Decoding the upper chamber of the Great Pyramid - part2

Abstract

The Great Pyramid of Giza is a well known ancient monument on the outskirts of Cairo. Its upper chamber, commonly known as the King's chamber, has walls composed of five levels of finely polished granite blocks which are precisely constructed with sub-millimeter vertical joints between them.

In a previous paper in this series I showed that the vertical wall joints on the north and west walls of the upper chamber of the Great Pyramid can be decoded as binary digits by placing a logical grid of rectangles across the walls and then using the modern IEEE 754 floating point storage protocol to decode the digits.

In this paper I apply the same technique to the south and east walls of the upper chamber having first shown that there is a simple encryption system used in the wall's design. I then extract the numerical data from these walls, the floor and other related sections above the upper chamber and show that the following fundamental physics constants are explicitly specified in decimal numbers within the Great Pyramid of Giza, and are expressed to much greater accuracy than our contemporary data:

The angular velocity of the Earth at the date of construction
The angle of the ecliptic to the invariable plane of the solar system at the date of construction
The mass of the Earth
The mass of the moon as a fraction of the Earth's mass
The geocentric gravitational constant
The universal gravitational constant

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The Great Pyramid papers

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Decoding the upper chamber of the Great Pyramid - part2

The north and west walls of the upper chamber of the Great Pyramid contain binary encoding using the wall's vertical stone joints, and the numerical data that can be extracted from this binary data was presented in a previous paper in this series *"Decoding the north and west walls of the upper chamber of the Great Pyramid"* [1]. The work in this paper assumes that the reader is familiar with this earlier work.

The south and west walls also contain binary data in the wall joints, but there are three features of the wall which make it impossible to decode without first having discovered the scale model of the Earth that is contained within the pyramid's architecture[2]. The first feature is that the south wall uses the architect's master measuring unit of the perfect meter (pM) on the lowest rows of stonework, a value which is only available after the Earth model has been fully resolved. The second is that the south wall has an encryption system contained within its architecture which cannot be resolved until the lowest row of stonework on the south wall has been decoded from the binary vertical wall joints. Thirdly, the checksum that was used in the chamber stack in the previous paper is also required, and it is for those reasons that the decoding of the upper chamber walls is split across two papers.

The upper chamber south and east wall

The stonework of the south and east walls of the upper chamber of the building are shown in Diagram H1, which illustrates the walls as viewed from inside the chamber.

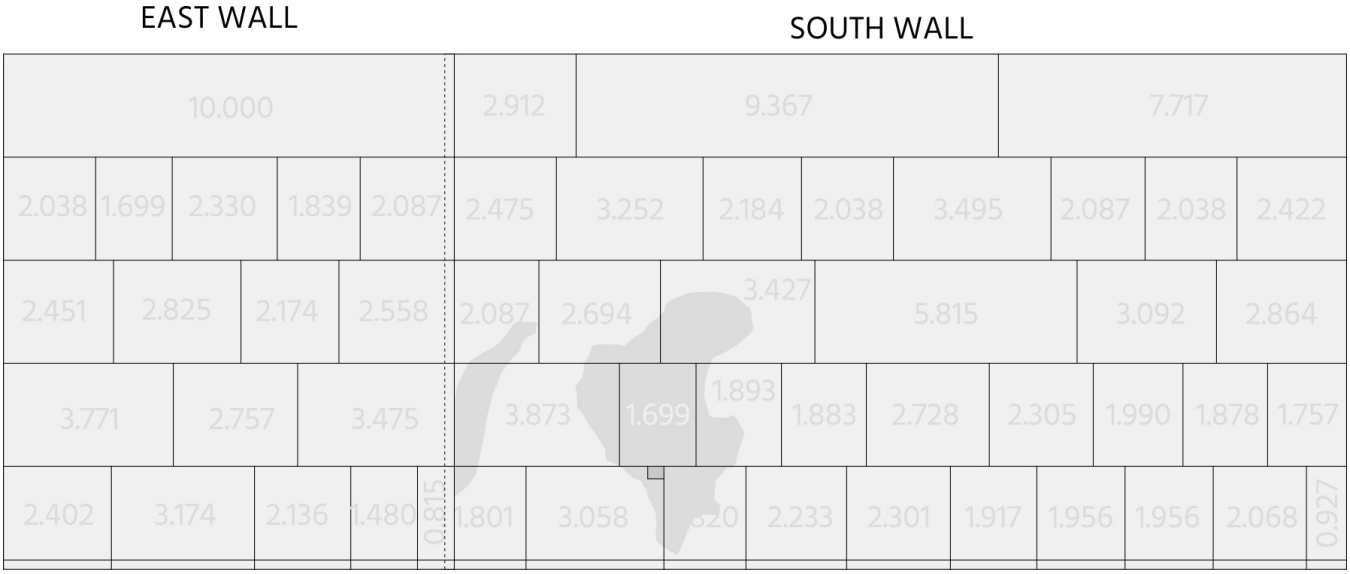

Diagram H1 - The wall stones of the south and east walls of the upper chamber viewed from inside the chamber

The numbers that are superimposed on the wall stones are the measurements of these stones' lengths taken from the work of Professor Smyth[3] and converted into cubits at a ratio of 20.602 inches to the cubit.

The darker areas on the diagram are the parts of the wall that contain significant damage, with the wall stones faces destroyed to a depth of up to 10cm in places. Analysis shows that this damage is original to the architecture and is designed to indicate that when viewing the south wall from inside the chamber you are viewing the damaged rear of the wall, and that the south wall needs to be viewed from the other side when analysing the stonework. The difference that this makes is significant because when decoding the first row of the north wall[1] the movable coffin was used as a bit mask to remove some of the vertical wall joints from the calculations. If the south wall were to be viewed from inside the chamber, the coffin would once again mask out certain wall joints on the south wall, and this turns out not to be the case.

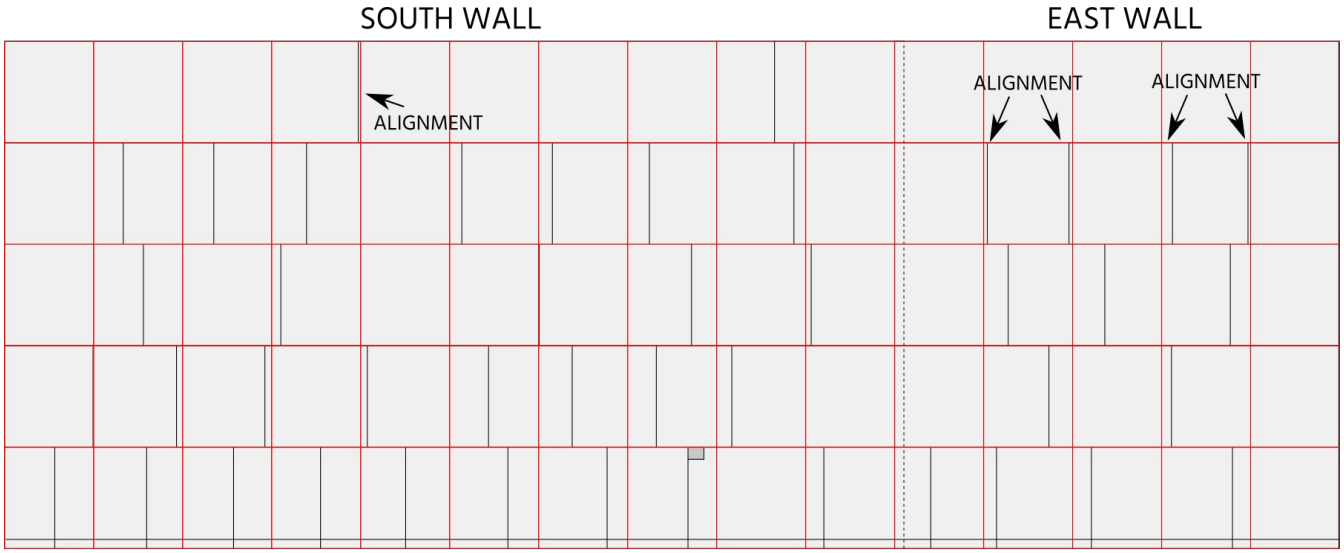

Diagram H2 - The south and east walls viewed from the south, with the alignment markers

Diagram H2 shows the alignment grid of the north wall placed onto the south and east walls of the chamber with the walls both being viewed from the rear, which has the effect of swapping over the two components of the IEEE 754 floating point system from left to right, but has no effect on the manner in which the wall is decoded. Diagram H2 is a mirror image of diagram E19 from the earlier paper in this series[1].

Decoding the south and east walls

1st row of wall stones

As most of the logic system in the pyramid works with opposites, then it is no surprise that it is the lowest level of the south wall that needs to be decoded first because on the north wall it was the upper most level where the decoding began.

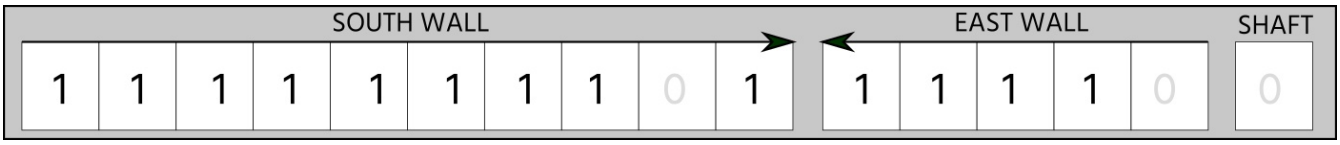

Diagram H3 - The binary digits extracted from the first south and east wall row of stones

Using the IEEE 754 floating point protocol that was shown in the earlier paper[1], the south wall's binary digits give the decimal number 767 and the east wall gives the decimal number 30 which, when placed into the floating point number calculator gives the value 57312.

