to accept shelter in already over-crowded and demoralised neighbourhoods, where there is little light, drainage, water, or ventilation, and no proper convenience for natural wants—and what happens? After a few weeks the strong man is bowed down, and the children are left an increase of pauperism to society."—Extract from the "Social Crisis in England," by W. Martin: Birmingham, 1873.

"At the Manchester City Police Court lately, a man and woman, baby-farmers, living at 126, Knightly Street, Queen's Road, were charged with the murder of a female infant. They were also charged with *attempting* to murder two female infants and one male. The former were discovered lying together on some dirty straw, covered with an old damp blanket; the latter was being nursed by a boy, and the woman was detected in the act of trying to conceal the body of the dead child. Two ounces of mouldy flour was the only eatable thing found in the house."—*Edinburgh daily paper*, 1873.

mercantile business and for speculating on in every element of life, must enlarge enormously : with the inevitable result, on one side, of a few clever geniuses making more colossal fortunes, whether honestly or otherwise, than ever ; but on the other side, of the wretchedness, the woe, the wickedness, and the degradation of the chief mass of the population going on increasing in all large centres of gathering together, and becoming more terrible in the long future ages than anything chronicled yet.

Contrast this inevitable outcome of human rule, increasing infinitely in disaster if continued for unlimited time unchecked by anything above the laws of nature as philosophers see them now,—with the sacred system of the Messiah's monarchy when He shall be in presence and power over all. A faint idea of only one of the characteristics of that kingdom was given in the happy condition of equality in health and relative prosperity, in the camp of the Israelites, when setting forth out of Egypt with Moses ; not under human rule only, but under the guidance also of the Angel of the Covenant : and when "there was not one weak one amongst them."

What are all the triumphs of human learning to that glorious result in a great nation ; and where has anything like it been seen either before or since ?

But in place of approaching such a desirable consummation for our perishing, yet increasing, millions, modern science and the churches, politics, war, and police, are swerving further and further from it every day. Yet poor science, in so far as it is for once truly so called, often maligned and never wealthy,—viz., the exact mathematical science of such men as the late Archdeacon Pratt, and which was "*not* at variance with Revelation,"—has yet proved herself of precious service to all mankind, if she has enabled us in the present day of growing doubts, and hearts failing them for fear,

to read off the great pre-historical, and prophetic, monument of Melchizedek in the land of Egypt; and to find that, besides scientific metrological knowledge, it utters things which have been kept secret from the foundation of the world; things which not even the Apostles were permitted to know of, 1840 years ago, viz., times and seasons which are in God's power alone. Wherefore thus it is, that the Great Pyramid is now, and only now, beginning to announce that a termination to the greatest misery of the greatest numbers of human beings, or to their continuing indefinitely under mere human rule, whether of kings or of republics,—is at length drawing nigh.

CHAPTER XXV.

GENERAL SUMMATION: SECULAR AND SACRED.

LET us now cast a rapid glance over the principal results obtained in the course of our long research.

(1.) The Great Pyramid, an entirely prehistoric monument, is found, though in Egypt, not to be *of* Egypt; *i.e.*, belonging to, or participating with, anything spiritually characteristic of that land and people in their long course of rebellion against the God of Revelation.

(2.) By being *in* Egypt, which is central to the land surface of the whole world, the Great Pyramid becomes similarly central to the Kosmos of man's earthly life and habitation: but yet has no Egyptian building to compete with it for architectural *intention* to be in that remarkable position; because it alone visibly stands with appropriate topographical attributes, over the outspring of that country's delta, or rather fan-shaped, area of soil. At the centre of physical origination of the Lower Egyptian land, therefore, the Great Pyramid was placed; yet by virtue of the *sector*-shape, both at the centre, and *also* at one side, of it,—just as with that "altar or pillar to the Lord *in the midst of the land of Egypt*," and "*at the border thereof*," which is to be manifested in the last day (Isaiah xix. 18—20): expressly to serve at that ultimate time "for a sign and witness unto the Lord of Hosts," as well as for a parable and wonder to all intervening ages (Jeremiah xxxii. 18—20).

(3.) At every structural point at which it is examined with sufficient minuteness, ability and knowledge, the Great Pyramid is found not only unlike the most characteristic buildings of the ancient people of Egypt, but is actually antagonistic to them. Especially is this the case in *their* inveterate tendencies to idolatry, animal worship, assertions of self-righteousness, Cainite boastings of themselves, with contempt and hatred of all other peoples. And while all these native and indigenous buildings, together with the gigantic stone idols of Egypt, are doomed in the Scriptures to bow down, and their country to become the basest of kingdoms,—the Great Pyramid is alluded to in the most honourable manner, both in the New and Old Testaments; its head-stone being even taken as a type of the Messiah; and its being brought forth to view, having been described there, as a sight which caused the morning stars to sing together, and all the sons of God to shout for joy, with cries of "Grace, grace unto it!"

(4.) The Great Pyramid, in a land where all other characteristically *Egyptian* buildings are profusely decorated and covered from top to bottom, and both inside and out, with inscriptions of portentous length and size both in writing, painting, and sculpture,—the Great Pyramid has, in and upon its finished parts,* no decoration, no painting, no inscription, no destination given to it, in any human language under the sun.

And yet, while no other Egyptian buildings can speak to their own absolute dates, and have set all the scholars of mankind grievously astray on impossible, ridiculous, and totally anti-Biblical chronologic schemes,—the Great Pyramid sets forth its own absolute date on unerring grounds of astronomical science. Whereupon, being already allowed by the best Egyptologists to be *relatively*

* Excepting, therefore, the oft-mentioned rude quarry-marks on the rough stones in Col. Vyse's "Hollows of Construction."

older than all other known buildings of any kind of pretence, whether in Egypt or any other part of the ancient world,—the Great Pyramid takes at once the lordly position of prescribing limits in time to all those other buildings, or we may say to all architecture whatever; and those Pyramid limits are now found to be in an eminent manner confirmatory of Holy Scripture.

(5.) While every other ancient structure of Egypt, and in so far of the world, was built for its own time and its then owners, and has had in their day its utilisation, its attendants, worshippers, frequenters or inhabiters, either living or dead,—the Great Pyramid has had no use ever made of it: no living man could enter its stone-filled passages when finished; no dead body either was, or could have been regularly deposited there; the coffer or so-called sarcophagus is too broad to pass in any way through the lower part of the first ascending passage;—the king of that time, according to triple historical tradition, and recently found local indication, was buried elsewhere; neither, until the last very few years, was the building in any degree understood by any nation, though all nations have guessed at its hidden mystery, its parable in stone; a prophetic and portentous parable, long since thrown in the very way of the ungodly in order that, "seeing they might see and not perceive, and hearing they might hear and not understand."

A thousand years ago Al-Mamoun broke violently into the building, but discovered nothing of its design as now known; and though others smashed many of the stones, chipped the edges of more, and performed whatever mischief man could perform with axes, hammers, and fire, —yet they have no more prevented certain grand ideas with which the whole was fraught in the beginning of the world, coming to be appreciated in these last very few years,—than did the destruction of the Temple of Solomon and the carrying away of all its golden vessels

to assist in the service of idols in Babylon,—prevent the accomplishment of the Hebrew prophecies touching their chief end, the appearance of the Saviour of Mankind among the Jews in Jerusalem.

(6.) What then, is, or is to be, the end or use for which the Great Pyramid was built?

The confident public is too apt to override this question with the far lower demand to be promptly told, "Who built the Great Pyramid, and what was his name?"

If you mean who plodded at fulfilling in masonry the orders given to, and exacted from, them according to patterns furnished (some of which are still to be seen on the Pyramid Hill in the azimuth trenches and the trial passages),*—I answer,—the subjects of the Fourth Dynasty's Egyptian king, Cheops in Greek, Shofo or Khoufou in Coptic; and they were legion.

But if you mean who furnished the design of the building and saw to its being realised,—even as the authorship of Milton's "Paradise Lost" was a far higher work than the hand labour of him who first set it up in type,—the answer is, Philitis in Greek, Shem or Melchizedek in Scripture.

And now, those answers to interposed calls being rendered, let us return to the practical end for which the Great Pyramid was both designed and built. The *manner* of that end appears—on putting facts together—to have been, to subserve in the fifth thousand of years of its existence certain pre-ordained intentions of God's will in the government of this world of man. For the Pyramid was charged by God's inspired Shepherd-

* A description of both of these very remarkable features, unexplainable on any but the strictest "Promethean," and scientific, theory, is given on pp. 125 and 185 of vol. ii. of "Life and Work." While an account of the happy manner in which W. Petrie was enabled to elicit the "testimony of the trenches" in favour of the circle-squaring *intentional* figure of the Great Pyramid, is to be found in my "Antiquity of Intellectual Man," at pp. 191—193.

Prince, in the beginning of human time, to keep a certain message secret and inviolable for 4,000 years, and it has done so; and in the next thousand years it was to enunciate that message to all men, with more than traditional force, more than the authenticity of copied manuscripts or reputed history,—and that part of the Pyramid's usefulness is now beginning.

Only as yet beginning; wherefore let no one jump too hastily at what the whole purpose may eventually prove itself to be. I, at least,—who have been drawn on by a train of events too wonderful for me to resist, to devote my best energies to this work; in presence of which, I by myself am of the weakest of the things of the world,—I presume not to speak to any other than such parts of the building as have already practically developed themselves. Herein, too, enough seems now to have shone forth to enable any one to state roundly, that the message wherefor the Great Pyramid was built, is largely of a duplicate character; or thus—

(A.) To convey a new proof to men in the present age, as to the existence of the personal God of Scripture; and of His actual supra-natural interferences, in patriarchal times, with the physical, and otherwise only sub-natural, experience of men upon earth. Or to prove in spite, and yet by means, of modern science which in too many cases denies miracles, the actual occurrence of an ancient miracle; and if of one, the possibility of all, miracles recorded in Scripture being true.

(B.) In fulfilment of the first prophecy in Genesis, which teaches, together with all the prophets, that of the seed of the woman without the man, a truly Divine Saviour of Mankind, was to arise and appear amongst men; a man apparently amongst men; in poverty, too, and humility; in further fulfilment thereof, the Great Pyramid was to prove,—that precisely as that coming was a real historical event, and took place at a definite

and long pre-ordained date,—so His second coming, when He shall descend as the Lord from heaven, with the view of reigning over all mankind and ruling them all with one Divine sceptre, and under one all-just, beneficent, omnipotent sway, that that great event will likewise be historical, and will take place at a definite and also a primevally pre-arranged date.

Now let us look a little closer into the first of these two reasons, or purposes ; viz.—

(A.)

In an age when writing was a rarity indeed, and barely more locomotion was indulged in by any of mankind than merely to roam with flocks and herds from summer to winter pasturage and *vice versâ*, and this only in little more than one central region of the earth,—in that primitive age it was announced that the day would come, when of the multiplication of books there should be no end,—when knowledge should be wonderfully increased, and men run to and fro over the whole earth, even as they are doing now by railway and steamer from London to the very Antipodes. In the interests of commerce they do it every day ; and in the interests of science, they are on the eve of specially doing it from every country of Europe and America, at unlimited expenditure of national wealth,—though only to gain a *little* more knowledge of the exact numbers to be set against a particular datum in astronomy which has already been ascertained within a hundredth of the whole amount, and has had thousands and tens of thousands of money spent upon it. And all these countries are highly encouraged and applauded for so continuing to spend their national resources and results of taxation of the people, because this is the scientific age of the

world, when science-knowledge to the most minute and microscopic degree has so excessively developed amongst mankind, that every one is open-mouthed for science; and science is supposed to enter into, and support, and deserve the best of, every ramification of life.

Therefore, it would seem to be, that an Omniscient mind which foresaw in the beginning the whole history of the world under man, ordained that the message, arguments, proofs, of the Great Pyramid should not be expressed in letters of any written language whatever, whether living or dead;—but in terms of scientific facts, or features amenable to nothing but science, *i.e.*, a medium for the communication of ideas to be humanly known and interpretable, only in the latter day. The employment of a written language, moreover, would have been a restricted mode of conveying the message essentially and characteristically to one nation alone; whereas the Pyramid's message was intended for all men, even as Christ's kingly reign at His second coming is to be universal.

Trace, too, the several scientific steps by which this purpose of the Great Pyramid is being, and has been, accomplished; and note how each and every one of those steps, while of the most important class for all science, is yet of the simplest character to be looked on as being any science at all:—so that the poor in intellect, and neglected in education, who are the many, may partake of it, as well as the more highly favoured who are only a very few.

Not in the day of the Great Pyramid at all, but rather since the revival of learning in Europe, no *pure mathematical* question has taken such extensive hold on the human mind as, the "squaring of the circle." Quite right that it should be so, for a time at least, seeing that it is the basis alike of practical mechanics and high astronomy. But as its correct quantity has been ascertained, now more than one or two hundred years ago, and, under

the form of π, or the proportion of the diameter to the circumference of a circle, is found in almost every text-book of mathematics to more decimal places than there is any practical occasion for (see page xvi.),—men might rest content and go on to other subjects. But numbers of them do not, and will not; hardly a year passes even in the present day, but some new squarer of the circle appears. Generally a self-educated man, and with the traditional notion in his head, that the proportion of length between the one line already straight and the other to be made straight in a circle, has never been ascertained yet; and that either the Academy of Sciences in Paris or the Royal Society of London has offered a large reward to whoever will solve the problem: so down he sits to the task, and sometimes he brings out a very close approximation to the first few places of figures in the fraction, by practical mechanics; and sometimes by erroneous geometry he produces a very wide divergence indeed. But occasionally the most highly-educated university mathematicians also enter the field, and bring out perchance some new algebraic series, by which a more rapid convergence than any yet invented to the true numbers of π may be obtained; see for instance such a case in the last volume (XVII.) of that most important one now amongst the scientific serials of the world, the Smithsonian contributions to knowledge (Washington, 1873); besides its references to similarly intended formulæ in other recent mathematical works. Wherefore that numerical expression 3·14159 + &c., is shown on all hands and in all countries, to be one of the most wonderful, lasting, characteristic, and necessary results of the growth of science for all kinds and degrees of intellectual men; and in an increasing proportion as they arrive at a high state of civilization, material progress, and practical development.

Is it not then a little strange, that the first aspect

which catches the eye of a scientific man looking with science and power at the ancient Great Pyramid, is, that its entire mass, in its every separate particle, all goes to make up one grand and particular mathematical figure expressing the true value of π, or 3·14159 + &c.

If this was accident, it was a very rare accident; for none of the other thirty-seven known pyramids of Egypt contain it.* But it was not accident in the Great Pyramid, for the minuter details of its interior, as already shown, signally confirm the grand outlines of the exterior, and show again and again those peculiar proportions, both for line and area, which emphatically make the Great Pyramid to be, as to shape, a π shaped, and a π memorializing, Pyramid; or the earliest demonstration known of the numerical value of that particular form of squaring the circle which men are still trying their hands and heads upon.†

Physical Science of the Great Pyramid.

Again, in physics, as a further scientific advance on the foundation of pure mathematics, is there any question so replete with interest to all human kind as, what supports the earth; when, as Job truly remarked, it is hung from nothing, when it is suspended over empty space, and yet does not fall? In place, indeed,

* The learned Dr. Lepsius enumerates sixty-seven pyramids; whereupon Sir Gardner Wilkinson remarks, with irresistible pathos of modesty and feeling, "but it is unfortunate that the sixty-seven pyramids cannot now be traced."

