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Giza pyramids



This article deals with nuttery surrounding the pyramids of Giza. See [Sphinx of Giza](#) for nuttery surrounding the Sphinx.



Doo dee doo doo doo...

The **Giza pyramids** have been the cause of more extreme wingnuttery, [pseudoscience](#), [bullshit](#), and [woo](#) than any other ancient monument on the planet. They are popular focal points for theories concerning [ufology](#), the [Illuminati](#), [Atlantis](#), and certain sects of [Christianity](#). People who espouse such ideas in relation to the Giza pyramids are referred to as **pyramidiots** (similar to, but not to be confused with "[IDiots](#)").

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Historical and geographic introduction [\[edit\]](#)

The Giza Plateau is a desert plateau located west of modern day Cairo. The plateau is in fact simply the northernmost of a long string of necropolises that run along the desert

Fiction over fact Pseudohistory



How it didn't happen

- [Bible](#)
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The woo is out there UFology



Aliens did it...

- [Ed Grimsley](#)
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west of the Nile from Giza as far south as the Faiyum. This string of necropolises contains well over 100 pyramids, built between the Third Dynasty and the end of the Middle Kingdom.^[1] As such it is important to discard the implied but rarely stated assumption of these "alternate" theories that the "big three" pyramids at Giza are the only ones in Egypt.

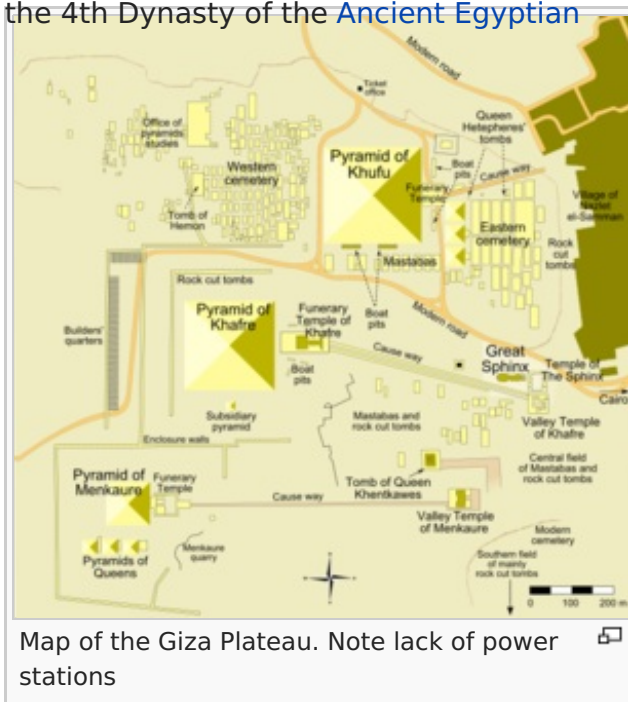
The main three pyramids on the Giza Plateau were built between c. 2470-2396 BCE over the course of 5 reigns during the 4th Dynasty of the Ancient Egyptian

- Kecksburg UFO incident
- Laura Knight Jadczyk
- Nick Redfern
- The McPherson Tape

... and ran away

- Church of Scientology
- Didit fallacy
- Hopi
- Rapa Nui
- Robert Charroux
- Zecharia Sitchin

v - t - e



Old Kingdom.^{[2][3]} The first, and also the largest, was built by Khufu (a.k.a. Cheops). Its original capstone no longer exists, so a metal frame on top now indicates its original apex. This is followed by the pyramid of Khafra (the most well known, due to its association with the Sphinx and also

being the most photogenic, retaining its smooth casing stones toward the top); and finally the smallest, which was built by Menkaure, a little distance from the others, and originally intended to utilize granite instead of limestone in its casing layer.^[3]

Each pyramid formed a self-contained complex, featuring a pyramid temple built immediately adjacent to the main structure, and a valley temple, located further away toward the river. This was linked to the pyramid by a long, elevated stone causeway that was originally roofed. In addition there were subsidiary pyramids as part of these complexes for the burial of close members of the Royal family.^[1]

Later pyramids included religious texts, inscribed within the burial chamber (the Pyramid Texts, now translated, and widely available), but this practice was only introduced in the 5th Dynasty, so is not present in any pyramid at Giza.^[1]

Orion correlation "theory" [\[edit\]](#)

The Orion Correlation Theory was first dreamed-up postulated by Robert Bauval, a professional construction [engineer with an interest in esoterica](#).^[4] In his book *The Orion Theory* (Arrow Books, 1994), he presents his Orion Correlation Theory (OCT), which, in short, centres around the idea that the Giza Pyramids were built as part of one "master plan" to map out certain key constellations on the ground (the "big three" at Giza being Orion's Belt... if viewed from the south, which the Egyptians considered "up"),^[5] and that the small shafts in Khufu's pyramid were aligned to view Orion and Sothis (Sirius).^[6] Whilst this might be stretching credibility, it only truly snaps once Bauval comes up with an "epic fix" by claiming that, as some of his alignments don't work when applied to the heavens at the time of construction, the layout of the pyramids was planned not around 2470 BCE, but in 10500 BCE, more than 8000 years earlier, or to put it another way, almost three times the length of the entire duration of the Pharaonic period, and four times the length of time between Julius Caesar and the present day.