This, like the value extracted from the first row of stones on the north wall, is a cubit based value but requires the checksum from the stack calculations adding to it before it makes any sense. The scaled up checksum value is 26.01 cubits, and when added to the first stone row value gives a total of 57,338.01 cubits which can then be converted into perfect meters using the conversion ratio derived from the building's latitude of 0.523223726 radians, to give 30,000.6 perfect meters. This value is three quarters of the Earth's circumference. (The IEEE 754 protocol does not give a continuous set of numbers due to its nature, and the part of the result after the decimal point can be discarded without consequence.)

Because this is a somewhat complex calculation involving various parts of the logic system contained within the pyramid, the architects have made sure that its validity can be cross checked. The first row of stonework on the north and on the south walls of the upper chamber are complementary to each other.

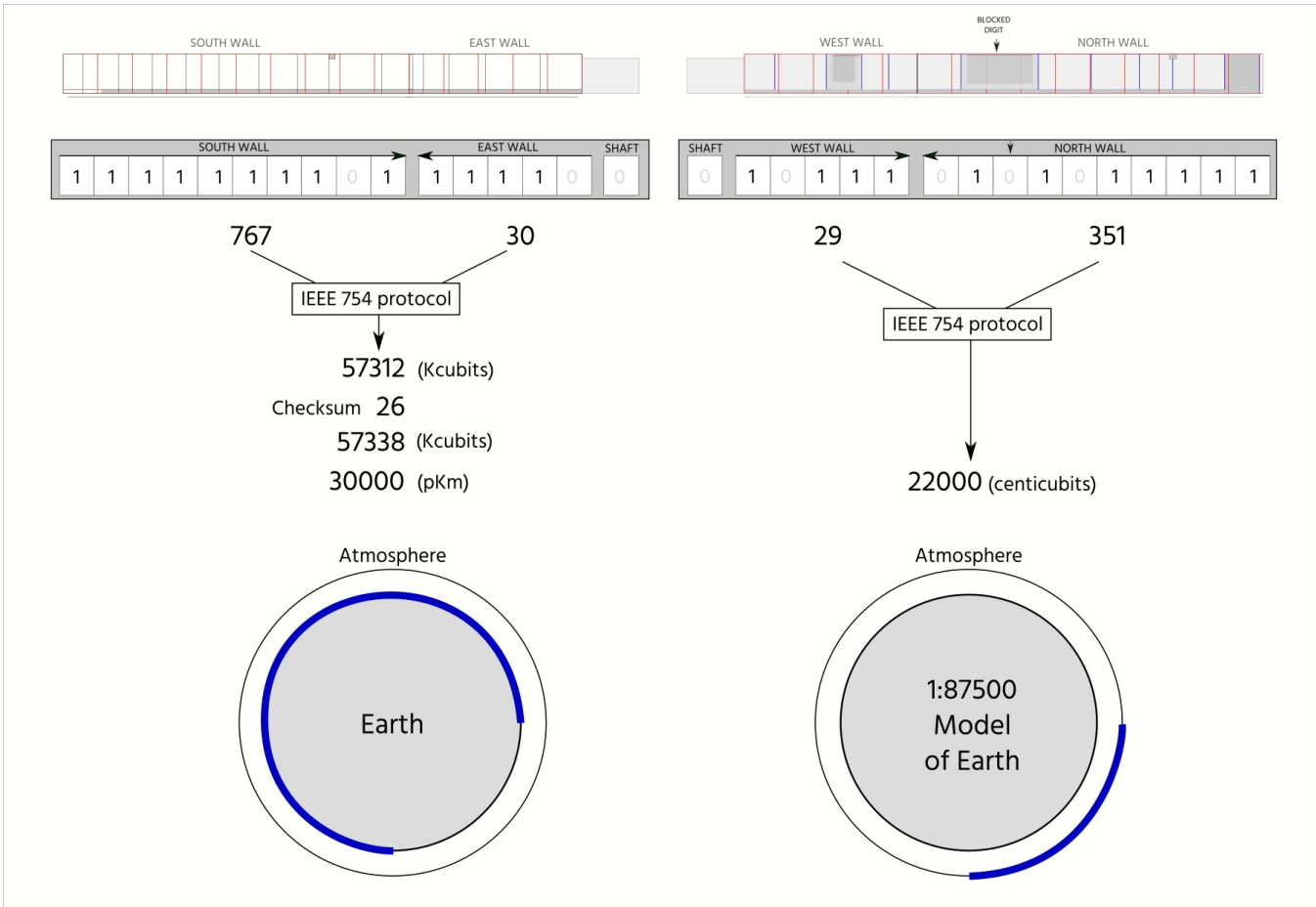

Diagram H4 - The complementary nature of the north and south walls

The north wall of the chamber decodes to give one quarter of the circumference of the Earth's atmosphere on the 1:87500 scale model, and the south wall gives three quarters of the Earth's planetary circumference at full size, and therefore the number derived from the south wall's first stonework row is 30000 pKm or perfect kilometers and the raw number on the first row of stones must be in given kilo cubits. The north and south walls demonstrably give matching complementary results when correctly decoded.

A preview of the 5th row of wall stones

Because the first row of stonework decodes unequivocally from the vertical joints, the IEEE 754 protocol must be in use on the south wall. On the north wall the 5th row of stonework was used to show the number 16 without the use of the IEEE protocol, indicating the 16 bit format that is in use in the encoding, therefore the fifth row of stonework on the south wall should show the same value, but doesn't.

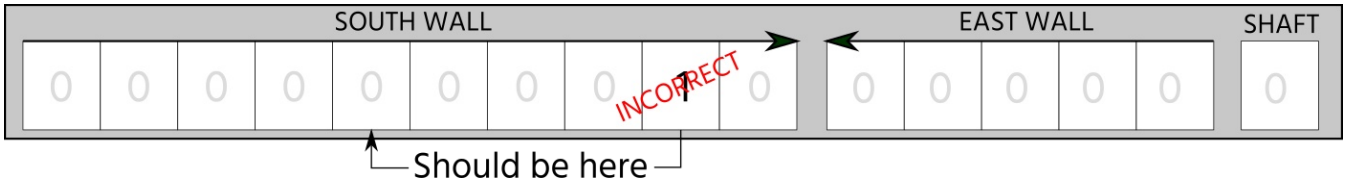

Diagram H5 - The fifth level of stonework, as built

The single vertical joint on the 5th row is in the wrong place if it is to replicate the north wall's bit size declaration, and therefore needs to be shifted 4 places to the left, at which point the 5th row of stones would give the binary representation of the decimal number 16. If the fifth row of data requires bit shifting, then it can be deduced that the south and east walls contain an encryption system.

The south wall encryption system

If the lowest row of stonework is named level 0, which is the standard method used in computer systems where numbering always starts at an index of zero, and this level decodes perfectly without any adjustments being made to the binary digits, and the upper row of stonework is named level 4, and requires its bits shifting 4 places left, then a simple encryption system can be seen from this pattern. Each level of stone's binary digits need to be shifted to the left by the index number of the level which they are located on, as shown on Diagram H6.