† In further reference to the ante-chamber case in chap. x., where the Abbé Moigno had already produced the neat expression, from its measure in inches, of $\frac{c^2}{\gamma^2} = \pi$, — Professor Hamilton L. Smith, including the anterior and posterior passages with the length of the ante-chamber, and taking account also of the breadth, similarly in Pyramid inches, finds, in those terms, $(1 + \pi) \times 10$; $(\pi + \pi^2) \times 5$; and $(\pi^2 + \pi^3) \times 5$,— all of them given well within the limits of error of the best modern measures, as set forth in "Life and Work," vol. 2.

of falling destructively, the earth regularly revolves around a bright central orb, and in such a manner as to obtain therefrom light and heat suitable to man, and day and night. What is the nature, then, of that path which the earth so describes, and what is the distance of the physical-life luminary round which it now revolves, but into which it would fall straightway as to its final bourne and be destroyed by fire, if that onward movement were arrested? As in squaring the circle, so in measuring the distance of the earth's central sun, both learned and unlearned have been working at the question for 2,300 years, and are still for ever employing themselves upon it; and nothing that all nations can do, whether by taking their astronomers away from other work, or enlisting naval and military officers as temporary astronomers, and furnishing them profusely with instruments of precision of every serviceable science, and sending them to every inhabitable, and some uninhabitable, parts of the earth, is thought too much to devote to this question of questions in physics for the future behoof of a world grown scientific. Yet *there* is the numerical expression for that cosmical quantity nailed to the mast of the Great Pyramid from the earliest ages; for it is its mast or vertical height, multiplied by its own factor, the ninth power of ten, which is the length all modern men are seeking, and struggling, and dying, and will continue to die, in order to get a tolerably close approach to the arithmetical figure of: and this accurate sun-distance at the Pyramid is accompanied by an exhibition of the space travelled over during a whole circle of the earth's revolution, and the time in which it is performed.

And if from solar-system quantities we turn to matters of our own planet world in itself alone,—does not every inhabitant thereof yearn to know its size; and yet was not that impossible to all men, of all the early ages, to

attain with any exactness? In illustration whereof it is recorded, that the Deity confounded Job at once with the words: "Hast thou perceived the breadth of the earth? Declare if thou knowest it all." *

And the only answer that Job, one of the chief and wisest men of the earth at that time, could return, was—

"Therefore have I uttered that I understood not; things too wonderful for me, which I knew not. Wherefore I abhor myself, and repent in dust and ashes." †

But precisely that thing which all mankind from the Creation up to the day of Job, or of Moses, had not accomplished, and had no idea or power how to set about to perform it, and did not make even any rude attempts in that direction during the following 2,500 years—though they do know it now with considerable accuracy—was not only well known to the author of the design of the Great Pyramid, but was there employed as that most useful standard, in terms of which the base-side length is laid out; or with accurate decimal reference to the earth's peculiar figure, its polar compression, the amount thereof, and the most perfect method of preserving the record for all men.

Who but the Lord could have done that wonder above man's power *then* to do? For, "Have ye not known? have ye not heard? hath it not been told you from the beginning? have ye not understood from the foundation of the world? It is He that sitteth upon the circle of the earth." It is He also "Who hath measured the waters in the hollow of his hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales and the hills in a balance." ‡

* Job xxxviii. 18. † Job xlii. 3, 6.
‡ Isaiah xl. 12, 21, and 22.

Who, indeed, but the God of Israel could have performed this last-mentioned still greater wonder than any mere linear measure, so far as its exceeding difficulty to men even in the present scientific generation is concerned; and could have actually introduced, both into the King's Chamber Coffer, and the said chamber itself, an expression for the next most important quality, after size, of the earth-ball we live upon—viz., its "mean density;" besides expressing in the base diagonals of the Pyramid the enormous cycle of years composing the earth's disturbed rotation or precession period of the equinoxes; a period six times as long as the whole historic life of man yet accomplished, and the only known phenomenon for keeping longest records, suitable at once to all degrees and states of men.

Science not the Great Pyramid's Final Object.

Yet with all this amount of science brought before us out of the Great Pyramid, yea even with all this quintessence of scientific results, let us not be run away with by the notion of some,—that to teach science, was the beginning and end for which that building was erected. Certain men, I do indeed know only too well, will not go astray in *that* direction; for they have already wandered off into the opposite error of assuming, that the many successive results deduced from the measures of the Great Pyramid, cannot be each and every one of them intentional, or indicative of any wisdom of Divine Inspiration,—because each of them, after the first, was a necessary mathematical result from, and consequence of, any Pyramid whatever, if it had a shape and size so far given.

This reasoning is strangely short-sighted; because in the first place, both the shape and size required the superior mind to choose and decide them; and then, no

second or third cosmical result has been yet deduced, from any *necessary* subsidiary features in the size of the Great Pyramid, without introducing, at the same time, a second or third unit of measure of diverse order, and connected with the first, by no features of the mere geometry of the Pyramid, but rather by allied physical researches and Biblical readings. As, for instance, after the whole vertical height, undivided, was appropriated for sun-distance,—then the unit of a *sacred Hebrew cubit* was employed for the days of the year when applied to the base-side length; and finally the earth's axis commensurable *inch* for the amount of a year's precession, in conjunction with the length of the base-diagonals. While the earth's mean density, if expressed in the same inches cubed, is obtained, not from the same parts or any necessary deductions from those parts of the whole Pyramid, but from the totally independent features of the King's Chamber and the Coffer; which were absolutely separate results of the mind of the designer of the whole structure, and are to be found in no other Pyramid, temple, or tomb whatever.

Further Fallings Away from Simple Fact and Truth.

Another class of modern educationists, however, have lately deviated towards still another point of the compass of error; as thus:—Throughout all Sir Isaac Newton's dissertation on cubits, he dwells on nothing more forcibly, and explains nothing more clearly, than the absolute antithesis between the cubit of the Hebrews and the cubit of the Egyptians. Each of them was sacred to its own party; but, while the sacredness of one of them is confirmed by Scripture, the sacredness of the other is sinfulness there; it is profane in Scripture. Yet some men have been lately deceived into fancying that there

are just as many glorious cosmical coincidences in the size of the sacred Great Pyramid and its parts when measured by the profane cubit of idolatrous Egypt, as by the cubit which Moses told the Israelites was the cubit of the Lord their God.

This cannot be, if the Pyramid contains original Messianic allusions. But it may be *almost so;* for again and again Scripture warns us to beware of temptation and the wiles of the tempter,—that sin can put on so specious an appearance of sanctity, that almost all men shall be carried away by its devices; and the danger will never be greater than in the very last times immediately preceding the Lord's Second Coming; for then Anti-Christ shall appear personally, giving out that he is Christ, and working such signs and wonders as shall deceive, if it were possible, even the very elect.

A nearly parallel case, in the ancient land of the Great Pyramid (recorded doubtless for our guidance), is that of the enchantments of Pharaoh's Egyptian priests with their rods, against the heaven-performed miracles of Aaron's rod. The enchantments of either side for a while were almost the same, for either party turned their respective rods into serpents large or small; but in the end, Aaron's grand rod swallowed up all the unholy brood of petty snakes from the rods of the Egyptian priests: and then those unhappy men were totally unable to go on any further with *their* enchantments.

Now apply this case to the metrological rods still surviving,—viz., the sacred cubit of Moses on one side, and the profane cubit of Egypt on the other, and both of them in the Great Pyramid. The former has its first grand acknowledgment of its really ruling there for the Lord its originator, in giving forth the days of the year, when applied as the standard of measure to the side of the base of the whole structure; *i.e.*, the side of the ancient base, divided by the days of the year, gives the

length of the sacred cubit of Moses, and shows it to be the 10^7th part of the earth's semi-axis of rotation in length. But the profane cubit of Egypt is not so produced, or producible by, or from, any of the leading dimensions either of the bodies of the solar system, or of the Great Pyramid. No, indeed, it is only by going to a much smaller part—the King's Chamber, and chopping up its length into *twenty little bits*, that then an approximate representative of the profane cubit of Egypt, 20·61, rather than 20·7, Pyramid inches long, is obtained; and some secondary physical phenomena are said to be evenly commensurable therewith.

But what Pyramid authority is there for any Christian, for sacred purposes, chopping up that grand unit, the King's Chamber length, into twenty parts and producing all this vermin swarm? None that I know of, for there is no twenty marked in the room; and the floor length is, in actual fact, one noble whole, which no one should dare unauthorizedly to destroy as such.

Yet still, what one given scientific *reason*, intellectual men are obstinate in asking, can be shown, for preserving that length of the King's Chamber untouched? It *is* a fact, so far; but does it mean anything in, and by, that whole length; a length which, so far as we can *superficially* see, says nothing in favour of the sacred Hebrew cubit, or decimal numeration, or notable Pyramid parts,—but rather the contrary? Up to July, 1873, I myself had not the slightest idea; and it was only when in pain and distress at the falling away of some of my best friends towards both the profane cubit of Egypt, and the sidereal year of a few doctrinaires and *two* of the Pyramid measurers only, in place of going to the solar year of all humanity and of *all* of the Pyramid measurers taken *fairly*,—that suddenly, not by my own penetration, but rather by a veil being withdrawn from my eyes, I suddenly understood what had been before

me for eight years, as well as published for six years to all the world, and yet had never been guessed at either by me or the world.

The length of the King's Chamber, as taken from the mean of all my measures (because far more numerous than those of any one else), is 412·132 Pyramid inches: it is moreover the longest granite line in the Pyramid, and admirably adapted, with its level position, polished rectangular ends, and uniform temperature, for a good measure being made of it. Indeed, it *is* the best modern measured line of the best preserved of the ancient parts of the whole Great Pyramid.*

But still, demand the querists, why was not so conspicuous a length made a *round* number of sacred cubits?

Because it was intended to typify reasons as well as facts, I am now enabled to reply; for it expresses,—1, the length of the base-side of the whole Great Pyramid, agreeably with the mean of *all* the direct measures thereof; 2, its vertical height; 3, its π shape; 4, the metrological combination of sacred cubits and earth-commensurable inches; and, 5, the absolute length of that sacred cubit which was ordained of God, in after-ages, to Moses and the Israelites.

* My original measures of the King's Chamber are given in "Life and Work," vol. ii. pp. 101, 102, in British inches, and with the mean taken roughly. They are also given similarly at page 178 of this book. Here, with the same original numbers, they are turned from British into Pyramid inches, and the mean taken more exactly, or to three places of decimals; introducing the breadths observed also; a necessary refinement, now that from Mr. James Simpson's sums of the squares (see page 181), the breadth of the chamber may be inferred to be theoretically and exactly half of the length, and with the following result for the final mean of the whole:—

Final means for each element, giving double weight to the lengths directly measured . { 412·182, 412·182, 412·054, 412·054, 412·188

Grand mean of all the elements concerned = 412·132 P. in.

All these several things out of one and the same set of numbers?

Yes, out of one and the same set of numbers, when used on certain principles of calculation of which plain indications are given on the walls of the ante-chamber to the King's Chamber by the original builders; viz., the diameters of a circle and square of equal area with each other; together with a reference of this theorem to a length of four times 103 inches and a fraction long.*

That length can, of all lengths thereabouts, of course be no other than the 412·132 of the King's Chamber floor itself.

Now 412·132 is, no doubt, an awkward-looking fractional and uneven number, bearing no easy or self-evident proportion to the known length of base-side or vertical height of Great Pyramid, or to Pyramid numbers of inches, or cubits, or to the value of π. But, following the hint given in the ante-chamber (Captain Tracey's most suggestive discovery), and calling those 412·132 Pyramid inches 412·132 Pyramid, or sacred, cubits (of 25 such inches each),—consider that number, I say, of cubits the diameter of a circle; and then,—

* Four lines of that length, deeply and grandly cut, are on the south wall of the ante-chamber. We have already taken them as symbolising a division of that wall-surface, transversely into 5; as they do, and have led us from that circumstance to recognise the division of the walls of the King's Chamber into five courses. But they do not, therefore, cease to be four lines; four lines, too, of a certain length. The exact original length is now a problem, for the lower part of them is broken away in the general modern breakage of the top of the ante-chamber's south doorway, and it may have been as much as 105·6 inches (viz., the difference between the height of the doorway and that of the ante-chamber), if the lines were continued to the very corner. But while that original completeness is not proved, the 105·6 is quite close enough to $\frac{412 \cdot 132}{4}$, and distant from any other competing line, for all the ante-chamber's purposes as a mere synopsis of what is to be found in the King's Chamber, to refer one to the 412·132, and leave all exactitude to be obtained from that length, as there laid down, in one whole accurate quantity.

(1). That circle has equal area with a square (see computation below *), each side of which measures 365·242 + &c. sacred cubits; or is equal in those cubits to the length of the socket side of the Great Pyramid from the mean of *all* the measures; and equal also, in days, to the universally acknowledged number of days and parts of a day in a mean solar tropical year; *i.e.*, a solar year for the general times and season purposes of all mankind.

Next (2), consider that same length of 412·132 cubits to be the side of a square,—that square is of equal area with a circle whose radius = 232·520 + &c. sacred cubits;† also = the already concluded height of the Great Pyramid from all the measures; equal also, when reduced back from cubits to inches, very nearly to the mean of the *two* distinct heights which the King's Chamber so curiously possesses in simultaneous

* 412·132 = diameter of a circle . . . = log. 2·6150363
Find its area . . . . . × 2

5·2300726

Add log. of $\frac{\pi}{4}$ . . . . = 9·8950899

Log. area of required circle . . = 5·1251625

Find length of square of equal area . . . . 2)5·1251625

Log. side required . . . = 2·5625812
Nat. number of side required . . = 365·242 + &c.

† 412·132 = side of square . . . . = log. 2·6150363
Find area of that square . . × 2

Log. of area required . . . = 5·2300726

Find radius of circle of equal area . . . . 5·2300726

Subtract log. of $\frac{\pi}{4}$ . . . = 9·8950899

5·3349827
÷ 2

Log. diameter . . . . = 2·6674914
Nat. number of diameter . . = 465·041
Radius required . . . . = 232·520 + &c.

existence; or to double the 116·26 length of the antechamber floor.

Further (3), the diameter of a circle having 232·520 + &c. for radius : (*is to*) the periphery of a square whose side length = 365·242 + &c. of the same units : : 1 : π, the grand and leading Pyramid proposition.

(4.) When Pyramid inches inside the King's Chamber are found to tally with sacred cubits measured outside the Great Pyramid to the 1,000th part of unity, not only in giving a coincidence in numbers, but in assigning a good scientific reason for them,—we cannot but allow that those Pyramid inches and those sacred cubits were acknowledged and used by the designer of the entire structure. And finally,

(5.) The absolute length of the sacred cubit of the Great Pyramid and Moses, is deducible now to the ten-thousandth of an inch from a direct measure of the most glorious and best preserved part of the ancient structure, viz., the King's Chamber, on being simply computed according to the modern determination of the value of π and length of the year; and comes out from the local measure of 412·545 British inches to be 25·0250 + &c. British inches.

In which case that whole quantity of length of the King's Chamber floor has an importance of symbology and signification in its *integrity*, which enables it in a moment to overcome and swallow up all that artificial brood of little, useless, profane cubits which ill-advised persons had attempted to manufacture out of its supposed cutting up; and defies *them* to produce, in terms of their units, or by means of their enchantments, overthrown like those of the old Egyptian priests, anything of equal importance to men, religion, and history,—either in the Pyramid's structure or the cosmical order of nature.

These modern Pharaonists have even brought themselves under more solemn cognizance; for—

"Produce your causes, saith the Lord; bring forth your strong reasons, saith the God of Jacob.

"Let them bring them forth and shew us what shall happen: let them show the former things, what they be, that we may consider them, and know the latter end of them; or declare us things for to come."—Isaiah xli. 21, 22.