However, the "epic fix" doesn't work.^[7] In addition to this, to keep the all-important "master plan" workable, several pyramids had to be "removed" from Bauval's calculations,^[8] as well as putting faith in the idea that the Pharaohs followed a multi-generational master plan for the necropolis (drawn up 8000 years earlier), despite that fact that very often no more than a passing effort was made to finish the burial of one's predecessor relatively quickly and easily, as evidenced by the Seneferu, Menkaure and many others.^{[9][10][3]}

It is also claimed that in this grand alignment, the Milky Way is represented by the Nile,^[11] though no effort is made to explain where the Nile flowed in 10500 BCE, despite it migrating drastically both east and west in the Giza area.^[12]

Stephen Quirke, professor of Egyptology at University College London and curator of UCL Collections Petrie Museum of Egyptian Archaeology,^[13] presents a rather more practical picture for the location of the Giza pyramids; that they lay on a good line of sight with the great temple of Ra at Heliopolis, and its Benben stone (the original obelisk).^[14] The 4th Dynasty was the beginning of the focused, consistent devotion to the solar cult that dominated the Old Kingdom from that point onward. Although not absolutely conclusive, his theory is sound, reasoned, and consistent. Quirke is also a recognized professional in his field.

Based on this, one can only conclude that OCT is nothing but pseudo-science, based on ideas which are sound (such as the religious importance of certain stars to Egyptian religion) taken to

their logical, but ultimately absurd, conclusions.

Zahi Hawass's April 2015 hissy fit [\[edit\]](#)

The very name *Robert Bauval* is a major red flag to Zahi Hawass, the disgraced former Minister of Egyptian Antiquities. Hawass accuses Bauval of having vandalized the Great Pyramid by scraping some paint off a cartouche. Although the dirty deed was actually attributed to a pair of German wood-meisters, Hawass thinks Bauval was the real instigator.

A scheduled debate between Hawass and [Graham Hancock](#) on 22 April 2015 was cut extremely short when Hancock displayed his very first slide, depicting the Orion correlation theory and Bauval himself. Hawass stormed out.^[15]

Power station "theory" [\[edit\]](#)

In a classic example of extreme wingnuttery, Christopher Dunn, a [mechanical engineer](#) with an interest in history,^[16] claims that the Egyptians used machine tools to build the Giza pyramids.

He argues how the Great Pyramid (the others don't matter) was, in fact, a massive power plant that used the magnetic poles and "vibrations" channeled through "harmonic resonators" and the dimensions of the structure to generate huge amounts of power,^{[17][18]} before being destroyed in a massive fire caused by its use of hydrogen.

Central to his argument is the supposition that the ancient Egyptians had a generally ultra-high level of technology, as evidenced by the accuracy and quality of their stonework. In support of this he points to examples of work with hard stone around the Giza pyramids and the [Serapeum](#) at Saqqara. He fails, however, to mention several key points:

- The Serapeum was constructed in the 19th Dynasty, and used through much of the Late Period, a time with ample textual and archaeological sources, rather than belonging to "prehistory" as Dunn describes the artifacts.
- There is absolutely no archaeological or textual evidence whatsoever to support the existence of these hypothetical super-technologies.
- That the effects on stone he ascribes to the use of advanced technology have been accurately reproduced through experimental archaeology using quite simple tools, and that these results have been widely published,^[19] including in the mass media.^[20]
- That the power station theory he postulates uses the internal layout of Khufu's pyramid, which is significantly different from

the others at Giza, let alone elsewhere in Egypt. What the others were for, then, is anyone's guess.

Whilst the achievements in accuracy and quality of engineering and workmanship in both the Pyramids of Giza and elsewhere in Egyptian sculpture and architecture are humbling, it was well within their capabilities as a Bronze Age civilization thanks to an efficient bureaucratic and social organisation that was able to control the quality and speed of work, availability of labour, tools, and supplies, and provide literate expertise to oversee and guide the work being done.

The theory that the Great Pyramid was some kind of machine was also postulated by author Alan Alford, in his book *Gods of the New Millennium*, although he later retracted this in the foreword to his follow-up book, *The Phoenix Solution*.

