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A SUGGESTIVE QUESTION.

A few months ago the following question was presented to the Ohio Auxiliary Society: "What would be the most perfect method for preserving a record for the benefit of the whole world 4,000 years after date?"

A half dozen written replies were given, showing a wide diversity of opinion. One writer was sure that no method whatever could be devised, because long before the expiration of 4,000 years, "the world and all that is therein shall be burned up." Another believed that the use of the printing press, and the spread of general intelligence have rendered indestructible *every* record worth preserving which is now extant, or which will ever hereafter be made.

Another writer decided that "pictorial representation" upon granite would be the most durable, and the most legible record.

A fourth writer asserts "that the granite hill and mount alone, save man's embellishment [of granite], was and is the only method for preserving records 4,000 years, or to the end of time . . . . . [but] that God's inspiring power, which developed intellectuality in the creature, did in the early age of the world inspire the builders of the pyramids of Egypt to a successful solution of the problem."

Another replies to the question: "It would be to find a universal language, and to express it in a form imperishable

EFFIGIES IOHANNIS GRAVII.
A.D. 1650.

E. M. fec.

and everywhere present. God has done this in the book of Nature, and man can come nearest to it by most nearly representing nature on a comparatively small scale. To do this in a work of art, and to make the representation both intelligible and beneficial to the whole world, he must discover [and record] some standard of weights and measures founded in Nature."

The writer believes that the Great Pyramid of Egypt is the ideal of such a work of art.

Another correspondent says: "Four things must unite in the preservation of any record. 1st. The thing done must have the concurrence of several witnesses. 2d. It must be evident to the senses. 3d. Some monument, record, or outward observance of the fact must be set up. 4th. Such monument or record must have been set up at the time of the occurrence of the fact, and have been uninterruptedly continued. . . . The concurrence of these four is infallible evidence of the certainty of a fact, however much time has elapsed since it is said to have occurred:—and the evidence strengthens by 'age.'"

This question of the record was presented to the society for a definite purpose, and, by the kindness of the literary editor, the propounder of the question is permitted to explain his design in an article which may be entitled:

FITNESS DENOTES PURPOSE.

Whenever we see a strange object we naturally inquire: "For what was it made?" and we examine it carefully to discover to what purpose it is adapted; for everybody practically believes that fitness denotes purpose. Sometimes we fail to discover fitness, and then, if the object appear trivial, we pronounce it worthless, and pass it by. But sometimes we find an object so mysterious that we cannot readily discover the purpose for which it was made, yet are convinced from the evident care and skill bestowed upon it, that its maker must have had an earnest purpose in its construction. Our curiosity is then aroused, and we investigate more carefully, and, if we still fail to find the obvious design, we form a hypothesis, and proceed to test its adaptation to our hypothesis. Many of the grandest discoveries in science have been made by this process of induction.

The pyramids of Egypt are remarkable witnesses of skill, and knowledge, and perseverance, and energetic purpose, on the part of their builders, yet that purpose is so obscure as to

have baffled investigation for many centuries, until men had at last settled down to the conviction that the pyramids are only worthless monuments of kingly folly.

Within a few years, however, the hypothesis has been framed that the Great Pyramid was built to transmit an exact mathematical record of true science, that it might become a witness to the harmony of science with the revelation contained in the Bible.

Let us apply the test of fitness to this hypothesis by inquiring,

What would be the most perfect method for preserving any record for the benefit of the whole world 4,000 years after date?

Every object which bears any trace of human work is a record, so far as it reveals to us the skill, or knowledge, or purpose, of the workman.

The architects of ancient Nineveh, the sculptors of Greece, and the mediæval painters of Italy, are studied to-day with as great delight and profit as the poems of Homer, or the writings of Herodotus.

Hence we may decide to choose other material than paper, or parchment, or other methods than written language, to convey our ideas to future generations.

Now, since foresight is acquired through experience, we can best select the material and the method by studying existing records, and observing the means by which they have been preserved.

Every material thing grows old and decays; and, so far as I have learned, the four following illustrations cover all the methods of preservation by which we possess any record more than 2,500 years of age.

First, Portions of the Bible were written more than 4,000 years ago; but the original manuscripts have long since disappeared; and the preservation of the genuine text through a succession of copies is due to the reverence in which it has been held in every age, and to special divine protection.

Second, The poems of Homer have survived for nearly 3,000 years, because their surpassing beauty of thought and language has charmed every generation.

Third, The buried ruins of Nineveh have been concealed beneath the ground, and thus have been saved from vandalism, and from decay, until an appreciating generation has uncovered and interpreted them.

Fourth, The stone pyramids of Egypt have stood for thousands of years, because their vast bulk, and the stability of their form, and the favorable nature of the climate of that land have fitted them to withstand decay and violence.

The first two of these methods, as illustrated by the Bible, and by Homer, depend upon constancy of interest; but of this we could not be sure beforehand.

The third illustration, that of Nineveh, depends upon safe concealment, and opportune discovery; but discovery at the right moment, and by the right person, 4,000 years after date, cannot be predetermined by human wisdom.

In the light of history, therefore, the Egyptian pyramid method, which chose the most favorable climate, the most durable material, the most stable form, and the most gigantic magnitude, is the only plan for preserving a record which may reasonably be expected to be serviceable 4,000 years after its date. And, beyond dispute, the oldest and the grandest of all these ancient monuments, the *chef-d'œuvre*, of which all the others are but imitations, is THE GREAT PYRAMID OF JEEZEH.

If fitness may be accepted as proof of design, surely treasures of knowledge lie in this, the most perfect repository ever made by man. But we are no longer left to inference in this matter; for the outline of the pyramid records in its proportions that long sought quantity which is of more importance than any other in the whole range of mathematics, and yet has been the most difficult one to obtain, namely, the ratio of diameter to circumference in the circle.

Now this ratio is the most apt symbol which could be chosen as the title to a record of exact science, just such a record as the Great Pyramid is disclosing by its dimensions expressed in modern measures.*

*See article "Objections Answered," for an explanation of the method by which the architect of the Great Pyramid has recorded exactly determinate formulæ by approximately determinate dimensions in stone. The remainder of this article is supplementary to both that article and this.

Thus we find that the recent hypothesis concerning it accords with discovered facts; therefore, resting assured that fitness denotes design, we declare that the Great Pyramid *was designed* to contain a record of exact science; and it *was designed* to transmit the record to distant ages. And, whether the architect himself was consciously inspired with this purpose; or whether, using his own measures and his own methods, he has unconsciously fulfilled the purpose of a higher Master Builder, to prove that Egyptian measures and our measures, and the Egyptian race and our race, had a common origin—in either case, the Great Pyramid is a witness that revelation and science harmonize.

J. H. Dow.

COMPILATION OF METRIC ANALOGUES.

The dimensions in this compilation must be, to some extent, taken as analogues by relation of value rather than derivation.

As to the cubit, many of the quotations are undoubtedly of different versions of the double duodecimal foot, or 24 inch gauge. But, aside from this, the extraordinary number and wide distribution of the dimension significantly point to the long period characterized by successive overflows of population from the East, extending from the downfall of the later Assyrian monarchy to the destruction of the Roman Empire. And there remains a doubt, whether, after all, the original source may not, in some instances, have to be sought further back still.

It is different with the Turkish mile, and its correlative fathom, toise or klafter. The limits are pretty clearly coincident with the advance of the Saracens. As a recognized itinerary, no evidence has been observed that it dates farther back than the time of Posidonias; and perhaps not farther than the assertion of the paramount division of the circle by 24, in the Apocalypse 186 years later.

No account has been taken of itineraries, or other measures,

assignable by relation of dimension to other cubits, or other divisions of the circle.

Both the Babylonian cubit and the Indian or 18 inch cubit must depend for their interpretation on the value assignable to the inch, at the time they originated.

For the purpose of comparing itineraries, the relation of the others may be taken as follows:

English feet.

Egyptian ancient cubit - - - - =1.4592

Egyptian royal cubit, an apparent Egyptian adjustment of the Babylonian, $\left.\begin{matrix}\\\\\end{matrix}\right\} = \left\{\begin{matrix}\frac{6}{5} \text{ of Egyptian or} \\ \frac{24}{25} \text{ of Mosaic cubit}\end{matrix}\right\} = 1.7511$

Mosaic cubit $= \frac{5}{4}$ of Egyptian, $= 1.824$

A comparison on this theory brings out a variety of curious results, for instance: The theoretical correlation of the Arabian measures seems to be, on the rule of a three-cubit fathom, 1 mile = 500 kassāba = 1000 fathoms = 3000 guz, = 2083⅓ yards, if we take the guz at exactly 25 inches. But their mile is quoted at 2146 yards, and the kassāba at four and one-tenth. The non-correlation is doubtless ascribable to different versions of Ezekiel's measures; but the evident intent was to make the mile equal to 500 reeds, without regard to geographical relations. A kibrath-arctz, ascribed by Alexander to the ancient Hebrews, = 2.4220 statute miles, is probably a version of 1000 reeds, in use towards the close of their national history. The dain of Rangoon, the roënung of Siam, liene-de-post of France, and the post-meile of Saxony and Weimar, have the same aspect.

The English mile, from its dimension, suggests pretty forcibly the measurements of Eratosthenes, computed by the Babylonian or Egyptian royal cubit, a geographic mile of 1751 yards, relating decimally to an unwieldy division of the circle by 25, but changed to its present form on the invention of Gunter's chain.

The ly of An-naver is very accurately two-tenths of the Jewish mile.

Both the leuza of the Ancient Gauls and the mile of Sardinia are the Jewish mile.

The French liene is two Jewish miles.

The Russian verst is very accurately eight Egyptian stadia, that is, they have used this stadium as a furlong. Their verschock is also one-eighth of the archine.

The li of China is 1000 Jewish cubits, or one-fourth the Jewish mile.

ANALOGUES—METRIC CUBIT = 25.025 ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*Metric Cubits.*
Alen	Copenhagen	Alexander	0.9875
Alen	Iceland	Alexander	0.9879
Aln	Stockholm	Alexander	0.9317
Archine	Russia	Alexander	1.1193
Arn	Dantzic	Alexander	0.9027
Anne, of Brabant	Brussels	Alexander	1.0948
Anne, old measure	Cambray	Alexander	1.1272
Anne, old measure	Lorraine	Alexander	1.0061
Anne	Lucerne	Alexander	0.9875
Anne	Mechlin	Alexander	1.0839
Braccio	Ancona	Alexander	1.0123
Braccio	Bergamo	Alexander	1.0323
Braccio	Bologna	Alexander	1.0151
Braccio, for woollens	Brescia	Alexander	1.0604
Braccio, for silk	Brescia	Alexander	1.0069
Braccio	Cremona	Alexander	0.9359
Braccio, for silk	Terrara	Alexander	0.9981
Braccio, for woollens	Terrara	Alexander	1.0597
Braccio,	Florence	Alexander	0.9173
Braccio	Genoa	Alexander	0.9144
Braccio, for silk	Ionian Isles	Alexander	1.0139
Braccio, for woollens	Ionian Isles	Alexander	1.0863
Braccio	Leghorn	Alexander	0 9182
Braccio	Lucca	Alexander	0.9362
Braccio, old measure	Milan	Alexander	0.9227
Braccio	Modenna	Alexander	0.9087
Braccio, for silks	Parma	Alexander	0.9251
Braccio, for woollens	Parma	Alexander	1.0069
Braccio, di panno; woollens	Pisa	Alexander	0.9182
Braccio	Placentia	Alexander	1.0619
Braccio, weavers	Rome	Alexander	1.0006
Braccio, for linens	Sienna	Alexander	0.9443
Braccio, for silk	Treviso	Alexander	0.9975
Braccio, for woollens	Treviso	Alexander	1.0635
Braccio, for silk	Venice	Alexander	1.0049
Braccio, for woollens	Venice	Alexander	1.0751
Canna, woodland	Carrara	Alexander	0.9827
Codo, of Riberia	Spain	Alexander	0.8894

Name.	*Locality.*	*Authority.*	*Metric Cubits*
Covado	Goa	Alexander	1.0708
Covado,	Lisbon	Alexander	1.0317
Covado	Rio Janeiro	Alexander	1.0261
Covid	Java	Alexander	1.0789
Cubit	Batavia	Alexander	1.0789
Derah	Cairo		1.0185
Dra, mesrour	Aleppo	Alexander	0.8730
Dra, Stambouli	Aleppo	Alexander	1.0185
El, old measure	Amsterdam	Alexander	1.0821
El, of Brabant	Amsterdam	Alexander	1.0923
El, of Flanders	Amsterdam	Alexander	1.1180
El	Bergen op Zoom	Alexander	1.0896
El	Breda	Alexander	1.0896
El, retail	Dendermonde	Alexander	1.0950
El	Dordrecht	Alexander	1.0750
El	Gronigen	Alexander	1.0907
El, old measure	Nimeguen	Alexander	1.0754
El	Zealand	Alexander	1.0860
Elle	Aaran	Alexander	0.9343
Elle	Aix-la-Chapelle	Alexander	1.0521
Elle, of Hamburg	Altona	Alexander	0.9014
Elle	Anhalt-Cœthen	Alexander	1.0004
Elle, for cloth	Antwerp	Alexander	1.0768
Elle, for silk	Antwerp	Alexander	1.0973
Elle, for woollens	Appenzell	Alexander	0.9692
Elle	Augsburg	Alexander	0.9319
Elle, mercers	Augsburg	Alexander	0.9589
Elle, legal	Baden	Alexander	0.9440
Elle, mean of 36	Baden	Alexander	1.0437
Elle, legal	Berlin	Alexander	1.0492
Elle, old measure	Berlin	Alexander	1.0505
Elle	Bohemia	Alexander	0.9345
Elle	Brabant	Alexander	1.0943
Elle	Bremen	Alexander	0.9262
Elle, of Prussia	Breslau	Alexander	1.0492
Elle, of Silesia	Breslau	Alexander	0.9060
Elle	Brunswic	Alexander	0.8979
Elle, old measure	Carlsruhe	Alexander	0.8716
Elle	Coblentz	Alexander	0.9018
Elle	Coburg	Alexander	0.9217
Elle, old measure	Cologne	Alexander	0.9050
Elle	Courland	Alexander	0.9607
Elle, legal	Dantzic	Alexander	1.0492
Elle, old measure	Dantzic	Alexander	0.9207
Elle	Dresden	Alexander	0.8913
Elle, old measure	Dusseldorf	Alexander	0.9291
Elle	Dusseldorf	Alexander	1.0780
Elle, of Brabant	Frankfort	Alexander	1.1000
Elle	Frankfort a. d. o.	Alexander	1.0438
Elle	Giessen	Alexander	0.9018
Elle	Gotha	Alexander	0.9050