—*i.e.*, things which the scientific and sacred theory of the Great Pyramid seems to enunciate in its second part,—

(B.)

This second part of the end wherefore the Great Pyramid was built, I have already said, appears to begin somewhat thus; viz., to show the reality, and the settled, as well as long pre-ordained, times and seasons for each of the two comings of Christ. Both for that one which has been, *i.e.*, which was 1873 years ago, and under whose then commenced spiritual dispensation we are still living; and also for that other one, in kingly glory and power, which is yet to beam upon us.

When, that second coming has been appointed to take place, must be a most momentous question; and is one to which I can only reply, that, so far as the Great Pyramid seems to indicate at present in the Grand Gallery, the existing Christian dispensation must first close (in some partial manner or degree), the saints be removed, and a period of trouble and darkness commence; for how long, it is difficult to say, seeing that the scale of a Pyramid inch to a year appears to change there.

Very long the time can hardly be, if the Pyramid standards of the metrology of that universal kingdom, the only successful universal kingdom that there ever will be on earth, the kingdom of the Lord Christ, are already beginning to appear from out of the place of security where they were deposited in the beginning of the world.

But that place of security, the Great Pyramid, is in Egypt. Is Egypt ready to receive the Lord?

Of Egypt in the latter day, incomprehensibly wonderful things are recorded in Scripture. It is apparently to be the first of the three,—Egypt, Assyria, and Israel; and the Lord of Hosts shall bless it, saying, "Blessed be Egypt my people, and Assyria the work of my hands, and Israel mine inheritance." (Isaiah xix. 24, 25.)

But previously to that day, and after the Great Pyramid shall have become manifested as a sign and a witness to the Lord of Hosts,—there shall go up a great cry unto the Lord from the land of Egypt: "for they shall cry unto the Lord because of the oppressors, and he shall send them a saviour and a great one, and he shall deliver them. And the Lord shall be known to Egypt, and the Egyptians shall know the Lord in that day, and shall do sacrifice and oblation; yea, they shall vow a vow unto the Lord and perform it. And the Lord shall smite Egypt; he shall smite and heal it; and they shall return even to the Lord, and he shall be entreated of them and shall heal them."

The New Policy of Old Egypt.

Now what is this great cry to go up unto the Lord from Egypt and because of the oppressors?

Of old, all men who drank the waters of the Nile on either *side* of the lower part of the course of that river, say from Assouan, say even from the Second Cataract in Nubia down to the sea, *i.e.*, from the very furthest distance that can pretend to any Coptic civilization or people,—all these men were considered to belong to Egypt.

But within the last few years an insane ambition, or a hardening of the heart, has touched the Court at Cairo, to apply the ancient proverb to *length* all along the stream, as well as distance on either side of the lower part only; and to maintain, that all lands through which the Nile flows, and from which it comes (though

those lands have remained utterly unknown to, and unvisited by, Egyptians from the beginning of the world), belong by right to Egypt. The main reason, as yet given forth, why modern Egypt should have a right to attack and take possession of the other Nile countries, and not they, take Egypt, seems to be,—that Egypt is the only one of them all which has astonished and delighted mankind (but offended God) through forty centuries with triumphs of ornamental architecture, glories of sculpture, and mysteries of painting and wisdom. Wherefore every zealous paid servant of the Egyptian state has now to argue this case to the outside world; and to maintain victoriously against all comers, that His Highness the Khedive, being the direct successor of Rameses the Great, is fully justified in sending up armies to make war on all men and countries so far as they may be found eventually on the course of the Nile; because he has an hereditary right forcibly to annex them all, even right away into the southern hemisphere, and bring them under Egypt's inevitable Pharaonic rule.

The scheme has a certain air of grandeur about it; so majestically ignoring all ordinary ideas of what constitutes a *casus belli;* and the very notion of present-day Turks, who cannot draw at all, and are bound by their religion to eschew everything in the shape of human portraiture,—the idea of them of all men claiming the reward due to Egypt's ancient artistical skill, and her sculptured idolatry too,—is rich beyond expression. But the wisdom wherewith the subtle measures for accomplishing the purpose are being taken, is a feat transcending diplomacy; and yet,—"the Egyptians are men, and not God; and their horses flesh, and not spirit;* wherefore out of those very steps and means, as the pride that goeth before a fall, it may be that the close of the Turkish rule will come.

* Isaiah xxx. 1, 3.

Slave-holders possess Egypt.

In setting up again, and in a new French garden, as the officials of the Khedive are now doing, the statues of Rameses, and the stone and metal idols of old Egypt, in order to claim æsthetic credit with European *dilettanti* (who themselves dabble far too much in the accursed thing), these Egypto-Turks are losing their only claim, as Mohammedans, to any favour from the God of Israel over the reprobate, image and relic-worshipping, Christians of the East. These degraded men being apparently the wretches who, though plagued by the locust and scorpion-like Saracen armies that proceeded out of the smoke from the bottomless pit, yet, to the last, "repented not of the works of their hands, that they should not worship devils, and idols of gold and silver, and brass and stone, and of wood; which neither can see, nor hear, nor walk." (Rev. ix. 20.) And the Khedive's ruse of sending up a large army to the sources of the Nile, under an *Englishman* forsooth, to annex all the negro countries he should discover, to the slave-power of Egypt,—for the pretended purpose of putting down the slave-trade, when its result can only be to give into the slave-holding hands of the Egyptian Government more extensive and uncontrolled supplies of slaves than ever,—while that ruse carries deception to a point beyond which probably the arch-deceiver himself could no further go, it may be the very item that was required to fill the catalogue of woe, and bring the question of the slavery of mankind to its last footing.

The English emancipation was great; the Russian greater; the American still greater; but the Egyptian, may prove to be the greatest of all; for with it, the slavery of Constantinople and of the Mohammedans generally, will fall too; and that slavery of theirs includes another horror within itself, far beyond all that Christian slavery

ever did; for it requires Government manufactories for converting boys into odious machines, fit to guard the multitudinous hareems of rich Mohammedans; and the pains, the woes, the slaughter amongst the poor innocents, before the fell purpose of their tyrant masters is accomplished, can be known to God alone.

"Oh, but when the slaves do reach Cairo (for these heinous manufactories are a long way up the river), they are well treated," say some would-be apologists for the secret system of slave-marts which they know go on in Egypt, in spite of all the counter protestations to Europe by a Government which profits by, and *uses*, them. "When the slaves do reach Cairo," say these well-meaning but weak apologists, "they get considerate masters, enter rich households, and pass far more easy, comfortable lives, than any of the independent Arab, or Coptic, fellahs in their agricultural villages."

"But the principle is bad," insists a man of sterner mould, "and the results must therefore be degrading to the master as well as the slave; not to say anything of all the previous and some following cruelties, which shall make so many afflicted ones in the land of Egypt, cry to the Lord because of the oppressors. And though the Lord may have long tarried, the time will come, and the Great Pyramid indicates it to be near, when, in some supranatural manner, God *shall send them a saviour and a great one, and he shall deliver them.*"

The Egypt of the Lord Christ.

If, then, the present possessors of Egypt be not those of whom the Lord Christ is likely to say (at least, in their present and most unrepenting state), when His personal reign begins,—"Blessed be Egypt, my people, and Assyria, the work of my hands, and Israel, mine in-

heritance,"—who are those favoured ones, in and for Egypt, likely to be?

Of the present localities of the ancient Assyrians, we do not know much, though there is a growing idea that they have drifted with the human current of history westward from their original habitats, and are now to be found amongst those whom the ethnologists delight to call Indo-Germans; but who seem phlegmatically content to be, and remain, an inland, continental people without a single foreign possession. But of Israelites our nation is now becoming, even year by year, through means of the works of John Wilson and Edward Hine, far less blind than it has been through all the previous period of its occupation of these Isles of the Sea which contain us now; from whence too we have overflowed both to rule with order, enlightened justice, and a firm hand among many Eastern nations, and to occupy and make to blossom the "desolate heritages" of distant parts of the earth. While the resemblance of our earliest Saxon, or *Ephraimite*, metrology to the system of the Great Pyramid, both gives us a species of "Inheritance" interest in that building, and may include something else still more noble in connection with the coming universal Messianic kingdom: when, "All the ends of the world shall remember, and turn unto the Lord: and all the kindreds of the nations shall worship before him." That is, when such kingdom of the Lord's shall at last be established. But before then,—what?

Only last year, when the Abbé Moigno, in Paris, was advocating amongst his countrymen, with a heavenly patriotism higher than all patriotism usually so-called, the weights and measures of the Great Pyramid; and pleading for them as belonging to that government whose Father and King is God,—he was met by a noted *savant* of the Academy with the argument, "No! let us keep to our own invented French metre; because Great Britain,

with an inch so very like the Great Pyramid's inch, would have a glorifying advantage over us if that ancient system were to be universally adopted."*

Alas! has national rivalry or national envy driven modern Frenchmen to so suicidal a policy as this! And at the same time, has national apathy, if not apostacy, brought some Englishmen so low, that it is even *now*, within these last very few years, that they have begun to talk about abolishing their own hereditary measures, and propose to throw in their metrological lot with the all-compelling republic, to be perhaps for a moment, under the Communistic French metric system, and amid the general drifting (which is now going on) of all the classically descended nations into infidelity.

If, on the one hand, in the coming contest of the standards of measure, the promises of God made to our nation of old, are abundant beyond what the heart of man could conceive;—on the other, our responsibilities, perhaps dangers, are most grave. For though on one side we are Scripturally told (in connection with the preparations for setting up the Messiah's kingdom), that it shall be "when God has bent Judah for Him, *filled the bow with Ephraim*, and raised up thy sons, O Zion, (Israelites of both houses,) *against thy sons, O Greece*, and made thee as the sword of a mighty man,"—

Let *us* "be not high-minded but fear," when on the other side we also read, in the same undying scroll,—"The children of Ephraim, being armed and carrying bows, turned back in the day of battle."

May the Lord in his mercy, preserve all those who have once put their hand to the plough, from ever looking back.

* "Les Mondes," November 7, 1872, p. 393.

APPENDICES.

APPENDIX I.—MR. WAYNMAN DIXON'S CASING-STONE.

„ II.—DR. GRANT'S CRUCIAL PYRAMID INVESTIGATIONS.

„ III.—DR. LEIDER'S SUPPOSED PYRAMID.

„ IV.—MR. JAMES SIMPSON'S FURTHER PYRAMID CALCULATIONS.

„ V.—RUDE STONE MONUMENTS *VERSUS* THE GREAT PYRAMID.

„ VI.—RECENT ATTEMPTS TO SHORTEN BOTH THE GREAT PYRAMID'S BASE-SIDE AND THE PROFANE CUBIT OF EGYPT.

I.

MR. WAYNMAN DIXON'S CASING-STONE.

THIS fine example of one of the old casing-stones of the Great Pyramid, is a recent acquisition in further illustration of Chapter II., and was discovered by Mr. Waynman Dixon, C.E., in 1872, loose, and forming part of the mediæval hill of rubbish on the north side of the Great Pyramid.

Not only is it the *largest* casing-stone fragment which has yet been brought to Europe, but it has this superior feature of interest above all known examples; viz., that it has portions of the two original, worked, *end surfaces*, as well of the top, bottom, and sloping front.

It is therefore the only casing-stone from the Great Pyramid of which we know, or may measure, the ancient length from one end side to the other. For although the far larger casing-stones *in situ* discovered by Colonel Howard-Vyse near the middle of the north foot of the Great Pyramid, *might* easily have been measured in similar length,—and perhaps were, before being mischievously broken to pieces by night depredators, as related by the Colonel,—still no actual measures of the *length* of those stones are extant, so far as I am aware.

There is not indeed any theoretical necessity, in view of the first and chief purpose for which casing-stones of the Great Pyramid are usually interrogated (viz., the angle of slope or bevel of the front, compared with the horizontal planes of the top and bottom surfaces of the stone), that we *should* know their length from side-end to side-end. But in the example of this, Mr. Waynman Dixon's casing-stone, when its length was at last, and very recently, measured by him, it was found so very close to the formal quantity of 25 inches, as inevitably to raise

some question whether that length had been *intended.* For such intention would have been equivalent in that place, both to exhibiting the length of the linear symbolical standard of the Great Pyramid, and showing, by its proportion to the whole base-side length of the monument, the number of days and parts of a day in a year,—a piece of practical astronomy far in advance of all men in that early age.

This at present unique stone, then, having been kindly presented to me by Mr. Waynman Dixon, has been formally deposited in the Library of the Royal Observatory, Edinburgh, at 15, Royal Terrace, and is roughly of the following leading dimensions:—

20·6 inches high, from level bottom to level top surface;
36·7 „ deep, or from front to back, at the bottom;
20·3 „ „ „ „ „ top;
26·2 „ in slope, from bottom foot up to top of sloping bevelled face; and
25·5 „ long, from side end to side end, at front.

But on attempting to arrive at much accuracy of measurement, there are several further details to be taken into account, as thus:—The original worked surface forming the back of the stone, is entirely gone or broken away, and only fragments (sometimes much less than the half) of each of the other five worked surfaces remain. Hence a necessary preliminary to any exact measure proved to be, the making up of each broken surface-plane to its ancient completeness of superficies by applying thereto either a flat drawing-board or a sheet of plate-glass held in contact position.

Even this method, unfortunately, was not quite accurate or fair to the ancient masons, because the full truth of their surfaces was intended by them to be tested only by the circumferential border thereof,—the central region of every surface, except the bevelled slope, being slightly lowered beneath the borders; and in no case is there now any opportunity of measuring all across one of these surfaces, or from border to border. Making, however, between such parts of any worked surface as were still extant, the best compromise which the case admitted of, the following results have been obtained since the earlier chapters of this book were written:—

1. The top and bottom surfaces of the stone are not quite parallel; for, while their mean distance apart (or height) is 20·63 British inches, their particular distance is,—

(1) At back of stone .	on east side	= 20·41,	and on west side	= 20·42
(2) At front top . . .	„	„	= 20·62	„	„	= 20·65
(3) At front top, produced so as to be vertically over the front foot of the stone	„	„	= 20·78	„	„	= 20·71

2. The errors, or variations of height seen above, are evidently of a nature which would have tended to being corrected, had the back borders of both bottom and top surfaces been in place. But it is otherwise with the length of the stone from side-end to side-end, both at different heights, and still more at different distances from front to back; for the error there is not only in the other direction, but is far larger; and is directly of such a kind, as to make the back of the stone broader than the front, or to cause it to be wedged in and held fast when built into place. And this was the very feature of Great Pyramid masonry, combined often with stone cramps, which gave Colonel Vyse so much trouble when excavating into the south side of the monument; for he could only get each stone out by breaking it into pieces *in situ*, and drawing it forth piecemeal. Accordingly we find for Mr. Dixon's casing-stone,—

Length from end side to end side,			at back foot . . .	= 28·2 ins.
„	„	„	at back top . . .	= 27·8 „
„	„	„	at front top . . .	= 26·2 „
„	„	„	at front at middle level .	= 25·6 „
„	„	„	at front foot at lowest level	= 24·9 „

3. Hence the sloping or bevelled front of the stone cannot be said to be accurately, or simply, 25 inches long from side end to side end. It is indeed of that length at a level of about 6 inches above its base, because it is 0·3 inch shorter than that at the very base, and 1·2 inches longer at the top; but that is a very different thing from being 25 inches broad all the way up and all the way down.