Piramids and Phiramids [\[edit\]](#)

One of most active and influential branch of pyramidology is to look for mathematical and/or physical constants in the measurement of the Great Pyramid of Giza (the GP) and to find some everywhere. Historically, most pyramidiotic theories have been focusing on π and the so-called golden ratio ϕ . These theories fall in two broad categories although nowadays they tend to be mixed together.

The slope [\[edit\]](#)

It happens that the slope of the GP is $28/22$ resulting in a square base with edges of 440 royal cubits for a height of 280 royal cubits. At the time of Khufu, it was an obvious choice for technical and historical reasons ^[21] yet, it also became a perfect bedrock for pyramidiotic theories because :

$$\frac{4}{\pi} \simeq \frac{28}{22} \simeq \sqrt{\phi}$$

This, of course, is a simple mathematical coincidence but, with basic skills in algebra and a little bit of imagination, one may easily turn it into a whole set of woo-geometrical statements. Classical examples include: "half the perimeter of the base divided by the height equals π ", "the height of the GP is the radius of the circle which circumference equals the perimeter of the base", "the apothem of each face divided by half an edge of the base equals ϕ " or "the surface of the four faces divided by the surface of the base yields ϕ ".

All of these statements are, of course, raw approximations that are valid for any pyramid built with a 28/22 slope and independent of the unit of length used. It seems like the whole thing was

“discovered” back in 1859 by a guy named John Taylor.

The meter [\[edit\]](#)

A slightly more subtle version was popularized by a guy named Charles Funck-Hellet in 1952. It happens that the royal cubit used in the GP is usually estimated to be about 52.35 cm long but, by another funny coincidence:

$$\frac{\pi}{6} \simeq 0.5236 \simeq \frac{\phi^2}{5}$$

As a result, pyramidologists stated that the royal cubit was exactly 0.5236 meters long and, starting from this, found another bunch of π and ϕ . The trick is pretty simple: one may safely assume that any measure in royal cubits that is a multiple of 6 (resp. 5) will, once converted into meters, yield a multiple of π (resp. ϕ^2).

Typical statements based on that relationship include : "the height of the pyramid in meters plus half a edge of the base in meters yields a hundred times ϕ^2 ", "the height of the pyramid in meters minus half one edge of the base in meters yields a ten times π ", "the perimeter of the King's Chamber in meters minus its width in meters yields ten times ϕ^2 ." or "the perimeter of the King's Chamber in meters yields ten times π ".

Other weird theories [\[edit\]](#)

Other theories include [aliens building the pyramids](#), often based on the idea that there is no way the Egyptian civilization was capable of designing and building such structures, and on supposed "sacred" measurements.^[22] However, Egypt had a number of different measurements, not all of which are fully known to us, thus making these "sacred" numbers meaningless. It is entirely possible to make the numbers you want, since there are so many possible units to choose from. It is also entirely plausible that the Egyptian civilization had the necessary expertise, infrastructure and motivation to build even the most impressive of those pyramids.^{[23][24]}

The Mars connection [\[edit\]](#)

The frisbee expert and self-described "civilian intelligence analyst" [Robert Morningstar](#) proposed in 1998 that the geometry of the Giza plateau mimicked the three Martian volcanoes known as *Tharsis Montes*. [See this](#). Morningstar's theory fails at first inspection, since there is no possible way the pyramid builders could have seen Tharsis, let alone mapped the volcanoes with the necessary precision.

The archaeology [\[edit\]](#)

Long before the first modern archaeological expeditions got underway, it was known that the pyramids were Old Kingdom Royal tombs; for example, [Herodotus](#) clearly recorded them as such. ^[25]

The beginning of modern study of the pyramids began with the invasion of Egypt by Napoleon. Along with his army he brought many of the best French scholars of the day to Egypt to catalogue the country, both ancient and modern, in the "Description De l'Egypte", which documented the plateau itself as well as the interior of the Great Pyramid, but did not attempt to explain what the structures were used for, concerning itself simply with mapping and drawing their architectural features. ^[26]

This study was complemented by the work of Karl Richard Lepsius under a Prussian expedition backed by King Frederick Wilhelm IV. Lepsius mapped some 67 pyramids from Giza to Dashur, and carved a hieroglyphic inscription to his King on the pyramid of Khufu, above the original entrance. ^[27]

None of these experts found any reason to contradict the classical authors' assertions that the pyramids functioned as Old Kingdom Royal tombs, though some of their more fantastical accounts of their construction have now been debunked due to more recent discoveries.

All three main pyramids contained large granite sarcophagi up until the 19th century, when Colonel Vyse removed Menkaura's sarcophagus in order to ship it to London. ^[28] Within it he found shards of a coffin from the Late Period, mostly likely the 26th Dynasty, and human remains from the Coptic period. ^[28] Sadly, the ship was lost en route. The sarcophagi of Khafra and Khufu remain in situ.