Name.	*Locality.*	*Authority.*	*Metric Cubits*
Elle	Gueldres	Alexander	1.0438
Elle	Halle	Alexander	0.8986
Elle, for silks, etc	Hamburg	Alexander	0.9014
Elle, for woolens and prints	Hamburg	Alexander	1.0878
Elle	Hanover	Alexander	0.9188
Elle	Hesse-Cassel	Alexander	0.8965
Elle	Holstein	Alexander	0.9014
Elle	Konigsburg	Alexander	0.9044
Elle	Leipsic	Alexander	0.8894
Elle	Lippe	Alexander	0.9110
Elle	Lubec	Alexander	0.9059
Elle	Lucerne	Alexander	0.9876
Elle	Mannheim	Alexander	0.8780
Elle	Mecklenburg	Alexander	0.9014
Elle	Neufchatel	Alexander	0.8741
Elle	Nürnberg	Alexander	1.0327
Elle	Oldenburg	Alexander	0.9093
Elle	Osnabruck	Alexander	1.0044
Elle	Pomerania	Alexander	1.0239
Elle, of Bohemia	Prague	Alexander	0.9345
Elle	Presburg	Alexander	0.8780
Elle	Rostock	Alexander	0.9049
Elle	S. Gall	Alexander	0.9618
Elle	Schaffhausen	Alexander	0.9369
Elle	Schweitz	Alexander	0.9440
Elle	Silesia, Austrian	Alexander	0.9099
Elle	Prussian	Alexander	0.9061
Elle, for woollens	Thurgan	Alexander	0.9692
Elle	Transylvania	Alexander	0.9802
Elle, old measure	Ulm	Alexander	0.8943
Elle	Uri and Vaud	Alexander	0.9441
Elle	Weimar	Alexander	0.8872
Elle	Wurtemburg	Alexander	0.9664
Elle	Zurich	Alexander	0.9441
Endêsi, for cloth	Bucharest	Alexander	1.0420
Endrasi	Constantinople	Alexander	1.0813
Gez	Mocha	Alexander	0.9990
Gueza, ordinary	Persia	Alexander	0.9916
Guz	Bet-el-Faki	Alexander	0.9990
Guz, miminum	E. Indies, Gugerat	Alexander	0.9324
Hatebi	Constantinople	Alexander	1.1149
Halibin	Bucharest	Alexander	1.1033
Indîse	Smyrna	Alexander	0.9849
Lokiec	Cracow	Alexander	0.9275
Lokiec, since 1819	Cracow	Alexander	0.9062
Monkelzer	Persia	Alexander	1.1273
Pas	Ypres	Alexander	1.0773
Pic	Abyssinia	Alexander	1.0787
Pic	Aleppo	Alexander	1.0640
Pic, for muslins	Alexandria	Alexander	0.9868
Pic, for cloths	Alexandria	Alexander	0.8810

Name.	*Locality.*	*Authority.*	*Metric Cubits*
Pic, Stambouli	Alexandria	Alexander	1.0541
Pic, Turkish	Algiers	Alexander	0.9959
Pic	Cairo	Alexander	1.0651
Pic	Candia	Alexander	1.0026
Pic, for silks	Constantinople	Alexander	1.0526
Pic, Stambouli	Constantinople	Alexander	1.0193
Pic	Damascus	Alexander	0.9164
Pic	Jerusalem	Alexander	1.0791
Pic	Morocco	Alexander	1.0399
Pic, for cottons and woollens	Patras	Alexander	1.0792
Pic, for silks	Patras	Alexander	0.9994
Pic	Smyrna	Alexander	1.0504
Pic, for cloth	Tunis	Alexander	1.0586
Pic, for silks	Tunis	Alexander	0.9923
Pié, Surveyors	Ravenna	Alexander	0.9197
Pié	Lucca	Alexander	0.9281
Raso	Chamberi	Alexander	0.9039
Raso	Turin	Alexander	0.9430
Thuoc, mercers	China	Alexander	1.0221
Pic	Alleppo and Asia	Haswell	1.0641
Pic	Constantinople	Haswell	1.0745
Pic, or ell	Candia	Haswell	1.0025
Pic	Damascus	Haswell	0.9163
Pic	Smyrna	Haswell	1.0581
Pic, great	Turkey	Haswell	1.1148
Pic, or dreah	Tripoli	Haswell	0.8691
Archine	Russia	Haswell	1.1189
Guz	Arabia	Haswell	0.9990
Guz	Mocha	Haswell	0.9990
Cubit	Brazil	Haswell	1.0382
Derah	Egypt	Haswell	1.0186
Braccio	Florence	Haswell	0.9183
Pied	Geneva	Haswell	0.9202
Fuss, Geneva	Switzerland	Haswell	0.9202
Braccio, grosso	Venice	Haswell	1.0749
To illustrate relations.			
Cubit (civil)	Jewish	Richard, Lord Bishop of Petersburgh, Haswell	0.8746
Cubit	Hebrew	Haswell	0.8713
Cubit, royal	Anc. Egyptians	Haswell	0.8256
Cubit	Anc. Babylonians	Alexander	0.8328
Cubit, great	Anc. Egyptians	Alexander	0.8328
Ammah, sanctuary	Anc. Hebrews	Alexander	0.8252
Cubit, sacred	Anc. Hebrews	Haswell	0.9600
Cubit, sacred	Anc. Hebrews	Sir Isaac Newton (limits.)	0.9191 1.0789
Cubit (Great, of the restoration, a cubit and a hand-breath)	Anc. Hebrews	probably about	1.0000
Gauge, builders; mediæval	Gt. Britain & Continent	24 inches	0.9591

ANALOGUES—METRIC FOOT = 10.01 ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*Metric Inches.*
Ady	Malabar	Alexander	10.446
Fuss, surveyors	Aix-la-Chapelle	Alexander	11.090
Fuss	Altona	Alexander	11.267
Fuss	Antwerp	Alexander	11.232
Fuss	Brunswic	Alexander	11.223
Fuss, old measure	Cologne	Alexander	11.312
Fuss, old measure	Dantzic	Alexander	11.284
Fuss	Dresden	Alexander	11.140
Fuss	Frankfort	Alexander	11.194
Fuss	Gotha	Alexander	11.312
Fuss	Hamburg	Alexander	11.268
Fuss	Heidelberg	Alexander	10.987
Fuss	Hesse-Cassel	Alexander	11.312
Fuss, surveyors'	Hesse-Cassel	Alexander	11.206
Fuss, old measure	Hesse-Darmstadt	Alexander	11.312
Fuss, since 1818	Hesse-Darmstadt	Alexander	9.833
Fuss, common	Leipsic	Alexander	11.099
Fuss, builders'	Leipsic	Alexander	11.117
Fuss	Lubec	Alexander	11.325
Fuss, surveyors'	Neufchatel	Alexander	11.294
Fuss	Osnabruck	Alexander	10.984
Fuss	Rostock	Alexander	11.323
Fuss	Weimar	Alexander	11.088
Fuss	Wesel	Alexander	9.245
Fuss	Wurtemburg	Alexander	11.268
Jankal	Sumatra	Alexander	8,991
Keub	Siam	Alexander	9.450
Link, old measure	Scotland	Alexander	8.919
Palmo	Alicant	Alexander	8.899
Palmo	Cagliari	Alexander	9.769
Palmo	Carrara	Alexander	9.583
Palmo	Genoa	Alexander	9.797
Palmo, commercial	Lisbon	Alexander	8.966
Palmo	Malta	Alexander	10.265
Palmo	Messina	Alexander	10.389
Palmo	Naples	Alexander	10.371
Palmo	Nice	Alexander	10.408
Palmo	Palermo	Alexander	9.304
Palmo, commercial	Rome	Alexander	9.794
Palmo	Sardinia	Alexander	10.324
Palmo	Sicily	Alexander	9.521
Palmo	Valencia	Alexander	8.918
Pan, of Dauphiny, Max:	France; Arles	Alexander	10.065
Pan, mean of 31	France	Alexander	9.543
Pan	Piedmont	Alexander	9.833
Pié	Arragon	Alexander	10.108
Pié	Canary Island	Alexander	11.115
Piè	Castille	Alexander	10.947
Piè	Curaçao	Alexander	11.114

Name.	*Locality.*	*Authority.*	*Metric inches*
Pié	Havana and Mexico	Alexander	11.118
Pié	Malta	Alexander	11.156
Pied, old measure	Aix-en-Provence	Alexander	9.776
Pied	Avignon	Alexander	9.749
Pied	Brussels	Alexander	10.845
Pied, old measure	Lorraine	Alexander	11.259
Pied, old measure	Rouen	Alexander	10.557
Pous, Pythian	Ancient Greeks	Alexander	9.713
Pous, Sicilian	Ancient Greeks	Alexander	8,751
Schuh	Brunswic	Alexander	11,223
Schuh, builders' and surveyors'	Lindan	Alexander	11,356
Schuh, builders' and surveyors'	Lucerne	Alexander	11.180
Schuh, city, old measure	Strasburg	Alexander	11.374
Schuh, stone-cutters'	Zug	Alexander	10.570
Span	England and U. S.	Alexander	8.991
Spanne, miners	Prussia	Alexander	10.287
Spanne, miners	Saxony	Alexander	9.647
Spithama	Ancient Greeks	Alexander	9.094
Spithama	Ancient Romans	Alexander	8.727
Stopa, since 1819	Poland	Alexander	11.327
Tercia	Madrid	Alexander	10.947
Voet	Amsterdam	Alexander	11.133
Voet	Breda	Alexander	11.241
Voet	Harlaem	Alexander	11.241
Zereth	Ancient Hebrew	Alexander	8.595
Foot	Amsterdam	Haswell	11.133
Fuss	Antwerp	Haswell	11.264
Fuss	Bremen	Haswell	11.369
Fuss, or schuh	Brunswic	Haswell	11.219
Foot	Canary Isles	Haswell	11.117
Fuss	Dantzic	Haswell	11.289
Fuss	Dresden	Haswell	11.139
Fuss	Hamburg	Haswell	11.268
Fuss	Leipsic	Haswell	11.137
Piè	Malta	Haswell	11.156
Piè	Mexico	Haswell	11.117
Palmo	Naples	Haswell	10.371
Foot	Riga	Haswell	10.779
Fuss	Saxony	Haswell	11.137
Palmo	Sicily	Haswell	9.521
Foot	Spain	Haswell	11.117
Foot	Utrecht	Haswell	10.729
Foot	Amsterdam	Byrne	11.129
Foot	Antwerp	Byrne	11.229
Foot	Bremen	Byrne	11.369
Foot	Dresden	Byrne	11.129
Palmo	Genoa	Byrne	9.711
Foot	Hamburg	Byrne	11.279
Foot	Leipsic	Byrne	11.099
Palmo	Lisbon	Byrne	8.631
Foot	Malta	Byrne	11.156

Name.	*Locality.*	*Authority.*	*Metric Inches.*
Palmo	Naples	Byrne	10.370
Foot	Riga	Byrne	10.779
Foot	Sardinia	Byrne	9.770
Foot	Sicily	Byrne	9.520
Foot	Spain	Byrne	11.109
Foot	Utrecht	Byrne	10.972

ANALOGUES—METRIC REED = 100.1 ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*Metric reeds.*
Braca	Brazil	Alexander	0.8550
Braca	Lisbon	Alexander	0.8597
Cana	Arragon	Alexander	0.8148
Canna, woodland	Florence	Alexander	0.9172
Canna, architect and surveyors	Florence	Alexander	1.1477
Canna	Genoa	Alexander	0.8817
Canna, surveyors	Genoa	Alexander	1.1756
Canna	Leghorn	Alexander	0.9181
Canna, for cloth	Lucca	Alexander	0.9518
Canna, for silk	Lucca	Alexander	0.9329
Canna	Malta	Alexander	0.8923
Canna	Pisa	Alexander	1.1473
Canna, architects and surveyors	Rome	Alexander	0.8787
Canna	Sardinia	Alexander	1.0324
Cavezzo	Bergamo	Alexander	1.0332
Cavezzo	Cremona	Alexander	1.1334
Cavezzo	Milan	Alexander	1.0270
Cavezzo	Rovigo	Alexander	0.9067
Dumplachter	Bohemia	Alexander	0.9344
Ikje	Japan	Alexander	0.8331
Kaneh	Ancient Hebrews	Alexander	1.0314
Latte	Bordeaux	Alexander	0.9822
Ngu	Siam	Alexander	0.9582
Pertica	Florence	Alexander	1.1474
Pertica	Pisa	Alexander	1.1473
Pertica	Ancient Romans	Alexander	1.1636
Pertica	Venice	Alexander	0.8198
Ruthe	Bavaria	Alexander	1.1479
Ruthe	Berne	Alexander	1.1534
Ruthe, surveyor	Dresden	Alexanedr	1.1140
Ruthe	Friburg	Alexander	1.1534
Ruthe	Solothurn	Alexander	1.1534
Ruthe	Strasburg	Alexander	1.1375
Ruthe, legal	Wurtemburg	Alexander	1.1267
Sagine	Russia	Alexander	0.8394
Toisc, le-compte	Besançon	Alexander	0.9846
Toisc	Burgundy	Alexander	0.9770
Toisc, maximum, old measure	France; Guincamp	Alexander	1.0221

Name.	*Locality.*	*Authority.*	*Metric reeds.*
Toise	Geneva	Alexander	1.0221
Toise	Neufchatel	Alexander	1.1534
Wussa	Malwah	Alexander	0.8951
Wussa	Surat	Alexander	0.9750
Canna	Malta	Haswell	0.8236
Sachine	Russia	Haswell	0.8380
Fathom, Jewish	Ancient Hebrews	Richard, Lord Bishop of Peterborough	0.8746
Ezekiel's reed, a full reed of six great cubits	Ancient Hebrews	Richard, Lord Bishop of Peterborough	1.3120
Ezekiel's reed	Ancient Hebrews	More probably	1.5000