4. The vertical height of the stone having been determined = 20·63 inches, to within ·01 inch at the best part of the block for measuring the slope length of the bevelled front; and the latter having been determined to be somewhere between 26·22 and 26·24 inches; that is equivalent to saying (after trigonometrical computation) that the angle of slope is between 51° 53′ 15″ and 51° 49′ 55″. And these quantities

evidently contain the theoretical angle of the Great Pyramid, 51° 51′ 14″, between them very fairly.

The angle of the stone might perhaps have been obtained closer than the limits of the 3 minutes above given, had the mass been either larger, or in that exceptionally fine state of preservation which Colonel Vyse's magnificent examples *in situ* were in, when he discovered them. But this other example which we are discussing, besides having experienced some tremendous violence by falls or blows (as testified to, by its great conchoidal bases of fractures) has certainly weathered somewhat, even on the best-preserved parts of its front slope; so that near the bottom thereof, in one place, there is part of a fossil shell (a very unusual feature too in the Mokattam limestone) sensibly projecting above the general surface, and capable of vitiating the result of measure, if not specially guarded against, by 0·05 of an inch, amounting there to 8′ of angle.

Wherefore it is more than ever to be regretted, that Colonel Vyse's two colossal casing-stones, so exquisitely preserved almost intact for 4,000 years, or from the primeval and prehistoric days of the earth down to the year 1837 A.D., have been wilfully destroyed within the last forty years of the scientific and educated age of the modern world, for no known object.

II.

DR. JAMES GRANT, OF CAIRO, ON SOME CRUCIAL POINTS OF SIZE AND STRUCTURE IN THE GREAT PYRAMID. By Letter dated 8th December, 1873.

(A) THE COFFER'S PATHWAY INTO ITS PRESENT ABODE.

Preliminary Explanation by P. S.

Although it is usually held, on the sepulchral theory of the Egyptologists, that the passages of the Great Pyramid were formed, both in size and angle, for nothing but the convenience of introducing the coffer, or sarcophagus, to its present final resting-place, yet there are some remarkable limitations opposed to that idea by leading mechanical features, thus:—

1. The coffer being, without any lid, of the same height as the door of the King's Chamber, within the fraction of an inch,—and an orthodox granite sarcophagus lid having always stood 6 or 7 inches higher than the sarcophagus itself,—the coffer could only have been introduced lidless, or not in sarcophagus fashion at all.

2. Even lidless, the coffer could not have been got in under the corner in the ceiling of the entrance-passage when trying to pass from that passage into the first ascending passage.

Both of these objections are generally admitted by every one who has been at the Great Pyramid, measuring-rod in hand; but the latter of the two difficulties was recently sought to be obviated by the suggestion thrown out by a London engineer —that the coffer had never been required to turn the above-mentioned corner, because, instead of being introduced into the Pyramid by the descending entrance-passage, it had been brought into an unknown chamber on the base level, from

whence he conceived that an ascending passage commenced to rise, in the exact angular line of the first ascending passage produced downwards, through the floor of the entrance-passage and the masonry beneath it.

This would evidently have been a complete method of avoiding the one alleged difficulty of turning a corner, if indeed such a lower chamber and continuation passage really existed; but though the engineer went out to the Great Pyramid, and bored in divers directions, he could discover no symptoms of either one or the other. The question was then started, whether, even if such a passage did exist, the coffer could pass end first (and also without a lid) through the whole length of the known and existing Pyramid passages to the King's Chamber. And then came up the circumstance, hitherto chronicled only in "Life and Work," that the lowest part of the first ascending passage is so much contracted in breadth, in order to enable the conical granite block there to act as a cork-portcullis, that the coffer could not get through by an amount of about 0·3 of an inch.

The engineer, however, refused to accept these measures, and after going to the place, announced that he had found that the coffer *would* pass the contracted point by a quarter of an inch clear; a statement which both raised hopes again in many minds that the lower chamber and passage really existed, and even produced some indignation against my measures in "Life and Work" being *so erroneous*, "that by themselves they would have prevented any search being made for so promising an addition to our knowledge of the Pyramid's interior."

Now my measures of the breadth of the coffer, and the breadth of that contracted part of the first ascending passage, had not been made either relatively to each other or with the knowledge of any important question depending on a combination of the two; each had been measured by itself in absolute terms at the several times I was in each part of the Pyramid referred to;—and they were only confronted with each other several years after the thus separately obtained results had been printed. Knowing therefore, on one side, how possible it is for any one to make a larger error in two separate absolute measures, than in a difference; but on the other side, that no one who measured the end of the coffer simply and hastily in the present day, would get either the original

breadth of that end, or the present breadth of the chief part of the length of the vessel (by reason of the chipping that has been perpetrated all the way up and down the corner edges, requiring special methods of elimination, and not easy ones, in the darkness of the King's Chamber),—knowing, I say, these conflicting practical difficulties, I requested Dr. Grant, if his manifold official employments should permit him so to do, to go out to the Great Pyramid from Cairo, and make a new and careful mensuration of the two breadths, one after the other, with the same measuring-rod, and with attention to the coffer's peculiarities of fracture mentioned above.

This he has now happily done, and describes thus,—

"On December 5th I went out to the Pyramid, taking Mr. Waller (an English dentist in Cairo) with me. For the breadth of the lower end of the ascending passage, I measured, not as you did, the breadth of the portcullis stopping it up, but the breadth of the passage itself, at that point. Not, however, that that should make any sensible difference, for I don't think it would be possible to insert the thinnest kind of paper between the portcullis and the passage wall.

"The result of my measurement confirms yours, viz., the coffer in King's Chamber, although turned straight into axis of ascending passage, could not have been passed along it.

LOWER END OF ASCENDING PASSAGE, MEASURED CLOSE TO NORTH END OF PORTCULLIS, IN BRITISH INCHES.

Breadth from east to west, across top or north edge .	38·38
Ditto, across middle	38·44
Ditto, across bottom or south edge	38·12

COFFER IN KING'S CHAMBER.

Breadth of north end	38·62
Breadth of south end	38·75

"These are my measures, and I can vouch for their accuracy within $\frac{1}{4}$ inch.

"I think this strengthens the theory of the coffer having served some other purpose than that of a sarcophagus, as all sarcophagi have been introduced to their chambers *by the passages leading to them.*"

(B) COMPARATIVE QUALITIES OF MATERIAL AND WORK OF SEVERAL GRANITE PARTS OF GREAT PYRAMID.

Writes Dr. Grant: "Mr. Waller has taken for me a perfect cast or rather impression of the boss on the granite leaf, also of a normal part of the ante-chamber, also of a normal part of wall of King's Chamber, and also of a normal part of outside of coffer.

"These show distinctly that the coffer has had a finer polish than the walls of the chamber containing it; still the King's Chamber has been remarkably well polished, only the granite appears of a coarser grain than that of which the coffer is composed.

"Neither the ante-chamber, nor granite leaf, nor boss have been polished, but simply very accurately picked. Between granite leaf and north wall of ante-chamber no attempt seems to have been made even to level the surface of that part of the wall, so that on the east side there is quite a large bulging on the granite wall."

(c) This part of the letter refers to a small peculiarity of one of the five "pigeon-holes" on either side of the chasm at the north beginning of the Grand Gallery (see Plate XIII.), and also to the oblique, cruciform stones let into the wall, over against each of the holes in the ramp, beginning with the fourth from the north end. But this inquiry is not yet concluded (see p. 380).

III.

DR. LEIDER'S SUPPOSED PYRAMID.

The late venerable and Rev. Dr. Leider, of Cairo, enlarged much to me, in December, 1864, on the beauty (in German-English) of a little pyramid which was just visible on the western horizon, or far away in the Libyan desert, as seen from the summit of the Great Pyramid.

In April, 1865, on ascending that monument, I verified the account so far, that there was out there in that direction a conical eminence, which might be either a natural hill or a rounded and ruined pyramid, I could not, at so great a distance, say which.

Only after my return home did I fully appreciate the singularity, if the eminence was a pyramid, of such an erection being found so far away from the desert frontier line of Egypt, when all her other pyramids conform closely thereto. I made inquiries, therefore, far and wide as to any traveller, living or dead, having been into the desert in that direction, but without success. In the meanwhile, both Dr. and Mrs. Leider were dead; and three different parties whom I had successively primed on this particular pyramid subject when they were going out to Egypt, failed to perform their promised little piece of exploration.

At last, in 1872, Mr. Waynman Dixon, fortified by the companionship of Dr. Grant, of Cairo, took the field. A formidable party of their special acquaintances among the pyramid Arabs rushed to accompany them, on camels, with long guns and ancient battle-axes; and after a ten-hours' march into the thirsty and barren desert, westward from the Great Pyramid, they reached the conical mound—the veritable Dr. Leider's pyramid; but, as it turned out, not a true or built pyramid, or artificial structure of any kind;

merely a natural eminence; to which fact a reef of rock cropping out near the summit sufficiently and immediately attested.

A useful negative was thus given to sundry pyramid speculations, on a passage from Josephus, touching the second of the two scientific monuments built by the righteous descendants of Seth in their anti-Cainite visit to the land of Siriad, which had been flying about for several years; and the party was rewarded in the way of natural-history science by finding close to the hill the remains of a petrified forest, in the shape of silicified and jasperised trunks of trees; some of them remarkably well preserved, and others worn out of shape by the long ages of driving desert sand which they had been exposed to. But Mr. Waynman Dixon and Dr. Grant having visited the scene of this geological discovery of theirs several times since then, a further and fuller account may, I believe, shortly be expected from their pens.

IV.

MR. JAMES SIMPSON'S FURTHER PYRAMID CALCULATIONS: IN A LETTER FROM HIMSELF.

EDINBURGH, *15th December*, 1873.

MY DEAR SIR,

I have the pleasure to return the four letters on Great Pyramid measures which you kindly sent me on 8th current, and in doing so would take the opportunity of mentioning the following points, some of which you may not have noticed.

As before stated, the diagonal of either end of King's Chamber bears to length of Pyramid's base the same proportion nearly, that one day bears to the number of days in a lunation. The error is however too great to be neglected, for it makes the base-side 9127·84 Pyramid inches, instead of 9131·05; or more than three inches too short. Yet the relation seems intentional; for when all four sides of the base are taken as the measure of a lunation, then, instead of the above-mentioned diagonal, we have the circuit of the King's Chamber floor—equal to 12 of the chamber's units, and also to the 24 arris lines of the coffer—as a not altogether unfitting representative of the cycle of a day. To represent the year on the same scale would however require a circle with radius 71,871 inches. In connection with this it may be noted that the King's Chamber floor consists of two squares, each of which has an area in exact decimal miniature of the surface of a sphere described about the sun, at the mean distance of the earth; in other words, each half of the floor would receive $1\text{-}10^{22}$ of the rays of a vertical sun, shining constantly upon it, or the whole floor would intercept the same fraction of its rays, shining 12 hours out of the 24. This decimal relation is a simple deduction from the theorem

which connects the King's Chamber's proportions with the Pyramid's vertical height, and that which connects the vertical height with the sun's mean distance. The division of the said sphere-surface into 10^{22} equal areas is in a manner contemplated in the origin of the Pyramid: for, dividing the sphere's equator into 10^{11} equal parts for meridians, and its axis into 10^{11} equal parts for latitude planes,—these parts will be respectively 365·242 and $\frac{365 \cdot 242}{\pi}$ inches. The portion of the sun's surface corresponding to one of these parts would be about ·9148 square inch.

It is a fact curious enough in itself, and which perhaps furnished the Pyramid builders with a natural precedent for their extensive adoption of the same ratio,—that the volume of the sun is so nearly $1\text{-}10^7$ of that of the sphere just referred to; the mean radius for the sun which would give that ratio exactly, being 426,272 British miles. From which it would also follow that the sun's volume is 10^{20} times that of a sphere whose radius is the height of the Pyramid: for the latter sphere is to the sphere of the earth's mean distance from sun, as $1 : 10^{9\times3}$; and $10^{9\times3}$ divided by 10^7 is 10^{20}.

There is another and smaller sphere which may have something to say here. You have shown that Solomon's "Molten Sea" was, as to its general form, almost certainly a hemisphere, and its hollow contents a remarkable gauge of the size and weight of the earth. If its outer diameter were 250·4756 Pyramid inches, or but a fraction greater than the 10 S. cubits assigned to it, the contents of the whole sphere would be just $1\text{-}10^{25}$ of the sun. And nearly the same result would be brought out by considering its form as slightly spheroidal, so as to make the vessel a perfect model, on a scale of 1-2,000,000th, of one hemisphere (in equatorial section) of the earth. Then, if the hollow interior were *similar*, and its contents $50\times71{,}588$ Pyramid cubic inches,—or 1-20th of the sphere described about the King's Chamber,—the thickness of the brass, varying from 5·7244 and 5·7229 on the principal equatorial axes, to 5·7146 on the polar axis, would be eminently expressive, in inch-units, of nearly the same earth-density as is denoted by such interior capacity—namely, 5·727.

There is implied in the foregoing a certain near commensurability in size between the earth and sun, which can

be readily shown by comparing both with the Pyramid's altitude. Let the mean diameter of the earth (say 501,106,000 Pyramid inches) be divided by a million, and by the cube root of 10; the result will be 232·5924, or the number of S. cubits in 5814·81 inches, while the theoretical height of the Pyramid is 5813·01, or 1·8 inch less. Letting this difference pass, it will be seen that if the earth's mean diameter were half as great as it is, the volume of the earth would then be 10^{13} times the sphere whose radius is the Pyramid's height, while the sun is 10^{20} times the same, and is therefore = 1,250,000 earths. But in order that this should be exactly true, the earth's mean diameter would require to be 500,950,000 Pyramid inches.

The ratio of the Pyramid's height to the earth's diameter is the duplicate or square of that of the earth's ellipticity at some one meridian—the ratio to the mean diameter being 1-293·606th, which is probably not far from the ellipticity of the Pyramid's own meridian. Let E = linear value of this ratio, M = earth's mean diameter (or its diameter at the Great Pyramid ?), and A = Pyramid's height. Then

$$A : E :: E : M; \text{ or } AM = E^2$$

and expressing M in terms of A (see preceding paragraph),

$$A\,(40{,}000\sqrt[3]{10}\,A) = E^2; \text{ or } 40{,}000\sqrt[3]{10}\,A^2 \doteq E^2$$

$$\text{Square root of which} \quad = 200\sqrt[6]{10}\,A = E$$

$$\text{And} \quad 100\sqrt[6]{10}\,A = \frac{E}{2}$$

From this and previous propositions it appears that (neglecting small differences) the Pyramid's height is commensurable, in terms of integral powers and roots of 10, with—

1. The difference between the polar and some one equatorial radius of the earth;
2. The earth's mean semi-radius;
3. The sun's mean radius; and,
4. The mean distance of the sun, or mean radius vector of the earth's orbit;

or with decimal parts of these quantities.