In recent decades efforts have been made to excavate the nearby town which housed the workers during the construction of the Giza pyramids. Excavation is currently ongoing, but work by Dr. Mark Lehner and others have revealed a sizable, organised settlement for accommodating the workers. ^[29]^[30] This has disproved the [bullshit](#) "theories" of space lasers and/or vast slave armies being used in pyramid construction.



Khufu's pyramid. Built by highly effective people, not [aliens](#). 🔍

In summary, there is strong evidence and widespread acceptance amongst Egyptologists for the Giza pyramids being built during the 4th Dynasty for use as Royal tombs.

See also [edit]

- [Abydos helicopter](#)
- [Ancient astronauts](#)
- [Sphinx of Giza](#)
- [Uri Geller#Scottish mysticism](#) (he purchased one of a group of islands supposedly arranged like the pyramids)

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Orion correlation theory

The **Orion correlation theory** (or Giza–Orion correlation theory)^[1] is a fringe hypothesis in alternative Egyptology.

It posits that there is a correlation between the location of the three largest pyramids of the Giza pyramid complex and Orion's Belt of the constellation Orion, and that this correlation was intended as such by the original builders of the Giza pyramid complex. The stars of Orion were associated with Osiris, the god of rebirth and afterlife by the ancient Egyptians.^{[2][3][4]} Depending on the version of the theory, additional pyramids can be included to complete the picture of the Orion constellation, and the Nile river can be included to match with the Milky Way galaxy. The theory was first published in 1989 in *Discussions in Egyptology*, volume 13. It was the subject of a bestseller, *The Orion Mystery*, in 1994,^[5] as well as a BBC documentary, *The Great Pyramid: Gateway to the Stars* (February 1994), and appears in some new-age books.^{[6][7]}

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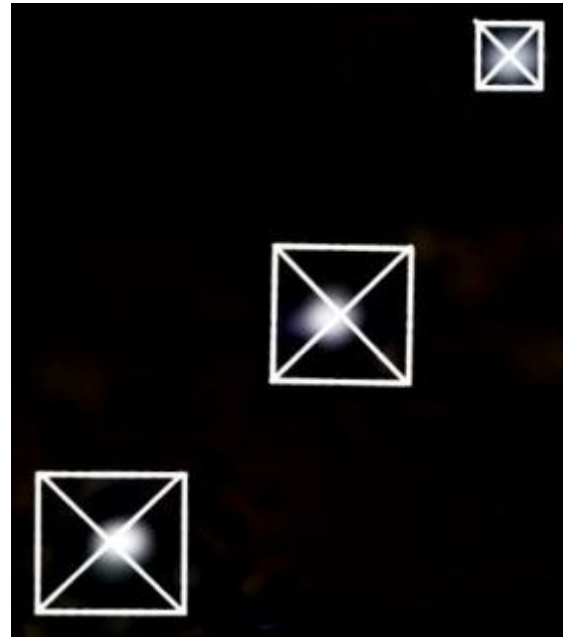
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History

The Orion correlation theory was put forward by Robert Bauval, and mentioned that Mintaka, the dimmest and most westerly of the stars making up Orion's belt, was offset slightly from the others. Bauval then made a connection between the layout of the three main stars in Orion's belt and the layout of the three main pyramids in the Giza pyramid complex. He published this idea in 1977 in the journal *Discussions in Egyptology*, volume 13. The idea has been further expounded by Bauval in collaboration with Adrian Gilbert (*The Orion Mystery*, 1994) and Graham Hancock (*Keeper of Genesis*, 1996), as well as in their separate publications. The basis of this theory concerns the proposition that the relative positions of three main Ancient Egyptian pyramids on the Giza plateau was by design correlated with the relative positions of the three stars in the constellation of Orion which make up Orion's Belt— as these stars appeared in 10,000 BC.

Their initial ideas regarding the alignment of the Giza pyramids with Orion ("...the three pyramids were a terrestrial map of the three stars of Orion's belt"— Hancock's *Fingerprints of the Gods*, 1995, p. 375) are later joined with speculation about the age of the Great Sphinx (Hancock and Bauval, *Keeper of Genesis*, published 1996, and in 1997 in the U.S. as *The Message of the Sphinx*). According to these works, the Great Sphinx was constructed c. 10,500 BC (Upper Paleolithic), and its lion-shape is maintained to be a definitive reference to the constellation of Leo. Furthermore, the orientation and dispositions of the Sphinx, the



Representation of the central tenet of the Orion Correlation Theory: the outline of the Giza pyramids superimposed over a photograph of the stars in Orion's Belt. The validity of this matching has been called into question by Hancock's critics.