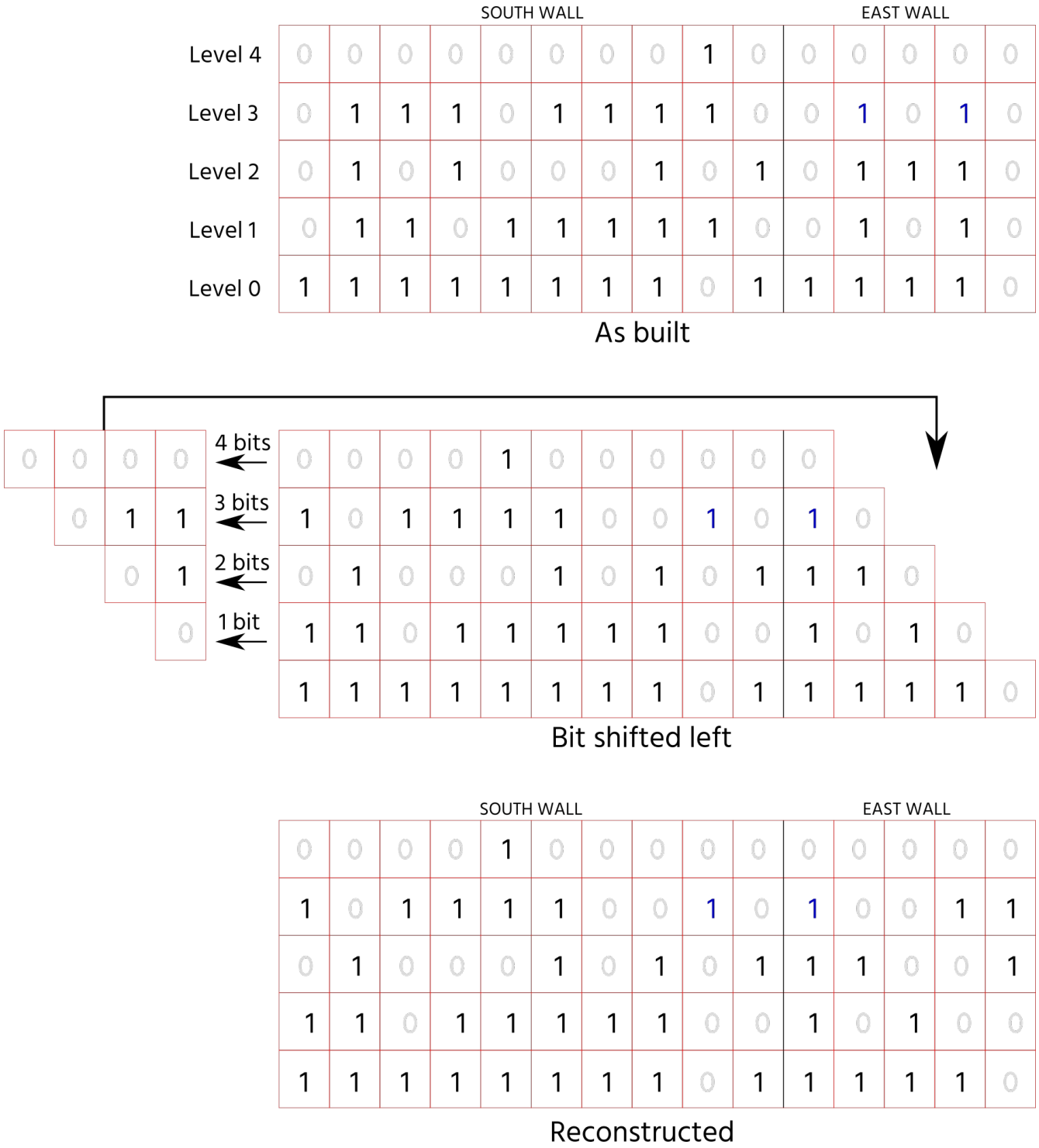

Diagram H6 - The bit shifted encryption system of the south and east walls

5th row of wall stones on level 4

The fifth rows of wall stones now correctly decodes to the decimal number 16 as shown in diagram H7.

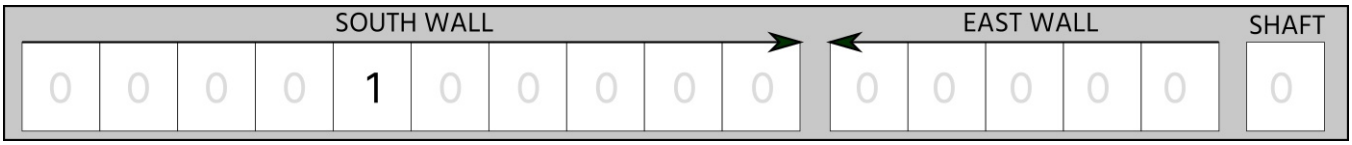

Diagram H7 - The binary encoding of the level 4 wall stones

2nd row of wall stones on level 1

The binary encoding of the vertical wall joints from the level one of the south and east walls is shown in diagram H8. The south wall binary digits give the decimal number 251 and the east wall binary digits give the decimal number 20 which, when placed into the IEEE 754 protocol gives the result 39.84375.

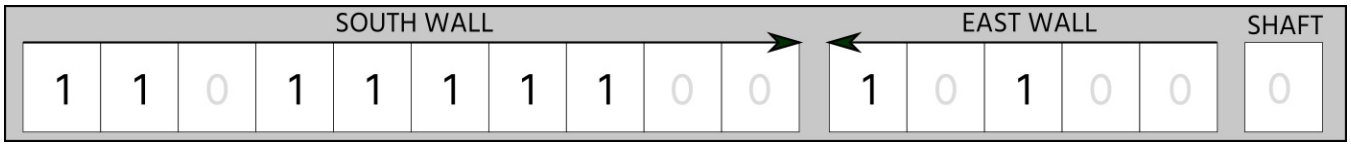

Diagram H8 - The binary encoding of the level 1 wall stones

3rd row of wall stones on level 2

The binary encoding of level two is shown in diagram H9 and gives the decimal number 674 on the south wall and the decimal number 25 on the east wall, resulting in the IEEE 754 floating point number 1698, the reciprocal of which is 0.000588928.

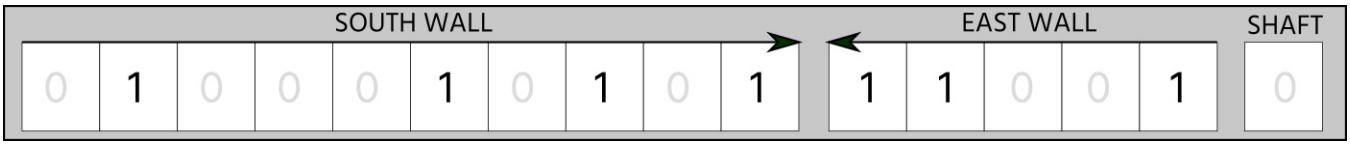

Diagram H9 - The binary encoding of the level 2 wall stones

The 4th row of wall stones on level 3

The fourth row of stones is slightly more difficult to decode because it contains the alignment system that was used to position the decoding grid on the south and east walls, and the architects accomplished this by using double wall joints that just fit between the lines of the grid as shown in Diagram H2. It is therefore not possible to decode the fourth row of stones in this state, because the grid rectangles do not contain a pure binary format of ones and zeros as the second and fourth grid rectangles on the east wall both contain two vertical wall joints, and therefore two binary digits.

The grid system therefore needs to be moved out of its regular position on the fourth row of stones, and the bit shifting to the left that was already used dictates the direction that the grid needs to be shifted. Diagram H10 shows the shifted grid on the fourth row which has been moved half of one grid rectangle to the left.

The grid rectangles now contain either single vertical wall joints or no wall joints, and can be decoded in the standard manner.

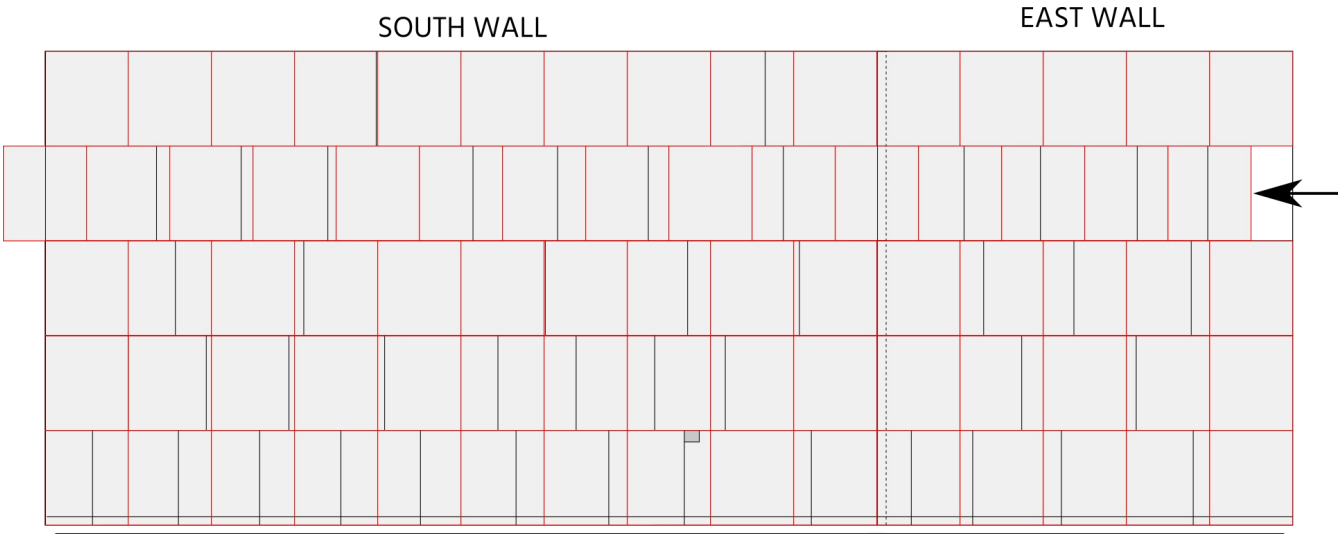

Diagram H10 - The shifted grid rectangles of the level 3 stones on the south wall

Diagram H11 shows the bit pattern that is extracted from this alignment, in which the wall overlap between the south and east walls is taken as representing a zero. The east wall gives the decimal value 15 which is known from the decoding of the north wall[1] to signify a special case in the floating point protocol, that being that the south wall contains a fraction that is split with the first three (lowest value) bits giving the numerator of a fraction and the remaining 7 bits giving the denominator of that fraction.

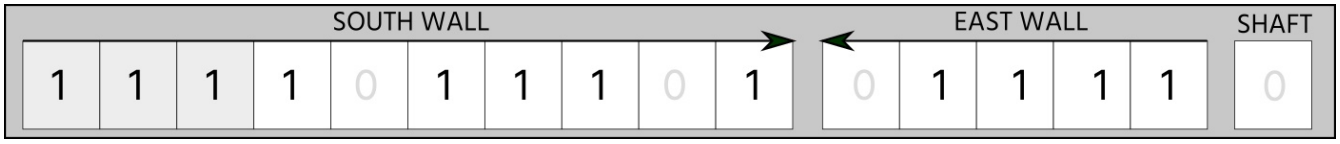

Diagram H11 - The binary encoding of the level 3 wall stones after the grid shift

The south wall numerator is therefore the decimal number 7 shown in the light grey boxes, and the denominator is the decimal number 221, a number which was previously seen when decoding the north wall, indicating that the binary data is correctly extracted.

The fraction 7/221 in decimal format is 0.031674208 and analysis shows that this is the angle, in radians, of the orbital plane of the Earth, the ecliptic, to the invariable plane of the solar system at the time the pyramid was constructed. The value in degree minute second format is 1° 48' 53.2744".