The theory of squares in Queen's Chamber gives for the cubic diagonal of that room 356·915 Pyramid inches. This is doubtless nearer the truth than the 356·04 derived from your mean measures, which are uncorrected for wall-incrustations, —and accords very nearly with another theoretical quantity obtained as follows. Ten million is the number of S. P. cubits in the earth's semi-axis of rotation, or of 50-inch cubits in the whole axis. If 10,000,000 *square* inches be formed into a circle, the diameter of that circle, divided by 10, will be 356·8246, or the cubic diagonal of Queen's Chamber. But 356·8246 is the diameter of a sphere whose contents are $= 1000$ coffers divided by 3, or $\frac{1000}{3}$ 71,365; and $356{\cdot}8246 \times \frac{1000}{5}$ is also 71,365. Again, if 10,000,000 *cubic* inches (the capacity of the Queen's Chamber) be formed into a sphere, the diameter of that sphere, divided by 10, will be 26·73008, or the interior breadth of the coffer; and 267·3008 squared is 71,449. A more direct connection between Queen's Chamber and coffer is this, that the cubic diagonal of the former is just 4 times the cubic diagonal of the interior of the latter: $356{\cdot}8246 \div 4 = 89{\cdot}206$; or $356{\cdot}915 \div 4 = 89{\cdot}229$; as compared with 89·168 from your mean measures of coffer. Hence, if 10,000,000 square *cubits* be taken, and made into a circle, that circle will have a diameter of 89,206 inches, $=$ 1000 coffer diagonals. But it is possible that the 4 interior diagonals of this vessel (perhaps also the 4 exterior diagonals) were purposely of different lengths. For instance, the mean length of the Pyramid's arris lines, divided by 100, is either 89·0946 or 89·3404, according as the base-side is called 365·242 or 366·25 S. cubits; and the latter number cubed gives 10 times the coffer's contents, or 713,090 cubic inches; while the mean (89·2175) agrees with the coffer diagonals derived above from Queen's Chamber.

If the cubic diagonal of the exterior of the coffer were 4 times the interior breadth, or 106·920 (my measures however give only 106·468), it would make the circumscribed sphere just one-tenth of that inscribed in the King's Chamber's height: for $230{\cdot}3886 \div \sqrt[3]{10} = 106{\cdot}912$.

Perhaps the coffer's size, shape, and position in the Pyramid may be indicated in the following way. Mr. F.

Petrie has observed that it stands at a level of 100 times its own height, below the Pyramid's summit:—

Let 40·9954 (King's Chamber semi-diagonal ÷ 2 π) = least or central height of coffer; then Pyramid's height, 5813·01, — 4099·54 = 1713·47, = level of *top* of coffer above Pyramid's base.

Let 41·4096 = greatest or corner height of coffer; then 5813·01 — 4140·96 = 1672·05, = level of *bottom* of coffer above Pyramid's base.

And the square roots of 1713·47 and 1672·05 are 41·4 and 40·9 nearly.

Let 5813·01 be divided into two parts, such that the square root of the less shall be 1-100th of the greater, these parts will be

(*a*) 4117·57,

(*b*) 1695·44,

and will represent the *mean* level of coffer, or level of its centre. And the square root of (*b*) = 41·1757 is the coffer's mean height; while the square root of (*a*) = 64·1683 is the mean of its *mean* length and breadth: which dimensions, combined with a proportion of 3 : 7 for length and breadth, give for cubic contents of exterior 142,704, or 71,352 × 2.

Also if 4117·57 be taken as radius, then circumference (or perimeter of plane through Pyramid at level of coffer's centre) = 25,871·5 or the years in Precession Period; agreeing closely with cubic diagonal of King's Chamber, measuring to foot of walls, × 100, = 25,873.

As the sum of the 24 arris lines of coffer is = circuit of King's Chamber floor, their mean length, and also the difference between length and breadth of base, will be 51·5165 inches, = diameter of a sphere whose contents are 71,588, which, though larger than most of the values for coffer's contents, seems entitled to some weight, as it is repeated in the sphere described about King's Chamber.

It would appear that the numbers 3, 5, 7, and 10 (whose sum is 25) play a prominent part in both the King's and Queen's Chamber, with this difference, that while in the King's Chamber 3 is coupled with 7, and 5 with 10,—as in the arrangements of the coffer, π proportions, and general "fiftiness" of the room;—in the Queen's Chamber it is 3

that is associated with 5, and 7 with 10,—as in the 3×5 arrangement of the squares, the 7 sides and 10 angles of the room, its 5×3 axis lines, and its 10^7 inches' capacity.

I am, my dear Sir,

Yours very truly,

PROFESSOR PIAZZI SMYTH, 15, ROYAL TERRACE. JAMES SIMPSON.

Postscript.

KING'S CHAMBER HEIGHTS.

With reference to the collection of my theoretic results for the size of the King's Chamber in Pyramid inches at p. 181, it is correct so far as it goes, but would have been completer for all the other problems to be solved—besides the one you were then treating of, viz., my sums of the squares—if you had added the second height which the room possesses; and which, if the first height = 230·3886, is according to your measures at the place, = 230·3886 + 5·0 Pyramid inches; say 235·3886.

My theoretic results acknowledge the necessity of such a second height to the room; for while its geometrical symmetry and some connections with outside of Pyramid, as well as an apparent reference to the earth's size and density (in height ÷ a density of 5·70424 being = $\frac{1}{10^7}$ side of a cube equal to the earth), depend on and come out excellently with the first height; the cubic capacity of 20 million inches, and the π relation between length of room and circuit of north or south wall—results not less important to a scientific monument—only come out on using the second height. At the same time, however, theory is not able to assign in every case one and the same precise value to the increment of second over first height; for in one problem it makes the quantity 4·85, in another 5·11 Pyramid inches, indicating on the mean 5·0 inches very nearly. While finally, the reference from chamber length to vertical height of Great Pyramid demands a chamber height almost equal to the mean of the two heights; viz., 232·52 Pyramid inches. A quantity, however, specially known to the architect, its exact half being represented in the 116·26 length of the ante-chamber, multiplied by 50 in place of 25.

J. S.

V.

RUDE STONE MONUMENTS *VERSUS* THE GREAT PYRAMID.

Under the first half of the above title, the chief philosophic architect of our time, James Fergusson, D.C.L., has published during the last year an important octavo volume of 532 pp., and 234 illustrations: and the book is abundantly descriptive of rough Cyclopean stone circles, such as Stonehenge, Avebury, Stanton-Drew, &c., and of all the occasional rows or groups of stones which, however rough, have evidently been brought to their places and set up by the hand of man, and are now known as dolmens, kistvaens, menhirs, cromlechs, trilithons, &c., &c., both in Europe, Asia, and Africa.

After brushing away the dust of supposed prehistoric, and with some persons even geologic, ages of antiquity; and after disestablishing the Druids from temples they were only theoretically promoted to, long after they had disappeared from the surface of the earth under the sword of the Romans—Mr. Fergusson successfully shows (avoiding indeed the earlier chambered tumuli of Lydians, Pelasgi, Etruscans, &c., and keeping chiefly to the extreme west of Europe)—he shows, I repeat, that the dates of all the chief examples of these rough and rude stone, or stone and earth, erections are certainly confined within periods of from 300 to 900 A.D., and were commemorative chiefly of the successful military exploits of those various new peoples who appeared in Europe at that time from the North and East, and established themselves on the ruins of the Roman Empire.

In so far this author's subject has nothing in common with the Great Pyramid, whether in its perfection of finish or vastly earlier date of erection; yet for all that is the Great Pyramid lugged into his book, and with such an effort at

mischief to the sacred and scientific Pyramidal theory, that a few words in explanation of what he considers he has accomplished towards that destructive end and aim of his ambition, may not be thought unsuitable here.

Under pretended cover, then, of following the method of the Pyramid scientific theorists, Mr. Fergusson demurely speaks of the size of his rude stone circles (which he knows were built some 1,200 years ago) being, as a rule, either 100 feet, or 100 *metres*, in diameter.

Whatever may be said for the feet, of course Mr. Fergusson understands, and no one better, that the old circle builders could not have had any modern French metre among them: but he asserts that such a standard is what legitimately comes out, as the rule, when the scientific Pyramid methods of theorising are applied to the measures of the size of his stone circles; and that he therefore and thereby not only obtains a short and easy method of describing their size, but also of reducing to absurdity whatever has recently been written for the sacred and scientific character of the Great Pyramid. And yet he is so mortally afraid of his character being injured in London society, by any one possibly supposing that he has admitted the truth of the smallest part of the said sacred and scientific theory of the Great Pyramid, merely because he has touched upon it at all,—that although he has "Piazzi Smyth his theories" in his index,—yet the subject-matter so alluded to does not appear in the large and readable letterpress of Mr. Fergusson's book, but in the almost invisible small print of a note, and even then with the following bashful apology for himself: —

"I am almost afraid to allude to it, even in a note, lest any one should accuse me of founding any theory upon it, like Piazzi Smyth's British inches in the Pyramids, but it is a curious coincidence that nearly all the British circles are set out in two dimensions. [Mark that, if you please, gentle reader: Nearly all the British circles are set out in two dimensions.] The smaller class are 100 feet, the larger are 100 metres, in diameter. They are all more than 100 yards. The latter measure (metres) is, at all events, certainly accidental, so far as we at present know, but as a nomenclature and *memoria technica*, the employment of the term may be useful, provided it is clearly understood that no theory is

based upon it:" and there then follow throughout Mr. Fergusson's book his frequent allusions to the stone circles, as being either 100 feet, or 100 *metre*, circles.

Now, though in the above extract I could not but be shocked at the learned architectural D.C.L.'s triple blunder of "*Piazzi Smyth's* discovery of *British inches* in the Pyramids,"—in place of "*John Taylor's* discovery of *earth-commensurable inches* being founded upon in the unique, primeval, and anti-Egyptian design of the *Great Pyramid*;" still I thought myself bound to accept, until the contrary had been proved, that the celebrated Mr. Fergusson had really alighted on a very curious numerical coincidence having the degree of closeness alone recognised in modern Great Pyramid theorising, amongst his rude stone circles. In which case, all honour to Mr. Fergusson, no matter what the consequences of his discovery might ultimately prove to be.

With the best desire therefore to appreciate the truth and cogency of James Fergusson's remarkable *find*, I have noted one after another, as they came up, the following measures of the stone circles, *out of his own book:*—

Page	51, chambered tumulus, stated, in diameter	=	24	feet.
„	55, "sacred" stone circle, by scale, in diameter	=	80	„
„	62, great stone circle, stated, in diameter	=	1200	„
„	62, smaller circle, stated, in diameter	=	350	„
„	62, still smaller, stated, in diameter	=	325	„
„	63, two interior circles, each, by scale, in diameter	=	150	„
„	75, stone circle, stated, in diameter	=	138 to 155	„
„	76, do. do.	=	45 to 51	„
„	78, Silbury tumulus, stated, base diameter	=	552	„
„	78, do. do. top diameter	=	102	„
„	85, mound, stated, diameter	=	198	„
„	124, stone circle, stated, diameter	=	60	„
„	124, do. do.	=	50	„
„	127, do. do.	=	330	„
„	139, circular platform, stated, diameter	=	167	„
„	139, rampart, stated, circumference $\div \pi$	=	261	„
„	140, stone circle, by scale, diameter	=	140	„
„	141, tumulus, stated, diameter	=	70 to 80	„
„	146, oval ring, stated, diameter	=	156 to 243	„
„	149, stone circle, stated, diameter	=	345 to 378	„
„	149, do. do.	=	129	„
„	149, do. do.	=	96	„
„	158, cist circle, by scale, diameter	=	55	„
„	160, stone circle do.	=	160	„
„	160, do. do.	=	102	„
„	161, do. do.	=	80	„
„	161, do. do.	=	63	„

Page 161,	stone circle, by scale, diameter		.	.	. =	57	feet.
,, 161,	do.	do.	.	.	. =	50	,,
,, 161,	do.	do.	.	.	. =	40	,,
,, 182,	do.	do.	.	.	. =	120	,,
,, 182,	do.	do.	.	.	. =	80	,,
,, 182,	do.	do.	.	.	. =	60	,,
,, 182,	do.	do.	.	.	. =	40	,,
,, 194,	oval mound	do.	.	.	. =	430 to 550	,,
,, 194,	curved mound	do.	.	.	. =	140	,,
,, 194,	circular mound	do.	.	.	. =	110	,,
,, 194,	do.	do.	.	.	. =	75	,,
,, 202,	stone circle, stated, diameter		.	.	. =	333	,,
,, 214,	do.	do.	.	.	. =	116	,,
,, 228,	circular rampart	do.	.	.	. =	580	,,
,, 241,	stone circle	do.	.	.	. =	340	,,
,, 241,	do.	do.	.	.	. =	104	,,
,, 259,	do.	do.	.	.	. =	60 to 100	,,
,, 259,	do.	do.	.	.	. =	42	,,
,, 262,	do.	do.	.	.	. =	60	,,
,, 264,	do.	do.	.	.	. =	46	,,
,, 266,	tumulus	do.	.	.	. =	70	,,
,, 266,	stone circle	do.	.	.	. =	100	,,
,, 266,	tumulus	do.	.	.	. =	50	,,
,, 266,	stone circle	do.	.	.	. =	80	,,

Now when we find here, that out of more than fifty of Mr. Fergusson's own examples, only one of them measures 100 feet, and not one of them 100 metres, and that the remainder vary from 24 to 1,200 feet in diameter,—it is pretty plain that he must have a positive deficiency in some part of his head touching numbers, though a large ambition in his heart to immortalise himself therein. And as to his accompanying dread of being possibly suspected in the London clubs of having become a veritable scientific Great Pyramid theorist, through means of his fallacious 100-metre circle discovery,—so that he conceals, at the same time that he publishes, such supposed discovery by consigning it to the small print only of a note at the foot of a page, and covered over, even there, with a particular apology:—alas! it may rather remind other men of a certain courtier in Asia Minor, who, while bursting with desire to tell of *his* then recent, and too wonderful, discovery, yet was so timid about it withal, that he must needs go far away from the haunts of men, dig a hole by the bank of a secluded river, breathe into it the suicidal words, that "Midas has the ears of an ass," and then hastily fill in the earth again: but which refused to retain the secret so confided to it; for the sedges which afterwards grew over the place, whenever a wind of

heaven rustled among their leaves, still murmured forth, "Midas has the ears of an ass."

But Mr. Fergusson is not always timid, for how he does delight to stamp upon painstaking Dr. Stukely, the lion of 200 years ago, who himself measured and mapped in the field so many of the rude stone circles. That work was perhaps Dr. Stukely's *forte;* wherefore, when Mr. Fergusson, at his own p. 149, makes such a mull as to name a circle of 345 feet in diameter, "a 100-metre circle," 100 metres amounting only to 328·09 feet, why did he not remember to say that his predecessor, Dr. Stukely, had remarked two centuries ago on many of those old circles having been laid out in round numbers of the far older, and indeed contemporaneous, *profane cubit of Egypt;* especially when that cubit, being taken in its double form of the cubit of Karnak, is equal, in its 100 multiple, to exactly 345 feet, or the very quantity which Mr. Fergusson had then before him to explain, if he could, without sinning against both mensuration truth and the sequence of history?

But there is worse to come.

THE ARCHITECTURAL FACTS OF THE GREAT PYRAMID.

In his p. 31, speaking of the Great Pyramid, Mr. Fergusson truly allows it to be "the most perfect and gigantic specimen of masonry that the world has yet seen;" and that, according to mere human methods of development and progression, almost infinite myriads of years must have intervened between the first rude tumuli, or stone sepulchres erected in Egypt, and the building of *such* a pyramid.

But in that case there ought to be vastly more stone monuments in Egypt *before* the day of the Great Pyramid, than *after* it, especially as in the dry Egyptian climate we are told again and again that "nothing decays;" and then comes the stunning announcement, both from Mr. Fergusson, Dr. Lepsius, and every good Egyptologist, that there are no monuments at all in Egypt older than the Great Pyramid. The Great Pyramid, therefore, according to all the known facts of the longest known country on the face of the earth, led off the art of stone architecture in Egypt in a *sudden* uprise to excellency, or a totally different manner from all human

experience of what always is, and must be, when man works by his own powers alone, unassisted by direct Divine inspiration.

Of this astounding, and humanly unexplainable, abyss of nothing of architectural remains at all before, but an abundant train after, the majestic Great Pyramid,—Mr. Fergusson says in another foot-note, "it is so curious as almost to justify Piazzi Smyth's wonderful theories on the subject."