Giza pyramids and the Nile River relative to one another on the ground is put forward as an accurate reflection or "map" of the constellations of Leo, Orion (specifically, Orion's Belt) and the Milky Way respectively. As Hancock puts it in 1998's *The Mars Mystery*^[8] (co-authored with Bauval):

...we have demonstrated with a substantial body of evidence that the pattern of stars that is "frozen" on the ground at Giza in the form of the three pyramids and the Sphinx represents the disposition of the constellations of Orion and Leo as they looked at the moment of sunrise on the spring equinox during the astronomical "Age of Leo" (i.e., the epoch in which the Sun was "housed" by Leo on the spring equinox.) Like all precessional ages this was a 2,160-year period. It is generally calculated to have fallen between the Gregorian calendar dates of 10,970 and 8810 BC.^[8]

The allusions to dates circa 12,500 years ago are significant to Hancock since this is the era he seeks to assign to the advanced progenitor civilization, now vanished, but which he contends through most of his works had existed and whose advanced technology influenced and shaped the development of the world's known civilizations of antiquity. Egyptology and archaeological science maintain that available evidence indicates that the Giza pyramids were constructed during the Fourth dynasty period (3rd millennium BC^[9]), while the exact date of the Great Sphinx is still unclear. Hancock does not dispute the dating evidence for the currently existing pyramids, but instead argues that they may have been an architectural evolution of sites whose origin and cultural significance dated back some eight thousand years before the current monuments were built—since the Orion correlation theory argues they are oriented that way—which, it is implied, provides further evidence for the influence of astronomical, mathematical, and historical knowledge that might not have been passed down to the pyramids' builders.

Critique

Arguments made by Hancock, Bauval, Anthony West and others concerning the significance of the proposed correlations have been critiqued.

Among these are critiques from two astronomers, Ed Krupp of Griffith Observatory in Los Angeles and Tony Fairall of the University of Cape Town, South Africa. Using planetarium equipment, Krupp and Fairall independently investigated the angle between the alignment of Orion's Belt and north during the era cited by Hancock, Bauval, et al. (which differs from the angle seen today or in the third millennium BC, because of the precession of the equinoxes). They found that the angle was somewhat different from the "perfect match" thought to exist by Bauval and Hancock in the Orion correlation theory. They estimate 47–50 degrees per the planetarium measurements, compared to the 38-degree angle formed by the pyramids.^[10]

Krupp pointed out that the slightly bent line formed by the three pyramids was deviated towards the north, whereas the slight "kink" in the line of Orion's Belt was deformed to the south, and to match them up one or the other of them had to be turned upside-down.^[11] Indeed, this is what was done in the original book by Bauval and Gilbert (*The Orion Mystery*),^[12] which compares images of the pyramids and Orion without revealing that the pyramids' map had been inverted.^[13] Krupp and Fairall find other problems with their arguments, including noting that if the Sphinx is meant to represent the constellation of Leo, then it should be on the opposite side of the Nile (the "Milky Way") from the pyramids ("Orion"),^{[10][11]} that the vernal equinox c. 10,500 BC was in Virgo and not Leo,^[10] and that in any case the constellations of the Zodiac originate from Mesopotamia and were completely unknown in Egypt until the much later Graeco-Roman era.^[13] Ed Krupp repeated this "upside down" statement in the BBC documentary *Atlantis Reborn* (1999).

Bauval stated that some astronomers including Archie Roy of the University of Glasgow have rejected Krupp's argument. Krupp presented a counterpoint to the objections, that Bauval stated had been made by the late Dr. Roy, who was a Professor Emeritus of Astronomy at Glasgow University (including the accusation that Bauval and Gilbert deliberately inverted the pyramid map).^{[13][14]}

In a ruling by the Broadcasting Standards Commission (UK), the committee ruled in favour of Robert Bauval that Krupp's statement that maps were placed upside down was "unfairly" presented in the BBC documentary *Atlantis Reborn*, without including Bauval's filmed response.^[1] Bauval and Hancock's filmed responses to Krupp's statements were included in the modified version of the documentary *Atlantis Reborn Again* shown on 14 December 2000.

Leo and the Sphinx

The Great Sphinx is a colossal statue with the face of a man and the body of a lion. Carved out of the surrounding limestone bedrock, it is 57 metres (187 ft) long, 6 metres (20 ft) wide, and has a height of 20 metres (66 ft), making it the largest single-stone statue in the world. The Great Sphinx is one of the world's largest and oldest statues, yet basic facts about it such as the real-life model for the face, when and why it was built, and by whom, are debated. These questions have collectively earned the title "Riddle of the Sphinx", a nod to its Greek namesake.