This fact can be checked by using the commonly accepted astronomy calculation formula of Robert Innes[4] given in an old copy of the handbook of the British Astronomical Association , a formula which is used for determining the angle of the ecliptic to the invariable plane of the solar system

Invariable plane angle = 1° 34' 59" 18" T

where T is the number of centuries that have passed since the year 1900. In the case of the pyramid, which has a *historical* date of construction of 2560 BCE, the value of T will be 44.60 and therefore our modern calculations give the angle of the invariable plane at that time as being 1° 34' 59" + 0° 13' 23" = 1° 48' 22". Displayed as radians, this value is 0.31522586 radians. This value is close to that which was extracted from the wall's level 3 binary data, but is clearly not correct.

The calculation can be done in reverse to determine the date of construction of the pyramid from the invariable plane angle on the wall, whereby the number obtained from the level 3 stonework has the value from the astronomy formula subtracted from it and the result is divided by 18 arc-seconds.

0.31674208 radians = 1° 48' 53.2744"
- 1° 34' 59"
= 0° 13' 54.2744"
/ 18"
= 46.3486

This yields a value for T in the astronomy formula of 46.3486 centuries and a resulting construction date of the Great Pyramid of 2735 BCE.

The commonly accepted *historical* date of construction of the pyramid is taken from written records of the lengths of the Pharaohs reigns in ancient Egypt[5] and is established at 2560 BCE. This historical date does not correspond to the date extracted from the architecture of the level 3 stone row in the upper chamber, but neither does the historical date correspond to the *scientific* dating of the Great Pyramid.

The discrepancy between the historical date of construction of the Great Pyramid and the radiocarbon dating of fragments found embedded within the cement and mortar used in its construction has been known by Egyptologists[6] since 2001. The published radiocarbon dating of the Great Pyramid gives the following results for the "one sigma" date ranges of the pyramid's construction

Date range BCE	**Probability (%)**
2862 2837	19.7
2818 2808	8.1
2776 2774	1.8
2756 2719	**32.1**
2704 2664	32.0
2647 2638	6.3

showing that the date extracted from the upper chamber's south wall corresponds with the optimal narrow date range from the radiocarbon dating.

Analysing the extracted numerical data

The decimal numerical data contained on the south and east walls of the Great Pyramid's upper chamber needed to be analysed at length to determine what it was and how it had been assembled, and the following explanation of the analysis is written after that work has been completed. Each of the subsequent sections in this paper is presented as factual information, rather than conjecture, in order to make the text easier to read.

The decimal number extracted from level 1 needs to have its digits shifted one place to the right, and therefore divided by 10, which gives the level 1 value as 3.984375. This number is specifically designed as having a recognisable similarity to one of Earth defining features, the geocentric gravitational constant 'GM' which has a value of 3.9860044 m^3/s^2 when expressed in modern units. The numerical value is similar because of two factors. First is that the building's architects defined the perfect meter in the same manner as the modern meter was defined and secondly the architect's unit of time must be the same unit as time that we are using, the SI second. Because the conversion ratio from perfect meters to meters is known[7] as being 1.000196573, then the conversion ratio to cubic meters can be calculated as being 1.000589835. Multiplying the decimal shifted value from level 1 by this conversion ratio gives 3.986725 showing that the level one value is very close indeed to 'GM' , but with an additional value of 0.000725 added to it.

The additional value that has been added is the angular velocity of the Earth which has a modern day value of 7.292115×10^{-5}, and when incorporated into the addition calculation has been shifted one decimal place to the left. It is possible to determine the Earth's angular velocity at the time the pyramid was constructed by reference to the research paper "*Measurement of the Earth's rotation: 720 BC to AD 2015*" [8] which shows the rotation period of the Earth is slowing at a uniform rate of 1.78 ms per century. By taking the historical date of construction of the pyramid as being 2735 BCE the time for one revolution of the Earth must have been 46.3486 x 1.78 = 82.5 ms faster at the building's construction time relative to now. Computing the corresponding day length and subtracting this value from the current sidereal day length of 86164.09164 gives a rotation period of 86164.00914 at the time of construction and therefore an angular velocity of the Earth of 7.292123×10^{-5} rad/s. It is this value of the angular velocity which needs to be deducted from the level 1 value and which must be specified numerically within the architecture of the pyramid so as to prevent contamination within the calculations from modern data.

The upper chamber roof and floor

The roof and floor of the upper chamber are shown in diagram H12. In the lower section of the diagram the coffin is shown in the location that it was moved to during the analysis of the north wall stones[1] and the darker coloured areas on the floor show missing floor stones. The west wall of the chamber is also shown.

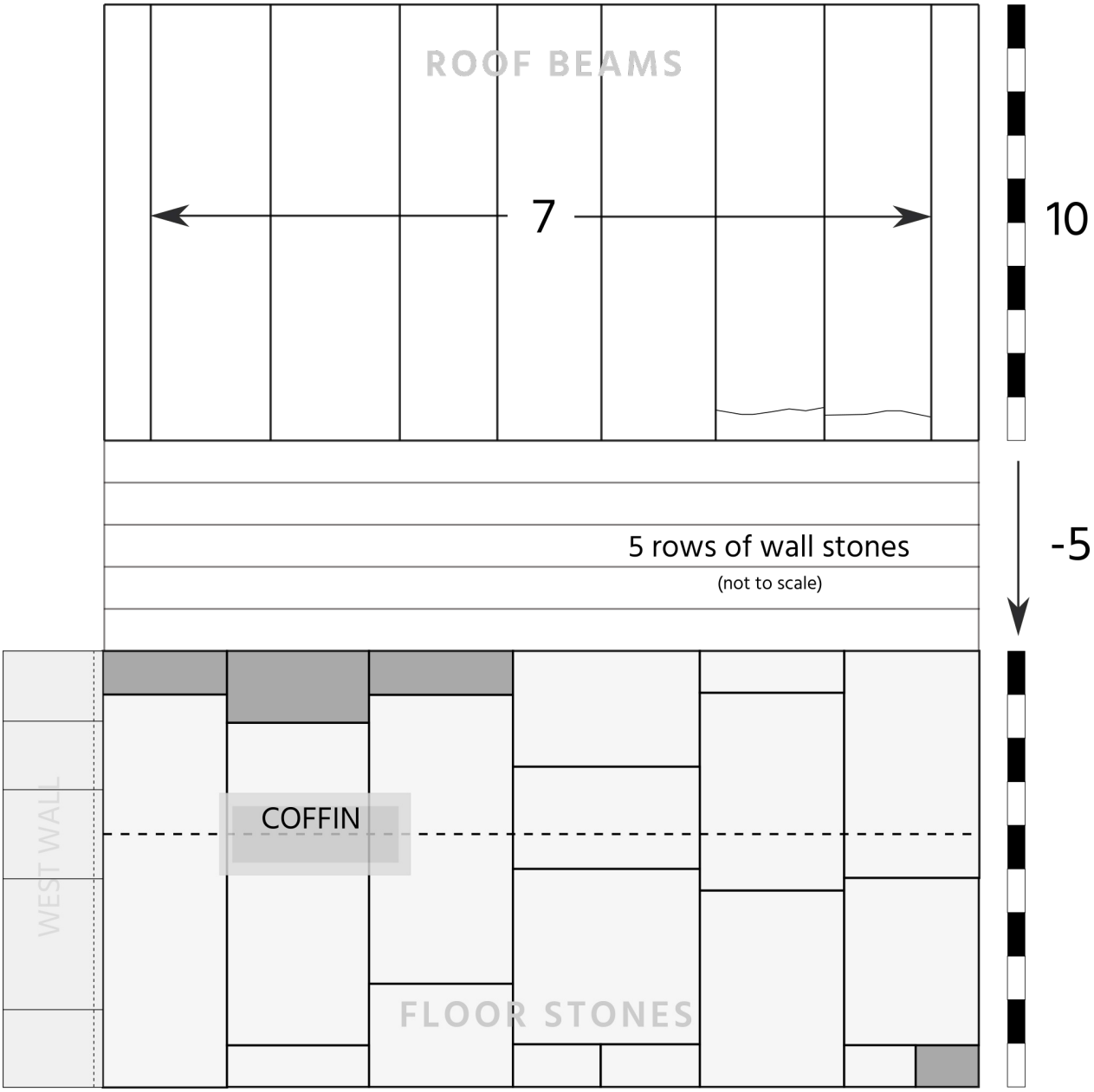

Diagram H12 - The plan views of the roof and floor of the upper chamber

There are seven complete roof beams which represents the integer portion of the angular velocity, the chamber is 10 cubits wide and the floor is five wall stone levels below the roof, which gives 7 x 10^{-5} as the starting information.

The decimal portion of the angular velocity is encoded into the floor stones.

The three dark floor stones in diagram H12 were all missing[9] when the pyramid was first explored and documented, and the Egyptian authorities, when they came to make repairs to the pyramid, 'repaired' these missing floor stones with modern 'replacements'. However, the missing floor stones are part of the original design, and in order to correctly extract the numerical data from the floor, the stones that butt up against the north wall from the next two rows closer to the doorway need to be removed, rather than the first three being repaired, as shown in diagram H13.