And what does Mr. Fergusson therefore do? Does he consent to the cogency of these, as well as all the other, facts of his own professional science, and his own still more peculiar methods of philosophising upon them in order to elicit the monumental history of man; and confess, that so far as they go, they do lead to nothing less than a Divine intervention in the history of man having here occurred in the primeval times of the human race; to the end that this, even still unequalled, glory of building, the Great Pyramid, appeared *suddenly* on the stage of history; as when the Lord says through Isaiah (xlviii. 3), "I did them suddenly and they came to pass"?

Nothing of the kind. The unhappy man merely wraps his mantle of prejudice more tightly than ever around him; and after actually attempting to thrust down the throats of the public the same improper unction which he has been applying to keep down the conscience-pricks of his own soul, exclaims, in the forced words of endeavour to shame the facts —"But there is no reason whatever to suppose that the progress of art in Egypt differed essentially from that elsewhere. The previous examples are lost, and that seems all."

That all, indeed! Why, that is admitting everything; and implies the destruction and total disappearance, without leaving a wrack behind in the most preservative of all climates, of more architecture than is now standing on the surface of the whole globe: and the admission may further worthily include what Mr. Fergusson nowhere allows (though the Great Pyramid scholars do), viz., the truth of the Noachic deluge, the dispersion of mankind according to the Bible, and the innate wickedness of the human heart.

VI.

RECENT ATTEMPTS TO SHORTEN BOTH THE GREAT PYRAMID'S BASE-SIDE AND THE PROFANE EGYPTIAN CUBIT.

THE following short paper,—having been sent to the Royal Society of London on October 27th, 1873, and not having been heard of again by me, except that it was received there, up to the time of going to press with this Appendix in January, 1874, it is printed here in the interests of truth and fact.

P. S.

On the Length of a Side of the Base of the Great Pyramid, by Piazzi Smyth, F.R.S.

My attention has been directed to the abstract of a paper in the Proceedings of the Royal Society for June, 1873 (pp. 407 and 408), through its having led Professor Clerk Maxwell into a serious error in an Egyptian allusion ventured by him in his otherwise most admirable address on "Molecules" before the British Association lately at Bradford.

The error, published by so influential a body, is far too grave to be passed over; because, not only does it fight against the time-honoured conclusions of the first Egyptologists of the age as to what was "the common" and indeed universal cubit length of ancient Egypt; not only too does it imply a metrological equality between Egypt and Greece, instead of Egypt and Babylon—but because the new length now assigned to the so-called "common" cubit of Egypt is only brought in at all by its author, General Sir Henry James, R.E., by means of—

1. An unfair selection, twice repeated, of the modern

measured lengths of the base-side of the Great Pyramid. And—

2. A meaning attributed by him to certain words in Herodotus, making them tell the very opposite story to what they were intended by their real author to do.

These things were indeed shown by me, in their simple and true light, in Vol. XIII. of the "Edinburgh Astronomical Observations," pp. R 67—R 72. But as Sir Henry James now returns to his errors as though they had never been questioned, and produces them as part of the regular work of the Ordnance Survey *of Great Britain;* and as they are moreover on the present occasion issued to the world (in abstract at least) under the name of the Royal Society, and have been further spread, with damaging effect to the truth in the minds of many, by the British Association—on all these accounts it seems necessary to make some public protest in the name and for the sake of the three noblest attributes of scientific man, viz., accurate measuring, truth stating, and just doing, with a glowing allusion to which Professor Clerk Maxwell closed his able and eloquent discourse.

OF THE LENGTH OF A SIDE OF THE SQUARE BASE OF THE GREAT PYRAMID, AS MEASURED BY MODERN SCIENCE.

"The most recent measures of the Great Pyramid's base side," says Sir Henry James, in the 'Royal Society's Proceedings,' "are those made by the Royal Engineers and Mr. Inglis, a civil engineer, and give a mean length of 9,120 British inches." Whereupon Sir Henry James adopts that quantity as exactly proving an hypothesis lately invented by himself, and mentions no other competing measures.

Yet Sir Henry James knew of other measures, and quite worthy ones too of being brought into the general mean determination. For while in that very Proceedings' paper he quotes Colonel Howard-Vyse and Mr. Perring for the base-side lengths of several other pyramids, though he does not quote them there for the more important Great Pyramid's base-side length,—he not only did quote those authors in a former paper in 1867 for that feature of that pyramid, but he erected them then, under the name of Colonel Howard-Vyse alone, into his sole authority, not even allowing Mr. Inglis's result at that time to appear by the side of it.

And the reason why Sir Henry James quoted so honourably Vyse's 9,168 inch measure and extinguished Mr. Inglis's 9,110 inch measure in 1867, was because he (Sir Henry James) had just then published an hypothesis declaring that the Great Pyramid's base-side *ought* to measure 9,168 British inches.*

While the reason on the contrary why Sir Henry James does not now continue to quote Vyse's 9,168 inch measure, but in place of it adopts Inglis's 9,110 (after having meaned it with his own men's 9,130) inch measure, is,—because he has now dropped his first hypothesis, and adopted another of totally different construction and requiring only 9,120 inches to measure the Great Pyramid's base-side.

In face of a method so unusual in science, as this alternate selection of some, and concealment of other data to suit quickly successive, and rashly launched, hypothetical views, it is but a small, and yet a proper, point for the Royal Society to be further informed of; viz., that Mr. Inglis's measures should not be quoted by any one (and least of all by any general commanding, and profiting in name and fortune by the acts of, British subalterns and soldiers), under Mr. Inglis's name alone; seeing that he, Mr. Inglis, was sent to the Pyramid by his then master, Mr. Aiton, to do whatever he did for Mr. Aiton at his (Mr. Aiton's) expense, and according to his (Mr. Aiton's) previous arrangements for it also on the ground.

Mr. Inglis, moreover, was assisted by me when at the Pyramid in finding two out of his four station points, when all his own efforts had failed; and his final mensuration results were communicated to me by Mr. Aiton for the first and only full and authentic publication they have had yet, viz., in my book, "Life and Work," published in April, 1867. All these circumstances too have been knowingly neglected

* See *Athenæum*, November 16, 1867, p. 650. The hypothesis was, that the sole reason wherefore the Great Pyramid had been built of its actual basal size was, to allow a side of the base to measure 360 cubits of 25·488 inches each. That number was stated by Sir Henry James to amount to 764 feet = 9,168 inches, which made the accord appear perfect with Vyse's measure of 9,168 inches. But afterwards it was pointed out to Sir Henry James that 360 × 25·488 amounted to 9,175·68 inches; and as, moreover, he could not find any authority for an ancient cubit 25·488 inches long, he abandoned that scheme and subsequently invented a new one, which has landed him in a totally different set of numbers.

by Sir Henry James, whose first entry into the Pyramid subject was an attack, in November, 1867, upon the book which contained them all; the attack beginning in these words:—

"Ordnance Survey Office, Southampton,
"*November* 9, 1867.

"The publication of the elaborate work on the Great Pyramid of Egypt, by Professor Piazzi Smyth, has led me to an examination of the proportions and dimensions of this Pyramid. . . . ."

But although Sir Henry James may *now* choose to throw Colonel Howard-Vyse and Mr. Perring's measure overboard, —and has led both the Royal Society and Professor Clerk Maxwell unwittingly to confirm the act,—the Royal Society may be assured that the French nation has not abandoned our greatest Pyramid explorer. Neither has that gallant people forgotten their own Academicians in the most scientific of all military expeditions. On the contrary, they cherish the remembrance that it was their *savants* of the Egypto-French Academy under Napoleon Bonaparte, who first discovered two of the only true station points for Great Pyramid base-side measuring, and ascertained the length of that base-side by their measures (certainly not inferior in care and skill to those of any one who has been there since) to be 9,163 English inches.

Indeed, it so chances that within the last few weeks there have been discussions in Paris, in the learned Abbé Moigno's journal, "Les Mondes," as to whether, on one side, a certain M. *Dufeu* was right in recently taking, as the *only* worthy authorities for the Great Pyramid's base-side length, the Napoleonic Academicians and Colonel-Howard Vyse, giving a mean of 9,166 inches; or, on the other side, the Royal Society and Sir Henry James in keeping back those measures and publishing a selection of other persons' measures *only*, implying a length of no more than 9,120 inches.

But as this subject is pretty certain now to be attended to in the interests of international justice by more able men than myself,—I hasten on to the second part of this short paper, or to what Herodotus did really say in the passage referred to.

STATEMENT BY HERODOTUS TOUCHING THE LENGTH OF THE EGYPTIAN CUBIT.

As regards "the common cubit" of Egypt, says Sir Henry James in the "Proceedings of the Royal Society," and already quoted from thence to the whole British Association,—"we have the statement of Herodotus that the Egyptian cubit was equal to the Greek cubit, that of Samos."

Three years ago I had the honour of showing, before classicists as well as scientists, that Herodotus made no such statement about the Greek cubit. He said that the Egyptian cubit was equal to the cubit of Samos; but Samos was not Greece. It was on the contrary, for the dates referred to, the opposite of Greece; especially in the eyes of Herodotus, who regarded it as Asian and Persian; and the first attack upon it by the Lacedæmonian Dorians, he terms their expedition into *Asia*, words which the Rev. Canon Rawlinson declares are *emphatic* as to the sense in which Herodotus used the term Samian.

In this sense also, and with its metrological application as well (or of the Samian cubit being of the same length as the Egyptian, viz., 20·7 inches nearly, and both of them the same as the Babylonian of 500 B.C.), the phrase of Herodotus was understood by Sir Isaac Newton nearly two centuries ago; also by our own chief Egyptologist, Sir Gardner Wilkinson; and likewise by the learned Babylonian scholar, Dr. Brandis, of Berlin, with almost all other authorities.

Hence, unless the Royal Society is consenting that a general officer of the Royal Engineers shall ride over both all the facts and all the best interpreters of the facts from Sir Isaac Newton downwards, they can hardly object to my bringing up once again, in the interests of the world, the most notable metrological equation of all antiquity; viz., that the Samian cubit, which the Egyptian cubit was said to be equal to by "the Father of History," was, together with the then contemporary Asiatic cubit, = 20·7 British inches in length $\pm$ 0·1 inch nearly. Hence we may be absolutely certain that the Samian cubit of Herodotus was not 18·24 British inches long only, as was the Greek cubit; and then see the unhappy position in which Sir Henry James has placed himself and the Royal Society.

He, erroneously imagining that the Samian cubit was no

more than 18·24 inches long, not only freely announced, on his own authority, the other day that the Great Pyramid was built to have a measured length of base-side = 500 of those cubits, viz., 9,120 British inches; but, in order to show an appearance of confirmation of his idea, he actually proceeded a second time to misrepresent the list of modern observations of the base-side of the Great Pyramid, by dropping out now the biggest ones and taking up only the smallest ones; and the Royal Society has published the perverted result.

REAL LENGTH OF THE GREAT PYRAMID'S BASE-SIDE.

Modern surveyors, even with the true Great Pyramid's base station points given them to measure between, have been lamentably wide of each other, whether they have measured one side only, or all four, and then taken a mean of the sides, of what every observer assumes to be a *square*, horizontal plane.

But though wide of each other, the four chief and extreme authorities may, I trust, be regarded as both honest and not very far from equal to each other in ability. Whence, if the results of different observers were—

(1) French Academicians in 1799 and 1800, on the north side only	= 9,163	Brit. ins.
(2) Howard-Vyse and Perring in 1837, on the north side only	= 9,168	„
(3) Aiton and Inglis in 1865, mean of all four sides*	= 9,110	„
(4) Ordnance Surveyors in 1869, mean of all four sides	= 9,130	„

—modern science, I presume, cannot pretend to say that the true result should be anywhere else than near the mean of the whole.

This was the conclusion which I came to in 1867; deducing, for reasons given in "Life and Work," 9,140 British inches, as the real Great Pyramid original and intended base-side length. A length, too, which I have been enabled to find within the last few months, is remarkably, even brilliantly and exactly, confirmed by the mathematical rela-

* In the Aiton and Inglis individual measures of each side, the north side appears as 9,120 British inches; indicating a constant difference in their measures as compared with those cited here as 1 and 2.

tions of the much more accurate measures (chiefly taken by two Professors of Astronomy, separated from each other by 230 years) of the King's Chamber, so-called, in the Great Pyramid. But as that striking case is already discussed at length in a work now at the press, I will not detain the Society any further with it at the present time.

THE ENTRANCE PASSAGE OF THE GREAT PYRAMID.

Towards the end of his abstract-paper in the "Royal Society's Proceedings," Sir Henry James alludes to the breadth of the entrance passage of the Great, as well as of other, Pyramids; but quotes only certain measures nearly forty years old, and taken to no more refinement than the nearest *half-inch.*

As such a proceeding misrepresents both the present-day literature of the Great Pyramid, and its metrical capabilities also,—may I request that the Royal Society will be pleased to accept the following copy of my measures, taken in 1865 and published in 1867,* of both the height and breadth of the Great Pyramid's entrance-passage, at several different points in the course of its length, and registered in all cases to the nearest *hundredth* of an inch.

P. S.

15, Royal Terrace, Edinburgh,
October 27, 1873.

CONCLUDING WORDS ON JANUARY 24TH, 1874.

This morning's post has brought important news, both public and private.

The public news is to the startling effect, that Parliament has been suddenly dissolved. If this should prevent Government from performing their promise of bringing in a Metrical Bill this year, it will add yet another example to the many previous ones, already alluded to on page 214, of such

* These measures being chiefly the same as those which appear on page 311 of this book, need not be repeated here.

intended bills having again and again been broken without hand.

The private news is a letter from the Royal Society of London, rejecting and returning me the original MS. forming the subject of Appendix VI., on the plea of a secret sub-committee of their own having reported, that it was not of a nature suited for reading before the Society.

Looking to the errors and something worse of the previous antagonist paper from the Southampton Office, which *was* thought suitable by the officers of the Society to be read, and honourably printed too, first in the Society's "Proceedings" and afterwards in its "Transactions,"—and comparing them with the simple contents of this plain paper in reply, which the secret committee (the Star-chamber of the Society) will not allow, for *suitability's* sake, to be read nor to appear in any way before the meetings,—the general public may form their own conclusions,—

1. As to whether the Royal Society really desires its publications, in matters relating to the science of the Great Pyramid, to represent "accurate measuring, truth-stating, and justice doing;" or, the exact opposite of those things? And,

2. How far modern science by itself alone, ruling in high places of the earth, is likely to satisfy the hopes of perishing humanity through all time to come?

INDEX.