ANALOGUES, METRIC ROD = 200.2 ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*Metric rods.*
Geestruthe	Hamburg	Alexander	0.9014
Perch or pole	England and U. S.	Alexander	0.9890
Perche, tillage	Neufchatel	Alexander	0.9036
Perche, vineyards	Neufchatel	Alexander	0.9227
Pole, woodland	England	Alexander	1.0789
Rod	England and U. S.	Alexander	0.9890
Ruthe, old measure	Aix-la-Chapelle	Alexander	0.8873
Ruthe	Bremen	Alexander	0.9100
Ruthe	Brunswic	Alexander	0.8979
Ruthe, old measure	Coblentz	Alexander	0.9144
Ruthe	Cologne	Alexander	0.9050
Ruthe	Dresden	Alexander	0.8908
Ruthe, woodland	Gotha	Alexander	0.9050
Ruthe, geestruthe	Hamburg	Alexander	0.9014
Ruthe	Hanover	Alexander	0.9188
Ruthe, old measure	Konigsberg	Alexander	0.9077
Ruthe	Leipsic	Alexander	0.8894
Ruthe	Lippe	Alexander	0.9110
Ruthe	Lithuania	Alexander	0.9582
Ruthe	Lubec	Alexander	0.9095
Ruthe	Mechlenburg	Alexander	0.9156
Ruthe, since 1818	Nassau	Alexander	0.9833
Ruthe	Nurnburg	Alexander	0.9559
Ruthe, actual	Oldenburg	Alexander	1.0493
Ruthe, old	Pomerania	Alexander	0.9192
Ruthe, old measure	Stettin	Alexander	0.8979
Ruthe	Weimar	Alexander	1.0671
Ruthe, old measure	Würtemburg	Alexander	0.9014
Ruthe, old measure	Würtemburg	Alexander	0.9258
Verge, surveyors, mean of 218	Belgium	Alexander	0.9897
Verge, minimum	Rheims	Alexander	1.1073
Verge	Venloo	Alexander	0.9059

ANALOGUES—METRIC PERCH = 250.25 ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*Metric perches.*
Fall	Scotland	Alexander	0.8919
Cuerda	Spain	Alexander	1.1006
Perch	Ireland	Alexander	1.0070
Perche, legal, old measure	France	Alexander	1.1243
Perche, of Paris	France	Alexander	0.9199
Perche, usual	France	Alexander	1.0221
Pertica	Turin	Alexander	0.9700
Pole, forest	England	Alexander	1.0070
Pole, old measure	England	Alexander	1.0070
Rope	England	Alexander	0.9591
Verge, surveyors', maximum	Belgium, Chimay	Alexander	1.0100
Verge, surveyors'	Breda	Alexander	0.8940
Verge, surveyors', maximum	France, Laon	Alexander	1.1243
Verge, surveyors', mean of 9	France	Alexander	0.9648

ANALOGUES—METRIC ACRE = 0.99837 ENGLISH ACRES.

Name.	*Locality.*	*Authority.*	*Metric Acres.*
Acker, tillage	Bamberg	Alexander	1.1680
Acker, woodland	Gotha	Alexander	0.8377
Acre	England, U. S.	Alexander	1.0017
Arancada	Spain	Alexander	0.9571
Arpent	Bayonne	Alexander	1.0362
Arpent, ordinary	France	Alexander	1.0474
Arpent	Troyes	Alexander	1.0445
Campo	Padua	Alexander	0.9557
Campo	Rovigo	Alexander	1.1014
Cawney, legal	Carnatic	Alexander	1.0063
Fanegada, minimum	Spain	Alexander	0.9276
Janchért	Lausanne	Alexander	1.1133
Janchért	Tyrol	Alexander	0.8903
Journal	Amiens	Alexander	1.0447
Journal	Burgundy	Alexander	0.8821
Journeè	Vannes	Alexander	0.9027
Juchart	Berne	Alexander	0.9572
Juchart	Friburg	Alexander	1.0638
Juchart, greater	Lucerne	Alexander	0.8999
Juchart	Wurtemburg	Alexander	1.1702
Juchart, woodland	Zurich	Alexander	0.8993
Juch, old measure	Oldenburg	Alexander	1.1214
Mesure	Arnes	Alexander	1.0618
Mesure	Saint Omer	Alexander	0.9777
Meytercè	Bourg-en-Breese	Alexander	0.9790
Mineè	Angers	Alexander	0.0790
Moggio	Naples	Alexander	0.8598
Morgen	Baden	Alexander	0.8910
Morgen, legal, since 1818	Bavaria	Alexander	0.8430

Name.	*Locality.*	*Authority.*	*Metric Acres.*
Pose..	Lausanne	Alexander	1.1133
Quadrato	Tuscany	Alexander	0.8427
Rasiere	Douay	Alexander	1.1190
Scheffel	Hamburg	Alexander	1.0402
Seterce	France	Alexander	0.8455
Setier, of Vermandois	La Fere, &c.	Alexander	0.8494
Starello	Cagliari	Alexander	0.9818
Stioro	Florence	Alexander	0.8377
Tagmatt	Bolzano	Alexander	1.1047
Zappada	Ionian Isles	Alexander	0.9972
Zoja	Udino	Alexander	0.8677

ANALOGUES—METRIC FATHOM = 65.6656 + ENGLISH INCHES

Name.	*Locality.*	*Authority.*	*Metric fathoms.*
Braça, marine	Portugal	Alexander	0.9893
Braza	Spain	Alexander	1.0013
Braza, marine	Spain	Alexander	1.0013
Cana	Barcelona	Alexander	0.9306
Cana	Majorca	Alexander	0.9377
Cana	Minorca	Alexander	0.9617
Cana	Tortosa	Alexander	0.9544
Canne	Caucasonne	Alexander	1.0701
Canne	Toalouse	Alexander	1.0769
Chebbo	Venice	Alexander	0.9382
Estado	Spain	Alexander	1.0169
Faden	Amsterdam	Alexander	1.0183
Famn	Sweden	Alexander	1.0652
Klafter	Berne	Alexander	1.0550
Klafter	Bremen	Alexander	1.0404
Klafter	Gotha	Alexander	1.0347
Klafter	Hamburg	Alexander	1.0307
Klafter	Leipsic	Alexander	1.0169
Klafter	Weimar	Alexander	1.0144
Klafter	Würtemburg	Alexander	1.0307
Pas, geometrical	France	Alexander	0.9739
Passo	Florence	Alexander	0.9860
Passo	Ionian Isles	Alexander	1.0417
Passo	Lisbon	Alexander	0.9893
Passo, geometrical	Oporto	Alexander	0.9829
Passo	Venice	Alexander	1.0415
Schritt	Germany, generally	Alexander	0.9409
Tesa	Turin	Alexander	1.0268
Toesa	Spain	Alexander	1.0169
Toise, minimum	Lorraine	Alexander	1.0267
Toise	Liége	Alexander	1.0054
Toesas	Spain	Haswell	1.0168
Toesas	Spain	Byrne	1.0161
Fathom	France	Byrne	0.9740

ANALOGUES—METRIC MILE = 1824 YARDS OR 1.03635 ENGLISH MILES.

Name.	*Locality.*	*Authority.*	*Metric Miles.*
Berri	Constantinople	Alexander	0.99947
Berri	Turkey	Haswell	1.00219
Berri	Turkey	Byrne	1.00109
Miglio	Florence	Haswell	0.99068
Miglio	Leghorn	Haswell	0.99068
Milgio	Tuscany	Haswell	0.99068
Miglio	Tuscany	Alexander	0.99153
Milgio	Venice	Haswell	1.04167
Mile	England; U. S.		0.96491

ANALOGUES—HEBREW FOOT = $\frac{1}{10}$ JOKTAN = 0.4 YARDS = $14\frac{4}{10}$ ENGLISH INCHES.

(Haswell quotes it at 1.212 feet = 14.544 inches.)

Name.	*Locality.*	*Authority.*	*English measure*
Braccio, for woolens	Sienna	Alexander	0.41297 yards
Brazetto	Tessiva	Alexander	0.43417 yards
Covid	China	Alexander	0.39067 yards
Fuss, surveyors'	Berlin	Alexander	0.41189 yards
Fuss, surveyors'	Frankfort	Alexander	0.38917 yards
Fuss	Trent	Alexander	0.40017 yards
Palmipes	Ancient Romans	Alexander	0.40444 yards
Palmo	Venice	Alexander	0.37993 yards
Pié	Bassano	Alexander	0.39086 yards
Pié	Bologna	Alexander	0.41569 yards
Pié, architects'	Milan	Alexander	0.43362 yards
Pié	Padua	Alexander	0.38735 yards
Pié	Venice	Alexander	0.38031 yards
Pié, mean	Venit. Lombardy	Alexander	0.37992 yards
Pié	Vicenza	Alexander	0.39086 yards
Pié	Bordeaux	Alexander	0.39014 yards
Pié, old measure	Franche-comté	Alexander	0.39097 yards
Pous, Macedonian	Ancient Greeks	Alexander	0.38592 yards
Pous, philetairic	Ancient Greeks	Alexander	0.38592 yards
Pugon	Ancient Greeks	Alexander	0.37930 yards
Pugma	Ancient Greeks	Alexander	0.42144 yards
Stopa	Cracow	Alexander	0.38981 yards
Terça	Lisbon	Alexander	0.39843 yards
Cubit	Ancient Greeks	Haswell	13.5984+ inches
Foot	Babylonian	Haswell	13.68 inches
Fuss	Turin	Haswell	13.488 inches
Pié	Venice	Haswell	13.68 inches
Piede, mannale	Genoa	Haswell	13.488 inches

Name.	*Locality.*	*Authority.*	*English measure*	
Foot, (Cracow).....	Warsaw	Haswell	14.03	inches
Foot.....	Milan	Haswell	15.62	inches
Foot.....	Poland	Haswell	14.032	inches
Foot.....	Russia	Haswell	13.75	inches

ANALOGUES OF INCH, ANSWERING TO $\frac{1}{12}$ OF HEBREW FOOT $= 1\frac{2}{10}$

ENGLISH INCHES.

Name.	*Locality.*	*Authority.*	*English inches*
Menu, old measure, mean of 5.....	Languedoc	Alexander	1.2287 inches
Menu, old measure, mean of 3.....	Provence	Alexander	1.2174 inches
Punt, or punto.....	Canton	Alexander	1.2188 inches
Zoll, since 1810.....	Baden	Alexander	1.1811 inches
Zoll.....	Vaud	Alexander	1.1811 inches
Zoll, surveyors'.....	Zurich	Alexander	1.1812 inches
Sun, 1-10 shaku.....	Japan	K. Minami	1.1875 inches

Several of the above are doubtless decimals of some 12-inch foot, as is the case in Japan.

JACOB M. CLARK.

ON THE ORIGIN OF THE WORD GEOMETRY.

The International Institute for Preserving and Perfecting Weights and Measures is naturally interested in the practical application of geometry to the objects of its pursuit.

Some of its members are, no doubt, interested also in geometry as an abstract, philosophic science. Among these, there must be some who might be interested also in the linguistic origin of the word "geometry."

Words, when traced to their first origin, forms, and meanings, become most valuable monuments of human history, aye, and even of that history which antedates any existing records of it made in any material objects. For man must have spoken in articulated words long before he had even come to the idea of recording the historic events of his life.

It is usually repeated after Herodotus, (History, II, 109), that the science of geometry took its origin in Egypt, from the

circumstance of the yearly inundations of the Nile, which obliterated all boundary marks of land property, involving the necessity of restoration, which begot this science. "It seems to me," says Herodotus in conclusion of the above section, "(that) thence, (*i. e.* from Egypt), the discovered (science of) geoometrie passed over into Hellas. For from the Babylonians the Hellens learned (the use of) the pole and dial, (*i. e.* the sun-dial), and the twelve parts of the day." Herodotus seems to favor the usual assumption, that the Greeks were the first who coined the name of this science from two words of their language, viz: "gea" and "metron," meaning "earth," and "measure," which they compounded into their one word "geoometrie," and by which they indicated the Egyptian origin of this science.

It is strange, however, that the highly scientific and esthetic Greeks should not have perceived the misnomer of this supposed compounded word, since the science which it denotes is, and must always have been, as indispensable for the measurement of the heavens and its hosts, and for objects on the earth, as for the measurement of the land of the earth.

But scientific men are usually poor linguists in general, and poor Semitic linguists in particular, and hence their ready acquiescence in the derivation of this word "geometry" from a Greek compound. The truth of the matter is, that the root of this word is a genuine Semitic one, and denotes most surprisingly the very origin of the science.

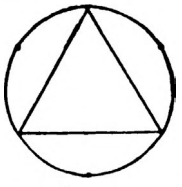
It may be of interest to some of the members of our Institute to know the circumstance which led me to the discovery of the true origin of this word "geometry."

This circumstance was the post Biblical Jewish word "gematria," and its meaning. The word itself is usually regarded as a corrupt transcription of the Greek word "geoometria." But the meaning of this word, in Jewish usage, does not at all refer to the science of geometry, but to the *numeric value of the letters of the Hebrew alphabet.*

Is there then a connection between the origin of geometry and the numeric value and shapes of the Hebrew letters? This question engaged my mind some three years ago, while

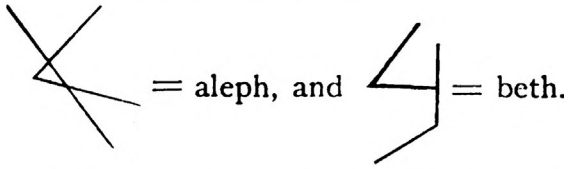
working on the geometry of the Tabernacle. The results of my investigations were as surprising as they were convincing, to my mind at least. I committed the same in an essay entitled, A Palæographic Study, which is ready for the press, and I await only the pecuniary favor of Providence to enable me to give it to the world.

