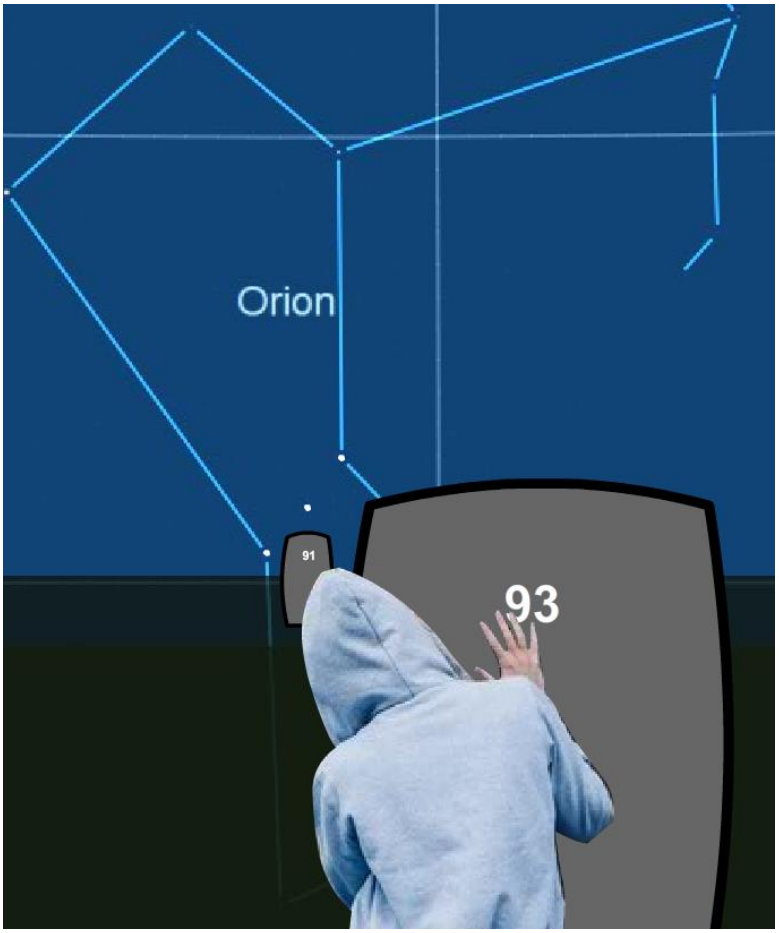


The Great Pyramid of Stonehenge

THE ROLE OF CIRCLE, SQUARE AND SILVER RATIO IN LARGE SCALE MEGALITHIC DESIGN, ORIENTATION AND ASTRONOMICAL OBSERVATION

Carl Balowski | November, 2024

Abstract

This paper proposes the Approximated Circle-Square Template (ACST) as a novel interpretive framework for understanding the alignment and design principles of ancient monuments like the Great Pyramid of Giza and Stonehenge. Anchored in the Silver Ratio and its intriguing 2.613 diagonal, the ACST offers a perspective through which we might explore how these ancient sites could have expressed an intended unity between terrestrial architecture and celestial phenomena. By applying this geometric approach, we propose that early designers may have crafted these monumental structures not only with structural precision but also with a possible intent to encode cosmic relationships within their architectural dimensions.

In examining the Station Stone Rectangle at Stonehenge and the Great Pyramid, we consider how the Silver Ratio might have influenced the designs of both sites, particularly through its distinctive 2.613 diagonal. This value aligns closely with the angular distances of solstice sunrises from key observational points, suggesting an intentional link to the cycles of the sun. This alignment may imply that these ancient structures served as reflections of a broader cosmological order, aiming to harmonize human construction with celestial cycles. From this viewpoint, the ACST emerges as a potential interpretive "key" that could unlock a deeper understanding of the mathematical and symbolic intentions behind these ancient architectural forms.

The ACST framework further allows us to revisit cultural artifacts like the Bush Barrow lozenges, which were discovered near Stonehenge and bear encoded angles that align remarkably with solstitial arcs and directional markers. The lozenges' precise angular relationships, including one close to the 79.9° solstice arc and another to the azimuth pointing toward Heliopolis and the constellation Orion, may suggest that ancient builders and priestly figures embedded these relationships not only in large structures but also in objects of ritual significance. These connections hint at the possibility of shared geometrical and astronomical knowledge that may have influenced the design of both Stonehenge and the Great Pyramid, perhaps stemming from common symbolic practices that sought to link earthly sites to celestial cycles.

By introducing the ACST, we consider that the Silver Ratio's 2.613 diagonal may have held both metrological and symbolic meaning, serving as a guiding measurement that harmonized geometry with solstitial alignments. This ratio could reflect the careful observation of natural cycles and provide a conceptual bridge between the physical and symbolic, grounding celestial events within the architecture itself. Such an alignment offers a fascinating perspective on how geometry might have been used by ancient builders to position monuments within a cosmic framework.

In conclusion, the ACST presents a thought-provoking hypothesis that invites further exploration of the geometric relationships underlying ancient monuments. It provides a way to revisit these structures not just as isolated feats of engineering but as expressions of a possible shared tradition of aligning human constructions with celestial order. While speculative, this hypothesis encourages us to consider the enduring influence of geometric principles as a symbolic language that might connect humanity with the heavens, reflecting a cross-cultural reverence for cosmic cycles embedded within the architecture of antiquity.

Introduction

The purpose of this paper is to explore the profound connections between ancient architectural design, astronomical alignments, and geometric principles that were employed by ancient civilizations like the Egyptians and Neolithic builders at Stonehenge. Specifically, we delve into the role of the silver ratio, and its relationship to the circle and square, as a foundational element that links the design of the Great Pyramid of Giza and the Station Stone Rectangle at Stonehenge. For convenience and standard of speech, all measures will be cited as meters and decimal degrees, and/or be converted to Royal Cubits accordingly. The Royal Cubit in this paper is understood to be equivalent to 0.523606 meters, based primarily on the 2015 survey data of Glen Dash as detailed in my previous papers.

This exploration will illustrate how ancient builders used geometry, particularly the silver ratio, to create alignments that resonated with their understanding of cosmic order, aligning earthly structures with celestial events like the winter solstice. Furthermore, we suggest that it may have been the same people or a shared tradition of knowledge that influenced both the Great Pyramid and the early phase of Stonehenge, particularly the Station Stone Rectangle with Heel Stone (SSRH). It is important to note that this does not imply the same people were responsible for the later stages of Stonehenge's construction, which evolved significantly over time.

The Silver Ratio's Geometric Presence

The Silver Ratio is intrinsically woven into the relationship between a circle and a square. This can be visualized by imagining a circle inscribed within a square, followed by a square inscribed within that circle, continuing this process indefinitely. In Figure 1, we see two squares inscribed within two circles, forming a pattern that either diminishes or expands, depending on perspective. Each square has four corners marked by red points, while each circle has four green points where it intersects the square, naturally dividing the circle's circumference into quarters. These points emerge from the ongoing geometric process of alternately inscribing circles within squares and squares within circles, illustrating, as will be shown, the Silver Ratio's organic presence.

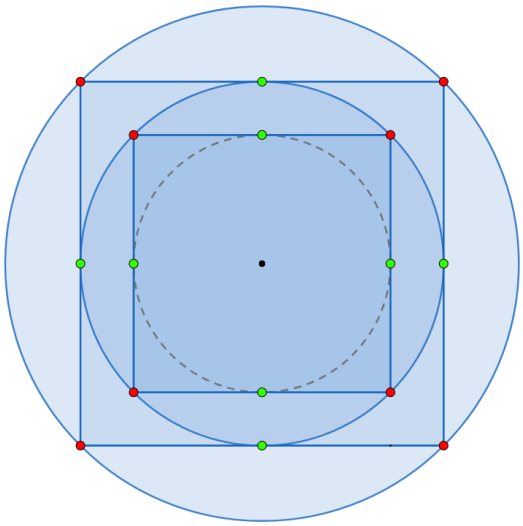


Figure 1

Understanding the Silver Ratio and Its Expressions

How does this work? First, it's essential to understand that the Silver Ratio compares the side of a square to the sum of its side and diagonal, or inversely, the diagonal minus the side compared to the side. This ratio can be expressed in various ways. One elegant approach is to use the square's diagonal as the radius of a circle, then compare the circle's segmented diameter to the square, as shown in Figure 2. Starting with a square of side AB, the diagonal AC becomes the radius of a circle with diameter DE. When we compare line DB to line AB, it forms the ratio (√2 + 1) : 1, the Silver Ratio. Similarly, comparing line AB to line BE yields the inverse ratio, 1 : (√2 - 1), also the Silver Ratio, as both expressions equal 2.414 : 1.

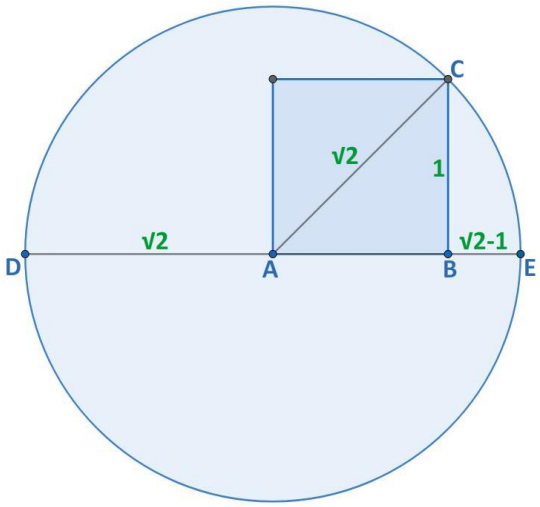


Figure 2

Applications of the Silver Ratio in Circle-Square Geometry

If we create rectangles from these silver ratios, we obtain two Silver Ratio rectangles, with the larger rectangle (in red) being $(\sqrt{2} + 1)^2$ times the size of the smaller rectangle (in green), as shown in Figure 3. Notably, the arc across CE, symbolic of the diagonal of the green rectangle, spans exactly one-eighth of the circle's circumference. This arc will become important as we continue in this study.

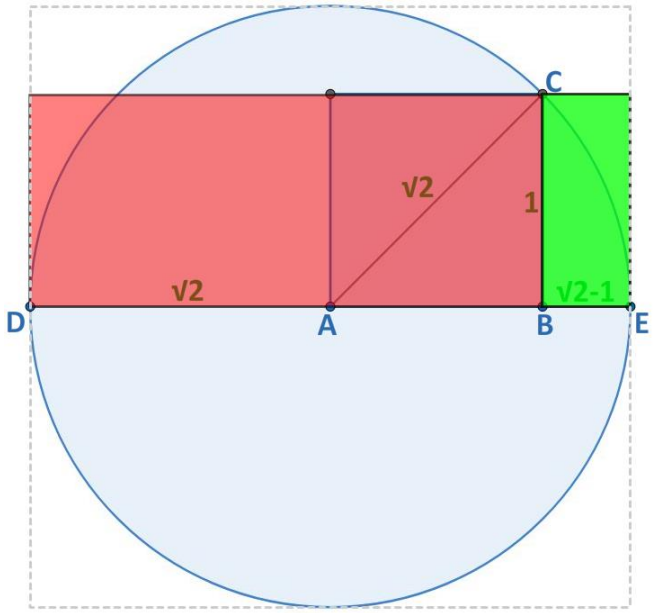


Figure 3

By completing the diagram with additional green rectangles, we reveal an octagonal segmentation of the circle's circumference and define both the outer square (in red) and inner square (in blue), with the circle (in black) nestled between them, as shown in Figure 4. This foundational process of "circling the square" or "squaring the circle" can continue indefinitely, embodying a profound geometric and metrological concept in which the area of each square or circle doubles (or halves) with each iteration, while the circle's arc almost ineffably passes through each Silver Ratio rectangle, one by one.

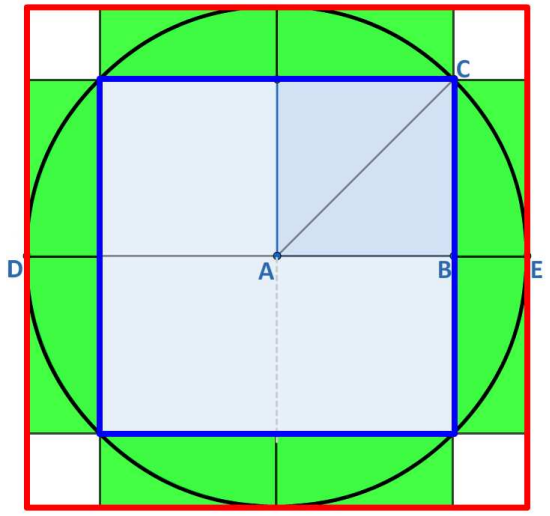


Figure 4

Returning to the concept of an indefinite series of inscribed circles and squares, we can see in Figure 5 (left) that the green line represents both the radius of the smaller circle and half the side of the larger square. Meanwhile, the red line represents both the radius of the larger circle and half the diagonal of the larger square. Assigning the values from above to these lines and observing their segmentation by the intersecting points reveals, as before, the Silver Ratio: (√2 + 1) : 1. This insight leads us to conclude that the relationship between this infinite series of circles and squares is inherently governed by a sequence of alternating Silver Ratio rectangles, each one scaled by √2, larger or smaller, depending on whether the progression is expanding or contracting, as shown in Figure 5 (right).

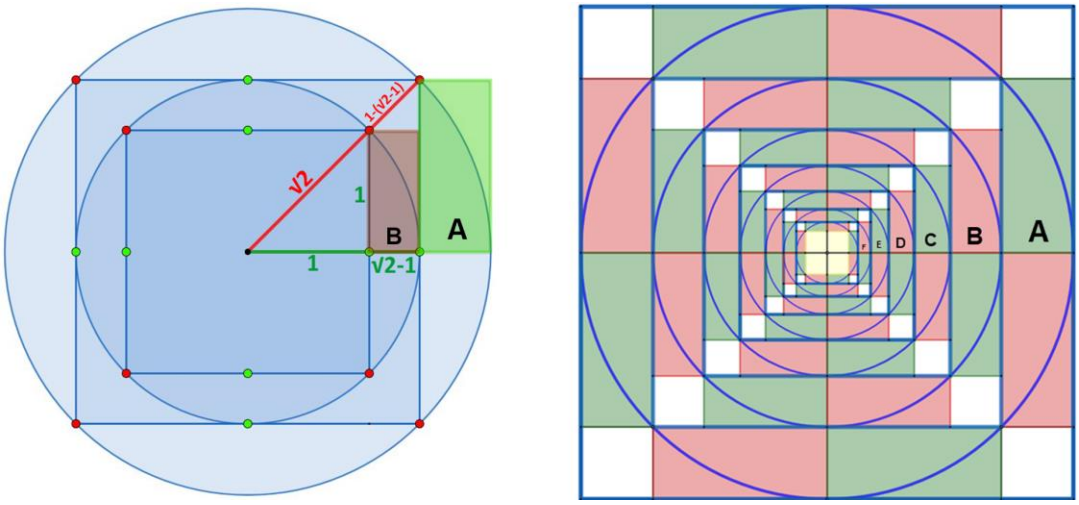


Figure 5

If the smaller, inner square has a side length of 1, then its perimeter is 4 and its area is 1, since $1^2 = 1$. The side of the larger square corresponds to the diagonal of the smaller square, which is √2. Therefore, the larger square's perimeter is 4√2, or approximately 5.6568, and its area is $\sqrt{2}^2$, which is 2.