A

ABD-ALLATIF, an Arabian author on the Great Pyramid, 356
Abel and Cain, contest between, 10
Absolute temperature in the King's Chamber of Great Pyramid, 168
Acts, 328, 440
Adams, John Quincey, 199, 233, 449
Adderley, Mr., on bushels, 203
Age of exploration, 381
Agnew, H. C., "Letters on the Pyramids," 94
Air channels, 348—352
Air channels, discovered by Col. Howard-Vyse, 93
Air channels in Queen's Chamber, 363—365
Airy, Sir G. B., 38, 63, 160, 163, 210, 372
Aiton and Inglis, 32, 178, 393, 513, 516
Al-Mamoun, Caliph, 79—82, 86—88, 92, 307, 351, 356, 357, 380, 422, 462
American "Journal of Science and Art," 361, 362
Amos, 434
Angle measures, 26, 27, 269
Angle of rise of Great Pyramid, 26
Anglo-Saxon chaldron, 228
,, corn measure, 108
,, ignorance of granite, 112
,, race, 37
Anomalies corrected by Great Pyramid system, 265
Antagonist of the Great Pyramid theory, 193
Ante-chamber, measures of the, 186
,, symbolisms, 146, 186
"Antiquités Description," 20
Antiquity of intellectual man, 145, 175, 242
Apology for the errors of earlier observers, 21
Arabs stopped up ventilating channels, 171
Architectural facts of the Great Pyramid, 209, 210
Armstrong, Sir W., 245
Arris lines, careful measure of, 26
Arthur's Seat, Ordnance Survey experiment on, 159, 163
Astronomical law with regard to the Great Pyramid, 313
,, Orientation, popular ideas of, 59, 60
Astronomy of the entrance passage, 312
Athenæum, 6, 23, 40, 513
Austrian Meteorological Society, 170
Authorities for the names of the builders of the three pyramids, 428
Authors, variety of, and their measures, 16

B

Baily, Francis, 119, 161—163, 168, 175, 206, 207
Baird, Sir David, 97
Barnard, President, 44, 446, 450—455
Barometric pressure, 266
Base-side lengths, 31, 32, 511, 512
,, measures by French Academicians and Howard-Vyse, 20, 516
,, original, not present, size, required to test John Taylor's proposition, 17
,, variations of measures of, 33, 516
Beginning of reference to the Great Pyramid's numbers, 35
Biblical views of Metrology in general, 435
Biblical week, 376—378
Birch, Dr. Samuel, 6, 309, 408, 415, 416
Birch, Dr. Thomas, M.A. (of 1737), 350
Bird's copy of Exchequer yard standard, 247
Bonaparte, 16, 65, 101, 188
Boss on the granite leaf, 190
Bramah, 161
Brandis, Dr., 288, 515
Brettell, Mr. (C.E.), 23
British Association, 121, 511, 512
British Government, weights and measures, 450
British inch, 35, 37, 247
,, Metrology, 199
Brugsch Bey, 408, 416
Brünnow, Dr., calculation of stars in the Pleiades, 325, 326
Bryant, 421
Brougham, Lord, 226
Bunsen, Baron, 412, 418
Burretinus, description of the limestone in the Great Pyramid passages, 308

C

Capacity measures, tables of, 229, 230
„ references in the Queen's Chamber, 185
„ relations between King's Chamber and coffer, 183
Cartouches of King Cheops found in Wadee Maghara, 111
Casey, Mr., 176, 384, 385, 390, 391, 393, 394, 396, 398
Casing-stone, Mr. Dixon's, 489—493
Casing-stones, Howard-Vyse's, 22
„ Howard-Vyse's, found large, 25
„ search for, 16, 17
„ Dixon's search in Cairo for, 17
„ Sir J. Herschel's angle of the, 23
„ Howard-Vyse's angle of supports, J. Taylor's proposition, 24
Catalogue of the Boulak museum, 415
Cavendish, Mr., 160, 162, 165
Caviglia, Signor, 75, 78, 381
Ceiling of King's Chamber, 352—355
Celsius, 258
Challenger, H.M.S., letters from, 213
Chalmers, Dr., 219
Champollion, 407, 408
Cheop's coffin! 144
Chisholm, Mr., 207, 208
Christison, Sir R., 252
Chronicles, 431, 436
Chronology, essence of, 34
Clarke, Dr., 97, 113, 148, 307, 381.
Clarke, Colonel Ross, 44, 159, 372
Classic antiquity on the interior of the Great Pyramid, 78
„ names for early Egyptian kings, 426
Cobden, Mr., 211, 212
Cocker, Mr., 233
Coffer, capacity of the, 143
„ capacity size by Joseph Jopling, 125
„ capacity size by John Taylor, 123
„ contents of pure water, 231
„ cubic contents, 145
„ determination of capacity by Greaves and Vyse, 106
„ drawing in the French work on Egypt of the, 131
„ ledge, anomaly of the, 130
„ measured in British inches, 134—141
„ often measured, 99
„ Perring's drawings of the, 131, 133
„ sarcophagus theory of the, 141—143
„ Taylor's suggested use of the, 118
„ weight, temperature, and pressure data for the, 172, 173
„ why of that size, 118
Coloured Pyramid, 116
Commensurabilities in the Pyramid, 151—153
Communistic French metre, progress of the, 446
Confirmations, 174—176
Corner-sockets, discovery of, 20
„ measurements of the, 29
Cory, J. P., "Fragments," by, 424, 431, 432
Coventry, Andrew, 375
Crucial test, 390—402
Cubit, Greek, 33, 515
„ hereditary measures of the, 252, 253
„ lengths, by Sir G. Wilkinson, 289
„ of Egypt, 36, 515, 516
„ of Great Pyramid, 36
„ of Memphis, 299
„ of Persia, 288
„ of Samos, 286, 287, 515
„ old Egyptian, 285
„ origination of the profane Eastern, 291
„ sacred, 36
„ sacred, by Sir Isaac Newton, 295, 298—302
„ sacred, of the Hebrews, 281, 294
Cubits, Dr. Hincks on, 288
„ of ancient renown, 282
Cumberland, Bishop, 294

D

Davies, Prof. C., 449
Davison's chamber, 354
Date of Great Pyramid, 313, 316
Day, Mr., 176
„ on the area of the Pyramid's right section, 13
„ on the excentric position of the boss, 192
„ on the shape of the coffer, 368
Day and year standard indicated in the Pyramid, 29
„ standard of lineal measure at the Great Pyramid, 36
"Dead Book" of the Egyptians, 290, 291
Defterdar Bey, 20
De Launay, M., 50
De Morgan, Prof., 175
Density and temperature, 146
De Saulcey, 408
Deuteronomy, 435
Differential chronology of the Egyptologists, 410—413.
Diodorus Siculus, 91, 426, 430
Director of the Ordnance Survey, misreads a passage in Herodotus, 286
„ of the Ordnance Survey on the Egyptian cubit, 285
Divine inspiration, 31
Dixon, Mr. John, 155, 156, 364
„ Mr. Waynman, 16, 20, 134, 135, 144, 155, 191, 359, 363, 365, 366, 394, 395, 399, 401, 497, 498
„ Mr. Waynman, great measuring work in first ascending passage, 366
„ Mr. Waynman, made cast of boss, 191
„ Mr. Waynman, measures by, 395
„ Mr. Waynman, on air-channels in Queen's Chamber, 363—365
„ Mr. Waynman, requested to make special measures, 394
Dufeu, M., 126, 127, 514

E

Earth and Pyramid analogies by John Taylor, 40

Earth-axis and year, commensurable result indicated, 34
Earthquakes unusual in Egypt, 16
Earth's density, closely approximated to, 371—373
,, equatorial diameter, 31
,, mean density, 157
,, mean density, Captain R. Clarke's result for, 372
,, mean density, mountain determination of the, 158
,, mean density, natural philosophy determination of the, 160
,, mean density, Sir G. B. Airy's result for the, 372
,, Polar-axis, latest determination of, 43
Edinburgh astronomical observations, 284, 287, 512
Egmont, Lord, 149
Egypt of the Lord Christ, 483
Egyptian cubit, length of the profane, 28, 36, 37, 515, 516
,, dynasties, table of, 412
,, hieroglyphics *versus* Greek scholarship, 408
Egypto-Arabians held the Pyramids in esteem, 80
,, -French Academy of 1799, 132, 514
Egyptologic details of early kings, 424—426
Egyptologists' date of Great Pyramid, 315, 316
,, ideas of pyramids, 75, 76
,, portcullis system, 153
Engineer-general, questionable theories of an, 155, 156
,, officers employed on trigonometrical surveys, 42
Enquiry into the data, 14
Entrance passage of the Great Pyramid, 517
Ephesians, 440
Equal surface projection, 68, 265, 266
Equality of areas, 181
Equatorial and other diameters of the earth, 45
Eratosthenes, 426
European mind enters into the question of the Great Pyramid, 90
Exchequer standard ell, 248
Exodus, 333, 338, 434, 473
Ewart, Mr., 212, 214, 221
Ezekiel, 280, 435, 442

F

Fahrenheit's thermometer, 257
Fallings away from simple fact, 472
Fergusson, James, 64, 412, 427, 505—510
Figure of the earth and sun distance, 40
First discovery of John Taylor's, 12, 14
Foot measures, 254
,, of man, size of, 27
,, standard unsuitable for π on the Pyramid's scale, 27
Forbes, Professor J. D., 162
,, Mr., travels (in 1776), 114
Fox Talbot, Mr., 283
Freemasons' marks, 128
,, on the origin of the coffer, 128
French Academicians, 121, 136, 188, 305
,, Academicians base-side length, 31, 515, 516
,, Academicians made first socket measure, 22
,, and Howard-Vyse base-side measures, 20, 512—516
,, Metre, 37
,, Metre's derivation, 38
,, Metric System, 37, 38
,, metrical reference for capacity measure, 119
,, metrical system, 217
,, metrical temperature and pressure, 261, 262
,, observed depth and height of the coffer, 132
,, philosophers' metrological scheme, 37, 38
,, *savants* on the passages of the Great Pyramid, 305
Further confirmations of J. Taylor's proposition, 25

G

Galloway, Rev. W. B., "Egypt's Record of Time," 388, 410
,, Rev. W. B., on Egyptian kings' names, 428
General summation, secular and sacred, 460
Genesis, 334, 433, 464
Geodesic science, growth of, 38
,, science, knowledge of at the Great Pyramid, 39
Geographical aptitudes of the Great Pyramid, 65
Geography and the exterior, 1
Geometrical derivation of the passage angle, 188, 189
,, proportions of the Great Pyramid, 12, 13
Gibbon's account of Al Mamoun, 79
Gibson, Mr. Milner, 212
Gliddon, Mr., 59, 97, 333
Glover, Rev., F.R.A., 176, 373, 438
Goodsir, Rev. J. T., 176, 290, 347
Graham, standards compared by, 248
Grand gallery's cubical commensurabilities, 378, 379
Grander Pyramid and Solar Analogy, 48
Granite, ancient and modern ignorance of, 113—115
,, leaf, 154
,, leaf, place of the boss on the, 191
,, the material of the coffer, 109
,, where used in the Great Pyramid, 117
Grant, Dr., of Cairo, 16, 134, 497, 498
,, Dr., of Cairo, assists Mr. Dixon at the Pyramid, 363, 366, 395
,, Dr., of Cairo, on Mariette Bey's wonderful stone, 415, 416
,, Dr., of Cairo, on some crucial points in the Great Pyramid, 493, 496
Great Pyramid, alleged error of its orientation, 60
,, all the other pyramids unlike the, 69
,, Al Mamoun at the, 81—89

Great Pyramid, always the favourite one, 80
„ an anthropological monument, 47
„ an effective surveying signal, 65
„ architectural facts, 509, 510
„ before science, 53
„ corner-sockets, uncovering all four, 32
„ directors of the building were not Egyptian, 69
„ earth's density number in the, 164
„ expresses the value of π, 26
„ free from all idolatrous inscriptions, 5
„ geographical indications in the, 55
„ geographical position, a testimony against some earth theories, 62
„ grand standards, 224
„ height of, 49
„ history and the interior, 71
„ latitude of the, 61
„ linear standard contrasted with French metre, 37
„ made of a particular size, 34
„ meridian, 67, 68
„ metrology of time, 276, 277
„ Mr. Henry Mitchell on the position of the, 65, 66
„ no Freemasons' marks in or on the, 129
„ non-idolatrous, 64
„ not of Egypt, 8, 9
„ number of wall courses in the King's Chamber of the, 149
„ orientation of, opposed by all early structures, 64
„ orientation of the sides of the, 55
„ position as described in Isaiah xix., 20, 67
„ position in the delta land of Egypt, 65
„ present appearance of the, 16
„ quasi-copies of the, 7
„ scenes transacted in the, 171
„ scientific knowledge of the, 11
„ shape of the, 49
„ subterranean chamber of the, 74
„ use of a polar star by the, 316—318
„ *versus* rude stone monuments, 505, 510
„ why was it built, and who built it? 9, 10
„ Sphinx consigned to its proper place, 413—417; no community between it and the Great Pyramid, 357
Greaves, Prof., 16, 57, 102, 127, 299, 307, 309, 353
„ conversation with Dr. Harvey, 348—350
„ description of the passages, 306, 308
„ figurative expression misled Jomard, 177
„ first named the granite leaf, 154
„ his useful work at the Great Pyramid, 58
„ on the builder of the Great Pyramid, 91
„ on the nature of the stone of the coffer, 111
Greaves, Prof., on the wall courses in King's Chamber, 147
„ the Oxford astronomer (in 1637), 103—106
Greek cubit, 33, 515
Gregory, Dr. Olinthus, 14
Grey, Sir George, 208

H

Haliburton, R. G. on the Pleiades, 321
Haroun al Raschid, 79, 82
Harrison, Dr., 440
Harvey, Dr., 348, 349, 350
Heat and pressure, 257
Heat, angle, money, time, 257—277
Hebrew measures, Bishop Cumberland on, 294
Hekekyan Bey, 126—128
Hereditary inch measures, 255
Herodotus, 6, 9, 19, 49, 78, 92, 104, 287, 288, 345, 391, 426—430, 437, 512, 514
Herschel, Sir John, 23, 175, 297, 324
„ advocates the inch as the unit standard, 220—223
„ confirmed J. Taylor's earth and Pyramid analogies, 40, 41
„ on the astronomical law with regard to the Pyramid, 313—316
„ on the diameter rather than the circumference of a circle, 38
„ on weights and measures, 220, 221
Hierologists and chronologists, 405—408
Hincks, Dr., 419, 420
Hine, Edward, 484
Hipparchus, 320
History and the interior of the Great Pyramid, 71
Hooke, Dr., 57, 58, 61
Hopkins, Mr. Evan, on earth's motion, 62
Human religious history, 389, 390
Human *versus* divine ultimate rule, 456
Hume, Joseph, 372
Hutton, 159

I

Ibn Abd Alkokm, 81
Inches typified in the granite leaf, 189
Inglis, Mr., 150, 513
International appendix to Great Pyramid capacity measure, 229
„ linear measure, 252, 253
„ weight measure, 242
Intellectual man, antiquity of, 145, 175, 242
Introductory statement touching the Great Pyramid, 3
Iron measuring-rod of Prof. Greaves, 177
Isaiah, 2, 198, 373, 404, 443, 470, 480, 481, 510

J

James, Sir H., 32, 49, 159, 372, 511—515, 517
Jeezeh, its varieties of orthography, 4
Jeremiah, p. vi.
Jerusalem, when founded, 432

Job, Book of, 72, 334, 335, 373, 437, 438, 470
Jomard, M., 19, 56, 95, 96, 132, 133, 169, 170, 177, 305, 353
Jopling, Joseph, 125
Josephus, 292, 293, 296, 338, 342, 498
Joseph Well, city of Cairo, 169
"Juventus Mundi," 425, 426

K

Karnak, double cubit of, 124, 509
Kelly, Dr., 200, 205, 215, 229, 256
Kepler, 51
Key signs of the Great Pyramid's architect, 356
Khedive, his highness the, 481
King Charles I.'s astronomer, 308
King, Mr. Clarence, on atmospheric pressure, 263, 264
King's Chamber and coffer mutually commensurable, 150
„ its temperature, 168
„ measures, 178, 182
Kings, 341, 436
Kitto, 294, 338