In that essay I have demonstrated that the first letter made by the inventor or inventors of the most ancient Aramaic alphabet was not the aleph, but the ghimel; *i. e.* not the first letter, whose numeric value is one, but the third, whose numeric value is three. I have shown further, that that third letter is a part of an equilateral triangle, viz: one side together with an angle of 60° at its upper extremity, and that this was the result of the inventor's attempt to define the number one, which he found as impossible as to completely admeasure the circle. He could draw circles of different sizes with his thumb and one of the fingers of his hand, say on the sand. But he could see soon enough that one circle cannot admeasure another circle. Then the discovery was soon at and in his hand, that the invisible straight line, which lay in the span between his thumb and any one of his fingers, with which he drew a circle, could also divide the periphery of that circle into six equal parts; connecting the six points of the periphery with the central point by the same straight line of his span, he had a hexagon inscribed in the circle. But this was insufficient for the definition of one or the admeasuring of the circle. Then the next step was too natural not to have suggested itself, viz: that of uniting the alternate points in the arc of the circle, and then the inscribed equilateral triangle within the one infinite circle was before the inventor as a veritable revealed mystery. There stood before him the THREE OF ONE admeasuring as best it could the infinite, immeasurable one, the circle.—

From this  then originated the 

which is the typical gamma, that is, the ancient Aramaic ghimel;

and that this geometrical sign of the three, or of the sound g, was the first one made by the Aramean inventor, or inventors, and only subsequently put as the third number or letter in the series of numerals and letters, is evident from the fact, that the numbers one and two, or the letters aleph and beth, are far more complicated than this ghimel or gamma, as you may persuade yourselves by looking at them, viz.



The human mind does not first begin with the complicated and then proceed from it to the simple, but the reverse. All the rest of the twenty-two figures of the most ancient Aramaic alphabet are derivable from the elements of the inscribed equilateral triangle. This I have demonstrated in my essay. Now, all these were derived from the first delineations with the human span, and the name of this in Aramaic and Hebrew is gomed, the consonants of which are g, m, d. The last two letters, viz, m, d, constitute the Semitic word mond, which means "to measure," and the d changed into a t, gave the Latino-Greek word metron = a measure, in which, our own English word, the t became an s. The Semitic word for span, "gomed," meant, perhaps, originally, "the measurer by three," as it is composed of the letter "g" and the word "mod," = "to measure." That "gomed" means a span and not a cubit, is evident from Judges vi., 16, where it is said that Ehud made himself a sword with two edges, of a gomed in length, and girded it under his garments upon his right thigh. His purpose was evidently to secrete it; hence if it was a cubit long he could not well do it, considering the short garment which the ancient oriental soldiers wore. And still further evident is the same, from verses 21 and 22, where it is said that when Ehud thrust that sword into the abdomen of King Eglon, it went into him together with the haft (handle), and did not come out again. This could not happen with a sword or dagger of a cubit in length.

The same word "gomed," in the plural "gammadim" is

used in Ezekiel xxvii, 11, to denote "engineers," *i. e.*, professional men whose business is that of mensuration. The prophet says to Tyre as follows: "The sons of Arvad and thy forces were upon thy walls around, and ('gammadim') engineers were in thy towers; they hung their shields upon thy walls around; they (*i. e.*, the 'gamodim') have perfected thy beauty." We know in all antiquity of no nation by the name of "gamodim," which the translators of the English common version alone assumed as having existed under that name, and whose people they denominate by the plural "gammadims."

The use and meaning of this word "gomed" in the post Biblical, Hebrew, and Chaldee is variously misunderstood by lexicographers, who are rarely original investigators, and for the most part compilers and copyists.

When the Greeks first learned the rudiments of the science which we now call "geometry," from the Chaldeans, it must then have gone by the name of "gmada;" then changing the d into a t, they added the formative ending "rie," as Herodotus has it yet, or "ria," as other Greek authors have it, to the stem "gmat," and formed the word "gmatria," as the rabbins have it yet, without any indication of the two long vowels between the g and the m. But the Greeks have a natural furtive tendency of so mutilating borrowed, or stolen, linguistic goods, that they become totally unrecognizable as to their origin, and pass in all the world as original Greek articles. And thus they made at last of the genuine Semitic word "gmada," the very Greek-looking and -sounding word "geometria," which, however, in its usual acceptation as a compound of "gea" = earth, and "metron" = a measure, is a ridiculous misnomer of the science which it denotes. Nor can it, on the supposition of this compound, being the origin of the word "geometria," be explained, either how the post Biblical Jews came to write it as they do, "gmatria," without the long e, and the long o, or how they came to use the word as denoting the numeric value of the letters of the Hebrew alphabet. My derivation of the word "geometry," may, therefore, claim the merits (1) of explaining a post Biblical, Hebrew, and Chaldee use of a word, and (2) that of restoring stolen property to its legitimate owners.

EPH. M. EPSTEIN.

A NEW SCALE FOR WEIGHTS AND MEASURES.

Now that the agitation of the subject of our weights and measures is likely to bring about a change of some kind, either by the adoption of the metric system or the remodeling of our own, it is essential that we give the subject careful and critical attention, so that we may act wisely, and not hastily adopt that which in the end may prove to be inferior.

It does not lie within the province of this article to enter into any discussion as to the particular merits or demerits of the metric system, but we will assume, that the expense attending a change to a system which has no commensurable relationship to our own, is so great as to make it practically prohibitory, and proceed at once to a discussion as to what is best to be done in remodeling our present system.

An eminent scientist has said: "The plan of decimal gradation in weights and measures, is the only rational one, because it is in accordance with the universally adopted decimal notation. If thoroughly carried out the facilities it would afford in every department of life are scarcely calculable. For one thing it is not too much to say, that one-half the time spent in learning arithmetic might be saved."

That the decimal gradation is the simplest and most convenient of anything of which we have any knowledge is evident to all, but there is one thing that seems to have been very generally overlooked, and that is the relationship of numbers to each other, to objects in nature, and to the mind of man. The student of mathematics is aware that certain quantities have certain mathematical peculiarities, some of which are due to their position in the scale of notation, and some are inherent in the numbers themselves, others occur more frequently in nature, and still others have certain qualities that enable the mind to better grasp them.

To get a clearer knowledge of these relative values, and through this knowledge to lead on to the selection of the best number for the radix of our system, is the aim of this article.

In going over our numbers we come upon ONE as the first and most important of all quantities. It stands for the individual or sample of all the rest. It is the perfect divisor of all other quantities, and is the foundation from which they are built.

Next in the scale of importance comes the smallest even number, TWO. By it we represent a pair or counterparts, as male and female, right and left, life and death, etc. It is, next to one, the simplest and easiest number to comprehend. Mathematically we use it more than any other number in our constantly recurring divisions and subdivisions. Graphically or geometrically, it is represented by a line, which has two ends, while one is represented by a point.

In the next step we find THREE as the number most constantly recurring in nature, and the most continually used in human affairs. It also ranks high in mathematical peculiarities. That three is a number founded deep in nature is seen when we notice how frequently it occurs in the fundamental bases of all existence. Thus, matter has three forms, solid, fluid, and gaseous. There are three grades in the solar system, sun, planets and satellites; three forms of motion, heat, light, and electricity; three kingdoms, animal, vegetable, and mineral; three plans of structure, mollusks, articulates, and vertebrates, and so on in almost an infinite number of cases. We also have three primary colors, three zones, three heads in a government, and the belief in a Trinity is almost universal. It is an easy number to deal with, both mentally and physically, as notice how readily we fold a paper into three parts, or group and speak of things in threes. Mathematically it is represented by a triangle, which is the simplest area that can be enclosed by straight lines, and all solid bodies have three dimensions, length, breadth, and thickness. In mechanics a tripod is the simplest form that will stand on legs.

The next number in importance is, without any doubt, FOUR. It holds this position more on account of its adaptability to halving and quartering than for any other reason. Mathematically it may be represented by the square, or by the tetrahedron, the simplest solid that can be enclosed by plane faces.

Beyond this point the determining of the exact order of importance of the various numbers is attended with more or less difficulty, but we will follow it a little further in the order of the numbers.

FIVE is a number much expatiated upon by mathematicians and theorists, and has been advanced by some as a suitable radix for our system of notation. It has some important points about it, the main one of which is that it is the half-way house to the base of our system. To this, and the fact that we have five digits on each hand, is due the common practice of counting by fives. In the vegetable kingdom five is a very common and beautiful form, but beyond these points and some few others it has little to recommend it.

SIX is the smallest perfect number; that is, the sum of its factors is equal to their product; thus $1 + 2 + 3 = 6$, and $1 \times 2 \times 3 = 6$.

It has some mathematical peculiarities, one of which is, that any cubic number, the root of which is less than six, being divided by six, the remainder will be the root; and any cubic number, the root of which is greater than six and less than twelve, being divided by six, the remainder added to six will be the root; thus $5^3 = 125$. $125 \div 6 = 20$ with 5 (the root) for a remainder. And $9^3 = 729$. $729 \div 6 = 121$ with 3 for a remainder, which, added to six, equals nine, the root. This peculiarity holds good when the system of notation is changed to one whose radix is different from 10, and shows that it is inherent in the number and not due to its position in the scale.

This brings us to SEVEN, an odd irregular number, which bears no relation to any other number under fourteen. To this irregularity is due much of its usefulness, and the more it is let alone the greater will be its usefulness in this particular field. The week is an illustration of the point in view.

EIGHT admits of more regular subdivisions than any other small number. It is also our smallest perfect cube. On these grounds it has frequently been brought forward as a number suitable for a radix of a system of notation, but there are a number of objections to it, which are too lengthy to be given here.

It is needless to carry this any further, as it will be seen by what has already been given that the smaller numbers are by far the more important ones; and any scale that we may adopt that neglects these small numbers will be faulty in itself.

The relative value in utility of calculation of the various numbers may be expressed on purely mathematical grounds by the number of quantities which each number will divide; thus, one divides 100 per cent. of all numbers, and the rest as follows:*

2 divides 50 per cent.	6 divides 16⅔ per cent.
3 divides 33⅓ per cent.	7 divides 14 2-7 per cent.
4 divides 25 per cent.	8 divides 12½ per cent.
5 divides 20 per cent.	9 divides 11 1-9 per cent.

Any number under eight as a radix for our tables would be too small on account of the great extent to which we would have to carry them. As a composite number is preferable to a prime number as a base, we may, in representing its value, use the combined value of its factors.

Commencing then with eight we find, by the table given above, that two and four, the only factors besides itself and unity, have a combined value of seventy-five. Nine is not a practical number, as it cannot be halved, and contains only three for a factor.

Ten contains two and five with a value of seventy. Added to this it has a value of its own on account of its being the radix of the system of notation, which may be considered sufficient advantage to double its value, making it one hundred and forty, but for reasons that will be apparent further on, this last may be neglected and its value placed at seventy.

Eleven having no factors will be of no practical value.

Twelve contains the factors two, three, four, and six with a combined value of one hundred and twenty-five. As no other number under twenty-four has so large a value, twelve may be

*This table does not represent the actual relative value of these numbers, but only their relative value for calculating purposes. Thus, the value of six can not be accurately represented simply by the percentage of numbers which it will divide, because that neglects to take into consideration its composite character, its beautiful and inseparable connection with the circle, and other peculiarities before mentioned, against which five and seven have no adequate offset.

considered to be the best and most practical value to use in our tables.

Twelve is used more than any other number above four, save possibly one hundred, as is illustrated by inches, ounces, months, hours, dozen, gross, a jury, etc.

The great objection to twelve, and a serious one too it is, is that in carrying out our tables and performing the operations connected with it we come upon such inconvenient numbers as 1,728, 20,736, 248,832, and 2,985,984.

This is not so in the decimal system, whose powers are created by simply annexing ciphers.

To bring this best of all quantities, twelve, to a basis where it will have all the advantages of ten, and at the same time not lose any of its inherent qualities, it is simply necessary to change the radix of our system of notation from the decimal to the duodecimal, or as it might be called a new decimal system. To do this requires the introduction of two new characters to take the place of the present ten and eleven. This can be done in the following manner:

1 2 3 4 5 6 7 8 9 ɵ Ɛ 10. To the two new characters I have given the names of *zen* and *elf* respectively; then it would read, eight, nine, zen, elf, ten, eleven, etc.

It has been asserted that quantities written in this system would be unpronounceable in any system of nomenclature that we possess at present, and that a new series of names would have to be given to all our numbers; as the names tens, hundreds, and thousands belong strictly to the decimal and not to any other. But is this strictly true? Has our language suddenly become so unpliable, or so perfect that we can never attach any new meaning to a word, or discard any old or unused meaning? If this be true, then indeed is the work of revising our tables a difficult one. It would require the introduction of an entire new set of words to express each and every one of our weights and measures. But luckily it is not true, as notice the inconsistency of these same objectors, who denounce the introduction of new values to such terms as hundreds and thousands but unhesitatingly give new meanings to our pounds, quarts, and miles. Then again, we must, if these objections

are true, revise the names of the last four months of the year, and September, October, November, and December can no longer be the ninth, tenth, eleventh, and twelfth months, but must become the seventh, eighth, ninth, and tenth, as their names imply.

But let us examine further into the merits and demerits of the two systems.

Any vulgar fraction may be exactly expressed in the present decimal notation, if the denominator is two or five or any number composed of these factors, of which there are fourteen between one and one hundred. All others give repeating decimals.

Under the proposed system any vulgar fraction may be exactly expressed if the denominator is two or three or any number composed of these factors, of which there are eighteen between one and ninety-six. Hence the ratio in favor of the proposed system is a little over eighteen to fourteen, or nine to seven. This ratio will appear greater if we take into consideration the fact that three is a more important number than five by the ratio of 33⅓ to 20, or 5 to 3.

Another very marked superiority of the new over the old base is its adaptability to subdivision; thus the present base is divisible by two and five, while the proposed is divisible by two, three, four, and six. Canceling the 2 common to both, we have to offset the factor 5, the three factors 3, 4, and 6, all of which are much more natural to use.

Then again it has been urged that the peculiar properties of the number nine would be destroyed by this system. Let us see. The properties of nine either are or are not inherent in the number itself. Those that are inherent in the number will be maintained in the new system, like those of six before mentioned, but those that are due to its position in the scale will naturally be transferred in the new scale to the new character *elf* (ɛ), and will not be lost.

It will be noticed that the greater part of our present tables present numbers that are perfectly commensurable with the new base and can therefore be readily reduced from one system to the other, whereas there are quite a number that can not be

reduced perfectly to our present ten. For instance the number five does not occur at all, and ten only in our tables of United States currency, while the numbers 3, , 9, and 12 occur a number of times.

By this means our present inch and foot could be maintained in all their integrity, and from them might be built all the other tables of weights and measures.

C. L. REDFIELD.

The above reminds us that our multiplication table extends to 12×12, and has done so from time immemorial, as if in anticipation of a duodecimal notation, to harmonize with and perfect our predominantly duodecimal systems of weights and measures and time reckoning, and to restore and perfect our old-time largely duodecimal system of currency.—ED.