Now, consider the circle. Since the radius of the smaller circle is equivalent to half the diagonal of the smaller square, its diameter equals the full diagonal of the smaller square, or √2. The circumference of the smaller circle is π√2, or approximately 4.44288, and its area is about 1.57079. This allows us to compare the areas and linear perimeters of the smaller and larger squares with the area and linear circumference of the nested circle, Table 1.

Table 1

Shape	Perimeter	Area
Small Square	4	1
Nested Circle	4.44288	1.57079
Large Square	5.6568	2

For the linear measurements, comparing the perimeters and circumference as ratios, we have:

4 : 4.44288 : 5.6568

For the areas, comparing the squares and circle as ratios, we have:

1 : 1.57079 : 2

To further explore the circle's relationship with each square:

1. Small Square: The small square's perimeter is 4, so the ratio of the circle's circumference to the small square's perimeter is 4.44288 : 4, which simplifies to approximately 1.11072 : 1.

2. Large Square: The large square's perimeter is 5.6568, so the ratio of the large square's perimeter to the circle's circumference is 5.6568 : 4.44288, which simplifies to approximately 1.2732 : 1.

These metrological ratios, 1.11072 : 1 for the inner square to the circle and 1.2732 : 1 for the outer square to the circle, reflect the 'measured' relationship between the squares and the circle. This entire framework, built upon the Silver Ratio, illustrates the innate proportional harmony between these primitive nested shapes.

Geometric Insights: The Circle and Square Connection

Now, that above observation is immensely interesting and provides valuable insight into the relationship between the circle and square, especially given the unique significance of the square's diagonal and the circle's diameter being the same line. This shared measurement bridges the circle and square, reinforcing their geometric connection. But ultimately, what practical value does this have beyond a theoretical framework? In other words, since we're dealing with the interplay between the irrational values of π and √2 and their manifestation in the Silver Ratio, how could ancient people, who clearly valued these relationships, have actually constructed anything based on them? The only feasible approach is that they must have developed whole-number fractional approximations of these metrological ratios. Such approximations would offer a precise representation of the irrationals without being so exact as to hinder practical use in calculations or everyday applications, such as creating a measuring rod.

Therefore, as detailed in my previous studies, it's likely that, recognizing the shared diagonal/diameter line, they used two specific values to approximate π and √2 with a common factor representing this diagonal/diameter. This approach would render the circle/square template ratios of 1.11072 : 1 and 1.2732 : 1 more "rational" to work with while maintaining adequate precision. After all, since both π and √2 are irrational, even today we rely on approximations to use them practically.

Approximating the Silver Ratio: Practical Applications in Ancient Metrology

Without delving deeply into previous discussions, and noting that later Egyptian Royal Cubits were divided into 28 digits, it seems likely that the number 140 (or 28 x 5) may have served as a practical reference for the diagonal/diameter in the circle/square template. This approach would allow for approximate values of π as 440/140 (or 22/7 x 20) and √2 as 140/99, creating a proportion of 440 : 140 : 99. In this framework, let suppose that if a circle had a circumference of 440 Royal Cubits (RC), the inscribed square would have a side length of 99 (RC) and a perimeter of 396 (RC), with both the circle's diameter and the square's diagonal measuring 140 RC. The next square in the sequence would have 140 RC as its side, 560 RC as its perimeter and then 198 RC as its diagonal, while the circumference of the circle would be 622.222 RC, but in Egyptian measure, this would equate to precisely 880 Remen, one-quarter of which is 220 Remen.

Using this methodology, we can approximate the actual irrational ratios of 1.2732 : 1 and 1.11072 : 1, identified above as inherent in the circle-square relationship, with the values 140 : 110 and 110 : 99, or 1.2727 : 1 and 1.1111 : 1, respectively. These approximations bring each value to within 99.96% of the true irrational values, sacrificing only 0.04% accuracy for complete practicality. And, given that the irrational nature of these values

was likely already understood, any approximation would ultimately be seen as just that—an approximation. What use was there in trying to reach something infinitely unreachable when a pragmatic solution was at hand?

Sacred Approximations and Architectural Flexibility

If this "sacred" approximation of the circle/square template was indeed employed, designers could have hypothetically chosen any scale within this endless series of nested circles and squares (Figure 6). With segments already divided by the Silver Ratio into eighths, quarters, halves, and so on, it's conceivable that they could simply select any scaled segment needed for various architectural elements—a room, wall, coffer, roof, arch, or statue. Such flexibility would have made the template highly adaptable and practical across a wide range of design needs, without compromising its 'sacredness'. This approach might even explain the Egyptians' initial adoption of the Remen and the Royal Cubit as primary linear measures, with the Royal Cubit being precisely √2 longer than the Remen.

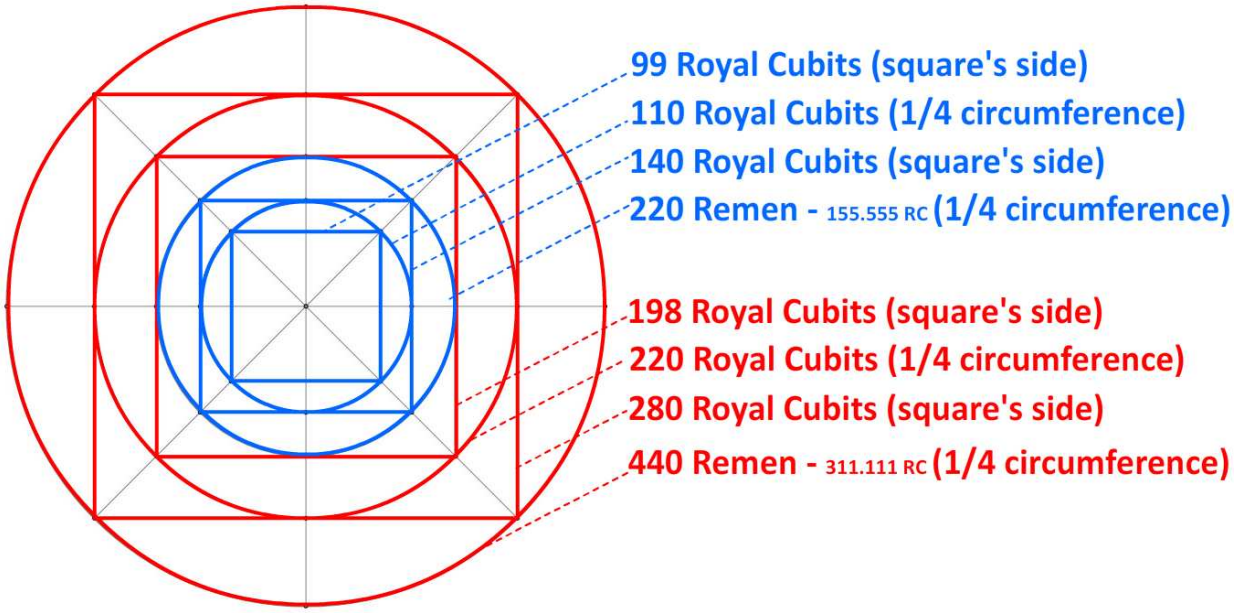


Figure 6

Cosmic Alignment and the Silver Ratio

With this simple circle/square premise in mind, I suspect that the Ancient Egyptians not only designed the Great Pyramid, both inside and out, but also positioned it with precision relative to Heliopolis, the Winter Solstice sunrise, Stonehenge, and even the Equator. While this may seem like a monumental claim, I believe it is not unreasonable, as I intend to demonstrate in the remainder of this paper. The exact methods by which they

achieved such precise construction or alignment, however, lie beyond the current scope of my investigation and remain open for further study.

The Silver Ratio, the Circle-Square and 2.613

Before moving on, it's essential to take one key insight from this section on the Silver Ratio: this ratio, which divides the circumference of the circle into eight segments, is inherent in the circle-square relationship. As a rectangle, the Silver Ratio establishes a relationship where the short side, long side, and diagonal are in proportion 1 : 2.414 : 2.613 (Figure 7). Additionally, the arc spanning its diagonal—a symbolic representation of the diagonal—equals one-eighth of the circle's circumference, and all these measures can be observed via the Approximated Circle/Square Template, which I affectionately now call the ACST.

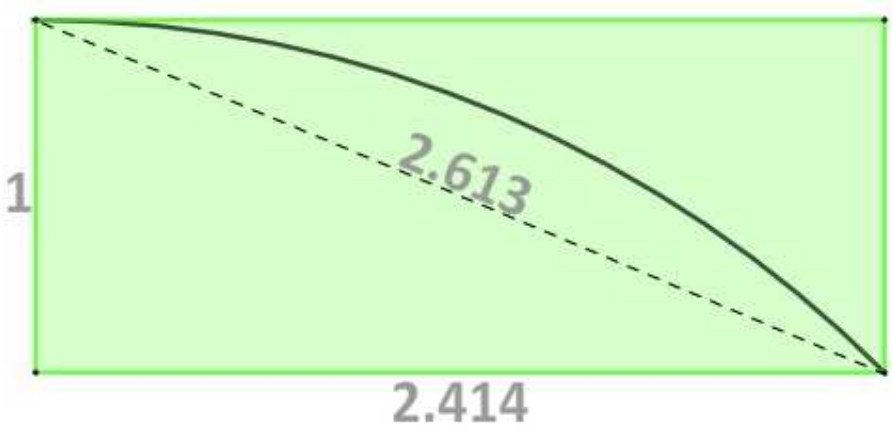


Figure 7

The Ancient Circle-Square Template (ACST) in Pyramid Design

As demonstrated in my 'Cosmology Part 2' paper, the Ancient Circle-Square Template (ACST) aligns perfectly with the construction of the Great Pyramid's exterior. Regarding the interior, though my investigations are still rather early, we already see a clear alignment—not only with the placement of the King's Chamber relative to the pyramid's height, which divides it according to the Silver Ratio, but also with several dimensions within the King's Chamber complex itself. Here, I provide a self-explanatory diagram of the North and East views of the Great Pyramid, illustrating the height of the King's Chamber and its relation to the pyramid's exterior through approximations of π and the Silver Ratio (Figure 8). Next, we'll discuss the astronomical implications of the pyramid's precise positioning relative to Heliopolis and the Winter Solstice sunrise and the Silver Ratio.

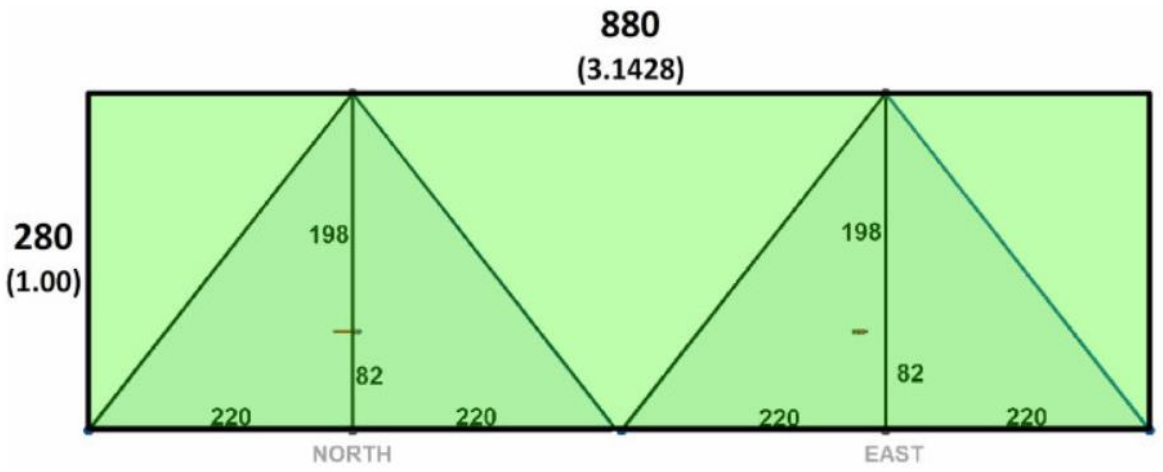


Figure 8

Understanding Solar Azimuths and Celestial Alignments

The azimuth of a sunrise represents the angular distance measured in degrees from True North to the point on the horizon where the sun first appears. This measurement varies depending on the observer's latitude and the time of year, influenced by Earth's axial tilt and orbital position. For the observer, the horizon creates a complete circle around them, so that his line of sight to the horizon is the radius of a large circle. For example, during the equinoxes, the sun rises exactly in the east (90° azimuth) at most locations, creating an angular distance of 90° between true north and the equinox sunrise (Figure 9). Understanding sunrise azimuth and angular distances is crucial for accurately locating celestial events, including the heliacal risings of stars and planets, enhancing navigation, astronomical observations, and cultural practices related to the sun's, planet's, and star's movements. The below figure is an approximate example of a sunrise happening at an observer's azimuth of 118°.

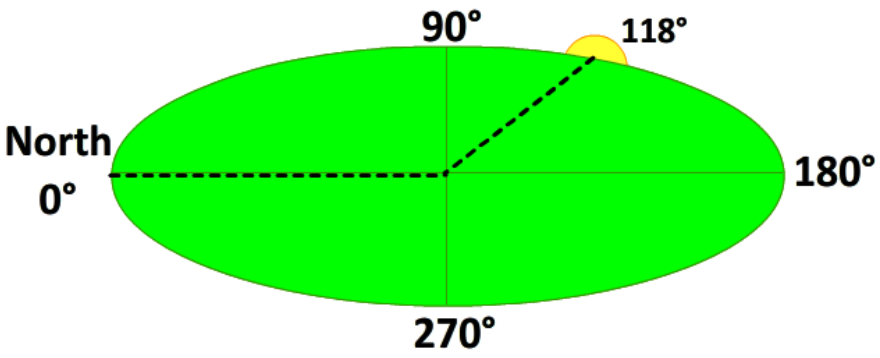


Figure 9

For the ancient Egyptians, observing the winter solstice sunrise was far more than an astronomical event; it symbolized cosmic order and divine renewal, reinforcing the pharaoh's link to the sun god Ra and his sustaining power. This moment, entwined with themes of death, rebirth, and the eternal cycle of time, held great significance in Egyptian cosmology, as Atum-Ra embodied both creator and sun god. The winter solstice sunrise, marking a time of renewal, was integrated into their architecture with precise alignments to harmonize earthly structures with the heavens. Monuments like the Great Pyramid of Giza, accurately aligned to the four cardinal points and ostensibly creating quadrants to observe the circular horizon, embodied this belief. Structures like the Great Pyramid served as metaphysical statements, crafted to secure the pharaoh's passage to the afterlife and to sustain ongoing cosmic renewal—not only linking the square-like terrestrial realm with the circular celestial domain but also standing as enduring material testaments to a seemingly astronomical permanence, inspiring future generations of archeoastronomers to observe it with the same awe as celestial events.