The Great Sphinx is commonly accepted by Egyptologists to represent the likeness of King Khafra (also known by the Hellenised version of his name, *Chephren*)^[15] who is often credited as the builder as well. This would place the time of construction somewhere between 2520 BC and 2494 BC. Because the limited evidence giving provenance to Khafra is ambiguous, the idea of who built the Sphinx, and when, continues to be the subject of debate. An argument put forward by Bauval and Hancock to support the Orion Correlation Theory is that the construction of the Great Sphinx was begun in 10,500 BC; that the Sphinx's lion-shape is a definitive reference to the constellation of Leo; and that the layout and orientation of the Sphinx, the Giza pyramid complex and the Nile River are an accurate reflection or "map" of the constellations of Leo, Orion (specifically, Orion's Belt) and the Milky Way, respectively.^[16]

A date of 10,500 BC is chosen because they maintain this is the only time in the precession of the equinoxes when the astrological age was Leo and when that constellation rose directly east of the Sphinx at the vernal equinox. They also suggest that in this epoch the angles between the three stars of Orion's Belt and the horizon were an "exact match" to the angles between the three main Giza pyramids. These propositions and other theories are used to support the overall belief in an advanced and ancient, but now vanished, global progenitor civilization.

The theory that the Sphinx is actually far older has received some support from geologists. Robert M. Schoch has argued that the effects of water erosion on the Sphinx and its surrounding enclosure mean that parts of the monument must originally have been carved at the latest between 7000–5000 BC.^[17] Colin Reader has suggested a date only several hundred years prior to the commonly accepted date for construction. These views have been almost universally rejected by mainstream Egyptologists who, together with a number of geologists including James Harrell, Lal Gauri, John J. Sinai, and Jayanta K. Bandyopadhyay,^{[18][19]} stand by the conventional dating for the monument. Their analyses attribute the apparently accelerated wear on the Sphinx variously to modern industrial pollution, qualitative differences between the layers of limestone in the monument itself, scouring by wind-borne sand, or temperature changes causing the stone to crack.

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External links

- "The Giza Pyramids as a Stellar Representation of Orion's Belt" (<http://robertbauval.co.uk/articles/articles/gizaorion.html>) by Robert Bauval
 - "The Orion Correlation and Air-Shaft Theories" (http://www.legon.demon.co.uk/de_33.htm) by John A.R. Legon
 - "Pyramid Marketing Schemes" (http://www.antiquityofman.com/Krupp_pyramid_marketing_schemes.html) by E. C. Krupp
 - "The Fundamental Flaws in the Orion-Giza Correlation Theory" (<https://web.archive.org/web/20110713000346/http://www.ianlawton.com/oc8.htm>) by Ian Lawton
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THE FUNDAMENTAL FLAWS IN THE ORION-GIZA CORRELATION THEORY

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Introduction

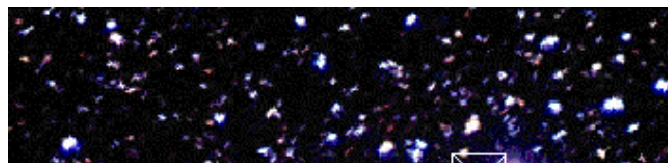
In Chapter 9 of *Giza: The Truth*, Chris Ogilvie-Herald and I laid out a full analysis of the various stellar alignment and correlation theories put forward concerning the Giza Plateau. One of the most celebrated of these is the so-called Orion Correlation Theory primarily proposed by Robert Bauval, which in its most basic form suggests that the three main Giza Pyramids were laid out to reflect the three belt stars of the Orion constellation. There are two further developments to this theory - one that there is a broader correlation between major pyramids at other sites and other stars in Orion and Taurus, and the other that certain astronomical calculations indicate that this layout reflects the position of the stars at 10,500 BC. We provide a number of arguments against these two further propositions in the book, but in essence if the basic theory of correlation is inherently flawed then these additional aspects become largely irrelevant.

I have argued in previous correspondence with Robert, reproduced on my web site, that there are two fundamental flaws to the *basic* correlation theory. The first concerns a complete mismatch between the relative sizes of the pyramids and stars. The second the compulsive evidence of extensive replanning of the Second and Third Pyramids which strongly suggests that they *could not have been constructed to a preconceived master plan*. A quick perusal of our correspondence reveals that, although he was quite happy to discuss the dating aspects of his theory with me, Robert refused to be drawn into defending his *basic* theory against these two fundamental objections.

However, because it seems that few people have yet picked up on this new aspect of the debate, and because the theory has once again come to prominence as a result of the BSC's recent decision to uphold Robert and Graham Hancock's complaints against the *Horizon* programme (specifically in relation to this theory only), I have decided to reproduce the relevant extracts from *Giza: The Truth* in this paper, and also to elaborate on certain aspects in the hope of making the logic of my case that much clearer.