OBJECTIONS ANSWERED.

A defense of the formulæ contained in "*The Argument Condensed*," (pp. 24 to 28 of Magazine), against the criticisms in Mr. Baxendell's article (pp. 35 and 36), and those by Mr. Searles in "*The Proportions of the King's Chamber*," (pp. 37 to 45).

The main objection which Mr. Baxendell seems to have against my formulæ, is that they apparently contradict the alleged record of the mean solar year in the base length of the Great Pyramid.*

The direct testimony of the measurements themselves is not capable of deciding the point at issue; since distances laid off upon stone, and remeasured after many centuries, cannot, with certainty, indicate so great a nicety as the thousandth part of an inch.

Now a distinctively mathematical record of the length of the mean solar year, indicated by units of measure, and designed to

*This theory of Prof. Smyth that the Great Pyramid is 365.2422 cubits square is supported by him with much force of presumptive evidence, but as yet without positive mathematical proof of exactitude. I am not prepared either to reject or to accept his theory.

contain within itself the proof of divine inspiration, must be capable of yielding exact interpretation; for approximation, even close approximation, of the length of the year had, doubtless, been made by the uninspired Chaldeans and Egyptians as early as the building of the Great Pyramid.

Evidently, therefore, the length of the mean solar year, which is not discoverable in its exactitude by any method yet learned, cannot be a factor in the fundamental formulæ which are to test inspiration; and we must look elsewhere for them.

How, then, may approximate measures of stone walls disclose exactly determinate numbers?—Mr. Skinner has discovered the secret. He has found that many of the interior dimensions of the pyramid, when expressed in British inches, are diametral values of integral circumferences.

These integral circumferences, in connection with π, whose value is determined by pure mathematics, independently of measured distances, constitute my formulæ, and make them exact.

Mr. Searles, while admitting that these formulæ are accurate, (and he splendidly proves their accuracy of number and exactitude of proportions), yet expresses the opinion that the architect accidentally made his measuring rod $\frac{324}{3.141592}$ British inches long, or as close to that length as stone walls are capable of indicating; and using this rod to lay out his other lines, he unwittingly carried the British inches all over the pyramid. But it is incredible that, of all numbers which were possible, the architect should have accidentally hit 324, a most suggestive number, in constructing his measuring rod; for this $\frac{324}{\pi} \times 100$ equals the number of square inches upon the surface of a sphere whose diameter is our modern analytical unit, or $\frac{180}{\pi}$. The 100 indicates the decimal system; the 180 denotes the modern circular measure; the analytical unit signifies modern higher mathematics; and the surface of the sphere aptly symbolizes universal science; and, moreover, the decimal system, and the circular measure, and the higher mathematics, and universal

science, are subsequently found in the King's chamber, and throughout the pyramid.

The British inch, at its present standard, is not ancient, unless the British parliament has accidentally restored the primitive measure. It has been changed, even in modern times; and to-day the British inch and the United States inch do not exactly agree, although they were of common origin.

Is it not a noteworthy result of the conquest of Egypt last year, by England, that the conquerors secured possession of the most durable and the grandest work of architecture ever built by man? But,—more wonderful yet:—

The Great Pyramid contains a record of England's present linear measure, circular measure, and higher mathematics, elaborately worked out, perfectly defined, and recorded as accurately as though the British had but recently built it themselves for that very purpose.

Has Britain indeed taken possession of a heritage providentially prepared for her 4000 years ago?—If so, let her not lightly esteem her birthright, nor the unit of measure by which her heirship has been proved. Or may we otherwise explain this fact that the pyramid records modern measures?—for the fact is fully proved, and the system is too complex to be explained by coincidence.

Either the pyramid must have been built by men inspired for the work, or else, using a measuring rod five Egyptian cubits in length, ($\frac{103.1324}{5} = 20.626+$ inches, which is nearly, perhaps exactly, their cubit,) they unconsciously prepared a demonstration which the Almighty designed should be discovered after the lapse of about 4000 years,—a demonstration that Egyptian and British weights and measures are of common origin, and that the primitive system was an exponent of perfect science.

Whichever explanation we accept, we are forced to the conclusion that the Great Pyramid of Egypt is indeed "A witness unto the Lord of hosts in the land of Egypt," against the tendency of modern scientists to deny ancient inspiration.

J. H. Dow.

ORIGIN OF WEIGHTS AND MEASURES.

Addressing Wisdom, the wise man says: "Thou hast ordered all things in measure, and number, and weight."—(Book of Wisdom xi., 21.)

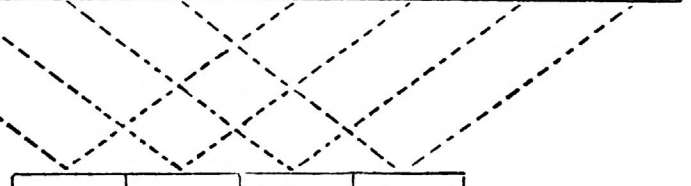
In this passage, we, the International Institute for Preserving and Perfecting Weights and Measures, are told of a perfect system of weights and measures already in existence, preserved for us, not merely 4,000 years, but from the beginning, in all things within and about us, by the Being who is "All and In All." To find it, we have only to turn our eyes inward, to the Spirit of Truth in its tabernacle of flesh, in obedience to the injunction, "If any man lack wisdom let him ask of God, who giveth liberally and upbraideth not;" for then, with our hands full of the desired wisdom, we are sure to turn our eyes outward, to the "all things" of God's "temple of the universe," in obedience to the command, "Whatsoever thy hand findeth to do, do it with thy might."

The International Institute seeks a cosmic system of weights and measures, as being the one only system worthy of becoming cosmopolitan. All-comprehensive as the universe, it is yet comprehensible by our finite capacities. The macrocosm is comprehended in the microcosm, as the stellar universe is mirrored in a drop of dew. Therefore, the universal system of weights and measures is comprehended in a nut-shell, as it were, and we have not far to go to find it. Its laws are the universal laws of order and harmony, ordained for the government of our entire being, moral, intellectual, and physical, as well as for the government of the spiritual and material universe. "For this commandment which I command thee this day," says the great Lawgiver, "is not hidden from thee, neither is it far off. It is not in heaven, that thou shouldst say, who shall go up for us to heaven, and bring it unto us, that we may hear it, and do it? Neither is it beyond the sea, that thou shouldst say, who shall go over the sea for us, and bring it unto us, that we may hear it, and do it? But the word is very nigh unto thee, in thy mouth, and in thy heart, that thou mayest do it"—(Deut. xxx,

11–14.) Indeed, so far as its manifestation in the weights and measures of commerce and the arts is concerned, it is also in every man's *hand*, that he may *see* it and *do* it.

The faculties through which we are most nearly related to the material universe are those which we call the physical perceptives, which take cognizance of the properties of matter and their relations to space, and which come in contact with these through the external senses, more especially through the sense of feeling and the mechanical instincts resident in the hand. The truth of this general statement no one will deny; but to the statement that the general is made up of certain definite particulars, standing to each other in relations of order and harmony, and thus constituting the unity and unison of the general whole, people whose specialties lie in other directions will turn away their heads with an expression of suspicion and distrust. Nevertheless, the object of this article is to show that there are eight primary properties of matter, bearing eight definite and distinct relationships to space, related to each other like the eight notes in music, and all recognizable by corresponding physical perceptives, through the medium of corresponding organs and functions of the human hand. Their names, in their orderly and harmonious relationships to each other, and the artistic products of these relationships, are represented in the following diagram:

PROPERTIES AND RELATIONS OF THE PONDERABLES.				PROPERTIES AND RELATIONS OF THE IMPONDERABLES.			
Place	Direction	Distance	Momentum	Colors	Order	Music	Reaction
Density	Sphericity	Size	Weight	Rarity	Angularity	Number	Lightness



Consist-ency.	Monofor-mity	Symmetry	Equilib-rium

COMPOSITE PROPERTIES, RESULTING FROM THE HARMONIC RELATIONS OF THE PRIMARY.

The diagram recognizes two opposite classes of material substances, *Ponderables* and *Imponderables*, each possessed of four primary properties, contra-distinguished from, or counterpartite to, the four of the other, constituting with them the harmony of fifths, and thereby producing four artistic, composite properties, the happy media between opposite extremes. People there are who deny the existence of such a class ef substances as Imponderables, on the ground that electricity and light and heat are mere forms of motion; but they forget that the etherial substances to which these phenomena are ascribed still exist, and are as imponderable as ever.

The four properties of the Ponderables are *Density, Sphericity, Size, and Weight;* those of the Imponderables are just the reverse, namely, *Rarity, Angularity, Number, and Lightness.* But these latter properties are chiefly manifested in and through the medium of the ponderables, in consequence of the fact that the imponderables, besides occupying the interspaces between the heavenly bodies, occupy the interspaces between their particles, causing their expansion, or *rarification*, chiefly by *heat*,—their crystalization, or *angularity* and *number of parts*, chiefly by *light*, —and increased *lightness* in the degree of increased rarety, angularity, and number over their opposites.

Do you say that what I call the imponderable elements between the particles of the ponderables are mere forms of motion, like the vibrations of the atmosphere, in the production of what we call sound? Well, my friend, when you can show me that the vibrations of glass, of bell-metal, and of the atmosphere, produce *expansion* of these substances, I will believe that the phenomena of light, heat, and electricity are ascribable to vibrations of the solid substances in which they appear, and not to etherial substances between their particles.

Now, though the etherial elements are not convertible into living souls, they are the media through which these act upon the grosser elements of living bodies, and the connection of their properties with those of the ponderables in which they are present tends to the production of the various degrees of composite development characteristic of the progressively higher and higher orders of the vegetable and animal kingdoms,

from the mineral kingdom up to man. United in equal proportions to each other, as they only can be by the blending and harmonizing power of a truly individual human soul, *Density* and *Rarity* make CONSISTENCY, *Sphericity* and *Angularity* make MONOFORMITY, *Size* and *Number* make SYMMETRY, and *Weight* and *Lightness* make EQUILIBRIUM.

Here then we have the eight Primary Properties of Matter, favoring an *octenary* system of weights and measures; and we have in addition, by their harmonic conjunction with each other, four Composite Properties, making in all twelve Properties of Matter, favoring a *duodecimal* system of weights and measures.

Having taken a general view of our subject, let us consider the properties separately, in the order presented in the diagram, in connection with the faculties by which they are recognized, and with the instruments of these faculties in the hand, through which they are manipulated. The first of the properties—the one most nearly synonymous with *materiality* is *Density*, and the instrument through which it is especially perceived and manipulated is the first bone and muscle of the body of the hand, the basis of the thumb. The densest bodies we come in contact with through the medium of a club, a sword, or a hammer, and it is to be observed that the handle of the instrument, and thus the force of the blow requisite to the overcoming of the density, comes in direct contact with the basis of the thumb, rather than with any of its fellows. If the substance under examination be of *moderate* density, as in the case of fruit of a doubtful degree of ripeness, the root of the thumb is repeatedly pressed upon it, as being that part of the body of the hand in which the degree of density or compactness is most distinctly appreciated.

The next property in the order of observability is *Sphericity*, —sphericity of the mass consequent on that of its particles and their tendency toward each other; and the instrument through which it is perceived by the sense of feeling, and at the same time manipulated, is the second bone and muscle of the body of the hand, the basis of the index finger. If a man wishes to know the form of a head shielded from sight by its hairy covering, he passes his hand about it in such a way that the basis of

the index finger comes in contact with the inequalities of the surface, for the simple reason that in this part of the body of the hand he gets the perception of the various degrees of sphericity better than in any other.

The property next after sphericity in the order of observation is *Size*, the effect of aggregation; and the instrument of feeling through which it is perceived and manipulated is the third bone and muscle of the body of the hand, the basis of the long finger. When a phrenologist wishes to judge of the size of a man's head, in distinction from its form, and without applying the tape-line, he takes its various diameters between his two hands, in such a manner that the middle bone of the body of the hand comes in contact, so to speak, with the cranium, for the simple reason that in this part of the hand the perception of size is more distinct than elsewhere. He is guided by instinct in the matter, rather than by consciousness, and acts wiser than he knows.

The fourth and last property of the Ponderables, in the order of perception, is *Weight*, and the instrument of its most perfect perception is the fourth bone and muscle of the body of the hand, the basis of the ring finger. Suppose yourself wishing to discover the smallest distinctly appreciable unit of lead, the densest of the common metals, by weighing it in your hand, preparatory to its use in balancing it against something to be bought and sold. In such a case, you experiment on leaden balls of various sizes, laying them in the hollow of your hand, and gently moving your hand up and down; for in this way you are enabled to judge, by a sort of bodily consciousness pivoted in the part of the hand on which the successive balls are rested, the least weight which the mind is able very distinctly and definitely to appreciate. Now, the hollow into which the ball naturally falls is exactly over the fourth bone of the body of the hand, requiring for its occupation an *oblique* position of the hand, rather than a horizontal; and, if I may judge of the sensations of other people by my own, the chosen ball is about the weight of *one ounce*. Either less or more than this you cannot so accurately estimate; hence I conclude that the *ounce* is the most natural unit of *weight*, and I doubt not it will

be found to harmonize best with the most natural units of extension and capacity.

We come now to the connection of the Hand with the four properties of the Imponderables, The first of these is *Rarity*, the opposite, the counterpart, the harmonic fifth in relation to *Density*. As the etherial elements take possession of the more substantial, dissolving them by an excess of heat and electricity over light, and crystalizing them by an excess of light over heat and electricity, we may naturally look for the sign of Rarity between the signs of Density, Sphericity, Size, and Weight, at their points of junction with the signs of their relations to Space,—that is to say, between the roots of the fingers. That the webs between the fingers signify the perception of Rarity, and are connected with the property of Rarity in those Ponderables by which the Imponderables are are most conspicuously occupied, such as air and water, is exhibited in all web-footed and web-fingered animals, and most astonishingly so in the bat. The aquatic beasts and birds owe their perception of the barometric states of the atmosphere, and their prognostication of the weather, to the faculty indicated by the web twixt their fingers and toes; and the blinded bat—deprived of sight for the purpose of experiment—owes his perception of the neighborhood of objects to the extremely fine sense of feeling resident in his leathern wings.