Modern Tools for Archeoastronomy

For enthusiasts of archeoastronomy, the complexity behind calculating solstice dates—factors like solar declination, Earth's elliptical orbit, precession, nutation, atmospheric refraction, and horizon adjustments—might seem overwhelming. Each of these variables plays a role in accurately predicting the Sun's position, but fortunately, modern astronomy software like Stellarium and Starry Night handle all of this behind the scenes. Programs like these incorporate detailed astronomical algorithms and historical ephemerides, accurately modeling the Sun's path across centuries and at any latitude, elevation, or time of year. This means that users don't need to know or manually calculate solar positions, solstices, atmospheric refraction effects, or adjustments for horizon elevation—all essential calculations are already baked into the program.

With these tools, enthusiasts can input any location and time to view accurate simulations of the sky, including sunrise, sunset, and solstice points. However, a bit of customization—such as adjusting the program's settings to match relative horizon elevations, like distant peaks—is often needed for extremely precise predictions. This fine-tuning allows users to enjoy a seamless experience focused on observing patterns, studying historical celestial events, or planning stargazing sessions, all while grounded in scientific accuracy.

Using Stellarium and assuming an absolutely flat horizon at sea level, if we were to observe the winter solstice sunrise at 2600 BC at the latitude and longitude of the base center of the Great Pyramid, the upper limb of the sun would appear to break the horizon at an azimuth of 117.4511°, as shown in Figure 10.



Figure 10

Limitations of a Flat Horizon in Stellarium Observations and the ECCP

However, there is slight issue. The base center of the Great Pyramid is not at sea level and does not look out onto an absolutely flat horizon, which is the default setting in Stellarium. According to Makroum and Boisee's study of the Giza Plateau and Abu Rawash, the original rocky hillocks upon which Khufu, Djedefre, and Khafre's pyramids were built served as substrata, with the Great Pyramid of Khufu likely having a rocky substrata (foundation) 75 meters above sea level. This seemed to be common practice, and suggests that the original Heliopolitan surveyors for the Great Pyramid conducted their survey from a natural hilltop on the Giza Plateau, approximately 75 meters above sea level, which served as their control point or point of origin for all observations. Thanks to Google Earth, we now know that from this elevated center control point (ECCP), they were able to observe both Heliopolis, precisely at an azimuth of 45°, and the winter solstice sunrise in the distance. The Great Pyramid was constructed in and around this substrata, utilizing the limestone resources

already in place, which ultimately made up approximately 23% of the total volume of the monument. This intentional choice ensured that the ECCP, located on the rocky hillock about 16 meters above the future pavement, became the vertical axis center and thus the designers 'point of origin' of the Great Pyramid—linking their precise surveying observations with the exact placement of the monument.

Therefore, knowing that Heliopolis is precisely at an azimuth of 45° from the center of the Great Pyramid, and that it was from this ECCP, 75 meters above sea level, that the Heliopolitan surveyors directed their line of sight toward Heliopolis, we must ask: at what azimuth was the Winter Solstice Sunrise observed from the ECCP by these surveyors? It is important to note that the surveyors could have chosen any distance from the temenos of Heliopolis to position the Great Pyramid, as long as it maintained a 45° azimuth. However, they deliberately chose the precise distance of 23,458 meters between the temenos and the ECCP, positioning the Great Pyramid at this exact point on the plateau for a specific reason, which will be demonstrated now.

Calculating the Adjusted Horizon from the ECCP

Using Google Earth and SRTM maps, along with a virtual survey of the azimuth at 117.45°—Stellarium's default Winter Solstice sunrise direction for the Great Pyramid around 2600 BC at a latitude of 29.979182°—we can examine the southeastern vicinity of the Great Pyramid over several miles. Our goal is to identify which distant hill most significantly "elevates" the horizon as seen from the ECCP. By adjusting this elevation for the observer's height and Earth's curvature, we calculate a "net" or "relative" horizon elevation as if viewed from the ECCP. This adjusted elevation is then added to the default 0° horizon setting in Stellarium to create a Relative Natural Horizon (RNH), simulating the view that a surveyor standing at the Great Pyramid's ECCP around 2600 BC would have had while observing the anticipated winter solstice sunrise.

Applying an Example Scenario for Elevation Calculations

Before considering the exact horizon data at the Great Pyramid, let's start with an example scenario to understand the methodology. Imagine a surveyor positioned 75 meters above sea level, like at the ECCP. Across the Nile to the southeast, the land gradually rises into foothills, eventually reaching a peak of 1000 meters above sea level at a distance of about 25 kilometers. Using this scenario, we can apply the relevant data and formulas to calculate the elevation angle.

Example Horizon Scenario Data

- Observer's elevation: 75 meters above sea level

- Distant hilltop elevation: 1000 meters above sea level

- Distance to hilltop: 25 kilometers

Step 1: Calculate the Drop Due to Earth's Curvature

The Earth's curvature causes a phenomenon known as "geometric drop," which can hide part of a distant object (like a mountain or building) from view. Calculating this drop allows us to adjust the apparent height of the hilltop. The formula for this drop is:

$\text{Drop} = d^2/2R$

Where:

- Distance d: Convert 25 kilometers to meters (25000 meters).

- Earth's Radius R: Use the average radius of 6371 kilometers, converted to meters (6371000 meters).

By plugging these values into our formula, we can calculate that the curvature of the earth causes a geometric drop in our example of 49.05 meters to the hilltop::

$\text{Drop} = 25000^2/(2 \times 6371000) = 49.0503 \text{ m}$

Step 2: Calculate the Elevation Angle

Now that we have the drop, we can find the relative elevation angle to the hilltop, which, considering how much of the hill would be visible above the horizon, if the horizon was at the same elevation as the observer, calculates an adjusted opposite angle (in degrees). Since this angle is relative to the observers' elevation, we can adjust our horizon in Stellarium, by 'raising' it according to this elevation angle:

$\Theta = \tan^{-1}(h_{\text{hilltop}} - h_{\text{observer}} - \text{Drop})/d$

Where:

- h hilltop is the height of the hilltop above sea level (1000 meters)

- h observer is the height of the observer above sea level (75 meters)

- Drop is the geometric drop due to the Earth's curvature (49.05 meters)

- d is the distance to the hilltop (25000 meters)

Θ=tan^(-1) (1000-75-49.05)/25000 = 2.006°

Example Scenario Results

In the above example scenario, where an observer is positioned 75 meters above sea level, at the ECCP, and views a hill that is 1000 meters high and 25 kilometers away, the apparent horizon experiences a net elevation increase of 2.006°. This calculation reveals that the hill blocks 2.006° of the sky, compared to if the horizon was completely flat, thus effectively 'raising' the horizon by this amount relative to the observer's elevation. Astronomers know that even the slightest 'raising' of the horizon (due to trees, hills, building, etc.) can be significant when considering astronomical observations of objects very low on the horizon, particularly heliacal risings and settings.

In this above example scenario, users of Stellarium or similar astronomical software should adjust their relative horizon settings by raising it by 2.006°. This adjustment is essential for ensuring that the software accurately mirrors the elevation impact of the distant hilltop, which is crucial for precise tracking of celestial events relative to the observer's location.

Applying the Methodology to the Great Pyramid Horizon

Consequently, let us examine the geological elevations in and around the Great Pyramid with 'real data' to determine the appropriate amount by which the horizon should be adjusted according to our methodology. This will allow us to align our virtual survey with the actual topographic conditions that would have influenced historical astronomical observations and large scale surveys.

Great Pyramid Horizon Scenario Actual Data

The survey site of the Great Pyramid's center, not merely situated on a flat plain, was strategically chosen on a rocky outcrop elevated 75 meters above sea level, which we call the ECCP, at a latitude of 29.979182° and longitude of 31.134267°. From this ECCP, the azimuth to the tenemos of Heliopolis is precisely 45°, and the approximate azimuth to the winter solstice sunrise is 117.45°. Recognizing that the horizon's elevation significantly affects the azimuth of heliacal risings, including solstice risings and settings, it becomes imperative to examine all potential hills within approximately 1° of the distant line-of-sight of 117.45° to accurately determine the winter solstice sunrise. By assessing the elevation and distance of each hill, via SRTM and Google

Earth, and factoring in the Earth's curvature, we can identify which hill most significantly alters the horizon and influences the observed azimuth of the winter solstice sun (Figure 11).

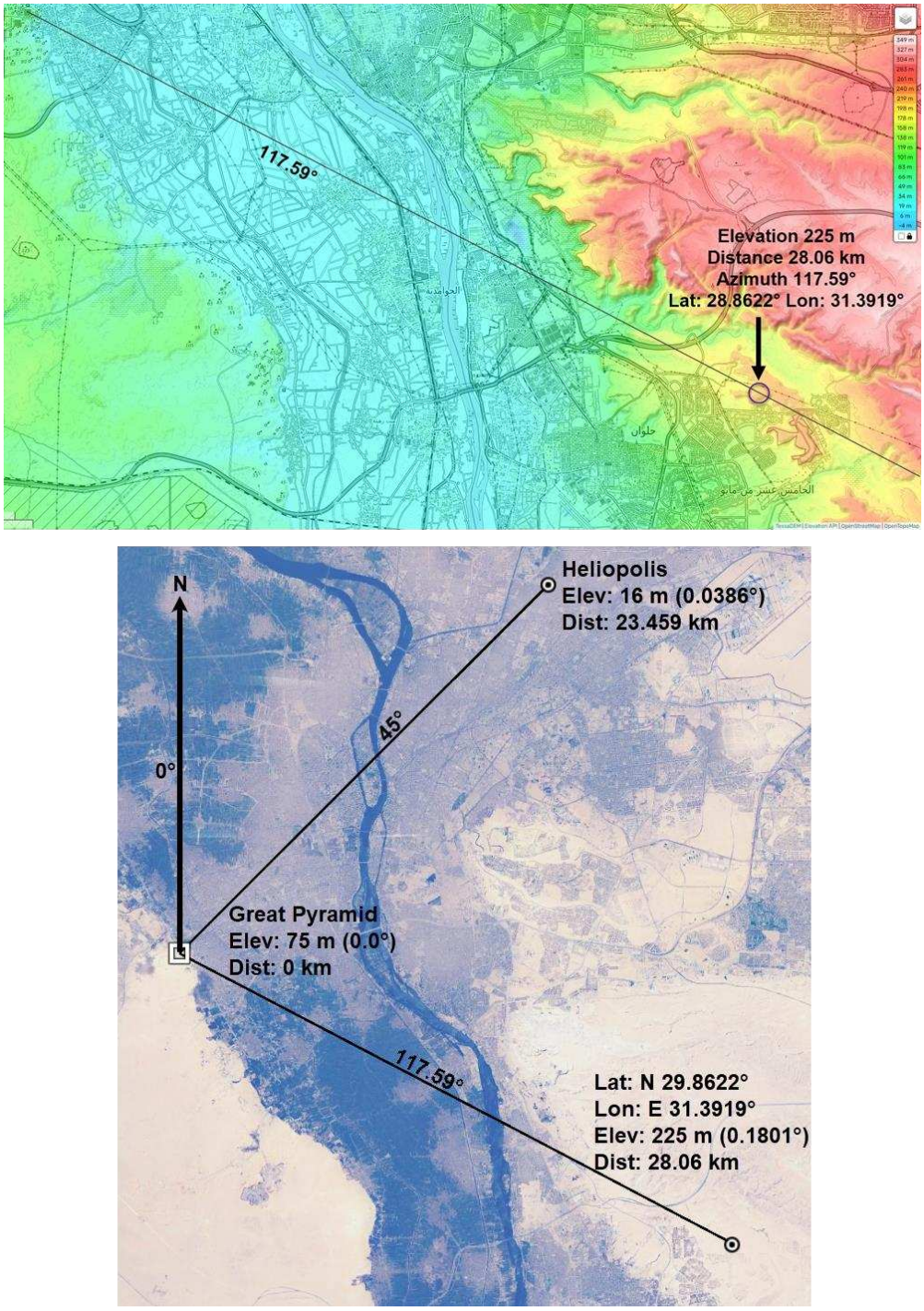


Figure 11

In this virtual survey conducted east of the Nile, where the terrain rises gradually, it became clear after several hours of mapping elevations that an area around Latitude N 29.862°, Longitude E 31.391°, with an elevation of 225 meters at a distance of 28.06 kilometers (17.43 miles), has the most significant impact on the horizon.

This specific section of the hill exerts the greatest influence on the relative natural horizon of an observer stationed at the ECCP of the Great Pyramid, looking towards the winter solstice sunrise. Therefore, we will use its data to calculate the actual relative horizon for observation from the base center of the Great Pyramid, circa 2600 BC.

Great Pyramid's Horizon Data

- Observer's elevation: 75 meters above sea level

- Distant hilltop elevation: 28060 meters above sea level

- Distance to hilltop: 28.06 kilometers

Step 1: Calculating the Geometric Drop

Where:

- d is the distance to the hilltop (28060 meters)

- R is the average radius of the Earth (6371000 meters)

By using these values, we can calculate that the curvature of the earth causes a geometric drop of 61.79 meters to the hilltop:

Drop= $28060^2/(2 \times 6371000)=61.79$ m

Step 2: Calculate the Elevation Angle

Now that we have the drop, we can compute the relative elevation angle to the hilltop:

Θ=tan^(-1) (h hilltop-h observer-Drop)/d

Where:

- h hilltop is the height of the hilltop above sea level (225 meters)

- h observer is the height of the observer above sea level (75 meters)

- Drop is the geometric drop due to the Earth's curvature (61.79 meters)

- d is the distance to the hilltop (28060 meters)

Θ=tan^(-1) (225-75-61.79)/28060=0.1801°

Great Pyramid's Horizon Results

This scenario, where a Heliopolitan observer ca 2600 BC is positioned 75 meters above sea level, on the ECCP of the soon to be built Great Pyramid, observing a hill 225 meters above sea level and 28.06 kilometers away, suggests that the horizon's relative elevation increases by 0.1801°. This minor yet crucial elevation increase, effectively raising the horizon by 0.1801° relative to the observer's level, necessitates manual adjustments in Stellarium. By increasing the relative horizon setting by 0.1801°, the software will more accurately reflect the topographical impact on celestial observations in that direction. This adjustment is key for precisely determining the azimuth of the winter solstice sunrise, as the slight elevation will delay the sun's appearance above the horizon, subtly increasing its azimuth.

