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Geometric Concepts in Architectural Design

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Abstract

Architecture has traditionally been regarded as a key component of culture, respected for its contribution to stability and order in particular. These characteristics are seen to result from the formal composition's geometric virtue. The pure form of architecture has always been the creation of structures that represent instability and order. Geometric shapes like cubes, cylinders, spheres, cones, pyramids, etc. Are used in building design, and when they are combined according to compositional rules, no form interferes with any other.

It is important to adhere to the fundamental principles of form and style. Over decades, centuries, and even millennia, Western society has developed a set of expectations that define a shared aesthetic. They are crucial. Therefore, it is only logical that breaching these conventions was one of the century's major themes. Arts that defied convention experienced a significant upsurge in the 20th century. One of the most well-known trends was postmodernism, which was characterized by a rejection of the idea that great theories and rigid definitions are necessary for art. Another is the architectural movement known as deconstructivism, which rejects the notion that structures must take on a unified form.

Triangles are employed to add dynamism; they go against the notion that a structure should have a unified, orderly appearance. Instead, they try to design structures that are divided into simple, unconnected parts. This building would be presented by an architect as the many shapes, rather than attempting to make them fit together. The better, the more contrasting and divided they feel. Without needing to be viewed as a component of a whole, each shape, angle, or form is taken into consideration separately.

The beginning

It is believed that the first time that all of the laws of geometry were recorded on paper was in 300 BCE by the Greek mathematician Euclid of Alexandria. In his De Architectura, or Ten Books on Architecture, the Roman architect Marcus Vitruvius from the first century BCE provided more rules. Vitruvius is largely responsible for the geometry employed in contemporary construction. He was the first to compile the ratios required to create a structure.

Renaissance Popularity and the Vitruvian Man

Using a few instances, the description and discussion of the connection between geometry and architectural design. The basic study of forms and their arrangement is geometry. The building blocks of architectural design are geometric shapes, transformations, and figures. In the past, set tools for architectural design were created by geometric rules based on the concepts of proportions and symmetries. It was discovered through analysis of nature's proportions that both nature and art have the same broad aesthetic characteristics. So, it was believed that proportions like the golden section might provide harmony to not just art but also music and architecture. There were overarching guidelines for harmony,

according to Pythagoras. They also found use in architecture, and they underwent considerable development, particularly during the Renaissance.

Builders have relied on copying natural formations since the dawn of time, such as the circular Stonehenge in Wiltshire, England, two miles (3 km) west of Amesbury. They then used mathematical principles to standardize and replicate the forms. Interest in Vitruvius did not become widespread until many years later, during the Renaissance. It is believed that Cesare Cesariano (1475–1543) was the first architect to translate Vitruvius' writings from Latin into Italian.

About 1520 CE. However, the "Vitruvian Man" was first doodled in a notebook decades earlier by Italian Renaissance architect and artist Leonardo da Vinci (1452-1519), who also painted. The artwork and words of Vitruvius served as inspiration for the Vitruvian Man depictions. The "man" being portrayed is a metaphor for a person. The figures' surroundings are composed of Vitruvian calculations of the physical geometry of man in the form of circles, squares, and ellipses. The first person to document his views of the human body was Vitruvius, who claimed that the symmetry of the human body—two arms, two legs, and two breasts—must have been created by the gods.

Models of Proportion and Symmetry

When constructing temples, builders should always adhere to exact ratios, according to Vitruvius. Because no temple can have a regular layout without symmetry and proportion. Vitruvius authored.

Vitruvius's recommendations for design symmetry and proportion in De Architecture were based on the human body. Vitruvius noted that every human is shaped in accordance with an incredibly consistent and exact ratio. An illustration. According to Vitruvius, the human face is one-tenth the height of the entire body. One-sixth of the height of the body is represented by the foot. So forth. Later, researchers found that all of nature, from swimming fish to spinning planets, shares the same ratio, phi(0), or 1.618, that Vitruvius saw in the human body. The Vitruvian "divine proportion," also known as the "golden ratio" or "divine ratio," has been referred to as both the foundation of all life and the secret language of architecture.

The golden ratio

The exquisite triangle, a nosceles triangle with the duplicated side in the golden ratio to the other side, is also referred to as a golden triangle. In the nets of several stellations of dodecahedrons and icosahedrons, golden triangles are found.

The base angles are each 72" because, as we all know, the sum of a triangle's angles is 180". A decagon or ten-sided polygon can also contain the golden triangle. By joining the centre to any two nearby vertices. Thus, a golden triangle will be formed. This is so because the internal angle is 180 (10-21/10-144 degrees), and the distance from the vertex to the centre is 144/2-72 degrees.

It is also well acknowledged that the golden triangle is the only triangle with three angles. In a 2:1:1 ratio.

What is a Kepler triangle? A Kepler's triangle is a right triangle with edge lengths that follow the geometric progression. A Kepler triangle's edge ratio, which is related to ratio, can be as close to 1: 1.272 (1618) as possible. This triangle's edges' squares are arranged in a geometric progression using the golden ratio. The Great Pyramid of Giza contains a triangle whose measurements roughly resemble a Kepler triangle.