The part of the hand connected with *Angularity*, the second property of the Imponderables, is the last bone and muscle of the body of the hand, the basis of the little finger. The connection is seen in the instinct of the carpenter to run this part of his hand along the surface of a board, to discover the degree of his success in rendering it straight and smooth by the use of his plane; also in the naturalness of using the outer edge of the hand in the folding of large sheets in a printing establishment. That the crystalline forms are ascribable to light is demonstrated in their production.

The third property of the Imponderables, *Number*, is connected with the bones of the wrist, which are *eight*, corresponding to the natural division of the cube into eight cubes, illustrating the principle that "the whole is like the parts that

compose it." In the eight bones of the wrist every man carries about with him Nature's testimony to the fundamental importance of this number as a multiple and divisor in the perfect system of weights and measures which she has ordained for the whole human family. Men do not count with the carpal bones, as they estimate forms and sizes and weights with the metacarpals, but whoever will take the trouble may see that the wrist is longer and broader, indicating a greater size of the bones of which it is composed, in great mathematicians than in other people, and I have observed some curious gestures, not easily described here, confirmatory of the idea that the eight bones of the wrist are connected with the faculty of Number.

Next after the property of Number comes that of *Lightness*. The perception of this fourth and last property of the Imponderables has its sign in the remarkable space between the first and second bones of the body of the hand, the signs of Density and Sphericity. It is what makes the thumb and fingers the friendly opponents of each other, so essential in writing and in all acts of mechanical and artistic dexterity. In tracing the natural order of the Physical Perceptive, the last brings us back to the place of beginning. The property of Lightness is the inherent tendency of matter to occupy space, or to fill a vacuum, as the property of Weight is the inherent tendency of matter towards itself, or to exist. That the space between the first and second bones of the body of the hand is caused by the perception and property of Lightness is seen in birds, these ærial creatures, especially the most etherial of them, having what corresponds to a thumb turned directly backward from what correspond to fingers, enabling them to grasp the limbs of trees with the utmost readiness and security.

We come now to the relation of the Properties of Matter to Space, as recognized by corresponding faculties of the Mind, and as indicated in the phalanges of the fingers.

The relation of *Density* to Space gives us *Place*, and this is indicated in the first bone of the thumb, *i. e.*, in the bone adjoining the sign of Density. That it is connected with the idea of place is shown in our instinctive use of the thumb to mark the center of a circle, while we move the long finger around,

in the manner of a compass, to describe the circumference. The habit of moving the thumbs around each other, with the hands clasped, indicates in the man addicted to it a large faculty of Place, confining him to a small revolution, mental as well as physical, around the spot he calls his home.

The relation of *Sphericity* to Space gives us *Direction*, and this is indicated in the first bone of the index finger, *i. e.*, in the bone adjoining the sign of Sphericity. Of course, this connection of the index finger with Direction is what gives it its name. It is easy to see that Direction is a description of Form in Space, whether we point it out or represent it in outline. In curvilinear drawing the index finger is made use of far more than either of the others, and a round hand-writing furnishes a key to a particular class of character.

The relation of *Size* to Space gives us *Distance*, and this is indicated in the first bone of the middle or longest finger, which bone adjoins the sign of Size. The connection of the long finger with distance is shown in the remarkable instinct of sewing-women to measure their cloth by applying it to the back of this finger, from its nail to its junction with the body of the hand, repeating the operation as many times as occasion requires. It is also shown in the instinctive use of the long finger, instead of the index finger, when distances are being described, instead of directions, as e. g. in referring to the distances from post to post in the construction of a fence. And in connection with the long finger, if anywhere in the hand, we ought to find *the unit of linear measure.* I find it in the average length of the nail bone of the long finger,—the bone with which the sewing-woman begins her instinctive measurement,—and this average length, as near as I can judge, is *one inch.* Of course, the hair-splitting distinction between "the British inch" and "the Pyramid inch" does not enter into my calculations as to the natural unit of measure in the human hand. All I can say is, that in the anatomy and physiology of the human hand, the sign of *Distance* favors the idea that the proper unit of measure is *an inch*, and the sign of *Weight* favors the idea that the proper unit of weight is *an ounce.* The one is to measure what the other is to weight; and if "twelve inches make a foot," in a

perfect system of weights and measures, "twelve ounces make a pound."

The relation of *Weight* to Space gives us *Momentum*, and this is indicated in the ring bone of the ring finger, resting on that bone of the body of the hand which is specially connected with *Weight.* Weight, acting in Space, as it does when a ponderable body is let fall, imparts to the body a constantly increasing degree of momentum, so that the force which began in the weight of pressure ends in the weight of a blow, expressing in the rate of its increase, the relation of Weight to Space. If, instead of allowing the leaden ball to rest in the hollow of your hand, you attach it to a string, in order to give it the motion of a pendulum, you instinctively change its position from superincumbence on the sign of Weight in the body of the hand to dependence on the sign of Momentum in the ring finger, and you change the sensation of the force from that of weight to that of momentum. If you swing the weight at the end of the string through the entire circle, thus greatly increasing the force of the momentum, within the limits of a capability of deducting it from the force imparted by your will, you still keep it attached to the ring finger, because through this you get most perfectly your sensation of the degree of momentum. And herein we find a key to the mystery of the ring. The law of force in Matter bears a correspondent relation to the law of force in Mind, and this we know to be the law of Love. As the orbit of a planet represents Momentum, or the relation of Weight to the infinity of Space, so the golden circlet on the ring finger of a lady represents the force of love, or the relation of love to the eternity of time, increasing in such a ratio that it can never become stationary and inert.

Having explained the Relations of the Properties of the Ponderables to Space, and having shown the signs of the corresponding faculties in the Hand, it is now in order to do likewise in regard to the Relations of the Properties of the Imponderables.

The relation of *Rarity* to space produces *colors*, and the *faculty* of colors is indicated in the space between the ring finger and the little finger. This space is not like the spaces

between the other fingers, but is more like that between the index finger and the thumb. In the parrot, woodpecker, and other scansorial birds, what corresponds to the little finger is turned directly backward, like what corresponds to the thumb, so as to form with this a diametric opposition to the phalanges in front; and all scansorials appear to choose for a retreat colors like their own. Indeed, in all beautifully colored birds the sign of color in the divergence of the outer toe or finger from its neighbour is remarkable. In the human hand the little finger is distinguished from the others by being supplied with a separate nerve, while the index and middle and ring fingers are supplied by a nerve in common, showing a common mandate of the will to these and a separate mandate to that.

But how does the relation of Rarity to space produce colors? As the Imponderables enter into and possess the Ponderables, overcoming certain of their properties and substituting certain of their own, so the relations of properties to space in the one case strikingly influence those in the other. There are three primary colors: *red*, *blue*, and *yellow*. Of these, *Red* is the result of *Momentum* imparted to rays of light; *Blue* is the result of *Distance*, and *Yellow* is the result of *Direction*, while *White* light is light in relation to *Place*, or light in relation to that from which direction and distance and momentum are derived. The different colors are modifications of one and the same ethereal element, not different elements of an ethereal compound. Distance "robes the mountain in its azure hue;" direction, in the refraction of the rays of the evening sun, gives the sunset sky its golden hue; and momentum, in the motion of the observer, with the diurnal motion of the earth, toward morning sun, gives to the otherwise yellow morning sky its tinge of red.

The relation of *Angularity* to space produces *Order*, and the sign of order in the hand is that bone of the little finger which rests upon the sign of Angularity. The outlines of a cube, or of any other crystalline form, represent its relation to space, and show order in relation to each other, quite the reverse of direction in relation to an end to be attained. That the faculty of Order is connected with the little finger is seen in the use of

this finger in pointing out an orderly arrangement of dots, and in its uplifted position in the drawing of straight lines and angles. In the drawing of circles and curvilinear figures the little finger is kept under and out of sight.

The relation of *Number* to space produces *musical vibrations*, which we may express by the simple word *Music;* and the sign of music in the hand is the eight remaining bones of the fingers, four in a row, answering, like space to matter, to the eight bones of the wrist, four in a row, signifying Number. The connection of the twice four outer bones of the fingers with instrumental music is shown in the instinct to drum with them, and to use them in playing on keyed and stringed instruments, like the piano and guitar. So we see that both *Music* and *Number*, as indicated in the hand, favor the idea of an *Octenary* System of Weights and Measures; but we have before seen good reasons for regarding the *Octenary* as only an element, though a *fundamental* element, along with *Decimal* and *Duodecimal*, in that *perfect* system which we seek to discover.

The relation of *Lightness* to space produces *Reaction*, or *Rebound*,—just the opposite of Momentum. The sign of the last physical perceptive, reaction, in the hand, is the last bone of the thumb, which is the last bone of the hand as well;—so that the eight relations of the eight properties of matter to space, like these eight properties, form a circle, the last of the series coming back to the first, from which the order of progression set out. In the hand, the eight signs of the perception of the relation of the eight properties of matter to space begin with *Place* in the thumb and end with *Lightness* in the thumb. The connection of the faculty of Lightness with the last bone of the thumb is seen in its great length in the aerial birds and beasts, in contrast with its shortness in the terrestrials. It is also seen in the instinct of human beings to snap light bodies at each other from the last bone of the thumb, and to express their light estimate of a vain pretense, or their resolute reaction from causes of depression, by a snap of the ball of the thumb from the ball of the middle finger.

In certain distinct parts of either hand we have Nature's units

of weight and linear measure, *the ounce and the inch;* in the two whole hands together, with the palms upward, the inner edges in close contact, and the fingers of one hand crossing those of the other, we have Nature's comprehensive unit of capacity measure, *the double handful.* By *the hand*, in the comprehensive sense of the term, we mean both hands in one; and in this sense we are to understand it in the question, "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 tierce, and weighed the mountains in scales, and the hills in a balance?"—(Isa. XL., 12.) The capacity of the cup formed by bringing the hands together in the manner indicated is about that of the "cup of cold water" to be given "to a disciple" to quench his temperate thirst; but perhaps it is to be regarded as still more properly the unit of dry measure, "heaped up and running over." What else can be referred to in the statement respecting the fulfillment of Pharaoh's dream, that "in the seven plenteous years the earth brought forth by handfuls?"—(Gen. XLI., 47.) and what else can have been meant by the silver cup hidden by Joseph in the mouth of the sack of corn belonging to his brother Benjamin, "the son of the right hand?" The cup with which 'such a man as Joseph did divine' was the cup with which he did divide, in his capacity of administrator of the corn of Egypt, was it not? Otherwise, of what significance could it have been in this connection?

It is urged by some, in this age of upstart revolution, that the province of capacity measure should be relegated to that of weight. According to Nature, however, capacity is the all-comprehensive measure, including in itself weight, diameters, and circumferences. This is beautifully shown by the cup formed by the two hands, and in the development of it into the most common form of pottery known to the successive ages of the world, from the most primitive to the most artistic. In the rim of the unit of capacity formed by the junction of the hands, you have the anatomical indication of the property and faculty of Sphericity; in the larger circumference next below the rim, you have the part of the hand belonging to the property and faculty of Size, or Quantity; just below this,

where the cup draws decidedly inwards, towards the center, you have that part of the body of the hand which is specially connected with the property and faculty of Weight; and at the bottom of the cup, where the hands join in gathering up the double handful of grain, and where they open, funnel-like, to let it out, you have the sign of the property and faculty of Angularity. This relation of parts in Nature's comprehensive unit of capacity is a revelation of her unity of design in one of the most important of her countless spheres of beauty and utility, and is carried out by the artistic instinct in the typical form of the vase, which, through all its infinite variations, always represents sphericity in its rim, size in the larger circumference immediately below, weight in its contracted bottom, on which falls the chief pressure of the contents, and angularity in the flattened base on which it stands.

Finally, whatever system of weights and measures we deduce from the hand will be a handy system; and this is just what we want.

J. W. REDFIELD.

THE BRITISH MILE.

Among the problems that have grown out of Prof. Piazzi Smyth's measurement of the Great Pyramid, the following is offered in the belief that one design of the huge structure was to provide a universal standard of weights and measures based upon the form, size, and density of the earth.

Much has been done already to show that the pyramid standard is represented in the British system of weights and measures. Whatever advantages other systems may claim, the convenience of the British system for subdivision into halves, quarters, eighths, and sixteenths, cannot be denied. The origin of this system may not be traced historically, but the discovery of numerous measures in the pyramid, corresponding to the different kinds of British measures, indicates a high probability that the British system as a whole is traditionally derived from the pyramid standard.

The object of this paper is to show how closely related to the geographical position of the pyramid is the British mile of 5280 feet. In January, 1880, I wrote to Mr. Latimer expressing my belief that 1′ of longitude at that point is identical with the British mile. He was so well persuaded of the truth of my belief that he urged me to pursue the investigation further. I have done so, as I could spare the time. The result may be of interest to the "Institute for Preserving Weights and Measures."

The longitude of the pyramid is about 30° east. The latitude given by Piazzi Smyth is 29° 58′ 51″ north. The question to be considered is, Does the parallel of latitude that measures 5280 feet to 1′ of longitude, coincide with the latitude of the pyramid? If it does not coincide, how far removed from the pyramid does it lie?

At the equator, 1° of the great circle measures a little more than 69 miles. In the diurnal revolution of the earth, every point of its surface, north or south of the equator, describes a circle parallel to the great circle. As we recede from the equator these parallel circles grow smaller. It has been proved by numerous observations and experiments that the curvature of the earth's surface from the equator towards the poles is not circular, but elliptical. The equatorial diameter of the earth is the longer axis, and the polar diameter the shorter axis of a meridional ellipse. Astronomers do not agree in their estimates of the polar diameter, on account of the great difficulty in determining the exact curvature of the meridional arc at any point. Sir John F.W. Herschel, in his Outlines of Astronomy, says that the meridian is a flattened ellipse. For general purposes, however, the earth is treated as a true ellipsoid, because this facilitates mathematical reckonings.

Now let us take a parallel of latitude of which 1′ is 5280 feet. Such a circle is 114,048,000 feet in circumference. Its radius is 18.151.284. What is the latitude of this circle? This depends upon the equatorial and polar diameters of the meridional ellipse. Captain Clark, R. E., says that the equator itself is an ellipse, of which one vertex is 14° 23′ east longitude. General Schubert places this vertex 26° 41′ eastward of Captain

Clark's. The middle point between these is 27° 43′ 30″ east longitude, which is very near the longitude of the pyramid. We may therefore take Captain Clark's estimate of the longer diameter of the equatorial ellipse as the equatorial diameter of the earth on the meridian of the pyramid. Captain Clark's estimate is 41,852,864 feet. His estimate of the polar diameter is 41,707,796 feet.