By carefully assessing the winter solstice sunrise azimuth with a 0.1801° horizon adjustment in Stellarium, it becomes evident that the sun's upper limb shifts from 117.4511° (the default flat horizon setting) to 117.5905° due to the elevation effect of the distant hill—an increase of approximately 0.1394° southward, as shown in Figure 12. This adjusted azimuth of 117.5905°, as observed around 2600 BC from the Heliopolitan surveyors' ECCP, aligns precisely with the 2.613 diagonal of the Silver Ratio. I propose that this winter solstice alignment was central to the precise positioning and design of the Great Pyramid, as well as its broader connection to the layout of the earliest stones at Stonehenge, specifically the Station Stones and Heel Stone, which I will demonstrate following a brief review of the pyramid's orientation to Heliopolis and Stonehenge.

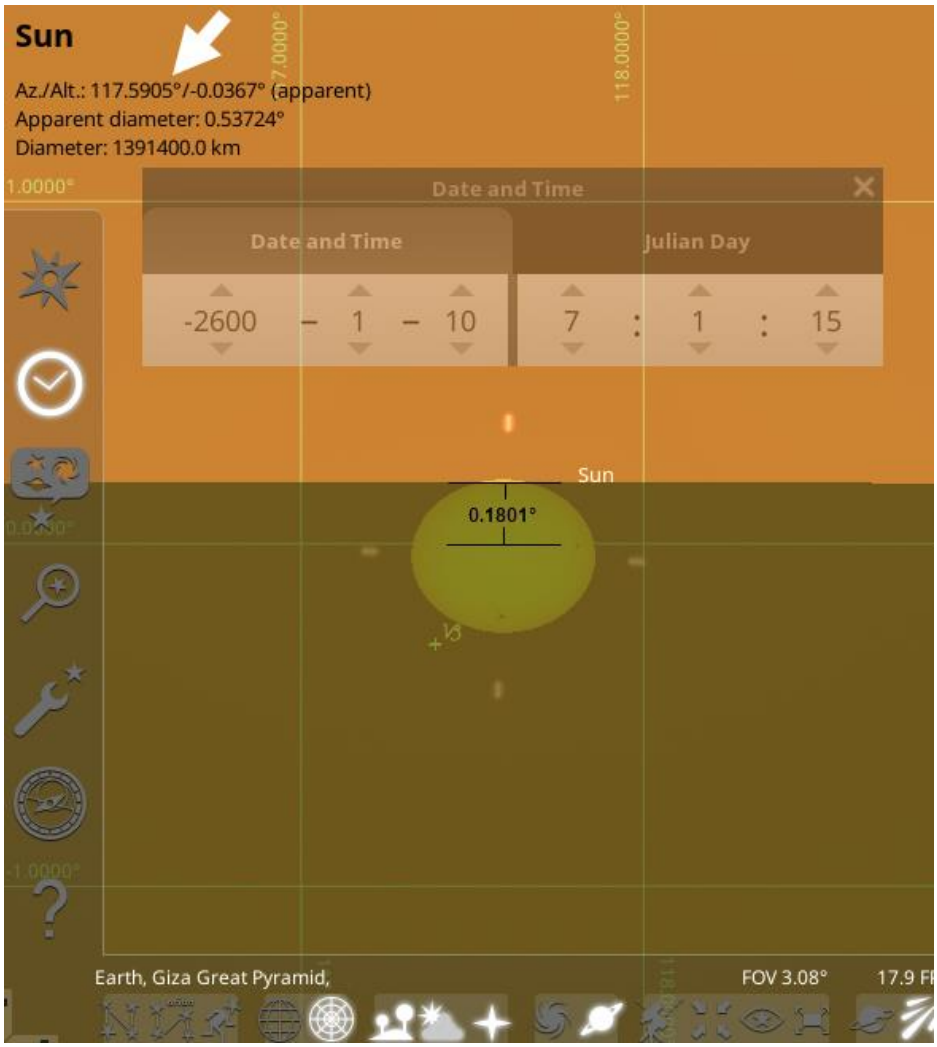


Figure 12

The 45° Alignment Between Heliopolis and the Great Pyramid

As detailed in my earlier papers, building on Giulio Magli's observation that the Giza plateau is oriented roughly 45° toward Heliopolis, my research has uncovered compelling evidence of a precise 45° alignment between the ancient temenos of Heliopolis and the ECCP of the Great Pyramid—mirroring a square's diagonal directed toward Heliopolis (Figure 13). The distance between the temenos and the pyramid's ECCP measures exactly 23.458 kilometers, which is precisely 72 times the diagonal of the Great Pyramid's base (230.387 meters). This implies a deliberate focus on the diagonal of the pyramid's square base, as conceptualized by its Heliopolitan designers using the Approximated Circle-Square Template (ACST). Further analysis also reveals that the latitudinal distances between Stonehenge (51.1788°), the Great Pyramid (29.9721°), and the Equator (0°) align in

the exact Silver Ratio, to within 2 meters when approximating √2 as 140/99, reinforcing the idea of a deliberate emphasis on the ACST (Figure 14). This finding suggests a remarkable and pragmatic mastery of angular measurements and their large-scale geographic application, indicating that the ancient designers highly valued the Silver Ratio as a guiding principle in their constructions.

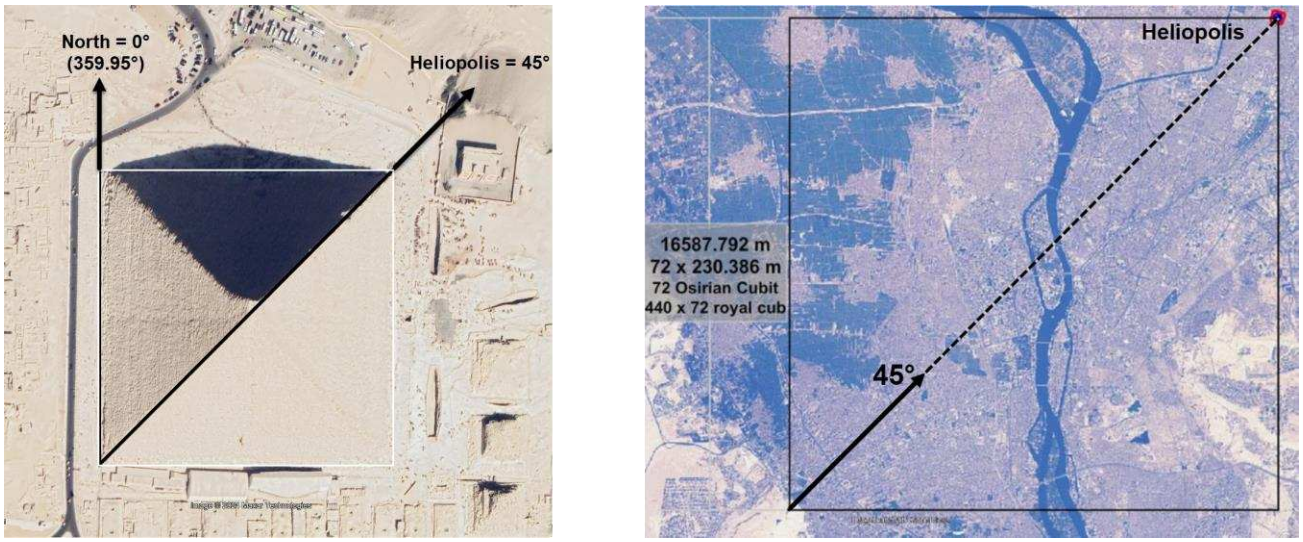


Figure 13

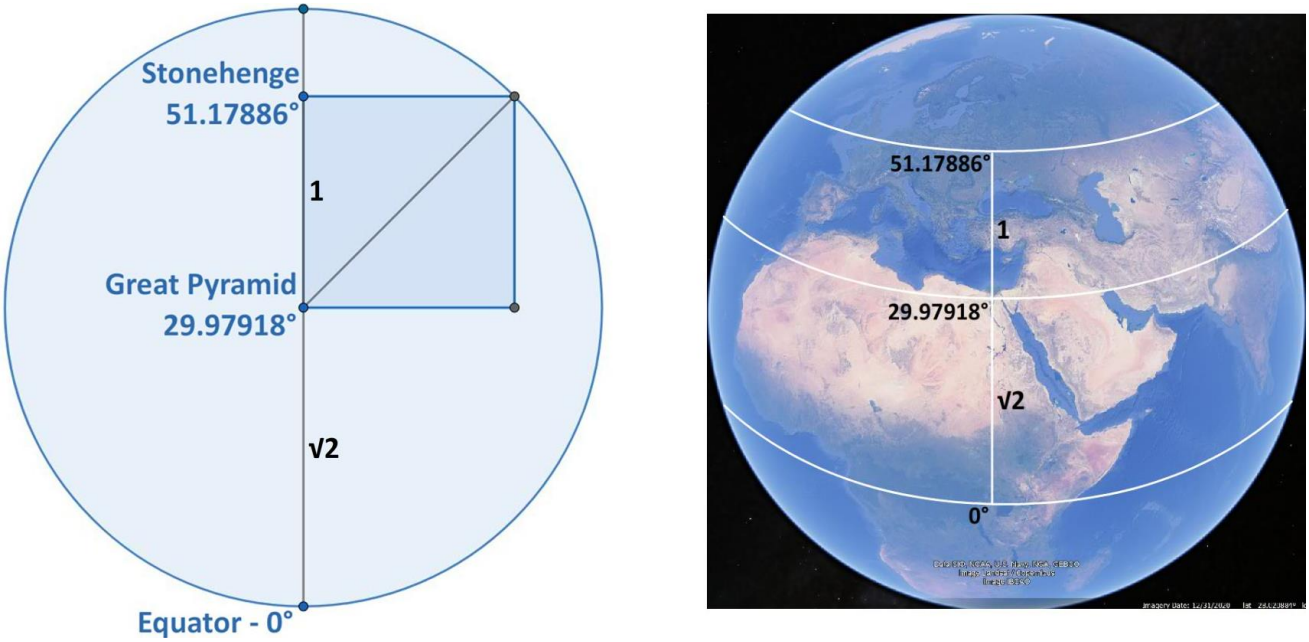


Figure 14

Visual and Symbolic Impact of the 45° Alignment

As a compelling demonstration of the powerful visual impact of this alignment with Heliopolis, Figure 15 illustrates how, when approaching the Great Pyramid from the northeast at approximately a 62° azimuth, a stark shadow casts an obtuse triangular shape across its northern face.

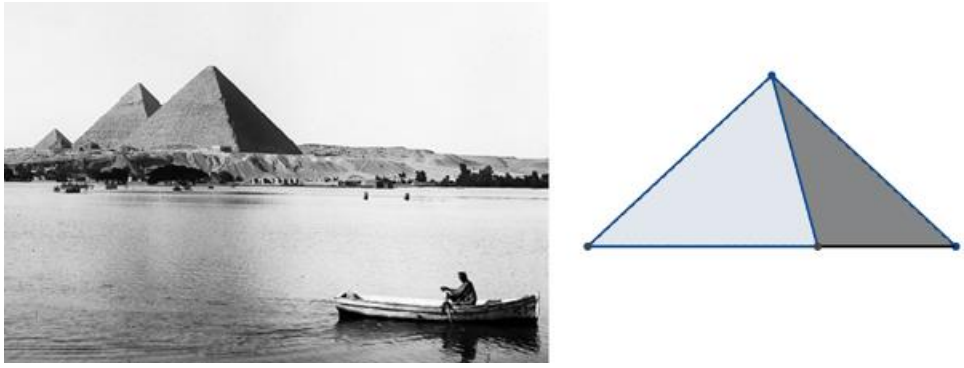


Figure 15

However, when viewed from exactly a 45° azimuth—such as from Heliopolis (Figure 16)—the winter solstice sunrise shadow creates a precise right-angled triangle with proportions of 162.90 : 146.61 meters, or 280 Royal Cubits : 440 Remen, equivalent to 1.1111 : 1 or 10 : 9. In this alignment, the pyramid's half-diagonal and northeast arris (edge) serve as the triangle's base and height, while the northwest arris forms the hypotenuse. This ratio of 280 Royal Cubits to 440 Remen aligns perfectly with the Approximated Circle-Square Template (ACST). The shadow, forming a distinct 10 : 9 right-angled illuminated triangle when viewed from a 45° azimuth, serves as a powerful visual symbol, strongly supporting the hypothesis that the Great Pyramid's design and placement are deeply rooted in the relationship between the circle and square, with the 45° diagonal and Silver Ratio at its core, as previously discussed.

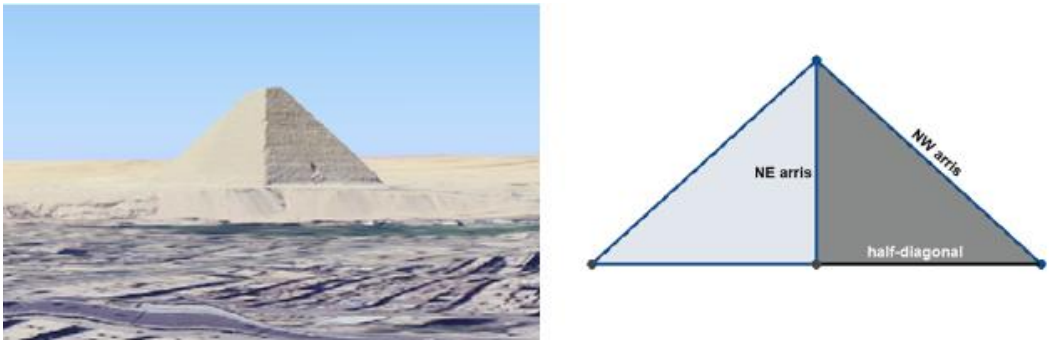


Figure 16

Cultural Significance and Shared Astronomical Knowledge

These alignments not only underscore the mathematical sophistication of the designers and builders but also hint at a broader cultural or civilizational connection, possibly rooted in a shared tradition of astronomical and geometric knowledge. The consistent application of ratios within the Great Pyramid's design and its precise positioning relative to Heliopolis, the Equator, and Stonehenge suggests that these monumental structures may have been influenced by a common heritage or unifying intellectual tradition. This connection is further highlighted by the winter solstice's significance to both cultures, linking their astronomical practices to deeper cultural influences, which we'll now return to and explore in more detail.

We can now observe that the angular distance on the horizon between True North (0°) and the winter solstice sunrise (117.5905°), as seen from the Great Pyramid's ECCP (like Khufu's original surveyors), can be "artificially" divided by the 45° azimuth toward Heliopolis, the site of the temple of the creator sun god, Atum-Ra. Both Heliopolis as the cosmological birthplace of creation and the winter solstice held profound significance for the Heliopolitan priests who advised Khufu. The winter solstice symbolized rebirth and cosmic renewal, intimately tied to the pharaoh's resurrection, making it plausible that this event fine-tuned the precise positioning of the Great Pyramid on the 45° axis to Heliopolis.

