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# Bouguer Gravity and the Giza Complex 4185 : 4815

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Many scholars have a difficult time accepting the possibility that the design of the Great Pyramid of Giza, commonly known as the Pyramid of Khufu (or Cheops), may have been constructed based upon a knowledge designed with the relationship of **pi** in mind. For example, were we to take as the side measurement of the base of the Great Pyramid as that of 756 feet, then the following may obtain:

**756 / 3.141592654** (pi) = 240.642274
**481.2845479** feet is close to the projected height of the Great Pyramid, which has been cited commonly as being **481.5** feet.

Besides considering the idea that the ancient Egyptians knew the concept of pi to an exact degree, it may be even more difficult to consider the possibility that they knew anything related to the concept of gravity. It just may be the case, however, that the Great Pyramid may represent some kind of station for measuring gravity. One cannot imagine such a monumental structure as the Great Pyramid merely representing a symbolic meaning. That is, a symbolic representation for the funerary purpose of Khufu himself, or even a symbolic representation of abstracted concepts like that of pi.

One somehow suspects that the Great Pyramid may have had (and may still have today) a more functional meaning...one that we have yet to discover. With this in mind, we may consider the relationship of the monumental structure of the Great Pyramid in terms of the measurement of gravity. There are many different aspects of the construction itself that suggests just such a meaning, at least in our view. We shall treat the aspect that relates to the possible symbolism for the measurement of gravity in terms of the ***Bouguer correction factor*** and other related themes.

Pierre Bouguer (1698-1758) was one of the first to compare the apparent brightest of celestial objects to that of a standard candle flame. He also presented a new determination for the exact shape of the Earth. More importantly for us, Bouguer measured gravity by a pendulum at distinct altitudes and was the first scientist to attempt to measure the horizontal pull of mountains. Bouguer considered the deviation of the force of gravity that was measured on a high plateau from that computed at the base of an elevation and exactly distinguished the mass of the matter between the station and the mean sea level.

From that one begins to suspect a relevancy for Bouguer gravity to the Great Pyramid. In a sense, Bouguer is making a measurement based upon the idea that an ideal slab exists between the height of the station and the sea level.

The **Bouguer correction** takes into account attraction due to an infinite horizontal slab. Correction = 2pGrh. The Bouguer correction increases g. The Bouguer Correction represents the adjustment to a measurement of gravitational acceleration in order to account for the elevation and the density of rock between the measurement station and a reference level. Mathematically, this may be expressed as the product of the *density of the rock*, the *height relative to sea level* (or some other reference), and a constant that is portrayed in units of *mGal*. The ***Bouguer correction*** is thus added to the known value of gravity at the reference station in order to predict the value of gravity at the measurement level. The difference between the actual value and the predicted value is the Bouguer ***gravity anomaly***, which results *from differences in density between the actual Earth and reference model anywhere below the measurement station.*

The Bouguer correction, then, represents a correction to gravity data due of the attraction of the rock between the station and the elevation of the datum (again, usually sea level). The Bouguer correction is +**0.01276rh** mgal (for measurements in feet) or +**0.04186rh** mgal (for measurements in meters) where **r** is the specific gravity of the intervening rock and **h** is the difference between the station and datum elevations. [*milligal*, or *mgal*, is a unit of acceleration used in gravity measurements that is equivalent to $10^{-3}$ gal or 10 microns per second, approximately one millionth of normal acceleration of gravity at the Earth's surface. The correction values vary from source to source in the literature, for example, from **0.4185** to **0.4193**.]

**Bouguer anomaly**

The gravitational attraction remaining after correcting the measured vertical component of gravitational acceleration at a point for: (a) the theoretical gravity at that point, usually using the *International Gravity Reference Field;* (b) the free-air correction; (c) the ***Bouguer correction***; and (d) the topographic elevation correction, usually correcting to sea level. This anomaly is the fundamental *gravity anomaly*, referred to as the ***Bouguer Anomaly***, thus reflecting all variations in density away from that expected for a homogeneous Earth.

Bouguer demonstrated that gravitational attraction decreases with altitude. The gravity anomaly is thus based upon the remaining value of gravitational attraction after accounting for the theoretical gravitational attraction at the point of measurement, the latitude, the elevation, the Bouguer correction and the ***free-air correction***. The free-air correction compensates for the height above sea level assuming there is only air between the measurement station and sea level. Free-Air gravity decreases according to the distance from the center of the Earth for every meter above sea level (**-0.3086** *mGal/ft*


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(or, **-0.09406** *mgal* for every foot above sea level). The Free-air correction usually adjusts gravity data measurements to sea level. As stated, the gravitational acceleration for the surface of the Earth varies at about **-0.3086 mgal** per meter in the difference of elevation. The negative expression indicates that as elevation increases, the observed gravitational acceleration decreases. If two gravity readings are made at the same location, but one is done a meter above the other, then the reading taken at the higher elevation shall be 0.3086 mgal less than the lower reading.

The Bouguer anomaly, thus stated, can be interpreted as representing density fluctuations below the surface. The free air correction adjusts the gravity reading to what it ought to be at mean sea level. The Bouguer correction removes the effect of any topographic mass (such as mountains) lying above or below the ellipsoid. Rock density varies by about a factor of two (from 1800 to 3400 $kg/m^3$) as a result of porosity and mineralogy. In areas where rock density is not to be measured, the Bouguer correction is made using a rock density that produces a gravity anomaly with the least correlation to topography possible. A difference in rock density (higher or lower) shall produce a gravity anomaly. A water filled void in **limestone** would have a density contrast of ***-1700*** $\boldsymbol{kg/m^3}$ ***(1000*** $\boldsymbol{kg/m^3}$ ***minus 2700*** $\boldsymbol{kg/m^3}$***).*** Lest we forget, the Great Pyramid is built of limestone. And, also, lest we forget, two historically significant counts are **17**, 34, 68, 136... and **27**, 54, 108..., for remember the base of the Great Pyramid may be represented as **7 *times* 108 = 756**.