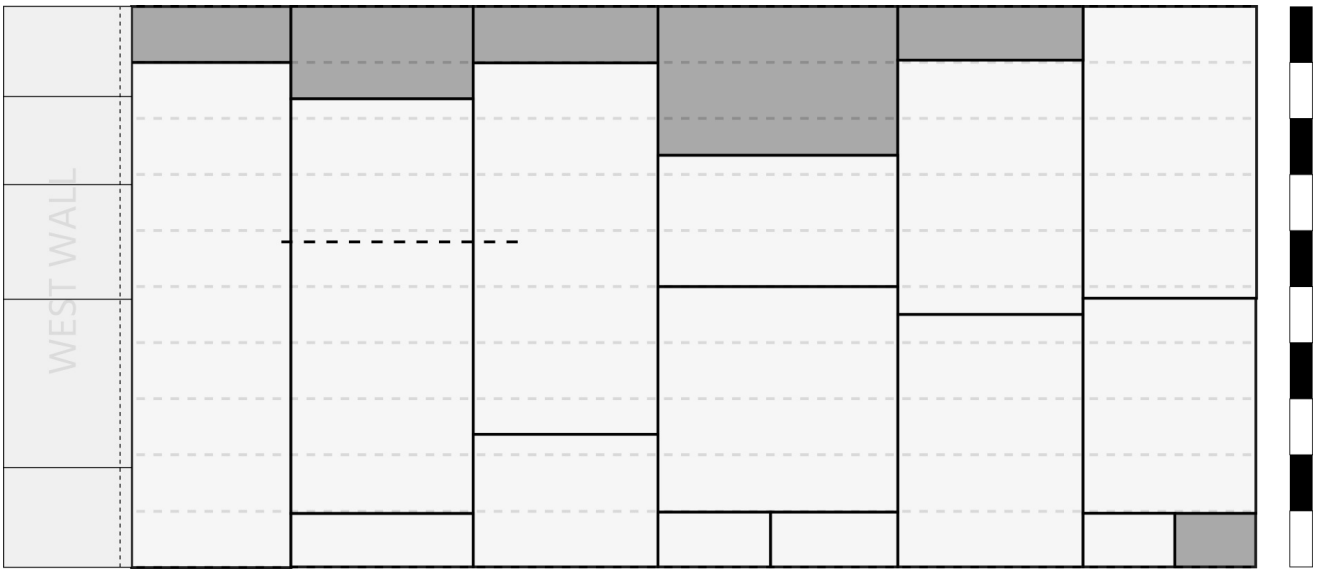

Diagram H13 - The floor with the extra stones removed and a cubit grid added

On diagram H13 the coffin has been removed and the central axis line of the coffin left in place, and a grid of 1 cubit wide sections has been underlaid on the diagram running along the length of the chamber and aligned with the 10 cubit divisions of the east wall. This system is the same as the system that was used with the grid of rectangles on the wall stones, and therefore the lines needs to be moved by one stack constant out of place before they can be used. Diagram H14 shows the moved grid with the grid's three alignment points in the chamber's architecture marked on the diagram.

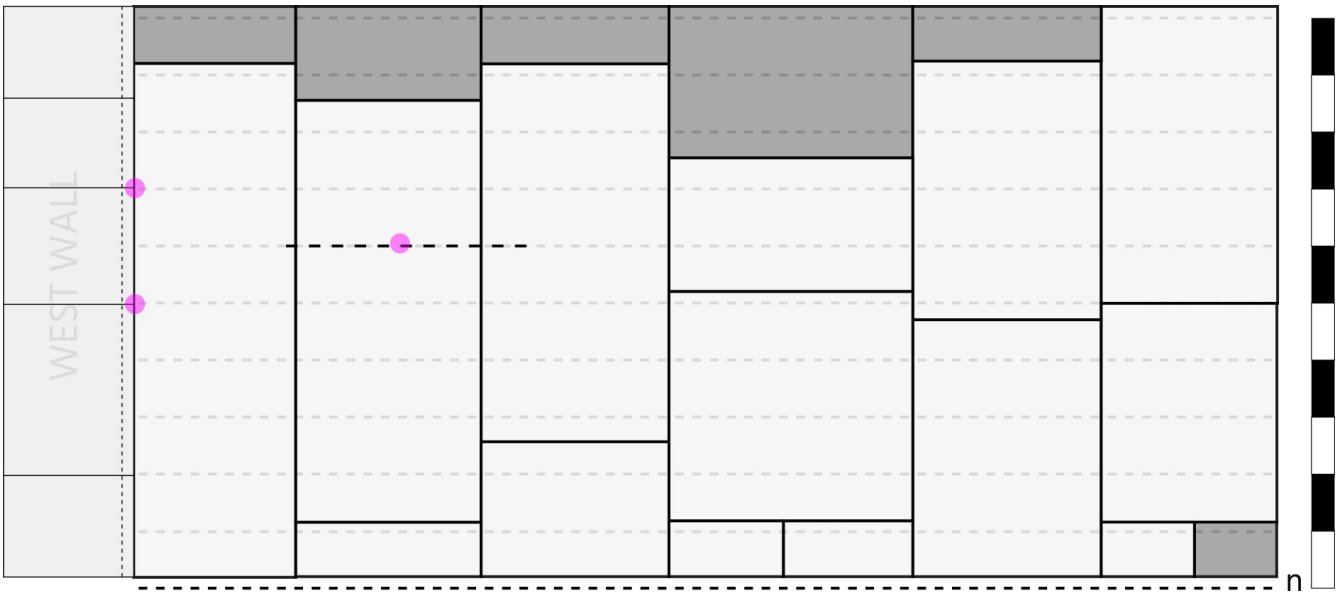

Diagram H14 - The floor grid alignments

In a manner that is consistent with the logic of the building, because the walls were encoded using binary numbers, the roof and floor have been encoded in the opposite manner using decimal numbers, and so the next step is to place a series of decimal number strips along the floor. This system is analogous to a modern combination lock and is shown in diagram H15 with the number zeros aligned along the north wall of the chamber and shown with the blue arrows.

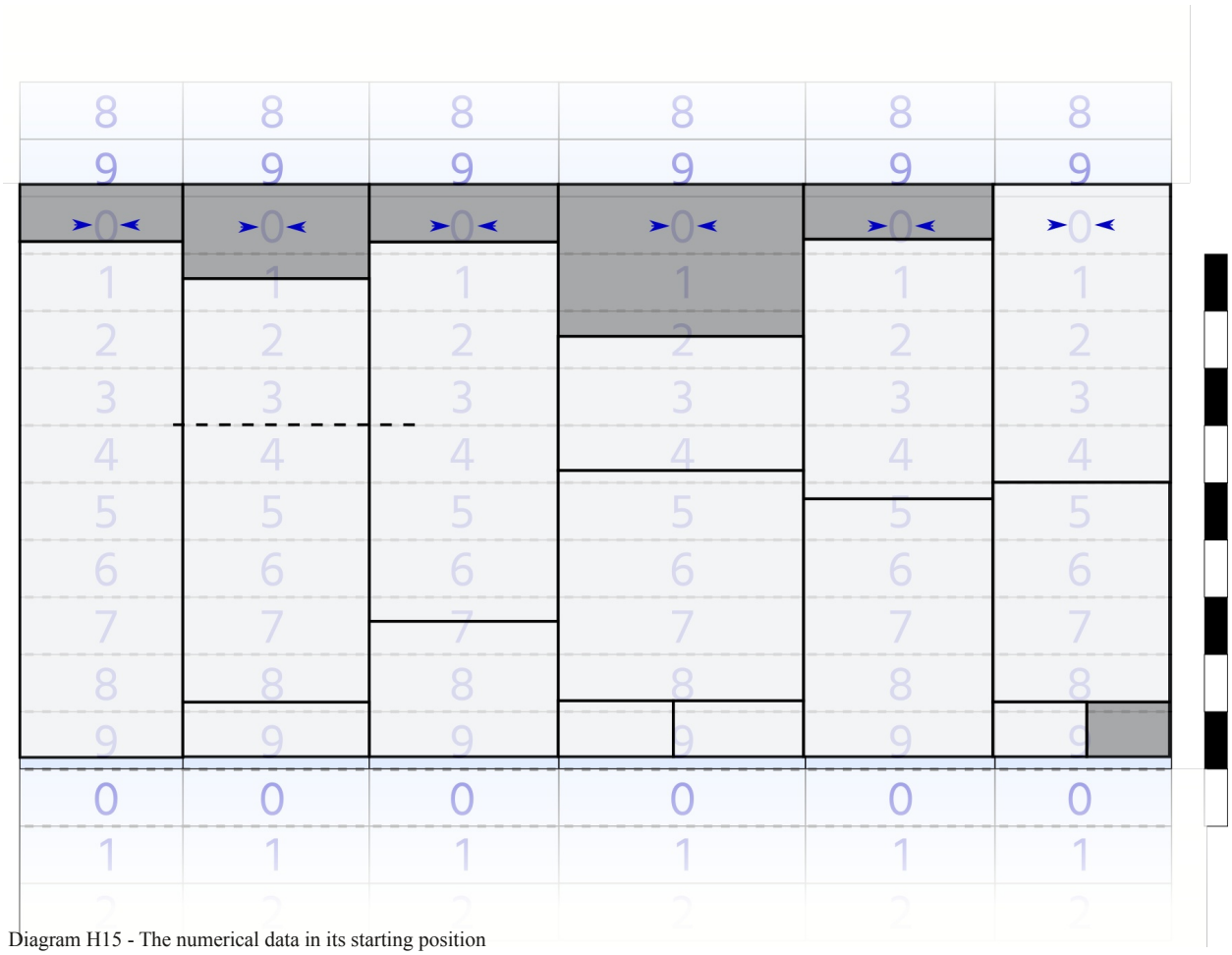

Diagram H15 - The numerical data in its starting position

The decimal number strips can then have their number zero aligned with the remaining floor stones on each of the rows of floor stones, and the decimal portion of the angular velocity can be read out across the line of the floor that is marked by the center line of the coffin as shown in diagram H16.