Angular Distance and the Silver Ratio Alignment

With this insight, an extraordinary and highly relevant discovery unfolds: by assigning a value of 1 to the 45° angular distance between True North and Heliopolis as observed from the ECCP, the angular distance to the winter solstice sunrise at 117.5905° becomes an astonishing 2.613—the exact diagonal of the Silver Ratio rectangle (since 117.5905° / 45° = 2.6131), as shown in Figure 17.

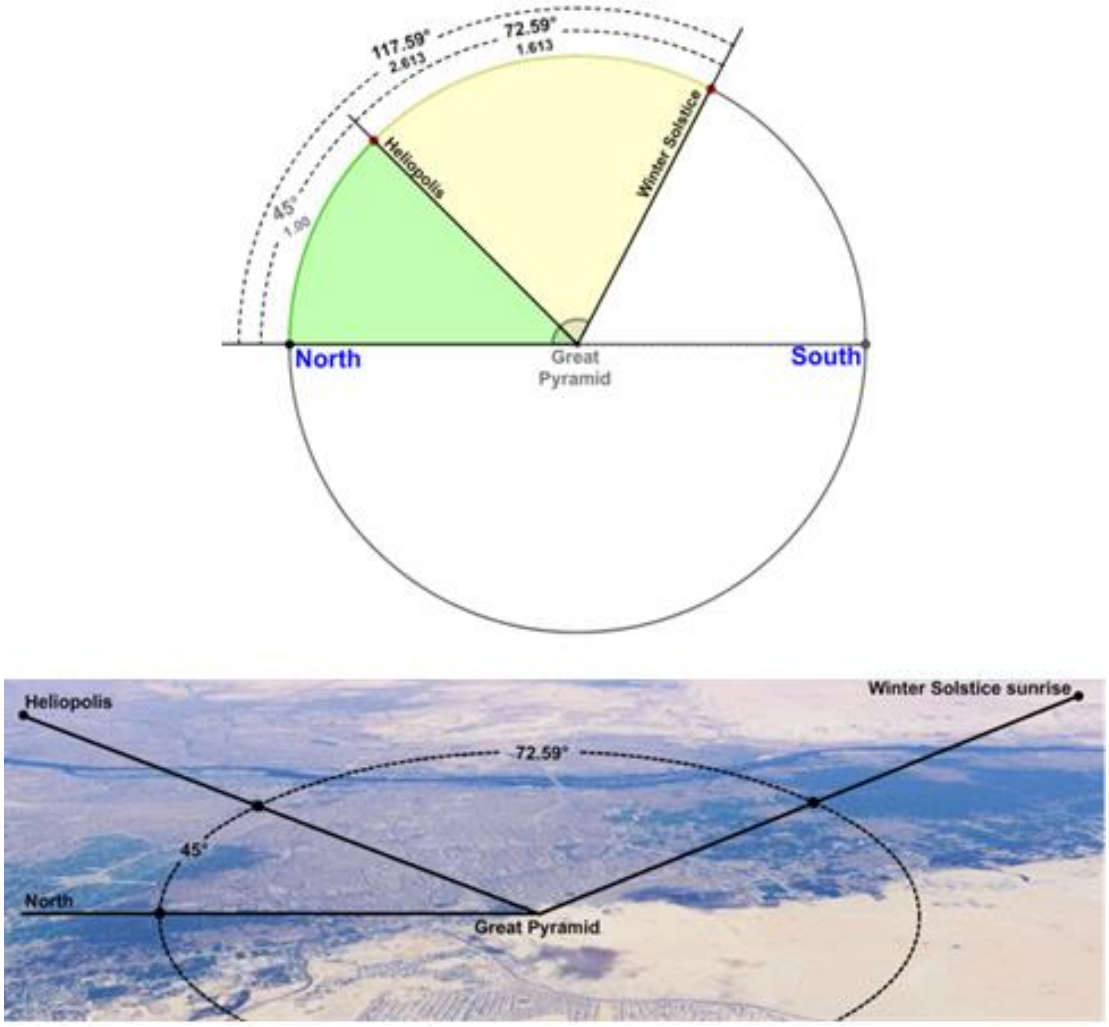


Figure 17

This alignment at the Great Pyramid with the Approximated Circle-Square Template (ACST) is extraordinary on its own, but it becomes even more remarkable when we observe that, at Stonehenge, the winter solstice sunrise at an azimuth of 129.4744° also aligns with the 2.613 diagonal of the Silver Ratio rectangle. Here, the winter solstice is measured relative to the summer solstice sunrise at 49.5438°, symbolizing Heliopolis, the city of Atum-Ra, the sun god. Just as Heliopolis represents a value of 1 from the Great Pyramid's perspective, the summer solstice sunrise at Stonehenge likewise represents 1, making the angular distance to the winter solstice sunrise at 129.4744° equal to 2.6133—the precise diagonal in the Silver Ratio rectangle (129.4744° / 49.5438° = 2.6133), as shown in Figure 18.

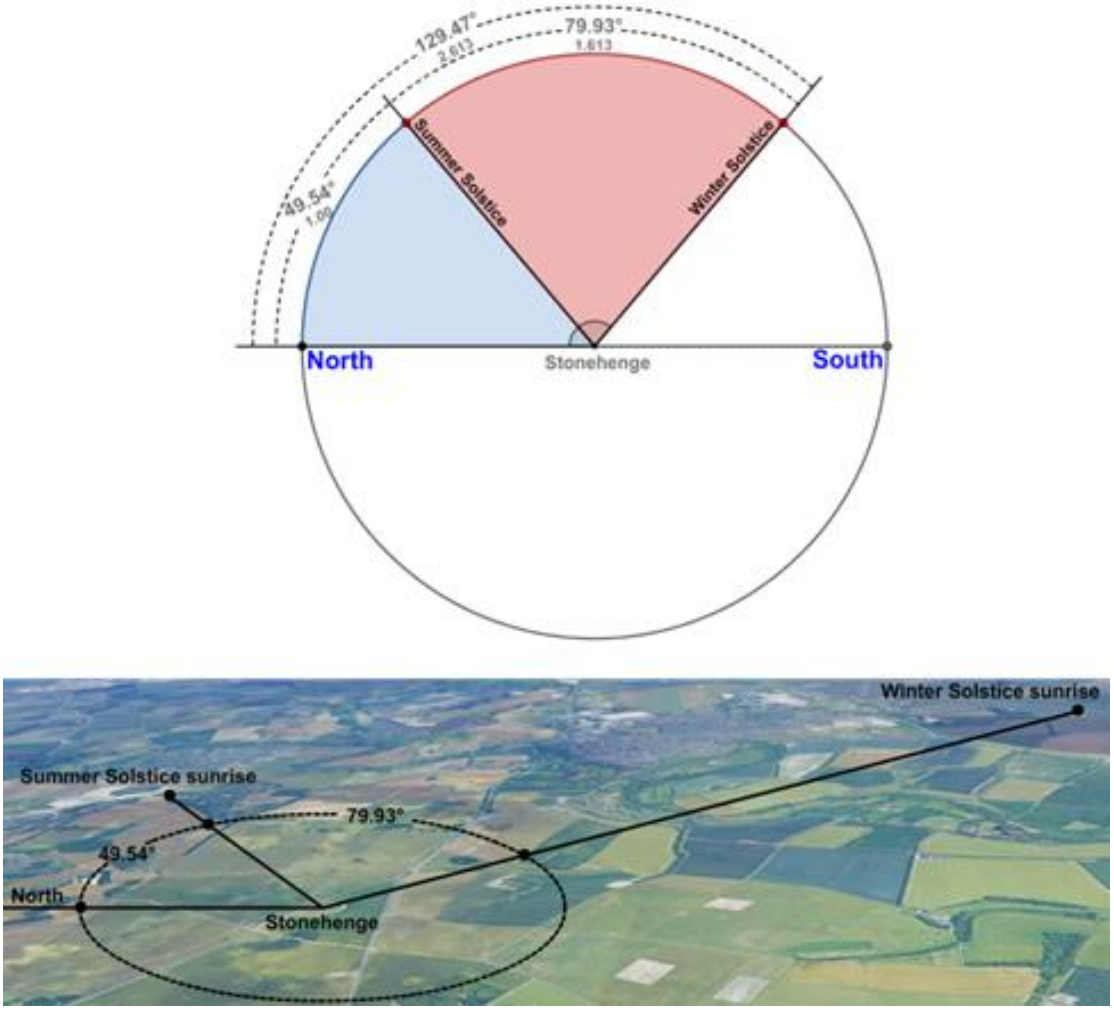


Figure 18

Unified Design Principles Across Ancient Sites

These alignments and design in accordance with the ACST, along with the large scale correlation between Stonehenge, the Great Pyramid, and the Equator, suggests an exciting new discovery. Such an intricate and intentional pattern points to a unified design principle across these ancient sites, urging deeper exploration of its profound implications. After confirming the accuracy of this astronomical alignment at Stonehenge using Stellarium as we did with the Great Pyramid, we will proceed to investigate the first stones at Stonehenge to see if any metrological correlations exist with the construction of the Great Pyramid. So, let's briefly examine the astronomical and elevation data for Stonehenge.

Just as in our analysis of Giza for observing the Winter Solstice sunrise, the same relative horizon methodology and calculations indicate that manual adjustments in Stellarium are needed for both the Northeast and Southeast horizons at Stonehenge. Here, for the sake of brevity, I will only provide the elevation data and its results and not list the actual calculations. According to Stellarium's default, in 2600 BC, the summer solstice sunrise would occur at approximately 48.3° on a flat horizon, while the winter solstice sunrise would occur at 129.1° azimuth. However, as shown in Figure 19, a 134-meter hill located just 2.67 km to the west of Durrington elevates the summer solstice horizon by 0.675°. Additionally, a 124-meter hill 5.58 km to the south of Amesbury raises the winter solstice horizon by 0.201° .

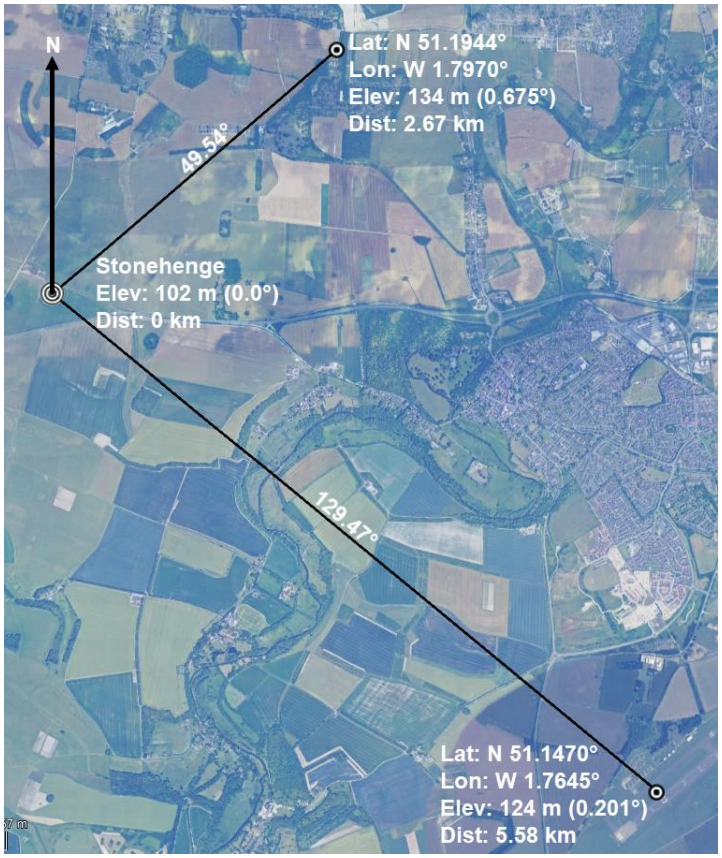


Figure 19

Adjusting for Horizon Elevation at Stonehenge

These elevations, like at Giza, 'delay' both the summer and winter solstice risings, moving them both slighlty southward on the horizon by 1.24° and 0.37° respectively, leading to solstices appearing at 49.5438° and 129.4744° as illustrated in Figure 20.