If an observation point is at a higher elevation than the datum, there is excess mass below the observation point that would not be there were we able to effect our observations at the datum elevation. The gravity reading is therefore larger due to the excess mass, and must therefore subtract a factor in order to move the observation point to the datum level.

In order to apply the Bouguer Slab correction we need to know the density of the slab used to approximate the excess mass. For a density of **2.67** $\boldsymbol{gm/cm^3}$, the Bouguer Slab Correction is about **0.11 mgals/m**.

The preceding summary regarding a very complex theme, which we have extracted from many different sources leads to only a few observations that are relevant to our studies for now.

The construction of the Great Pyramid reflects a direct relationship of the values involved in measurements for the cited corrections of gravity readings. In other words, if the ancient builders of the Great Pyramid enjoyed a kind of knowledge that we have only recently developed within the past few hundred years, then they would have utilized that knowledge in their construction efforts. The Great Pyramid may be constructed as of the values cited in the Bouguer correction factor as well as in relation to some of the other values.

Many scholars who are now analyzing the Great Pyramid do so based upon contemporary pre-judgments as to what the nature and *raison d'être* of the pyramids may have been. To suggest that they may have been measuring stations for the phenomenon of gravity on Earth might surely contradict many of the contemporary theses about their meaning. Yet,


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the measurements chosen for the Great Pyramid would almost certainly reflect many different values of the physical phenomena as we know them today. In the Earth/matriX series, we have been illustrating some of the possible relationships between ancient reckoning numbers/fractals and the contemporary physical constants of astronomy, physics, and even chemistry.

Right off, the very height and base of the Great Pyramid would appear to encode or symbolically represent the Bouguer correction factor. The baseline of the Great Pyramid has been cited as being nearly **756** feet square. Its projected height has been generally cited as being that of **481.5** feet.

**756 / 481.5** = 1.570093458

1 / 1.570093458 = .6369047619
**1.273809524**

In other words, when we take half of the baseline (378 feet) in relation to the height, the following obtains:

481.5 / 378 = **1.273809424**

This figure suggests the Bouguer correction factor. And, as we make some adjustments to the baseline, since it is not exactly the 756 feet as is often cited, then, the proximity to the Bouguer correction factor becomes even more significant.

We have shown in a previous essay how a natural computation of the base of the Great Pyramid may yield a side measurement of 755.7909764 feet, which is very near that cited by the Egyptian Government (755.79 feet).

755.7909764 / 2 = 377.8954882

481.5 / 377.8954882 = **1.274161812**

In previous essays regarding the theoretical reconstruction of the measurements of the Great Pyramid, we have projected the height to be that of **481.9087** feet. [Cfr., **Earth/matriX** Essay, *"The Great Pyramid: A Theoretical Construct" 2001*.]

481.9087 / 377.7909764 = **1.275243328**

A second projection that we offered, were the leading edge of the four corners of the Great Pyramid to represent the 360c day-count, by measuring 720 feet each, would produce a height of **482.4832** feet

482.4832 / 377.7909764 = **1.27676359**


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No one really knows what the actually height of the Great Pyramid was originally during its time. There are different kinds of reasoning that may be applied to the projections of its height, beginning with that of reconstructing the outer covering that has since been removed from the four faces of the pyramid. This outer covering would have given the Great Pyramid a projected distinct height no doubt. One can theoretically reconstruct the idea of the Great Pyramid from geometrical posits as we have done in previous essays.

Yet, what we find intriguing is the fact that the symbolic representation of those projections fluctuate around what would be the representation of the Bouguer correction factor as expressed in feet (fractal **1276c**).

The Great Pyramid's side measurements:

*North side 755.43 feet*
*South side 756.08 feet*
*East side 755.88 feet*
*West side 755.77 feet [Measurements offered by I.E. Edwards, The Pyramids.]*

481.5 / 755.43 = .6373853302, 1.27477066
**481.5 / 755.08 = .6376807755, 1.275361551**
481.5 / 755.88 = .6370058739, 1.274011748
481.5 / 755.77 = .6370985882, 1.27419176

Consider the possibility: **481.5 / 1.276** = 377.3510972
**754.7021944** [projected baseline]

**481.5 + 377.8954882** = 374647.25

the square root of 374647.25 = **612.0843488** feet [hypotenuse of the Great Pyramid].

One cannot help but note that the **481.5** ft measurement of the height of the Great Pyramid pertains to the same number series as that of the **.4185** Bouguer correction factor in meters. Symbolically and expressed in fractal values:

**481.5 - 418.5 = 63c** *[the ancient kemi count]*

One can only suspect for now that a direct relationship concerns the study of gravity and the well-defined measurements of the Great Pyramid. We have analyzed the Bouguer correction factor in relation to other pyramids within Egypt, and there would appear to be a direct link in this regard. Shortly, we hope to post these findings as well on the **Earth/matriX** web-site. Until then, check out our recent essay *(no.211)* on ***The Ancient Reckoning Number Series***, which explains how the number series similar to the 4815 and 4185 numbers function.


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