The Relative Sizes of the Stars and Pyramids

In Figure 1 I have superimposed the outline of the three Giza Pyramids onto a magnified photograph of the belt stars, scaling it so that the centre points of the two larger pyramids line up on the centres of the two stars they are supposed to represent. We can immediately see that both sets of three objects are relatively equidistant, so the general scale of this localised mapping does not present a problem. We can also see that the offset of the Third Pyramid, although not completely accurate, is in the right direction and is no further off than one would expect given the fact that the ancient Egyptians did not - at least we assume - have magnification telescopes. Furthermore this offset is clearly visible with the naked eye.



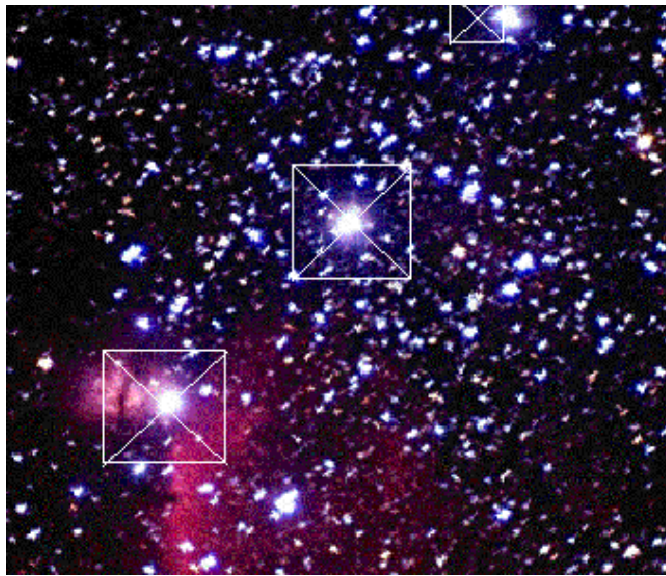


Figure 1: The Giza Pyramids Mapped onto the Belt Stars of Orion

However there *is* a problem when we come to the relative sizes. Mintaka, the uppermost star which is supposed to represent the smaller Third Pyramid, is not *noticeably* smaller than its two counterparts when viewed with the naked eye, nor even in the magnified photograph I have used in Figure 1.¹ Just to check this point I consulted the star catalogues and established the "visual magnitude" or brightness of the three stars - which is the key issue here since it correlates with observation with the naked eye and ignores the stars' distance from Earth.² Remembering that the *lower* the magnitude index the *brighter* the star, we can see from the data in the table below³ that in fact Al Nilam, the Second Pyramid equivalent, is the brightest of the three, and is more or less the same amount brighter than Al Nitak, the Great Pyramid equivalent, as the latter is than Mintaka. These figures are not easy to compare in percentage terms because a jump of one unit of magnitude produces a change in brightness of 2.5 times. However to the extent these variations are visible, they do not reveal Mintaka as substantially smaller than the other two - *and certainly not 80 per cent smaller, as the Third Pyramid's base area is compared to its two larger counterparts.*

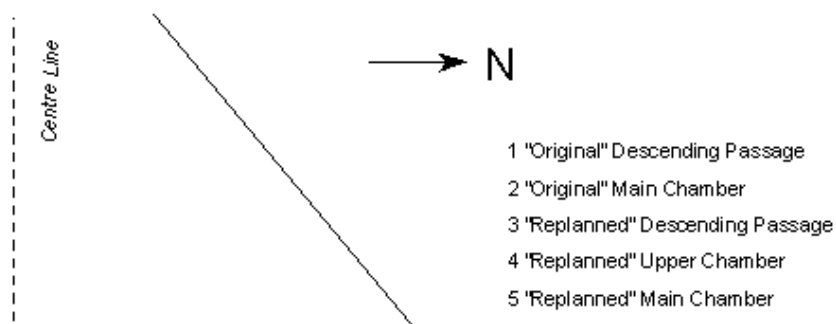
Pyramid	Star	Visual Magnitude
Great Pyramid	Al Nitak or zeta Orionis	2.05
Second Pyramid	Al Nilam or epsilon Orionis	1.70
Third Pyramid	Mintaka or delta Orionis	2.23

Whilst it is true that the undoubtedly advanced esoteric symbolism of the ancient Egyptians would not require total accuracy in the reproduction of the "above" in the "below", this is surely far too large a discrepancy to be written off to artistic licence.

The Replanning of the Pyramids

The foregoing notwithstanding, undoubtedly the *most* damning objection to the basic Orion Correlation Theory is the evidence of the replanning of the Second and Third Pyramids. (Note that although there is also considerable evidence of replanning in the Great Pyramid, none of this suggests a change to its size or position.)