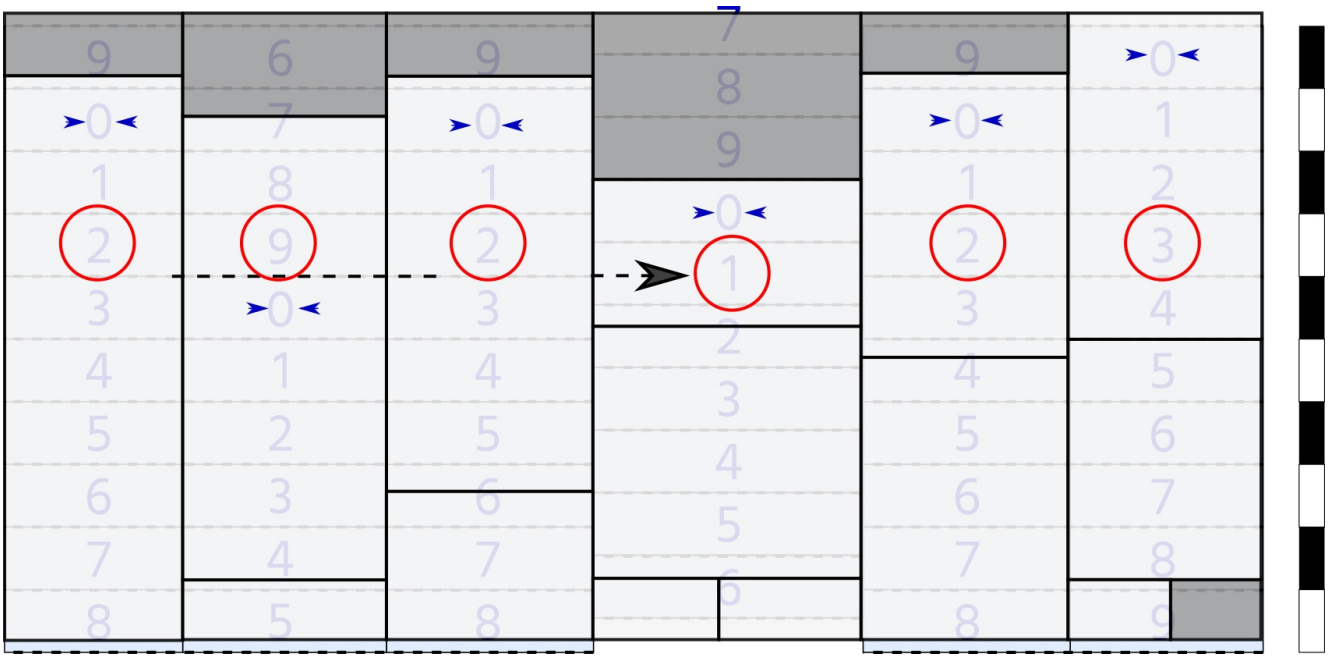

Diagram H16 - The decimal portion of the angular velocity in the floor stones

Note that on the second row from the left, the alignment of the zero is with the center line of the coffin and not with the northern end of the wall stone, ensuring that you cannot solve this part of the system unless you have previously solved the encoding on the north wall which dictates the coffin's placement. Also notice that the fourth line of stones from the left is half a grid unit out of line, deliberately mimicking the level 3 stones on the south wall and allowing the correct number to align with the center line of the coffin, thereby disambiguating the numerical result on the chamber's floor.

Combining the integer value and other data from the roof as shown in diagram H12 with the floor stones gives the value 7.292123 x 10^{-5} rad/s which is the correct angular velocity for Earth at the date the pyramid was constructed and shows again that the time unit in use by the architects must be the modern day second.

Combining the south wall data

If the numerical data from the south wall is now looked at again and the values are added together, they very nearly give the correct value for GM, the error being 0.0000001 m^3/s^2.

Building Feature	Item	Numerical shift	Value	
Level 3	Unknown	4 right	0.00000316742081	
Level 2	Unknown	2 right	0.00000588928151	
Level 1	Base number	1 right	3.984375	
Floor and roof	Angular velocity	1 left	-0.0007292123	
		Total	3.98365484440232	pM^3/s^2
		Metric	3.98600454423348	m^3/s^2

The reason that the sum does not add up correctly is that there is a checksum value that needs to be deducted from the total which is currently missing from the calculation. Finding the checksum involves identifying the numerical item on level 2 and identifying this data on level 2 involves looking at the Earth model once again that was documented in the previous paper[7].

The atmospheric volume and mass

When the checksum was identified in the vertical chamber stack it resolved the circumference of the Earth *model* as being exactly 800 cubits, and therefore the half base length of the pyramid as being 200 cubits. After investigation it can be seen that this checksum only relates to the model of the Earth and the pyramid, and when the model is subsequently scaled up to full size by the scaling factor of 1:87500 a different checksum has been used on the full size planetary data.

The full sized atmosphere is created by starting with the nominal 1 cubit thick pyramid pavement and scaling it up so that the atmosphere height below the south pole is 87500 cubits. The checksum that is then added to this distance is (87.5 + 1)n x 10^3 cubits, where n is the stack constant. The principal value from the vertical stack of 87.5 with an implicit one added to it has been used as the checksum value. This checksum complies with the logic that has been seen up to this point in the building's architecture and gives the values for the full sized Earth and atmosphere as follows:

	Model size	Formula	Full size 1:87500	
Vertical stack height	138.82077		12146817.30984	(cubits)
Pavement thickness	1.00000		87500.00000	(cubits)
Checksum		(87.5 + 1)n x 10^3	1810.69497	(cubits)
Polar atmosphere radius		b	12236128.00481	(cubits)
Equatorial atmosphere radius		a	12277291.39106	(cubits)
Volume of Earth and atmosphere		$(4/3).\pi.a^2.b$	7.72569837 x 10^{21}	($cubits^3$)

In this list of values, rather than show the circumference of the atmosphere as was previously the case, the volume of the atmosphere and the Earth has been shown in cubic cubits. The reason for this due to an ingenious system which has been used by the architects.

The system has been designed so that the volume of the Earth and the atmosphere is numerically identical to the density of the Earth and its atmosphere, the only difference between the two being the exponent. The result of this design means that once you have correctly identified the size of the ellipsoid that is in use, the mass of the planet and atmosphere can be calculated from it, as follows :

Volume of Earth up to Stratopause	$7.72569837 \times 10^{21}$	(cubits^3)
Density of Earth up to Stratopause	7.72569837×10^{2}	(pkg/cubits^3)
Mass of the Earth and Atmosphere	$5.96864153 \times 10^{24}$	(pkg)

The unit of mass 'pkg' is the perfect kilogram, and if this unit is defined in the same manner that we have defined the kilogram, namely that one *pkg* is the mass of water (at 4 degrees Celsius) that fits inside a perfect meter, then the mass of the earth in *pkg* can be converted to the mass of the Earth in kilograms by multiplying by the cube of the perfect meter to meter conversion ratio. The perfect meter was defined in the previous paper[2] as 1.000196573 m and therefore the cubic perfect meter must be defined as this value cubed, or 1.00058983519 m^3 giving

Mass of the Earth and Atmosphere	$5.972162044 \times 10^{24}$	(kg)

The modern value of the mass of the Earth and atmosphere is 5.9722×10^{24} kg, and is known to a relatively low level of precision.

Because the mass converts correctly the conjecture regarding the definition of the perfect kilogram can be seen to be correct, but the architects have left nothing to chance and have specified their unit of mass explicitly within the architecture of the chamber.

The upper chamber coffin

The coffin in the upper chamber has already been encountered during the decoding of the north wall binary digits, and a photograph of this object taken by Professor Smyth[10] is shown in illustration H17.

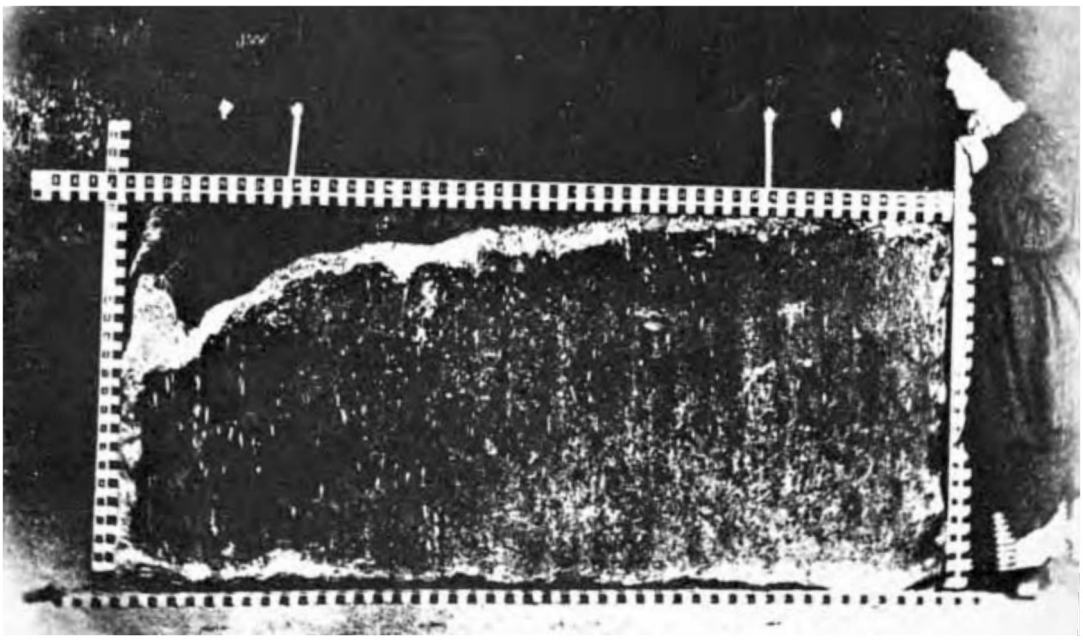

Diagram H17 - Smyth's photograph of the coffin in the upper chamber

This image shows two important parts of the original design of the coffin. The first is that the left end of the coffin is raised off the floor due to the fact that there was a 1.5 inch flint pebble underneath it at the time the photograph was taken, which has since been removed. When this photograph was published in Smyth's book it was rotated so that the measurement frame around the top and sides of the coffin was square to the page, making the floor measurement pole angled to the horizontal. The second feature is that the front left corner of the coffin appears to be severely damaged, although this is not the case and the coffin as pictured is in exactly the state it was built in.