L

La Caille, 51
Land and sea miles, 270
Lane, Mr., 148, 178, 412
Latitude, further test by, 61
Law, H., 14
Law of Egyptian pyramid building, 76
Layard, Mr., on Freemasons' marks, 128
Legend on the Pyramid of Dashoor, 352
Leider's, Dr., supposed pyramid, 497
Length and breadth of the Ark of the Covenant, 337
„ and breadth of the coffer, 134, 135
„ in British inches of hereditary measures, 252—256
„ measure by Prof. Greaves of the coffer, 105
„ measures of the coffer, 100, 136—141, 145
„ of the ante-chamber, 186—188
„ of the base-side of the Great Pyramid, 31—33, 351
„ of the earth's polar axis, 41—44
„ of the Egyptian cubit, 36, 515, 516
„ of the King's Chamber, 177—182, 475—478
„ of the Queen's Chamber, 185
„ standard of, employed in the Great Pyramid, 27
„ true base-side, 17, 21
„ varieties of measures of, 32, 33
Lepsius, Dr., 6, 76—79, 97, 142, 391, 408, 411—413, 468
"Les Mondes," 187, 485, 514
Letronne, 97
"Letters on the Pyramids," by H. C. Agnew, 94
Le Verrier, M., 50, 167
Leviticus, 435
Lewis, Sir G. C., *versus* Egyptologists, 408, 409
"Life and Work," 26, 32, 60, 149, 175, 270, 295, 327, 369, 374, 377, 388, 392, 397—401, 463, 475, 513, 516
Lindsay, Lord, on the wall courses in the King's Chamber, 148
Linear and superficial measure, 244
„ relations between the coffer and King's Chamber, 182
Lives of the Kings, 429
Louis Napoleon, 216
Luke, St., 440

M

Macdonald of Aberdeen, 114
MacKay, Rev. Dr., 176
Magna Charta, 199, 200
Maitland, Kenmure, 387
Manetho, 6, 104, 333, 409, 412, 424, 428, 431, 432
Mariette Bey, 383, 408, 412, 414—416
Mark, St., 440
Martin, W., 457
Maskelyne, Dr., 158, 159
Masondi, account of the Great Pyramid by, 89
Masonry of first ascending passage, 366
Matthew, St., 440, 442
Maxwell, Prof. Clerk, 511, 514
Mean temperature of the habitable earth, 266, 267
Measures of boss on granite leaf, 192
„ of casing-stone, by Mr. Brettell, 23
„ of coffer to be accepted or declined, 102, 103
„ of stone circles, by James Fergusson, 507, 508
„ tested for accuracy, 395, 396
Mechanical data, 348—352
Mediæval Arabian learning on the interior of the Great Pyramid, 79
Melchizedek, 433, 463
Menchores built the Third Pyramid, 418
„ the codifier of gods for his countrymen, 425
Mensuration data at the disposal of the New Theorists, 177
Mental accompaniments of several facts, 68, 69
Menzies, Robert, 387—390
Metric system, by President Barnard, 44, 450
„ by Professor C. Davies, 449
Michaelis, 337, 435, 436
Mina, or stone ball weight, discussion on, 364
Missing ramp stone, 382
Mitchell, Rev. John, 160
„ Henry, U.S., 65, 66, 67, 176
Mixed presence of two cubits, sacred and profane, 298
Modern astronomers proving the sun distance could not have been measured in the age of the Great Pyramid, 51
Modern measures of the coffer, 100
„ measures of the passages, 310
„ promiscuous quarrying, 355
Moigno, Abbé, 187, 484, 514
Mokattam limestone, 116
Money, 270, 271
Moses and the wisdom of the Egyptians, 328—330
Mosque of Sooltan Hassan, 16

Mummies of the Old Empire have not come down to our age, 418
Mummy of recent date, part of it found in Third Pyramid, 419
Murray's Handbook for Egypt, 332, 356
Murtedi, an Arabian author, 307

N

Names of the builders of the three largest Jeezeh Pyramids, 428
Napoleon Bonaparte, 101, 188, 514
New hierologists, 407
New policy of Old Egypt, 480
New school of Pyramid theorists, 176
New Testament allusions to the Great Pyramid, 440
New theorists, mensuration data at the disposal of the, 177
Newton, Sir Isaac, 30, 96, 158, 220, 295—299, 337, 339, 340, 472, 515
Niebuhr, 351
Non-Egyptian character of the Great Pyramid, 9
Norden, Captain, 351
Normal clock of Paris Observatory, 167
„ of Pulkova Observatory, 167
Norris, Dr., 283
Notes on Egypt, by T. Sopwith, 126, 302
„ on the Great Pyramid, by Sir H. James, 32
Nouet, M., observations to test the orientation of the Great Pyramid, 56
Numbers for the vertical height of the Great Pyramid, 25
Numerous abstracts by Howard-Vyse, 15

O

Objections, beginnings of, 18
Objector, first, 19
„ second, 20
Observed temperatures at or near the Great Pyramid, 169, 170
O'Farrell, Mr., 49
Of the number five, 330
Opinion of Brugsch Bey on Mariette's wonderful stone, 417
Oppert, M., on the Babylonian cubit, 288
Ordnance officers, attempt to turn the Pyramid cubit into ridicule, 47
„ survey of Great Britain, 512
„ surveyors, 516
Orientation of Chaldean buildings, 64
„ of Great Pyramid, 60
„ of the sides of the Great Pyramid, 55
Origines of the Anglo-Saxon race, 37
Osburn, W., 283, 408, 412, 413, 416, 418, 432
"Otia-Œgyptiaca," by G. R. Gliddon, 59

P

Parliamentary reports on standards, 206—217
Parties to the final contest, 454
Passage, astronomy of the entrance, 312—318
Passages, modern measures of the, 310—312
„ of the Great Pyramid, description of the, 306—310
Paucton, M., 435
"Penny Cyclopædia," 204, 226
Pentateuch, 334
Perigal, Mr. Henry, 143
Perring, Mr., 24, 131, 191, 346, 359, 360, 382, 512, 514, 516
Persian invasion, 74
Peter, St., 440, 442
Petrie, Mr. F., 150, 176, 180
„ W., 48, 49, 50, 176, 369, 371
Philitis, 384—387, 430—432, 442, 463
Philosophical Society, Glasgow, metrological discussion at the, 236
Physical science at the Great Pyramid, 468
Pin-ch-un, a learned Chinese envoy, 6
Playfair, Prof., 60, 159
Pleiades year, 318—327
Pliny, 19, 78, 111
Pocock, Dr., on the wall courses in King's Chamber, 148
Poets of El Kahireh, 88
Poole, Mr., 77
Popular ideas of astronomical orientation, 59
Porphyry, Egyptian quarries of, 110
Possibility of azimuthal change in the earth's crust, 56
Pratt, Archdeacon, 458
Precession of the equinoxes, 273, 319
Primeval Shemite shepherds, 422, 423
Probable error statements in modern scientific work, 163
Proverbs, 435
Psalms, 485
Ptolemy, 102
Pulkova Observatory, on temperature, 166
Pyramid, and British, capacity measures, 229
„ and early English inch compared, 248
„ arithmetic, 225
„ capacity measure, 225—230
„ coffer, 99
„ explanation of the word, 98
„ inch, 35
„ of Dashoor, spoliation of, 20
„ researches by John Taylor, 296, 297, 300
Pyramid sun-distance, 49
„ theorems by Mr. J. Simpson, 368—373, 375
„ weight measure, 231, 255
Pyramids and the Pentateuch, 344
„ of Egypt, the ancient, 2

Q

Qualities of the coffer's "quarter" measure, 107rks,
Quarry ma' or 6
"Quarter,' the corn measure, 98
"Quarterly Journal of Science" for October, 1873, 127
Queen's Chamber, air channels, 363—366
„ measures in, 359—362

Queen's Chamber, uses of, 359
Queipo's, Don Vincent, metrology, 288

R

Ramp-stone, who knocked it out of its place, 382—384
Ramps and the well's mouth, 379—382
Rawlinson, Canon, 64, 287, 412, 427, 429, 431, 515
Real length of the Great Pyramid's base-side, 516
Reaumur, 258
Recent discovery at the Sphinx, 414—417
Reflections on the numbers as measured, 101
Reich, Prof., of Freyberg, 161
Relations of King's Chamber to coffer, 367—371
"Religions of the World," by W. Osburn, 347
Representative antagonist of Pyramid Theory, 193
Researches at the Jeezeh Pyramids by Howard-Vyse, 75
Revelation, 450
Richardson, Dr., 148
Rigaud, Prof., 354
Rigid inquiry into the base-side length of Great Pyramid, 31
Romans, p. iii.
Roscoe, Mr., 261
Rossellini, M., 408
Rotation of earth's axis, 30
Royal Observatory of Edinburgh, its rock thermometers, 167
„ Society of Edinburgh, fragments of casing-stones deposited at the, 26
„ Society of London, 511—513, 514
Rubbish mounds at the Great Pyramid, 25
Rude stone monuments *versus* the Great Pyramid, 505—510

S

Sacred Ark of the Covenant, 337—340
„ in time as well as space, 300
„ pronounced to be Messianic, 386—388
„ touching the Great Pyramid, 384—386
Samos, Island of, 287
Sandys, George, 99
Saurid Ibn Salhouk, 80, 81
Savile, Rev. B. Wrey, 62, 63
Saxon metrology, 233, 484
Schihallion, Mount, 158
Schubert, M. de, 38
Science not the Great Pyramid's final object, 47
Scientific references for capacity measure, 118
Scottish Covenanters' phrase, 172
Scriptural allusions :—
Genesis, 334, 433, 464
Exodus, 333, 338, 434, 473
Leviticus, 435
Deuteronomy, 435
Pentateuch, 334
Scriptural allusions (*continued*) :—
Kings, 341, 436
Chronicles, 341, 436
Job, 72, 334, 335, 373, 437, 438, 470
Psalms, 485
Proverbs, 435
Isaiah, 2, 198, 373, 404, 443, 470, 480, 481, 510
Jeremiah, p. vi.
Ezekiel. 280, 435, 442
Amos, 434
Zechariah, 439, 485
St. Matthew, 440, 442
St. Mark, 440
St. Luke, 440
Romans, p. iii.
Ephesians, 440
St. Peter, 440, 442
Revelation, 450
Secret sign in Great Pyramid, 358
Seven homilies by Rev. J. T. Goodsir, 290
Shape of Great Pyramid independently discovered, 49
Sharpe, Mr. Samuel, 428
Shaw, Dr., 149
Sheddad Ben Ad, 80
Sheepshanks, Rev. R., 160
Shepherd Kings, 418—422
„ Bryant on the, 421
„ Osburn on the, 420, 432
„ Vyse's reasonings on the, 420—422
Shuckburgh, 246
Sidebotham, Mr. Joseph, 133
Sidereal day, 274
Silliman's American "Journal of Science and Art," 186
Simms, Mr., 161
Simpson, Mr. J., 176, 179, 180—185, 368, 370—375, 378, 379, 475, 499—504
Sinai Survey, Royal Engineers returning from, 32
Slaveholders possess Egypt, 482, 483
Smith, Mr. Benjamin, 214
Smith, Prof. H. L., 176, 180, 185, 361, 362, 368, 370, 468
Social crisis in England, 457
Solar day, 275, 276
Solomon's molten sea, 340—343, 500
Sopwith, Mr., 126, 309
Specific gravities, 240, 241
„ gravity, 235
„ standard of Pyramid weight measure, 241
Speculations on the Metrology of the Great Pyramid by Sir J. Newton, 96
Squaring of the circle, 13, 26
Standard measures, names of, 283
„ of length employed in Great Pyramid, 27
Standards Commission, 219
Stanley, Dean, and the Sphinx, 414
Statement by Herodotus touching the length of the Egyptian cubit, 515, 516
Stewart, Professor Balfour, 406
Stone circles, measures of, by James Fergusson, 507, 508
Stonehenge, summer solstice is now at, 62
Stone prepared without hands, 453
„ structures and pyramids, 343—347
Strabo, 19, 78, 426
Structural isolation of the Great Pyramid, 73

Struve, M. Otto, 166
Stukely, Dr., 509
Sun-distance as supposed at different ages of the world, 51
„ Great Pyramid, 50
„ MM. Le Verrier and Delaunay on the, 50
Survey of Great Britain, scale of map of, 250—252
Symbolic hints from the ante-chamber, 153
System, Great Pyramid's metrological, 276

T

Table of capacity, corn measures, 229, 230
„ dynasty of ancient Egypt, 412
„ earth's size in Pyramid inches, 45
„ Great Pyramid length measure, 249
„ measures of the Pyramid's coffer, 100
„ Pyramid and British lincar measure, 249, 252—255
„ Pyramid weight measure, 232
„ specific gravities, 240
„ system of angle measures, 269
„ temperatures, 268
„ the Pyramids of Egypt, 413
„ weight measure, 232, 235
Tables of coffer measures, 135—141
„ measures from "Life and Work," 397—402
„ Professor H. L. Smith's measures, 369—370
„ the sums of the squares, 178—181
Talbot, Mr. Fox, 283
Taylor, John, 9, 10, 12, 14, 17, 18, 21, 24, 25, 27, 35, 38, 39, 40, 46, 49, 97, 98, 108, 109, 118, 123, 124, 143, 175, 209, 224, 229, 247, 297, 341, 435, 437, 442
Temperature and density, 146
„ corrections, 164—168
Temperatures and pressures in weighing, 239
„ in Pyramid thermometer degrees, 268
Test, crucial, 390
"Thalia," by Herodotus, 287
The right man at last, 430
Thermo-dynamics, 257
Thermometers, 257—260
Time, duration of, 271
„ measures in the Great Pyramid, 304
„ sacred and prophetic, 374—376
„ unlimited divisibility of, 271
Times on our weights and measures, 211
Tombic theory, 92
„ M. Jomard on the, 96
„ receives a shake, 95
Tompkins, Henry, 344
Tracey, Captain, 176, 187, 190, 192
Transcendentalisms of the Great Pyramid astronomy, 321—327
Trial of hypothesis of Mr. Casey, 396—398
Troughton, 246
True primeval astronomical orientation, 64

U

Unexplained feature in the Queen's Chamber air-channels, 365
Universal metrology, 444
Useful factors in calculation, 14
Uses of the Queen's Chamber, 359—362

V

Variety of authors and their measures, 16
Venetian, M., description of granite, 112
Venus, sun-transit preparations for, 51, 52
Virgil, the Pleiades in the days of, 319, 320
Vyse, Col. Howard-, 5, 6, 15—22, 24, 26, 29, 32, 78, 90, 93, 94, 97, 99, 102, 103, 106, 131, 171, 178, 191, 286, 307, 313, 316, 346, 356, 379, 382, 413, 419, 422, 461, 512, 514, 516

W

Wagner, M., of Pulkova, 166
Wall courses of King's Chamber, descriptions of, 147—149
Wallace, Dr., analysis of Pyramid mortar, 364
Warden of the standards, 32, 285, 451
Weales, Mr., 256
Wealth, the number of the beast, by John Taylor, 209
Weights and measures derived from the Great Pyramid, 39
Wellington, Duke of, 102
What standards would suit π on the scale of the Great Pyramid, 28
What the ancients knew of the interior of the Great Pyramid, 73
Whewell, Dr., 160
Wild, Mr. James, pyramid construction discovered by, 77
Wilde, Sir W., on the wall courses in the King's Chamber, 148
Wilkinson, Sir Gardner, 16, 59, 83, 95, 289, 332, 356, 364, 382, 408, 427, 428, 468, 514
Wilson, John, 484
Wingate, Mr., 233
Woolhouse's weights and measures, 256
World's surface constant to the cardinal directions, 63

Y

Yard unit, 246
Young, Dr., 203, 205

Z

Zechariah, 439, 485
Zodiacs, Egyptian, 405, 407

VIRTUE AND CO., PRINTERS, CITY ROAD, LONDON.



Eiuck 11/12/37