According to these estimates it will be found, by the rules for calculating the ellipse, that the latitude in which 1′ of longitude equals 5280 feet is 29° 55′ 56″, or 2′ 55″ (about three miles), south of the given latitude of the pyramid. It is also found that 1′ of longitude, at the latitude of the pyramid, is 5277.8 feet. Whether this difference would be lessened by further observations I cannot say; but if it be true, as Sir John Herschel says, that the earth is an oblate or flattened ellipsoid, then 1′ of longitude at the pyramid must be a little more than 5277.8 feet.

Now this is a close approximation to the British inch; for if we take 5277.8 feet and divide it into 5280 parts, and one of these into 12 equal parts, one such part will be .99958 inches, that is, a line $\frac{1}{2500}$ of an inch less than the British inch. Did the pyramid builders obtain a *prime unit* of measure by finding the length of 1′ of longitude, either at the pyramid itself, or at a point within convenient sight of the pyramid, taken as a center of observation?

It has been observed that three measures of length are found in the pyramid; a cubit of 25 inches, the reed 103.13 inches, and the span 116.37 inches. The reed appears to be of special value; it is the length of the granite floor of the ante-chamber, and is the sole measuring rod used to determine the dimensions of the King's chamber. Yet if we take 5280 feet and bisect and sub-bisect it 12 times, we shall have a line of 20.625 inches, which multiplied by 5 gives 103.125 inches, the length of the granite floor to within $\frac{1}{7000}$ of an inch. It will also be observed that the seventh bisection of 5280, multiplied by 10, gives the well known pyramid number 412.5. These close ap-

proximations, if they do not demonstrate, at least give ground to believe that the British system of weights and measures is a traditional inheritance from that marvellous structure in the land of Egypt.

There is another fact connected with this 1′ mile longitude. The radius of a circle, measuring 5280 feet to 1′ of its circumference, is 18,151,284 feet, and $\frac{1}{10000000}$ of this is 1.8151 feet or 1 foot 9.78 inches. The Hebrew sacred cubit is 1 foot 9.8 inches (Haswell). The difference of these two measurements is $\frac{1}{2500}$ of an inch. The question again arises; having found the length of 1′ of longitude at the pyramid, did the builders take $\frac{1}{10000000}$ of the radius of its circle for their standard cubit? It would appear to be a very easy and simple process to get the measure of 1′ of longitude with great accuracy, and from this to determine the radius. If this study of the mile in relation to the pyramid lead to the discovery of other and closer relations, it cannot but enhance the value of "Our Inheritance," and strengthen our hold upon the weights and measures traditionally descended to English speaking people.

H. G. Wood.

PROFESSOR JOHN GREAVES, THE DISTINGUISHED OXFORD ASTRONOMER AND ANTIQUARY.

According to the design laid out for this Magazine, we present for the second of our portraits the great worker for humanity, Professor John Greaves, the Oxford astronomer.

It is a subject of much satisfaction to us to be able to present to our readers and members such a strong picture of the distinguished scholar. The manner of our coming into possession of it will be seen by the following from the Astronomer Royal for Scotland, who, in order that no possible failure should take place, sent two other negatives on glass through the

Smithsonian Institute at Washington, retaining one copy at home.

Last Monday I sent you in a box, per letter post, a photo-negative on glass, of an old etching giving a portrait of Prof. Greaves, A. D. 1650. . . . [It] was found at the Bodleian Library, Oxford: indeed, they have two copies of it there, and relate that they were printed from the copper plate, which had been kept in the family, many years after the Professor's death, by a grandson of his. . . .

If it arrives safely, pray see what your clever American photo-electrotypers can do with it; for it is apparently all that we shall get from Oxford; and it is a remarkable *effigies*, quite unlike the men of the present day, and therefore well worth reproducing.

Professor Greaves lived during one of the grandest epochs of the world's history—what is called the age of the new birth—with great reformers, poets, astronomers, painters, and warrior kings—at the time when the people of England arose with Cromwell, and England's king lost his head. It was during the time when the world was shaken by the 30 years' war, —that war which established the idea of the Reformation, the balance of power, and planted civil and religious liberty upon the shores of the new world.

It was the epoch of St. George, between the time when the mighty angel stood with his right foot upon the sea and his left foot upon the earth, and with a little open book in his hand, and a rainbow upon his head, declared that but a time should elapse until the end, when the Crescent was to be under the foot of the Cross; the time, perchance, when the angel stood saying: "Rise, measure the Temple of God."

Moved as with a mighty impulse, this remarkable man took his measuring rod in his hand, and with steady, earnest, religious purpose, as if by inspiration, he went to the Great Pyramid of Jeezeh, and measured with careful eye and hand that wonderful structure, particularly directing his attention to the mysterious coffer of the King's Chamber, as if the whole secret of the structure centered therein.

His picture reminds us strongly of the one whom he supported, King Charles I.; but whatever may have been his po-

litical views he was animated with a deep, earnest, strong desire to serve his God and his country.

For a comprehensive view of his life, we quote from the *Encyclopædia Britannica:*

GREAVES, JOHN (1602–1652), a mathematician and antiquary, was the oldest son of John Greaves, rector of Colemore, near Alresford, in Hampshire, and was born in 1602. He was educated at Baliol college, Oxford, and in 1630 was chosen professor of geometry in Gresham college, London. After traveling in Europe he, in 1637, visited the East, where he collected a considerable number of Arabic, Persic, and Greek manuscripts, and made a more accurate survey of the pyramids of Egypt than any traveler who had preceded him. On his return to Europe he visited a second time several parts of Italy, and during his stay at Rome instituted inquiries into the ancient weights and measures. Soon after his arrival in England, he was appointed to the Savilian professorship of astronomy at Oxford. In 1648 he lost both his fellowship and his Savilian chair on account of his adherence to the royalist party. But his private fortune more than sufficed for all his wants till his death in 1652.

Besides his papers in the *Philosophical Transactions*, the principal works of Greaves are *Pyramidographia, or a Description of the Pyramids in Egypt, 1648; A Discourse on the Roman foot and denarius, 1649*; and *Elementa Linguæ Persisæ, 1649*. His miscellaneous works were published in 1737 by Dr. Birch, with a biographical notice of the author. See also Smith's *Vita quorundam erudit, virorum*, and Ward's *Gresham Professors*.

A CORRECTION.

In the introduction to first number it was stated that the French metric system was compulsory in the Custom Houses of the United States. This was an error of copyist. The action of this Society has prevented Congress from falling into such a folly.

A paper, "The Capstone," has been received from C. A. L. Totten, U. S. Army, which will appear in next number.

The portrait of John Taylor will be the next in order.

ORIGIN OF INCH AND GRAIN.

The measures and weights which we have used as a race for thousands of years are so interwoven in our being that we never think to seek for their origin unless urged by some powerful impulse, such as to-day moves us, when we see that their existence is threatened by the advocates of the French system. We have shown before that the inch was the measure by which the pyramid was built; and we proved it by the fact that the length of the downward passage, the length of the King's chamber floor, its width, and, in fact, every measure within and without, were related to the circle of 360°. Thus, $360° \times 60 \times 60 = 1296000$, which is circumference to a diameter of 412529.+, and the King's chamber length is 412.529+. Now if it be proved in the above manner that the grain is the unit of weight, we shall have made a long step towards discovering the origin of our weights and measures; and I hope, by this paper, to pave the way to final proof that precisely as the unit of measurement, the inch, agrees with diametral seconds, so does the grain agree with the same diameter.

I take numbers from authorities, and have not used a single number as calculated or advanced by myself.

The French savans give 763.63 feet = 9163.56 inches, for the base length of the pyramid to the outer corners of sockets; Howard Vyse gives 9168 inches. Mr. Skinner, finding that 9167+ is diameter to a circumference of 28800, thence concludes that $\frac{28800}{3.14159+}$ inches, or $\frac{2400 \text{ feet}}{\pi}$ is the theoretical measure of the base, which he calculates to be 9167.32000776+, and its height 5836.092 inches.* Piazzi Smyth gives the cubic contents of the passages and chambers of the Great Pyramid in round numbers as 5250 pyramid cubic cubits, which, taken exactly, is equal to 82,277,592 British cubic inches. All authorities give 252.458 grains for the weight of a cubic inch of water at 62° Fahrenheit—barometer 30 inches.

Now, considering the pyramid as a water symbol—water being the base of all weights, ancient and modern,—we get for

*These are the measures to sockets, but the measures heretofore given are to the pavement, so called.

the number of grains of water in the volume of the pyramid, 41,253,055,671,500. This divided by 7,200, the number of grains in the old pound, gives $5,729,591,065\frac{35}{72}$, the weight of the pyramid in pounds. Now the number 41,253,055,671,500 is so close a decimal multiple of $\frac{1296000}{3.14159+} = 412529.61249576$, that it seems clearly to indicate the intention of the architect.

Now John Taylor declares that the old pound was composed of 7200 grains, and this is confirmed by Prof. Piazzi Smyth. Then, dividing 41,252,961,249,576 by 7,200 we have 5,729,577,951.3+, which is a decimal multiple of the analytical unit. For $\frac{180}{\pi} \times 100,000,000 = 5,729,577,951.3+$, which = the theoretical weight of the pyramid in pounds of water.

The foregoing rough estimate is so close to the exact relation of grains to seconds, that, if the interior passages and rooms had been assumed to be about two and a quarter cubic yards greater than the round 5250 cubic cubits, the relation would have been exact. We have therefore here the presumptive evidence that the original units of measure and weight were the inch and the grain.

Now Piazzi Smyth estimates that the ratio of the pyramid's weight to that of the earth is as one, or unity, to 10^{15}; and as the weights are given in pyramid tons of 2,500 pounds each, I will give the figures from his book, *Our Inheritance*, page 286: Weight of the pyramid, 5,273,834 tons; weight of the earth, 5,273,000,000,000,000,000,000 tons.

This mass of evidence seems almost to prove, that somewhere near this line lies the positive demonstration of the relation of pyramid dimensions in inches, and weights in grains, to cosmical dimensions and weights.

We have already fully proved inspiration in the pyramid along other lines of evidence; soon we expect to see this line fully open; and then, our faith confirmed by this old, new "witness," the Great Pyramid, we will with Isaiah's confidence say:

"*Who hath measured the waters in the hollow of his hand, and meted out the heavens with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in the scales and the hills in a balance?*"—Is. XL, 12. CHARLES LATIMER.

THE UNIVERSAL REPUBLIC.

Behold yon eagle in the sky,
  Aspiring toward the sun,
As though on him she'd fix her eye
  Until the goal were won.

Behold her now descending slow,
  In circling flight sublime,
As she would compass all below,
  And rule o'er every clime.

Behold her now on lofty pine
  Of mountain top alight,
As she would found a state divine
  On Freedom's holy height.

Behold her o'er her loyal nest
  Now spread abroad her wings,
As Liberty o'er East and West
  Abroad her banner flings.

Behold her now upon them bear
  Her eaglets to the wind,
As if 'twere mother country's care,
  Uplifting all mankind.

Behold her now soar all abroad,
  O'er furrowed land and sea,—
A mighty empire overawed,
  For bird of Jove is she.

Behold her now sweep down amain,
  With fearful, wild career,
And bear a lambkin from the plain,
  Her hungry brood to cheer.

And now, behold the Lamb of God,
  In Freedom's home on high;
For Freedom's sons must drink His blood,
  And eat His flesh, or die.

Behold Him rising from the dead,
  In eagle strength renewed;
The form with Freedom's wounds that bled,
  With power Divine endued.

Behold Him standing in the sun,
  With healing in His wings,
The universal scepter won,
  And He the King of kings.

O, Lamb of God! Thy rightful throne
In human hearts restore,
And make the Kingdom all Thine own,
Forever, evermore.*

ANSWER TO JOSEPH BAXENDELL.

I am willing and anxious to exclude all approximations as entirely inconsistent with the inspiration theory.

The distance to the sun stands upon its merits as the height of the pyramid multiplied by ten to the ninth power, irrespective of the question whether the proportion of the diagonal to center is to the arris lines as 10 to 9.

Mr. Chambers' three problems are based on pure mathematical formulæ, depending upon a certain supposed value of the parallax of the sun, which value was altered by the observations of 1774, on transit of Venus. My parallax comes out as five times the square root of π, as a consequence of adopting the distance as above, which seems to be the true one intended.

The semi-diameter of the sun in arc found, is a semi-diameter occurring twice per year, in May and September, and varies 10″ from the mean, but it nevertheless may mark a certain date in history according with a certain distance to the sun.

The only one who ever measured the downward passage to the angle, was Howard Vyse, and Piazzi Smyth records that as 4,126 inches. In regard to the pyramid inch, it is certain that it must have the circle of 360° for its support, else there is nothing certain and mathematical upon which to found it. The closeness of Piazzi Smyth and all others to the diameter values of the circle of 1,296,000 seconds, shows that this was

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*It is evident from the concluding verses of this anonymous poem, that by "The Universal Republic" the writer means "the commonwealth of Israel," the kingdom of the Christ who is to "sit upon the throne of his father David, to order and establish it in justice and judgment, from thenceforth even forever and ever;" and where so naturally as in Jerusalem, near or quite the midst of the four quarters of the globe? In the natural order of events, a consummation so devoutly to be wished must be in the far distant future.

the intention of the architect and Mr. Baxendell is obliged to found the pyramid inch upon it, else its foundation is merely from measures without foundation of mathematical *intent.*

CHARLES LATIMER.

A MEETING OF THE CLEVELAND AUXILIARY.

The regular meeting of the society took place March 28th, at its rooms in the Young Men's Christian Association building.

Dr. D. B. U. Fish, of Amherst, Massachusetts, was elected a member of the Institute.

A resolution was passed deprecating and protesting against the action of government officials in issuing orders for the compulsory use of the French metric system in the hospitals of the government, and in coining money with French weights and measures contrary to law.