The reason for the cut away corner is that the coffin is a functional piece of equipment that is designed to have water placed inside it, which will then overflow out of the coffin at the lowest part of the front left corner (on the photograph). What is important is the mass of the volume of water that can be fitted into the object, and this can be calculated to a decent degree of accuracy from knowing the coffin's dimensions. Diagram H18 shows the relevant surveyed data of the coffin.

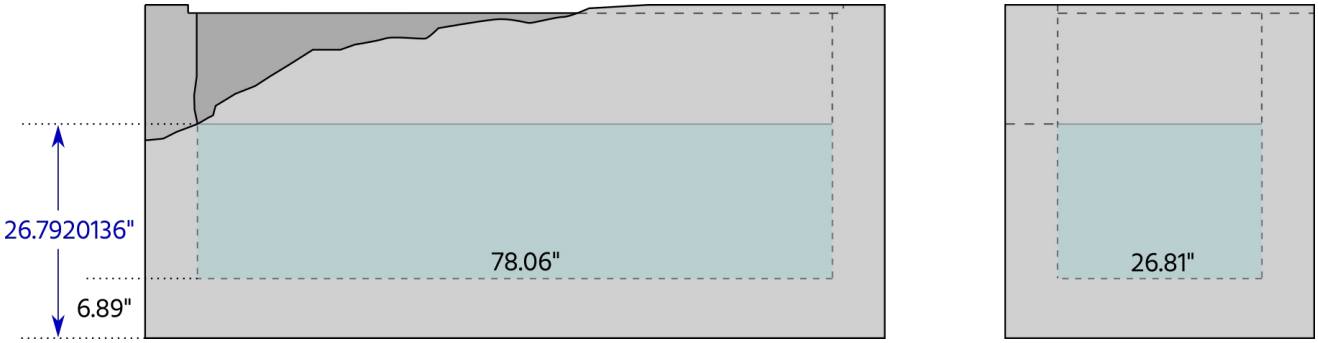

Diagram H18 - The coffin dimensions

The measurements in black show Petrie's surveyed values[11] of the internal dimensions, taken to 1/100th inch, and the measurement in blue shows the level of the water outlet, the value of which has been reverse engineered, but which can be checked against a graphically enhanced version of Smyth's photograph as shown in diagram H19 which has been rotated so that the top of the coffin is horizontal.

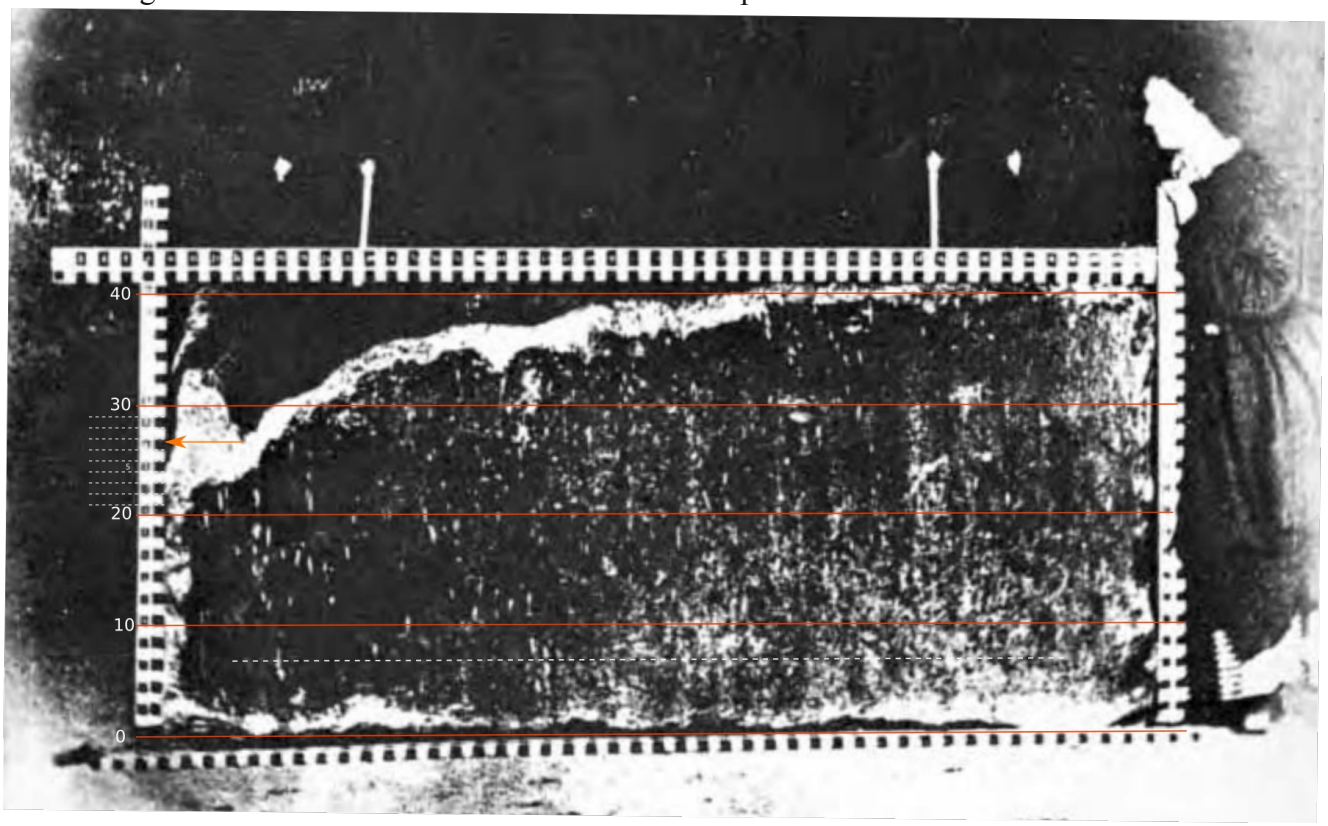

Diagram H19 - The height of the water spout outlet of the coffin on Smyth's grid

The orange arrow on the left side of the image shows the height of the water outlet as 26.8 inches from the base of the coffin. From the work in the previous paper, the conversion ratio of the inch to the perfect meter can be worked out as being 39.37781784. The volume and mass of water that can be placed into the coffin, which will level off at the height of the removed corner, is therefore

Inner volume =	78.06 x 26.81 x 19.9020136	= 41650.70722	(inches^3)
		= 0.68213046	(pM^3)
		= 682.13046	(pkg)

If you take the architect's mass of the Earth from the previous section in this paper and divide it by the scale of the Earth model 87500 x 10^20 the calculation is as follows

Mass of Earth	$5.96864153 \times 10^{24}$	(pkg)
/	87500×10^{17}	
=	682.13046	(pkg)

The purpose of the coffin is that it can be, and still needs to be, filled with water to determine the mass unit that the architect's used, and of course for this experiment to be carried out the underside base of the coffin would need to be placed on a perfectly horizontal level. Which is why there was a pebble under one end of the coffin, to show that the first operation that needs performing is the leveling of the coffin.

It is a testament to the building's designers that during the extensive number of hours of measurements that have been taken of this object, not a single person has ever measured the height of the broken corner.

Level 2 revisited

There is one point which needs to be resolved regarding the mass of the Earth calculation from the ellipsoid dimensions, and that is that the architect's model defines the atmosphere up to the Stratopause which is known from modern data[12] to contain 99.9% of the total mass of the Earth and atmosphere, with the rest of the mass being contained above the Stratopause. So the value for the Earth mass that was calculated from the architecture is ambiguous, as although it appears to be correct, it could be missing 0.01%. This ambiguity is resolved within the architecture.

The mass of the moon as a proportion of the mass of the Earth is currently known with a high level of accuracy[13] and is one part in 81.3005678 ± 0.0000027 or expressed as a decimal 0.012300037. The decimal value extracted from the binary data on level 2 of the south wall's stonework was 1698 which is being expressed as a reciprocal value when used in the south wall calculation, a value of 0.000588928. If this value is taken as being the mass of the Earth less the mass of the moon then it is possible to calculate the mass of the Earth from it using our modern day value of the two bodies' relative masses:

$$81.3005678 \times (5.88928 / 80.3005678) = 5.9626204 \text{ (pkg)}$$

If this value of the Earth's mass in *pkg* is compared to the *pkg* value calculated from the ellipsoid dimensions, 5.96864153, the values are clearly not the same. However, if the value from level 2 is considered to be the mass of the Earth and atmosphere only up to the Stratopause, and is therefore shown on the wall as 99.9% of the total mass, and it is subsequently multiplied by 1000/999 , then the level 2 value comes out at 5.96859 which is very close indeed to the mass value from the ellipsoid. This level 2 calculation is specifically designed to be a rough calculation by the architects to show that the value of the Earth's mass obtained from the ellipsoid is precise and is the mass of the Earth and *all* of the atmosphere, and the value obtained from the level 2 wall stones is approximate, but can be used to check this fact.