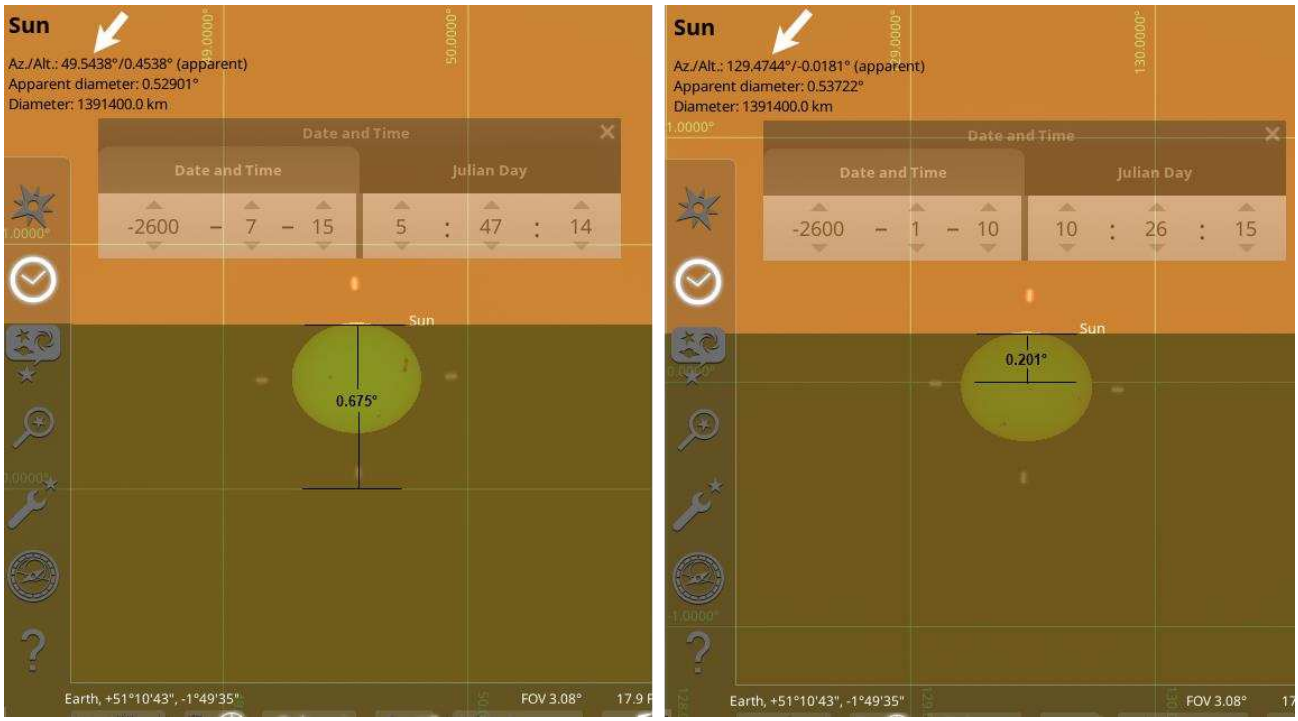


Figure 20

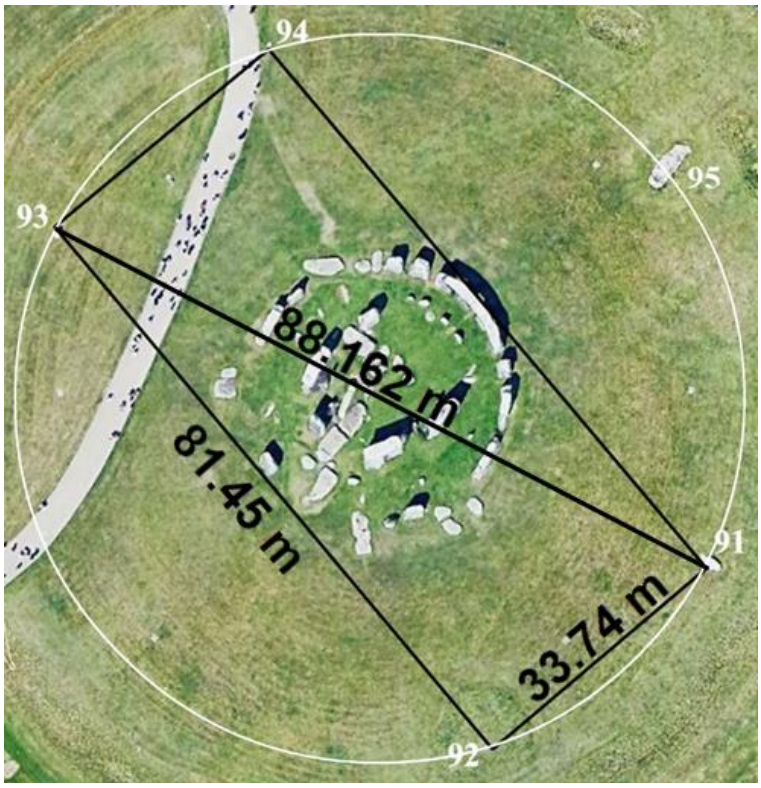
Silver Ratio Alignments and Unified Design

So, we astonishingly see that at Stonehenge, the angular alignment between the winter solstice sunrise at 129.4744° and the summer solstice sunrise at 49.5438° creates a 2.613 ratio, aligning precisely with the diagonal of the Silver Ratio rectangle. This pattern mirrors the alignment observed at the Great Pyramid, where the angular distance between True North and the winter solstice sunrise also forms a 2.613 ratio relative to the 45° azimuth line to Heliopolis. These consistent applications of the Silver Ratio at both sites suggest a unified design principle rooted in shared astronomical and architectural knowledge. Building on this foundation, we now turn to the earliest stones at Stonehenge—the four Station Stones and Heel Stone—to investigate whether they emulate the Great Pyramid's design principles through the ACST.

Overview of the Station Stones and Their Configuration

Stonehenge features four Station Stones, numbered 91, 92, 93, and 94, placed in an apparent silver ratio rectangular arrangement around 2600 BC (Figure trtr) on the outer edge of the Aubrey Circle. This layout resembles two sides of an octagon. The 'fallen' Stone 95, known as the Slaughter Stone, is not considered part of the Station Stone design but appears to have been added later. Although there was a 'pit' found underneath it, this pit was too shallow to support the massive Slaughter Stone. This suggests the pit might have originally

housed a smaller standing stone that was removed, with the Slaughter Stone placed over it at a later time. Additionally, two station stones, 92 and 94, are now missing, with only large pits marking their former locations.



Significance and Alignment of the Station Stones

The placement of the Station Stones is key to understanding the early phase layout and astronomical alignments of Stonehenge, and their significance is still a subject of debate among archaeologists and historians. Although specific dating evidence is limited, the estimated date of around 2600 BC aligns with a broader period of transformation at Stonehenge, when the site evolved from a simple earth and timber enclosure to a more complex megalithic structure.

The Station Stones appear to have been deliberately placed along the outer edge of the Aubrey Circle—a defunct ring of 56 post holes encircling the site and dating to around 3000 BC.[1] However, they do not sit "on" the Aubrey Circle itself, suggesting they were intended as a separate arrangement. This positioning is indicated not only by measurements but also by the fact that the Station Stones were installed with seemingly no regard for the Aubrey Circle's integrity. When placing the stones, the builders dug massive holes and barrows that

[1] Thom, A., Stevenson Thom, A., & Strang Thom, A: Journal for the History of Astronomy, Vol. 5, p.78-82.
Surveyed in 1973, Atkinson and Thom calculated 86.441 meters (283.60 feet) as the mean diameter of the Aubrey circle.

severely impacted parts of the Aubrey Circle, implying that this earlier feature was already considered obsolete by the time the Station Stones were erected. It's plausible that the designers used the Aubrey Circle as a general guide, aligning the Station Stones to its outer circular edge, but did not incorporate it as part of their own layout, but this remains open for discussion.

Calculating the Station Stone Rectangle's Dimensions

So, what is the diameter, or diagonal, of the Station Stone rectangle? The modern coordinate system now used to calculate the diagonals and sides of the Station Stone rectangle is based on Atkinson's "gold standard" survey of the site conducted in April 1978, in cooperation with Alexander Thom.[2] Atkinson, who had served as the archaeological director of Stonehenge for 14 years, undertook this precise survey to establish a reliable framework for understanding Stonehenge's layout and its component structures. In this analysis, we also rely on Atkinson's reported measurements for the sides of the rectangle, as they provide the most authoritative basis for determining the layout's dimensions.

To calculate the diagonals of the Station Stone rectangle, we first determine the distance between the centers of opposite stones: specifically, between Stations 91 and 93 for one diagonal and between Stations 92 and 94 for the other. Using the coordinates of each Station Stone, we find that the center-to-center diagonal lengths are approximately 86.67 meters for the diagonal between Stations 91 and 93, and 86.91 meters for the diagonal between Stations 92 and 94.

Historically, all four Station Stones were likely similar in size to Stone 91, which is one of the two stones still in place (the other being Stone 93). Although Stone 91 has fallen backward, it remains substantial in size, unhewn, tall, and semi-circular in girth, with an estimated diameter of about 1.3 meters (Figure 21). Stone 93, showing signs of tooling and smaller, is widely regarded as both badly damaged and a replacement stone rather than an original. Archaeologists generally believe that Stones 92, 93 and 94 were similar in size to Stone 91, as the large pits or holes where these stones once stood suggest a similar scale.

[2] ATKINSON, R. Some new measurements on Stonehenge. *Nature* **275**, 50–52 (1978). https://doi.org/10.1038/275050a0

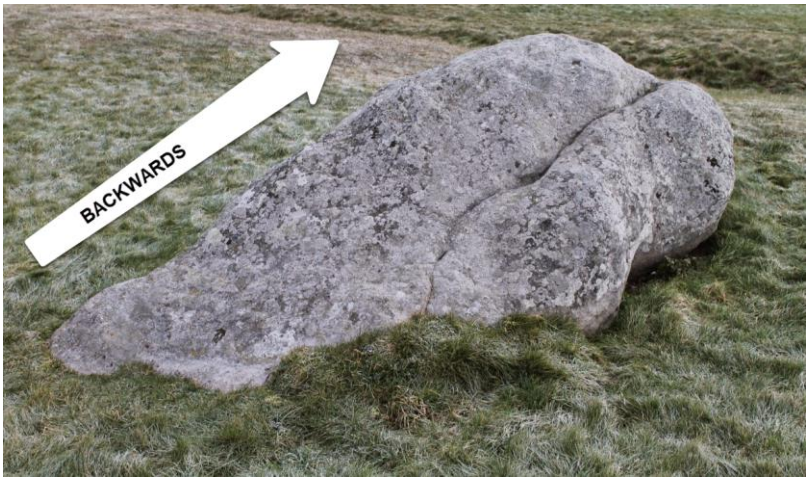


Figure 21

Assuming then that each Station Stone had a diameter of approximately 1.3 meters, like Stone 91, and that the original diagonal measurements extended beyond the centers, reaching from the outer edge of one stone to the outer edge of the opposite stone, the adjusted diagonal lengths become approximately 87.97 meters for the diagonal between Stations 91 and 93 and 88.21 meters for the diagonal between Stations 92 and 94. This adjustment aligns with the proposed ancient practice of including the full extent of each stone in sacred measurements, rather than stopping at the center. This approach is a reasonable hypothesis because, even in modern architecture, dimensions are typically based on the full footprint of a building rather than to the centers of structural elements. We can also see this approach in the Great Pyramid, where exterior and interior spaces are measured to the edges of walls and structures. Intuitively, it would make sense that the designers of circular henges, such as Stonehenge, were well aware of the stones' dimensions and incorporated their full widths into the design rather than using only "half" their width.

Applying this same principle to the long sides of the Station Stone rectangle, we find that the original center-to-center distances for the long sides were 79.93042 meters from Station 92 to 93 and 80.26425 meters from Station 94 to 91, as reported by Atkinson. However, when measured from the outer edges, each long side increases by 1.3 meters (0.65 meters added at each end), yielding adjusted lengths of approximately 81.23042 meters for the side between Stations 92 and 93 and 81.56425 meters for the side between Stations 94 and 91.

Aligning with the Silver Ratio: Sacred Geometry in Stonehenge

It is proposed that the designers had a specific goal: to achieve a diagonal length of approximately 88.162 meters for the Station Stone rectangle. By establishing this target, they adjusted the placement and dimensions of the stones to ensure that each long side measured around 81.45 meters—or, as we will explore, exactly 220

Remen each. This arrangement led naturally to the short sides measuring about 33.74 meters—the difference between 220 Royal Cubits and 220 Remen. With this configuration, the total perimeter of the Station Stone rectangle, in a silver ratio configuration, would measure 400 Royal Cubits, exactly matching the base length of the Great Pyramid, which, if divided by 2.613, precisely matches the diagonal of the station stone rectangle. This design reveals not only a profound mathematical relationship involving the diagonal of the Silver Ratio but also correlates with the astronomical segmentation of the solstices in a 2.613:1 ratio at both Stonehenge's and the Great Pyramid's latitude as indicated above. As we noted above the diagonal of the silver ratio rectangle, at 2.613, is exemplified by the 1/8 circumferecne (arc) of the circle, as demonstrated in the ACST, and represents the ratio of the circle to its inscribed square, or 220:198, 110:99, 10:9, or 1.1111 : 1. But there is also something else about the silver ratio rectangle and its 2.613 diagonal that seems almost magical, mathematical speaking.

Unique Mathematical Properties of the Silver Ratio's Diagonal

The silver ratio is much like the golden ratio, in that is has many self-similar characteristics, which won't be detailed here, however it is unique as it is the only rectangle when its side length is 1 then the square root of its perimeter equals its diagonal. To illustrate, first consider a square, a type of rectangle with all sides equal to 1 (Figure 22 – left). The perimeter of this square is 4, and since the square root of 4 is 2, its diagonal must be √2; therefore, the square root of the square's perimeter, being 2, does not equal its diagonal, being √2.

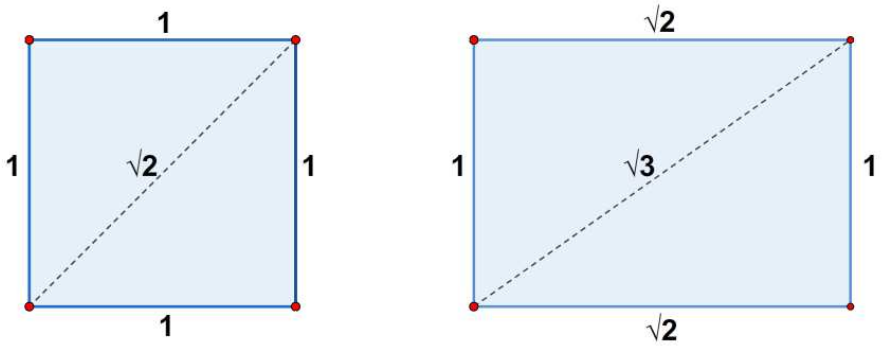


Figure 22

Next, let's consider a rectangle with side lengths of 1 and √2 (Figure 22 – right). The perimeter of this rectangle is calculated as 1 + √2 + 1 + √2 = 4.8284. Taking the square root of this perimeter gives approximately 2.1973, which does not match the length of the rectangle's diagonal, √3. Thus, the square root of this rectangle's perimeter, 2.1973, does not equal its diagonal, which remains √3.

However, when we examine the Silver Ratio rectangle (Figure 23), we uncover something profoundly surprising—a mathematical relationship that highlights its unique and unparalleled nature. Calculating the perimeter, we find:

$1 + 1 + (\sqrt{2} + 1) + (\sqrt{2} + 1) = 2 + 2(\sqrt{2} + 1) = 6.8284\ldots$

Taking the square root of this perimeter gives us 2.61312, so:

$\sqrt{6.8284} = 2.61312\ldots$

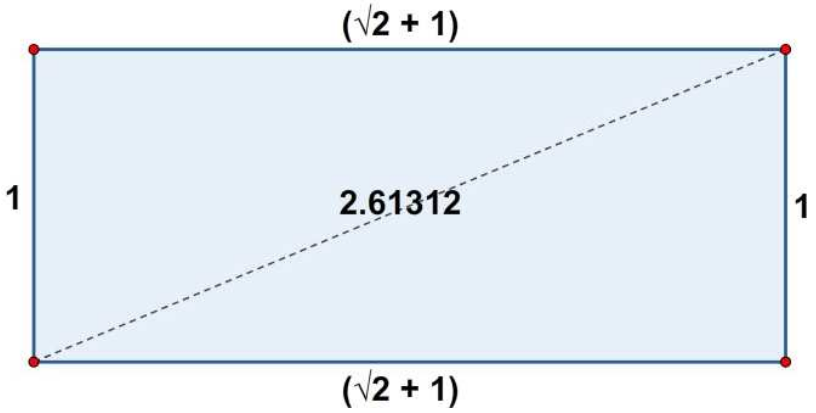


Figure 23

Amazingly, the diagonal of the Silver Ratio rectangle is exactly equal to the square root of its perimeter—a unique relationship exclusive to this remarkable shape. Even more compelling, this diagonal aligns with the diagonal of the Station Stone Rectangle at Stonehenge, whose perimeter matches the base of the Great Pyramid. When squared, this diagonal also equates to the base length of the Great Pyramid itself. The marvel continues: this same diagonal corresponds to the angular distance of the winter solstice sunrise at both Stonehenge and the Great Pyramid, which, relative to the Equator, align in a Silver Ratio proportion to each other. This intricate alignment suggests a deliberate and profound harmony of geometry, geography, and astronomy embedded in these ancient structures.