The nickel, about which so much has been said, was coined by order of the Secretary of the Treasury as of five *grammes* weight and twenty-one millimeters of diameter. There is no law for this. The law says sixty-seven *grains* and sixteen-hundredths. No size is given, but the Secretary in his order took pains to make this coin French metrical and it is contrary to law, although in fact five *grammes* are sixty-seven and sixteen-hundredths grains. The French metric advocates were boasting of the great symmetry of the old coin being five grammes weight and twenty millimeters diameter, but the late order upsets their hopes as to size.

A memoir of Sir Henry Boucher Wrey was read, in which it was stated that during the metric craze in England some government officials sent out maps and charts of the metric system into all of the public schools, but by his efforts and those of others they were taken down and destroyed, the government rescinding the order. A letter was read from Rev. Joseph Seiss, author of a "Miracle in Stone" and "Gospel in the Stars," in which he states that Mr. Gladstone in response to his letter has

sent orders out to the army to preserve the Great Pyramid in Egypt from desecration and make some additional measurements to connect the old governmental surveys with the pyramid, to obtain the exact longitude.

A very interesting letter was read from J. L. Damphier, of Canada, showing that from analogy of the past, touching the configurations of the planets, great events of especially marked character are near at hand.

A general discussion then followed upon Mr. Davies' proposed table of weights and measures, and it was determined by the meeting that there was no use for a ten-inch foot, and the inch, foot, yard, mile in yard and feet, should be considered indispensable. The mile of 5,280 feet is considered one of the most remarkable numbers, being divisible by 46 integral numbers besides itself and unity. It was shown that a strip 5,280 feet long and a half a rod wide is exactly one acre. It will be noticed that one half rod is the three numbers of the mile read backwards or 8.25.

A discussion upon the unit of weight next ensued, the grain to be the basis with the avordupois pound of 7,000 grains, decimally divided, and the cental or 100 pounds, and ton of 2,000 pounds.

The meeting was large, earnest, and deeply interesting. Adjourned for two weeks.

LETTERS.

Extract from a letter of March 31, 1883, from J. Ralston Skinner to Charles Latimer.

Some years ago I noticed that the reported measures of the Mound Builder constructions in the Ohio valley were so pat with our British measures that they seemed to be of to-day, instead of an unknown past. I made a note of the fact in Source of Measures. Mr. R. B. Moore, a practical builder and measurer here, a member of our Natural History Society,

and its president, in some way got hold of my works on measures, and became interested in them. He investigated the subject, and told me that no practical man could use them without seeing that the source was in Nature, because of their harmony, etc., etc. We talked of their antiquity, and I told him of the strange feature I had noticed about the mound measures. Well, there was a semi-elliptical stone in the society which had been found in the famous Cincinnati mound, wherein the Great Tablet had been found. He took it into his head to take the measures of this stone, and found that its straight edge measured just nine of our inches, while its curve was just twelve of the same.

This fall I thought I would carefully investigate the matter. In 1848 the Smithsonian, in their contributions, published Squeir and Davis' surveys of a great number of mound works—circles, squares, etc.—and contributed some which were the work of Mr. Charles Whittlesey, former topographical engineer of Ohio, now of your city. On examination, these surveys naturally fall into three groups; and this stone measure of 9 x 12 inches fitted everywhere, to show the key of construction, *even to the numerical ratio of diameter to the circumference of the circle.*

The first of these groups has a square and circles connected. This square is found to be 1,080 feet to the side in a great number of instances. 1,080 is circumference to a diameter of 343.-77450+, as you know. The second of these groups has a circle attached to a square, octagon, and other rectangle, and the circle is 1,050 feet in diameter. The third of the groups is in measure the even divisor of 5,280 feet, as 110, 220, 440, or 550 and 1,320 feet. The three groups comprise many hundreds of measures. The groups are scattered over an area of hundreds of square miles, *and the sameness and harmony of measures were never discovered till compilation from the field notes was made*—so that there was no attempt at making up, or "fudging," as it is called

Now take a measure of 9 by 12 inches: $9 \times 12 = 108$; in the scale of an inch for a foot, this gives $108 \times 10 = 1080$ feet, for the group *one*. Then, $9 + 12 = 21$, or 12 *reversed* $= 21$,

and $21 \times 5 = 105$; and $105 \times 10 = 1050$ feet, for group *two* But $105 + 108 = 213$, which is $35.5 \times 6 = 213.0$; that is, it is the multiple of 355, which is circumference to diameter of 113, or the famous Biblical Jehovah ratio of π, viz., 113.355. There is one very great exception to these groups, viz., in which the characteristic measure is 1130, which is diameter to circumference of 3550.

Now these groups culminate in those at Newark, on which the greatest pains were laid out, and emphasis laid on the circumference of the great circle, viz., 2880 feet. $\frac{1}{12}$ of 2880 is 240 feet, and the diameter of this is $381.971+ \times 2 = 763.942$, which is the exact measure of the base side of the Great Egyptian Pyramid. So that in these mound constructions we have identity of geometric forms, identity of measures, and identity of application, with our Egyptian monument. But what is more, we have three slabs which we can read in symbol. These connect themselves with the mounds; and what is most marvellous, with the hidden meaning of the Mosaic Books, in a manner that is startling.

In this array there is no forced work, through the multitude of measures. All is natural, easy, and so simple that it seems a primer. I cannot get over the marvel.

As to the questions of fact, there are but two very simple and straightforward ones: 1st. Is the measuring stone genuine? and 2d. Are the mound measures truly reported? As to the first, there can be no doubt of its genuineness; then the question remains only, Are its peculiar measures of exactly 9 by 12 inches a mere coincidence? As to the second the measures are expressly stated as reliable, and moreover there is a great mass of intrinsic evidence to that effect, which the surveyors could neither see nor have any idea of.

The work has been before me some months, and I feel now as described. The best idea of my feelings is that the image of "the valley of dry bones" has come to our knowledge, and is giving us its life of thousands of years ago. The bones can be grouped bone to its bone, and then they can live,—that is, give up to us the knowledge of the most ancient days.

Extract from letter of Prof. Smyth to Mr. Latimer, January 8, 1883.

Now there is a calculation which I should be very glad to get him (Prof. Stockwell) to make. I have tried, but in vain as yet, to get it out of Prof. Adams, of Cambridge, England, as the one man in Europe qualified to do it. The result is not for me individually, but for the Great Pyramid research at large; as thus—

There is much doubt in the pyramid theory, what date its astronomical quantities are intended for, whether its own date of foundation, or the beginning, or the end, of grand gallery; the doubt arising from the very small change in time of the solar elements.

But the lunar elements change much more quickly; and that important lunar document the "Moon's mean Lunation," or synodic period, is reckoned now to be 29.53058+ days.

Then the question is, What was the moon's mean lunation 2000, and 4000 years ago?

There is a very leading quantity in Great Pyramid, which may be that; and Prof. Stockwell will be of immense service if he can furnish us with a defensible answer out of pure astronomy, and such as he will not object to being quoted with his name attached; for his is a very great name for the higher computations of Newtonian gravitational Astronomy.

Extract from letter of Lieut. Totten, U. S. A., to Mr. Latimer, of March 2, 1883.

Your second letter, accompanied by Isis and the "Reverse of the Seal," is at hand. . . . . The Isis is full of, to me, most lofty thoughts, and there is more in it than mere coincidence. So, in the history of our Seal I find everything wonderful. I would gladly send you my article to read to your Institute . . . . . were it not so long. It covers some 400 legal cap manuscript pages, and 110 or more illustrations. . . . . I can give you little or no idea of its contents or treatment save to say, that I have tried to be as ex-

haustive as you have in Isis Unveiled, and that your own ideas of the Seal, so far as the pamphlet you send goes, are also mine. . . . . You yourself, whom I must look upon as the undeniable pioneer in this matter, would be absolutely surprised could you look over with me the manuscript, and see what the Seal teaches us, and hear some of the astonishing facts I have found out relative to its symbolism and history, both subsequent and anterior to adoption. I am as fully convinced as you are of the wonderful origin of this land of PEOPLE. I am no visionary. I can see the surface more easily than I can see beneath, for I am not worthy to go very deep; but when I do get at times an *in*sight, what numberless and manifold connections are revealed! In man's life there is apparently no little chance—but it is all surface. It don't seem to me as if there could be *any* such thing as "chance" *per se.* The Unveiling of Isis covers centuries in its minutiæ, and involves the apparently independent acts of unknown and independent men, yet how wonderfully it ramifies and self-fulfils down to dates, and names, and even to the phraseology employed *blindly* (?) by those who attempt to relate it, let them take any standpoint they will. . . . . I take it that the hairs of a great man's head are no more carefully numbered by the mystic "Palmoni" than are those of his more humble brother, and that the count in the sum total of some great event has many factors silent, and from the daily life of those who least suspect that *their* homely words or deeds were "*prime*" in the great common multiple of the Nation's progress. We cannot introduce this element into the life of a Washington, or a Luther, or a Columbus, without admitting that it must be also present in even the equation of *our own* life, be it small or large. It is a wonderful field of research that is opening up before us. It has so many pathways! and though they look diverse to those who travel any one of them, yet to us, who hear each one of them relate what they have seen, they have but come from different directions to the same range of peaks, from which they have looked over into the promised land of the future."

MARCH 22, 1883.

MY DEAR FRIEND:—How I wish you could have been here last night! I sat up working until 3 A. M., and, had some one to "chin" with been available, I am sure I could have surprised you with what I have now discovered in the pyramid. Last night it seemed to culminate, and truth followed truth so rapidly that it was like drawing in a chain each time more precious than before. I have actually rediscovered what I verily know is truth itself,—"the truth" as to weight, capacity, and length, and where manifested at length I have little fear —no fear, in fact,—for Anglo-Saxon traditions.

You have no idea how opportunely your letter arrived asking the question if I could help you by laboring with you in search of the key to which you found traces in the weight of the pyramid. I had, for some three days previously, been at work directly upon "weight" as such, and had just succeeded in actually correlating the whole Anglo-Saxon system with the pyramid. I mean this literally—or as you say at the end of a mathematical table, "no errors." Well, you can therefore easily imagine my feelings when I laid down my pen to read your letter and found that the problem you felt was so important had its means of solution, with the ink yet wet upon it, right before me. This solution I shall let you make yourself in due time. What you want is the pyramid "modulus," and I think I shall put it in your hands. Now I hate to write always in the strain of one who has found out great things, and yet not relate any of them. But you can well understand how difficult it is to pull a thread out of a cob-web. I prefer to wait till some day I can put it all before you at once. You know you will have it anyway, and perhaps be the one to burnish the gem I have discovered.

Well, I am working so fast and so hard that a moment is a diamond. How I do wish that we might work together. Two heads are so much better than one. If I go to Washington I will surely call upon Judge Lowe. What you tell me about the divining rod increases my interest. If we can ever run our tracks along side of each other for a mile or so, I too am sure that we could solve that riddle and put its arc into a practical

every day shape. Did you ever think of the Coptic name of Joseph? "Zaphnath-paaneah"—"the man to whom secrets are revealed." How literally is the prophecy involved in this name being fulfilled upon his descendants?

Your last meeting must have been an interesting one. I would love to see the new members, however, come in by the hundreds instead of tens. But we must have patience: it is a great purifier, and we are only agents anyway. The Great Architect himself has the revealing of our work in hand, and knows "his times and seasons" far better than we who simply cry "How long?"

But one more thing and I will close. Let me beg of you to influence the Institute to act on the principles of *festina lente* as to the establishment of its foundation principles. Do not let them do what may have to be undone. For instance, I think your resolution of the last meeting, "That the polar axis be the basis of our measures," is couched exactly right, and you can even resolve that its one ten-millionth be an inch, but do not commit yourselves as to absolutely what that inch shall be or is. We know it, of course, to within one-thousandth, but we must know it exactly before we speak. In the meantime the truth will come by intuition. Outside of the Society, and in our publications, it is well enough to fix upon what appears to be the true length, and to keep uniform on it as the latter day science shall pursue its polar axis measurements. Why I say this is as follows: I know that I have the truth within my grasp—I know that the pyramid will and does give this unit unerringly, and I am also convinced that when the true unit is seen it will be the common unit of the foot and the sacred cubit. I know the beautiful work that you and Mr. Skinner have done upon the English inch—I admire it, and acknowledge it as culminating, and in view of it I do not see how man can longer doubt the pyramid. Yet am I also positive that there are not and cannot be, from the nature of things, two inches, an English and a pyramid. There cannot be two units of length. We shall see them coincide in the full light of a very near future. I am anxiously looking for the publication of Mr.

Petrie's discoveries. We shall have a hard battle to fight after they come out. *Sed magna est veritas et puralabit!*

At present what I desire is to see the ideal pyramid in all of its proportions. Let us work at the monument with a view of getting its exact ratios. It is a symbolic structure and an old one. I care not if so be that it be found inaccurate from age; its ratios are eternal, and with those once in our possession, mark my words, we will make a cubit out of WATER!

I am delighted at what you told me about the funds of the society. I appreciate your act at its full worth. I understand it, and there is in due time more coming. There are thousands of men in America whose hearts are being occupied by the grand facts in the Great Pyramid, and whose overloaded pockets will burn to assist in searching at the center and the borders of the earth for facts still hidden there. Let Mr. Proctor to the contrary notwithstanding, continue to "fill his belly with the east wind!" It would do him good to read (if he can read anything with profit) the whole of Job's xv chapter.

But, good-bye; I cannot help writing enthusiastically upon this and kindred topics. Do not think, however, that I am a mere enthusiast. I hope I have given, and shall yet give, evidence of careful work, but now I am bursting with truths I want the world to know, and it actually strains my poor knowledge of our grand old Anglo-Saxon language to express it properly. However, I shall work away at my manuscript, and pray God that I may finish it, and rest assured that if I may not, then another will be provided.

Yours sincerely, C. A. L. TOTTEN,

CHARLES LATIMER, C. E. U. S. A.

Cleveland, Ohio.

Extract from Letter of Jacob M. Clark to Mr. Latimer, of March 22, 1883.

I am very glad the Compilation of Analogues is likely to prove of service. I could very readily extend the comparisons in the prefatory notes—by the help of a key I have by me—which I had not time to do when I wrote, hardly anticipat-

ing that you would propose to print it right away. I will gladly do so still, if the composition is not already set up, and you so desire, and will return the preface for that purpose,—or otherwise I will send you further comparisons by way of supplement if you prefer that course. I notice several very interesting points which would in my judgment increase the value of the paper.

[The suggested supplement will be requested, and our readers may look for it in our next.]

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