There is however a small problem, and one that has been seen before, and that is in order to perform this check the relative mass of the moon to the Earth is required, and the value that is being used is from modern data which is again contaminating the calculation. When this problem was encountered earlier it was solved by discovering the angular velocity of the Earth expressed in decimal format on the roof and floor of the main chamber, therefore the proportional mass of the moon relative to the Earth, a value of 0.012300037 must be included somewhere in the architecture.

Because all of the walls, floor, roof and coffin of the main chamber have already been solved and their data extracted, the only place for this number to be is within the roof chambers. If you refer back to diagram H13 and look at the the floor tiles of the main chamber which are shown with the missing stones at the top of the diagram it can be seen that a similar method of encoding numbers could be used in the roof chambers, all of which have cross beams of differing heights.

The analysis of the roof chambers in the earlier paper[14] showed that the roof chambers north elevation needed to be reconstructed starting at the fourth roof chamber, and so the method of recording the Earth-moon mass ratio data and the likely location of that data are predetermined.

The following diagram, H20, is taken from the work of Maragioglio and Rinaldi[15] and shows the profile of the beams on the south wall of the fourth roof chamber, with the drawing mirrored about the vertical axis so that the stones are being viewed from the south. Superimposed upon the drawing are an aligned series of decimal numbers which make up the decoding grid.

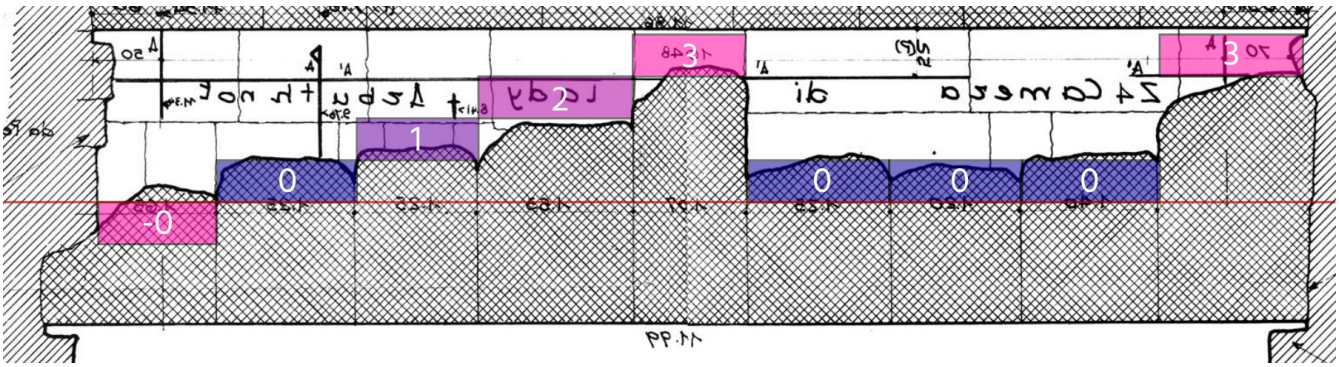

Diagram H20 - The earth-moon mass ratio in the fourth roof chamber

The moon's mass as a proportion of the Earth's mass is clearly encoded into the stone heights, and an encryption system has been used whereby the zeros are read from the top of their corresponding grid entries and the other numbers are read from the bottom of their grid entries, ensuring that the data can be read if you know what you are looking for, and cannot if you don't. The first stone on the left starts below the zero line, it represents the integer portion of the number, and shows that the number being expressed is negative.

The south wall summary

The data required to understand the south wall is now complete, and the final piece that was extracted from the fourth roof chamber is the checksum value that needs to be subtracted from the calculation for it to balance.

In the south wall calculation the level 1 number is shifted one decimal place to the right, the level 2 value by two decimal places to the right and so forth. Continuing this system, if the roof chambers section of the upper chamber are considered to all be on level 5 of the system then the moon-earth mass ratio just obtained will need to be shifted 5 decimal places to the right when it is inserted into the calculation.

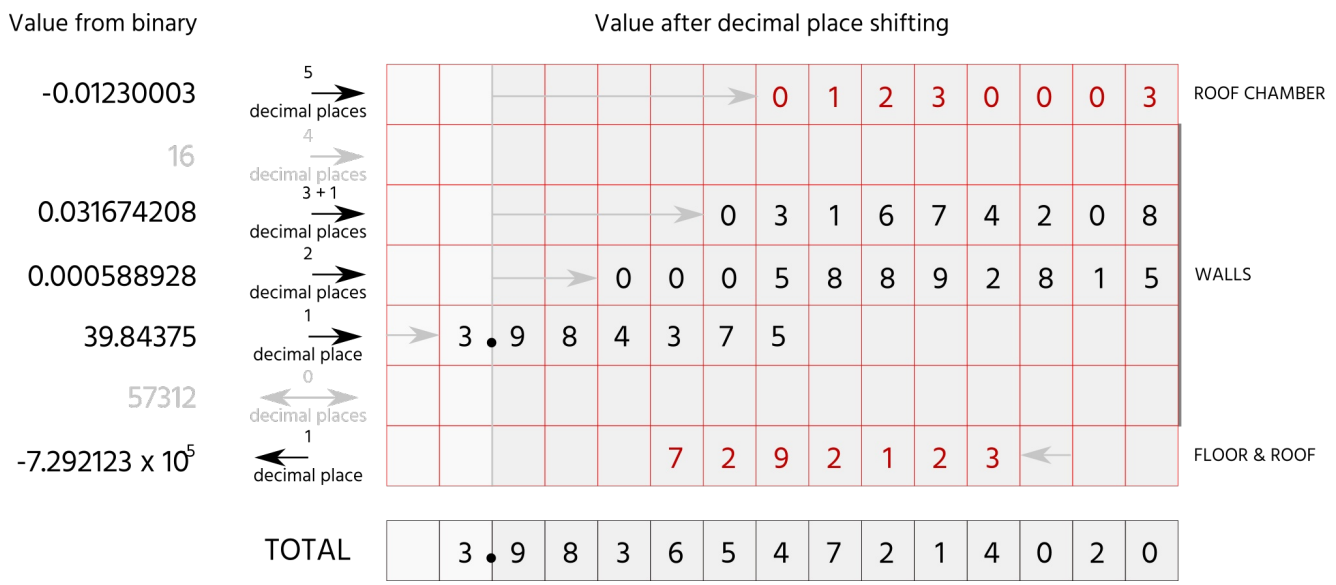

Diagram H21 - The decimal values of the south and east walls

The full calculation list for the south wall is shown in diagram H21 and for completeness includes the level 0 and level 4 wall levels which are not part of the calculation total. The values in red on the diagram are negative values, and those in black are positive and the grid of rectangles in which the numbers are placed is the same sized grid that was defined by the architects for the binary data extraction.

The sum total of the wall, roof and floor's numerical data gives the value of the geocentric gravitational constant in pM^3/s^2, which when converted into a metric value is 3.98600442116064 m^3/s^2 and actually adds 6 more decimal places of precision when compared to our modern day value of 3.986004418 ± 0.000000008 m^3/s. The decimal place precision of the calculation is explicit in the design and the geocentric gravitational constant is shown to 14 significant digits by the architects.

What is of great consequence is that the mass of the Earth has also been given explicitly by the architects using the ellipsoid data, and therefore the value of GM can be split into its component parts and the universal gravitational constant can be quantified to the same precision

Universal gravitational constant $6.6743072181684 \times 10^{-11}\ m^3 / kg.s^2$

The unit of time

There is only one incomplete part to this work and that is that the unit of time, the second, is being assumed to be the same in the architects design and in the numerical calculations above. Even though it is quite clear that this is the case, there must be a method within the architecture to prove this, because every other scientific detail is present in the architecture except this one.

The Great Pyramid demonstrably contains a perfect 1:87500 scale model of the Earth, and therefore the second pyramid of Giza must be in orbit around this model. As a conjecture, if we state that the second pyramid of Giza represents a satellite in orbit around the Earth model, and that the period of revolution of that satellite is 87500 seconds, then the distance between the centers of the two pyramids can be calculated from the the model scale and the physics equation for orbiting bodies

$$G.M=d.v^2$$

and then the calculated distance compared to the surveyed distance to prove the conjecture to be either true or false.

The physics equation resolves so that the distance between the center of the Earth and the satellite is given by the cube root of $G.M.t^2/4\pi^2$ where t is the orbital period in seconds, giving the distance as 42,598,867 m and therefore when scaled down by a ratio of 1:87500, 486.44 m or 19167.09 inches.

Petrie surveyed the distance between the two pyramids as being 19168.4 inches ± 2 inches, the error margin being due to the difficulty in locating the center points of the two pyramids and not from the triangulation.

The conjecture can be seen to be correct, and the unit of time being used by the architects can be seen to be the same unit of time that we are using.

The Great Pyramid's reference ellipsoid data

The following table shows the Great Pyramid of Giza's architect's reference ellipsoid and its associated data, named to correctly reflect the scientifically determined date of construction of 2735 BCE but also allowing for the exact year to be determined at a later date, alongside the modern WGS84 data.

	WGS84[16]	**GP-27X**		
Reciprocal polar flattening	298.257224	298.257566		(m)
Equatorial radius	6378137.00	6378136.99		(m)
Polar radius	6356752.31	6356752.33		(m)
Geocentric gravitational constant	3.986004418	3.98600442116064	$x10^{14}$	(m^3 / s^2)
Angular velocity	7.292115	7.292123	$x10^{-5}$	(rad / s)
Mass of Earth and atmosphere	5.9722	5.97216203999447	$x10^{24}$	(kg)
Universal gravitational constant	6.67430	6.67430721816839	$x10^{-11}$	(m^3 / kg.s^2)

Q.E.D.

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