Astronomical and Architectural Connections of the Silver Ratio

To conclude this exploration of the Silver Ratio rectangle and the Station Stones, it is crucial to observe that when again considering the Approximated Circle-Square Template (ACST), we find an elegant comparison between the Great Pyramid and the Station Stone Rectangle. If the largest outer square represents the Great Pyramid's perimeter at 1,760 Royal Cubits (or 921.546 meters), then the Silver Ratio rectangle, labeled as

Rectangle A in Figure 24, measures precisely with the dimensions of the Station Stone Rectangle. Here, the total perimeter of Rectangle A equals the length of one side of the entire 1,760 Royal Cubit square—440 Royal Cubits. Remarkably, the side of this square, being exactly equivalent to the side of the Great Pyramid, matches the dimensions of the Station Stone Rectangle exactly, underscoring the profound design interconnections between these ancient sites.

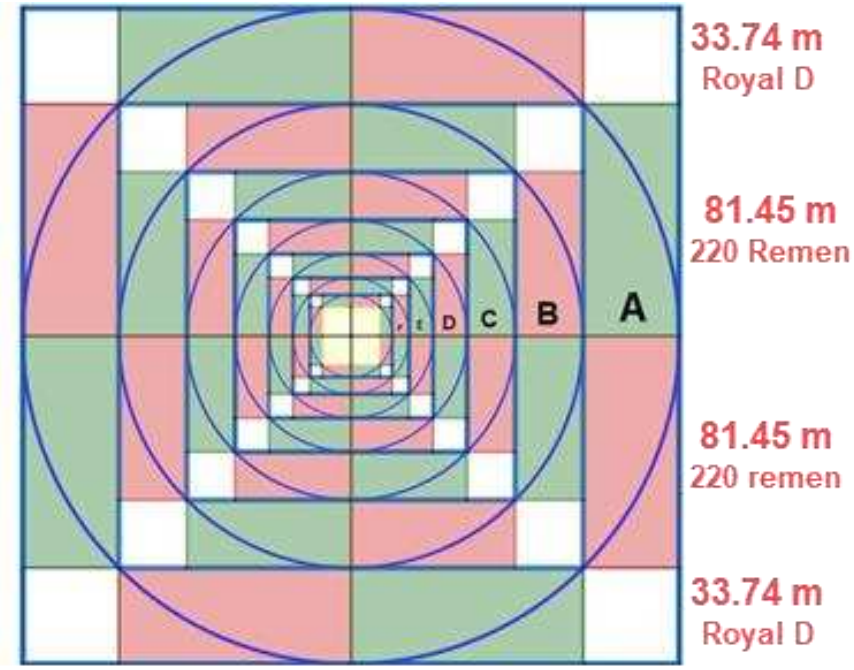


Figure 24

The Heel Stone and Station Stones as a Blueprint of the Great Pyramid

To complete this extraordinary picture, we now turn to an examination of the Heel Stone in relation to the Station Stones, revealing that the entire layout of Stonehenge may indeed serve as a planar "blueprint" of the Great Pyramid, inscribed on the earth in stone. The Heel Stone, being an unhewn megalith like the Station Stones, is likely part of the same project, symbolizing the apex of the Great Pyramid within this grand design.

As mentioned in my previous papers, I propose that the Station Stone Rectangle, in conjunction with the Heel Stone, was erected as part of the initial megalithic phase of Stonehenge, predating the inner Sarsen ring. The Station Stone Rectangle is often abbreviated as the SS Rectangle, but since the Heel Stone likely forms an integral part of this design alongside the Station Stones, I suggest referring to all five stones collectively as the

SSHS (Station Stones & Heel Stone). Tentatively, I suggest that this construction project was "commissioned" during the reign of Pharaoh Khufu, under the direction of his Heliopolitan priests, as a symbolic stamp of the pharaoh's divine identity as the incarnate creator god, Atum-Ra, on the Earth. Here, the term "pharaoh" need not refer specifically to Khufu himself but rather to the institution of the Pharaoh, embodying the living ruler and representative of Atum-Ra.

Latitudinal Alignment and the Silver Ratio Connection

This suggestion aligns with the latitudnal silver ratio relationship between the Great Pyramid and Stonehenge, using the Equator as a baseline, as demonstrated above. It also accounts for why the Station Stone Rectangle, approximating a Silver Ratio rectangle, not only mirrors this large-scale relationship but, as I will now show, also emulates the design of the Great Pyramid on a smaller scale that reflects the fundamental ACST (Approximated Circle-Square Template). Indeed, the footprint area of the Great Pyramid is exactly 8 x the Silver Ratio larger than the Station Stone Rectangle, or $8(\sqrt{2} + 1)$.

Proportional Measurements Between Stonehenge and the Great Pyramid

Consider the Figure 25. The Silver Ratio rectangle at Stonehenge, as defined by Stones 91, 92, 93, and 94 (A, B, C and D in the diagram), has two longer sides and two shorter sides meeting at these four corner stones. One longer side, stretching between Stones A and D, forms the more northern side of the rectangle, while the other, between Stones B and C, defines the more southern side. When measured from either northern corner (Stones A or D) to the Heel Stone (Stone X), the distance is exactly 73.30 meters, or 140 Royal Cubits—half the height of the Great Pyramid measured from its apex. Meanwhile, the distance from either southern corner (Stones B or C) to the Heel Stone measures precisely 103.67 meters, or 198 Royal Cubits, which corresponds to the height from the Great Pyramid's apex to the King's Chamber floor, as shown earlier. Notably, this measure of 198 Royal Cubits, or 103.67 meters, matches exactly 125 Megalithic Yards if we use Alexander Thom's final proposal for the Megalithic Yard as 2.721 feet. As a note, any further discussion of the Megalithic Yard is beyond the scope of this paper.

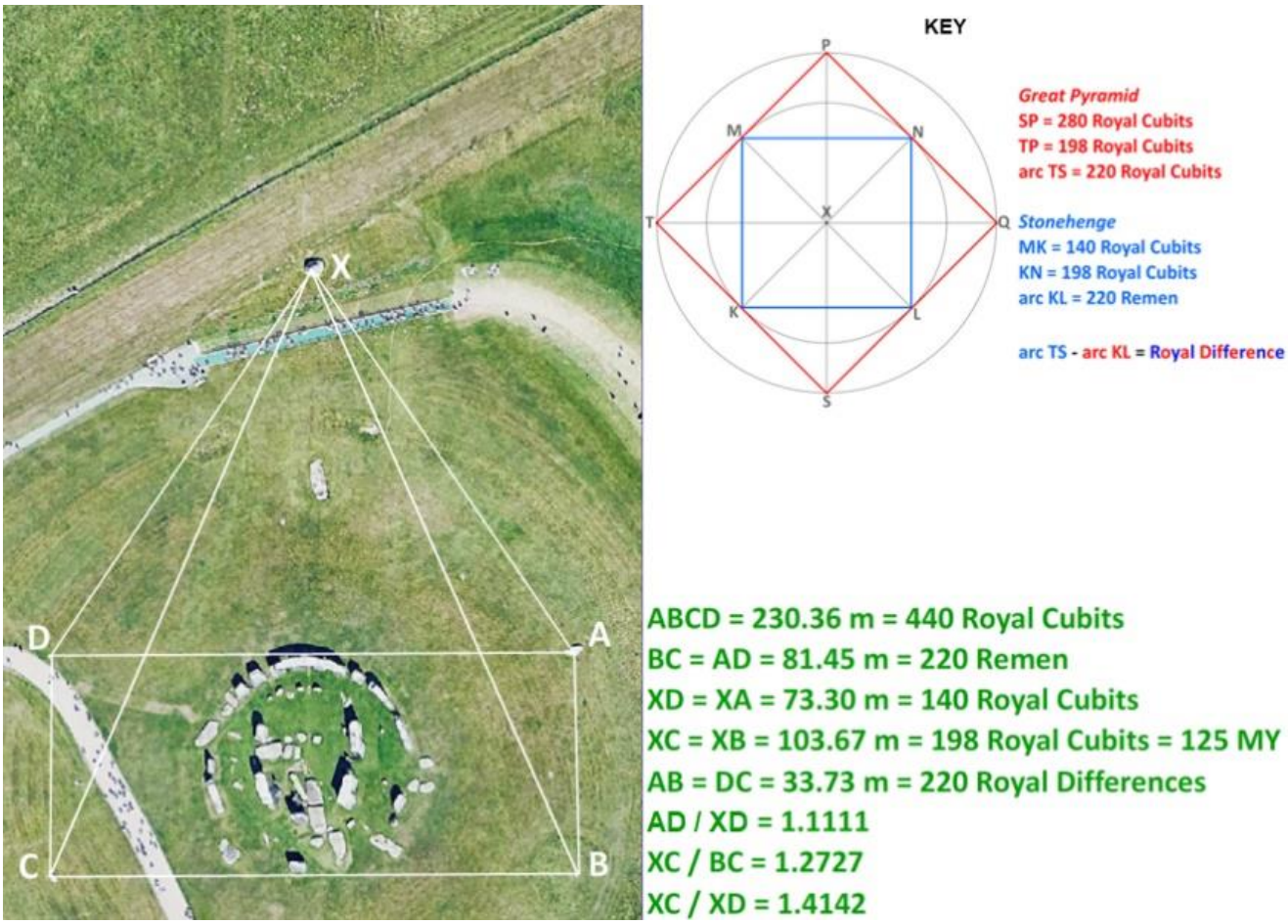


Figure 25

All these measurements observed at the SSHS are derived directly from the ACST, and when compared to the Great Pyramid, they mirror the same proportions found within it—namely, 1.1111 : 1 and 1.2727 : 1—only diminished by a factor of √2, as demonstrated in the ACST 'key' in the above diagram.

The Great Pyramid's Design Translated at Stonehenge

In essence, the three-dimensional design of the Great Pyramid at Giza is translated into a two-dimensional realization at Stonehenge. All we need to do is visualize the lines connecting the corners of the Station Stones Rectangle to the Heel Stone, which, itself, symbolically serves as the pyramid's apex. This framework allows us to see the Great Pyramid "laid flat" at Stonehenge, with its proportions replicated at a diminished √2 scale in alignment with the ACST. Meaning the SSHS is simply the first diminution of the ACST

Orion, the Chieftain and a Symbolic Artifact

Given the remarkable correlations between the Great Pyramid, Heliopolis, and Stonehenge, there is one final aspect to explore before concluding this paper. I will next demonstrate how the SS Rectangle establishes a very distinct "sight line"— aligning with the rising constellation of Orion directly over the direction of Heliopolis. To conclude, I will present an intriguing possibility: a gold artifact found buried with an ancient chieftain or priest less than a kilometer from Stonehenge aligns precisely with this Orion / Heliopolitan sight line and may have served as an amulet, possibly handed down from or crafted with Heliopolis in mind.

Challenges of Using Large Stones for Horizon Sighting

If each of the original Station Stones were as large as Stone 91, which seems to be the prevailing consensus, this raises the question of how they could have been used for sighting the horizon, as anyone standing directly behind them would have their view blocked and not be able to see the sighting stone in the distance. The most reasonable explanation is that ancient observers didn't look over the stones' centers; rather, standing behind each stone, they peered around its edge to sight a more distant target stone. This created, quite literally, a 'line of sight' between the edges of the stones in front and the one being sighted, allowing for precise alignment. In this way, it is quite conceivable that the ancient builders likely employed a sighting method known as parallax.

Understanding Parallax in Ancient Sighting Techniques

Parallax is a fascinating, self-evident phenomenon that demonstrates how an object's apparent position shifts when viewed from different perspectives. This concept can be grasped through simple observations or applied to technical measurements in surveying and astronomy.

Consider a basic example: hold your thumb at arm's length, overlapping it with a distant object (Figure 26). By closing one eye and then the other, you'll notice your thumb appears to shift against the background. This shift happens because each eye views the thumb from a slightly different angle. Similarly, if you observe a nearby tree against a distant mountain and shift left or right, the tree appears to move against the mountain, illustrating parallax due to your changed viewpoint.

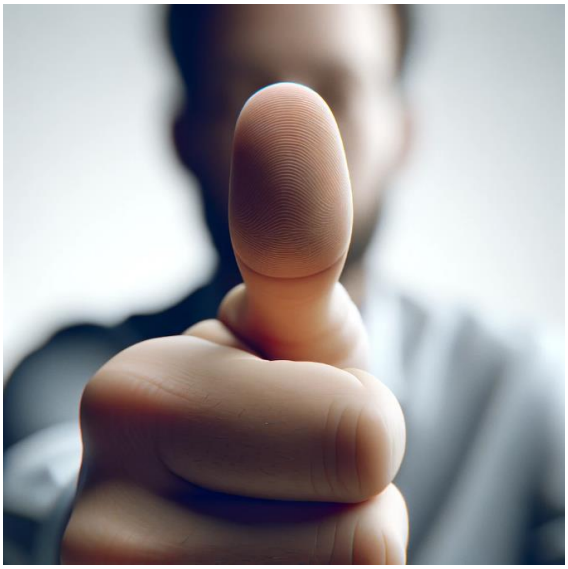


Figure 26

Astronomical parallax operates on a larger scale. Astronomers observe a star from two points in Earth's orbit six months apart, measuring its slight shift against the distant stars. This shift, though minute, is crucial for calculating the star's distance from Earth. Ancient Greek astronomer Hipparchus applied parallax in the 2nd century BCE to estimate the Moon's distance by observing lunar eclipses from different locations and analyzing Earth's shadow on the Moon. He calculated the Moon to be about 60 Earth radii away—remarkably close to the modern value of 60.3 radii. Hipparchus's work laid foundational principles for celestial measurement and highlighted an early, sophisticated use of parallax in astronomy.

Parallax and Astronomical Precision at Stonehenge

Some scholars, including John North, have proposed that the builders of megalithic sites like Stonehenge may have used parallax, sighting along the edges of standing stones to accurately observe celestial events.[3] Given Stonehenge's massive stones and reputation for astronomical precision, this idea is worth exploring through the Station Stone Rectangle, specifically its diagonal, thought constructed before any of the inner megaliths were erected. These stones, positioned 88.162 meters apart, mirror each other at opposite ends, with the left edge of one stone corresponding symmetrically to the right edge of the other, forming a balanced geometric alignment.

Imagine two observers standing strategically behind Stones 93 and 91, trying to see each other (Figure 27). Due to the stones' large size, their initial line of sight to each other is obstructed. To create a "visual portal" between

[3] North, J. (2007). Stonehenge. United States: Free Press, p. 458-65

them, each observer shifts slightly to the left, allowing a narrow “sliver of light” to emerge—a line of sight that bridges the spatial gap between the observers, enabling face-to-face sighting. Parallax comes into play here, as each observer shifts to look past the stones’ immediate obstructions, extending their field of view.