The pyramid of Giza

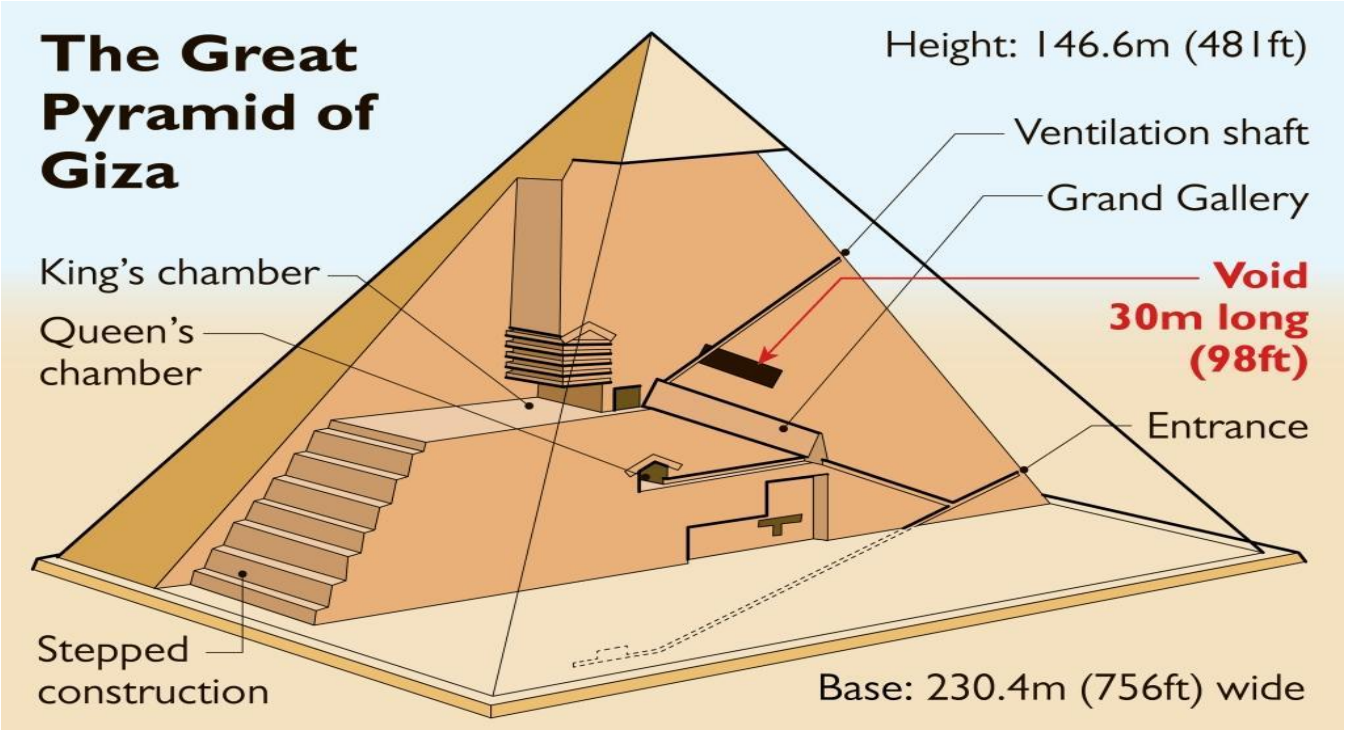
Egypt's pyramids serve as the best illustration of how well its people understood geometry. Their desire to base their human world on "cosmic order to symbolise their stability" is reflected in the pyramid. Religion and astronomy had a

close relationship with geometry. The "occult geometry system" served as the foundation for the entire architecture of the period.

The pyramid represents power, energy, and balance. It is employed by practically all retail establishments with more than three product displays, and this is not a coincidence. It's a striking shape that is utilised by more than just retail establishments, as you'll see in a moment. If you want to compare a certain product or idea against others, try using a pyramid shape. If you arrange your text in the shape of a pyramid, even if you don't have any goods to sell, you can relax knowing that people will be drawn to it. The sizes of the ancient Egyptian pyramids, which were built as tombs, have been subject to controversy. The ratio of the slant height to half the base length is 1.619, which is less than 1% off from the golden ratio, and the face angle is roughly 51-85. The utilisation of Kepler's triangle (face angle 51-49) would be implied if this was the design approach. 151] [52] The 3-4-5 triangle (face angle 53°8"), which is known from the Rhine Mathematical Papyrus (c. 1650-1550 BC), or the triangle with the base to hypotenuse ratio 1:4/% (face angle 51° 50"), are more likely the sources of the pyramids' slope.

The Great Pyramid has a base height of 230.4 metres (755.9 feet) and an original height of 146.5 metres (480.6 feet), according to estimates. Additionally, it results in a height-to-base ratio of 0.636, proving the existence of a Golden Triangle, at least to within three significant decimal places of precision. The height of a perfect golden ratio would be 146.5367 if the base is, in fact, exactly 230.4 metres. This is only 0.0367 metres (1.4 inches) or 0.025% different from the estimated true dimensions of the Great Pyramid, which may only be a measurement or rounding error.

The golden triangle pyramid would also have other intriguing characteristics. The surface area of the four sides would match the base's surface area in a perfect proportion. Each triangle side's area is equal to base x height/2, or 2 x 0/2, or The base has a surface area of 2 x 2, or 4. As a result, the ratio of four sides to the base is 4 x 0/4 or 0.



CONCLUSION

In conclusion, geometry has always been a key component of architecture, providing a framework for designing enduring, aesthetically pleasing structures. Modern architectural trends have questioned these traditions by introducing unusual shapes and compositions, while classic architectural styles continue to conform to established geometric principles. Architecture's investigation of geometry is still developing, leading to a wide range of cutting-edge designs that challenge conventional forms.

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