Figure 27

To expand this scenario, suppose the observer behind Stone 91 (the farther stone) is absent. The observer behind Stone 93 (the nearer stone) would, peeking from the left, find no counterpart to meet his gaze. Instead, his view would extend past Stone 91, sweeping toward the southeast horizon. In this way, the narrow opening created between the edges of Stones 91 and 93 acts as a sightline conduit, through which the horizon becomes visible.

This broader view clearly demonstrates the concept of parallax, akin to an exercise where one holds a thumb at arm's length, positioning it vertically against a distant backdrop. By closing one eye, the thumb seems to shift in relation to the background, showcasing how parallax results from different viewing angles. The thumb itself doesn't move; only the observer's line of sight changes. Similarly, Stone 93 and 91 remain stationary; it is the observer who moves, ‘altering his perspective’ and thereby performing a ceremonial ‘act’ or sacred ‘rite’.

Symbolic and Practical Implications of Parallax-Based Alignment

In the context of ancient megalithic constructions like Stonehenge, using parallax-based sighting likely carried profound practical and symbolic significance. If an observer’s extended view through this “sliver of light” aligned with a specific celestial event or prominent landmark on the horizon, such alignment could have served both

navigational and ceremonial functions. Given the sacred geometry embedded within the Station Stone Rectangle and Heel Stone (SSRH), it is plausible that the diagonal of this rectangle was especially revered, symbolizing not only the Silver Ratio but also having astronomical importance. This diagonal measures precisely 2.613 relative to its shorter side—a value that intriguingly corresponds with the angular distance of the winter solstice sunrise, both at Stonehenge and the Great Pyramid.

The Multi Significance of the Station Stone Rectangle's Diagonal

The diagonal of the SSRH might have multiple significance: it a minimum represented the Silver Ratio geometrically and also symbolized the angular distance of the solstices, not only at Stonehenge but also at the Great Pyramid. This knowledge, potentially brought by the ambassadors of the Heliopolitan priests, would have influenced the SSRH's creation as an emulation of the Great Pyramid with an eye toward Heliopolitan cosmology. Consequently, the "sliver of light" formed through the parallax sighting method could serve as a sighting portal or guiding beacon, with the diagonal acting as an astronomical and metrological "key," grounded in both ACST principles and observable cosmic events. With this perspective in mind, we now explore the broader implications of these alignments around 2600 BC, the period hypothesized for the positioning of the Station Stone Rectangle and Heel Stone.

Parallax Sightline to Heliopolis and the Belt Stars of Orion

Using Google Earth Pro, notably, the "sliver of light" created by the parallax shift when viewing past the southern edge of Stone 91, while peeking out from behind the left (north) edge of Stone 93, aligns precisely with an azimuth of 117.83 degrees on the horizon (Figures 28 and 29).

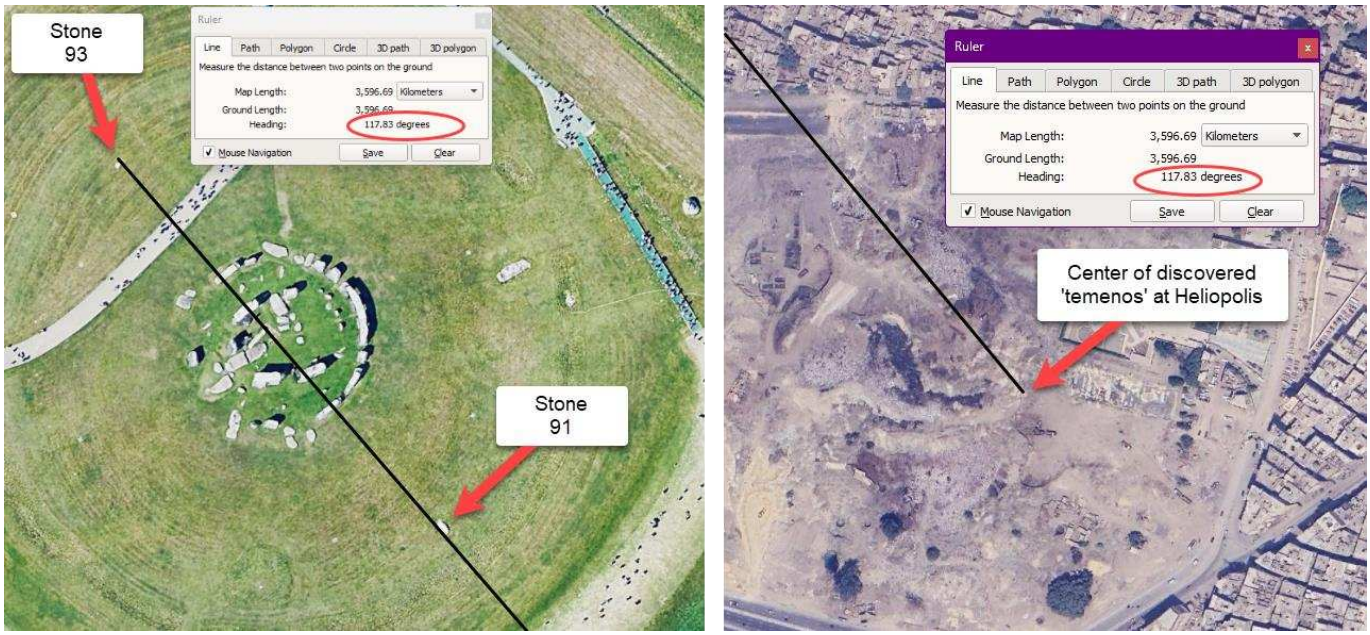


Figure 28



Figure 29

Intriguingly, this azimuth not only directs the observer's gaze directly through the Nile Delta and to Heliopolis, the major religious center devoted to Atum-Ra, but it also aligns with the rising of the three low-hanging Belt Stars of Orion (representing Osiris) just minutes before the Summer Solstice sunrise (Figures 30 and 31).



Figure 30

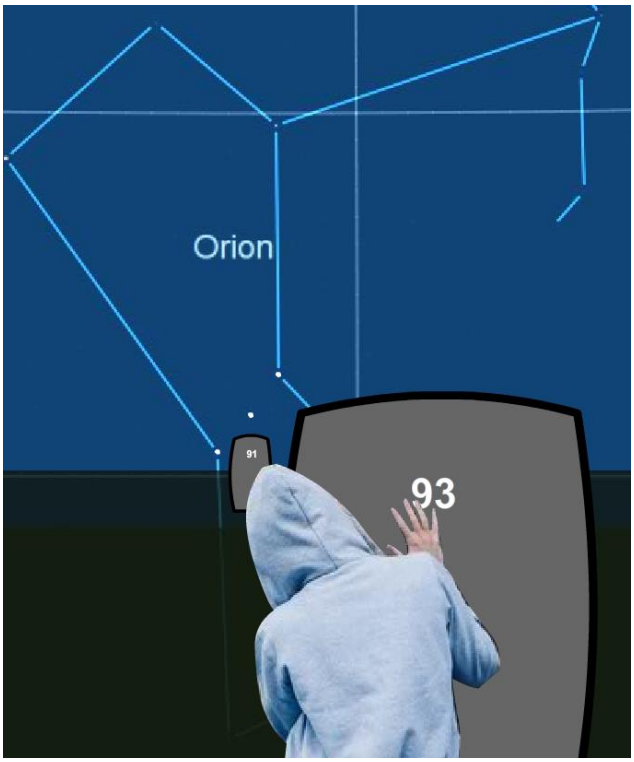


Figure 31

Symbolic and Cosmic Connections in Stonehenge's Alignment

While much of this remains in the realm of hypothesis, it is unmistakable that Orion, representing Osiris, was intimately connected to Atum-Ra and the pharaoh's persona as the earthly embodiment of these divine figures—perhaps even embodying aspects of both. The presence of this alignment, coupled with the extensive metrological, cosmological, and astronomical correlations already presented, warrants serious investigation.

The timing of Orion's appearance just before the solstice sunrise may symbolize Osiris, as Orion, preceding the presence of Ra. Such alignment at Stonehenge—potentially serving as a "portal" of light pointing toward Heliopolis—could function as both a navigational marker and a symbolic connection to these deities. Though speculative, the presence of this alignment alongside the meticulously measured Silver Ratio rectangle and other connections strongly suggests intentionality and invites further exploration. This intricate link between cosmic, architectural, and symbolic elements at Stonehenge, with their alignment to Egyptian cosmology, is an area ripe for deeper study.

The Bush Barrow Chieftain and His Astronomical Artifacts

We close with a final, compelling observation that lends "forensic evidence" to this hypothesis: the artifacts found buried with the Bush Barrow chieftain less than a kilometer from Stonehenge. These artifacts, known as the Bush Barrow lozenges, were discovered in the grave of a high-status individual, often described as a priestly chieftain. Buried around 2000 BC, the relics may have origins from much earlier, possibly passed down through generations, suggesting that he may have been among the last in a lineage of priest-astronomers.

The parallels between the chieftain's role and that of the Heliopolitan priests are striking. The priests of Heliopolis, Egypt's most revered religious center, were guardians of sacred astronomical knowledge, maintaining calendars, predicting celestial events, and ensuring rituals aligned with cosmic rhythms. The artifacts found with this chieftain suggest he may have held a similar role at Stonehenge—a keeper of astronomical and spiritual wisdom, bridging the earthly and the divine. This final observation hints at a profound connection between Stonehenge and Heliopolis, underscoring a shared reverence for celestial order.

The Larger Lozenge: Encoded Solstice Alignments

The larger lozenge (Figure 32), intricately designed with an angle of precisely 79.95°, aligns remarkably with the angular distance between the summer solstice sunrise and the winter solstice sunrise at Stonehenge (calculated as 129.4744° - 49.5438° = 79.93°). This lozenge is accurate within 0.02° of the actual observed solstice-to-solstice angle, a strong indication that this angular distance held significant meaning, perhaps even venerated in gold. If

the designers knew the angular distance to this degree of precision, it is reasonable to assume they also understood that 129.4744° divided by 49.5438° yields 2.613, representing the segmentation of the horizon in alignment with the Silver Ratio's diagonal—a knowledge embodied within the lozenge's design.

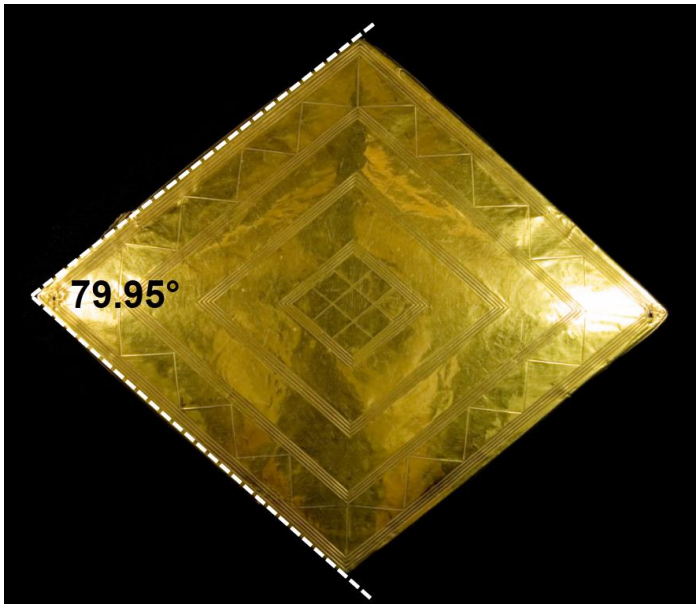


Figure 32

The smaller lozenge (Figure 33), often overlooked as decorative, bears an equally astonishing angle of 117.83°. As shown, this azimuth from Stonehenge not only points toward the western Nile Delta and directly to Heliopolis, the city of Atum-Ra, but also aligns with the rising of Orion just before the summer solstice sunrise around 2600 BC.



Figure 33

This angle of 117.83° can be recreated by viewing the horizon from behind the eastern edge of Stone 93 to the western edge of Stone 91, using parallax sighting. These lozenges imply that the chieftain held a sacred role, akin to a high priest at Heliopolis, deeply knowledgeable in celestial and directional matters. However, by 2000 BC, such alignments may have lost their practical relevance due to obstructions from later-standing stones. Thus, these lozenges likely became symbols of status and authority, amulets of ancient wisdom, accompanying him as tokens for the afterlife.

In summary:

- Large Bush Barrow Lozenge: Encodes the angular distance between the summer and winter solstice sunrises at Stonehenge around 2600 BC, and demonstrates knowledge of the silver ratio and it's diagonal.

- Small Bush Barrow Lozenge: Reflects both the azimuth to Heliopolis and the pre-solstice rise of Orion, as observed from Stonehenge and demonstrates that Heliopolis was of importance to its creator.

These artifacts offer a profound glimpse into the enduring significance of celestial alignments, suggesting a cultural and spiritual exchange between Stonehenge and the sacred astronomy of Heliopolis.

Conclusion

In conclusion, this paper introduces the Approximated Circle-Square Template (ACST) as a novel interpretive key for understanding the architectural and astronomical alignment of Stonehenge and the Great Pyramid. The ACST, grounded in the Silver Ratio, not only connects the square and circle but reveals a practical, symbolic relationship between these sacred sites and cosmic cycles, especially the solstice sunrises. Central to this template is the Silver Ratio's 2.613 diagonal, which emerges as a guiding proportion—a ratio that aligns both the physical design of the Station Stone Rectangle at Stonehenge and the Great Pyramid's orientation with key celestial events.

The 2.613 ratio, rooted in the diagonal of the Silver Ratio rectangle, underscores how ancient designers may have symbolically linked terrestrial and celestial realms. At Stonehenge, this ratio appears in the angular distance between summer and winter solstice sunrise points, while at Giza, it emerges in the Great Pyramid's precise 45° alignment toward Heliopolis, echoing the same sacred proportion. The ACST, as a geometric framework, thus reveals a shared design principle between these sites, suggesting that the Silver Ratio's diagonal was more than a mathematical curiosity; it was an intentional, foundational element in constructing monuments that resonate with cosmic order.

Furthermore, the Bush Barrow lozenges, with their angular precision, support the ACST's role in ancient design. The large lozenge's 79.93° angle corresponds exactly with the solstice-to-solstice arc, while the smaller lozenge's 117.83° angle matches the azimuth to Heliopolis, as well as Orion's pre-solstice rise. These artifacts symbolize how sacred ratios like 2.613 were not only embedded in grand architecture but preserved within ritual objects, demonstrating an enduring reverence for geometry that could align the terrestrial and the divine.

Ultimately, the ACST offers a powerful interpretive framework that connects sacred geometry with celestial alignment, revealing a unified tradition of knowledge between ancient cultures. Through this template, we gain new insights into the role of the Silver Ratio and 2.613 in harmonizing earthly structures with the cosmos, showing how ancient civilizations encoded a deep understanding of cosmic cycles in their monumental designs.