If we examine the layout of the Third Pyramid first, there is highly compelling evidence of a major redesign. It has two descending passages, the "original" of which comes to a dead-end right underneath the superstructure (and, perhaps surprisingly, was found by Howard Vyse to have even been sealed with blocks), and would have led to the "original" main chamber, the floor of which would probably have been higher (see Figure 2). It would then appear that at some point the architects decided to increase the size of the edifice, and probably lowered the floor of this upper chamber to assist the "replanned" descending passage to still emerge on the outside near the base, as well as constructing a "replanned" lower chamber to act as the main burial room. In this case, rather than any possibility of wholesale repositioning, there was clearly an increase in size about the same centre point because even the redesigned chambers remained under the apex. The original planned superstructure would probably have occupied only about *one quarter* of the base area.



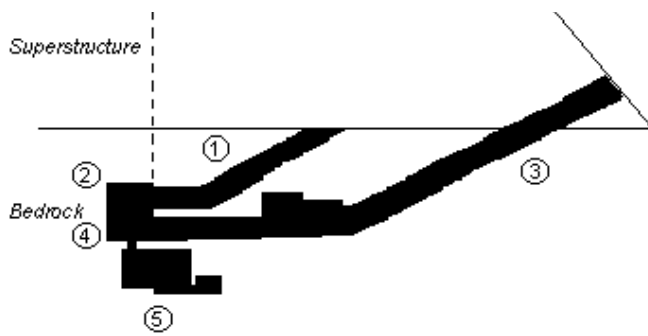


Figure 2: The Third Pyramid in Profile

This argument is certainly supported by renowned Egyptologist Professor IES Edwards, in his *The Pyramids of Egypt*.⁴

Internally, at least one and probably two changes of plan are apparent. The first design consisted of a sloping corridor of the usual kind tunnelled through the rock and leading to a rectangular burial-chamber, the longer axis of which ran from east to west. When this design was abandoned the floor of the burial-chamber was deepened and a second sloping corridor cut beneath the first. The only reason for this change of plan seems to have been a decision to enlarge the superstructure of the pyramid and the consequent necessity for constructing the corridor at a lower level in order to preserve the position of the entrance in the new north face at about the same height above the ground.

Turning now to the layout of the Second Pyramid, we find that it too has two descending passages, which although linked internally were designed primarily to lead to each of the two main chambers (see Figure 3). All the major pyramids tend to have their chambers more or less under the centre of the superstructure, and yet we can see that the "original" main chamber lies only about one sixth of the way in. With no other precedent for this arrangement, it strongly suggests that either the whole edifice was shifted a long way to the south so that the "replanned" main chamber would still lie underneath the apex, or that the size of the edifice was massively increased but with its northern perimeter remaining more or less in the same place. If this latter were the case the original planned superstructure would probably have occupied as little as about *one ninth* of the base area.

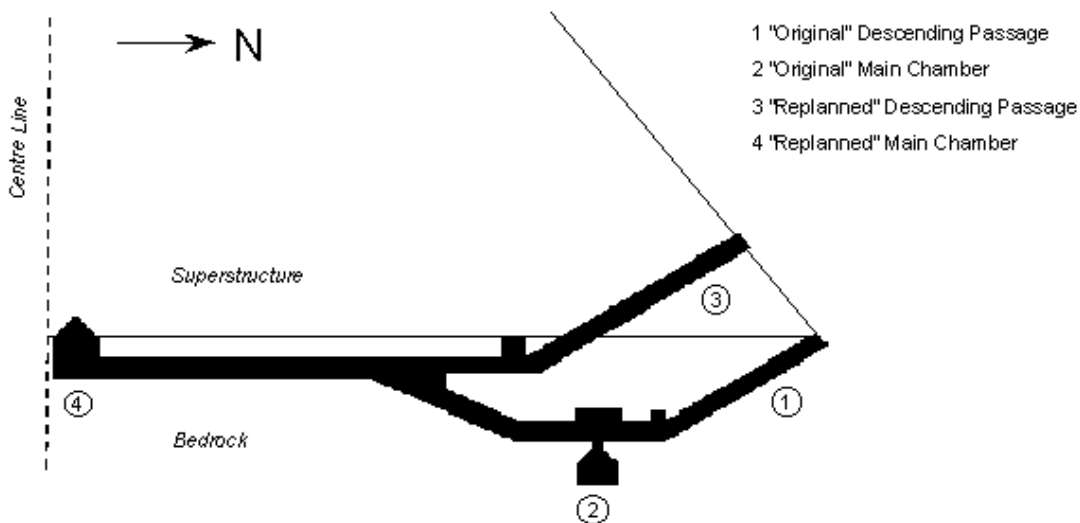


Figure 3: The Second Pyramid in Profile

There are those who suggest that the lower chamber is merely a "serdab", comparing it to the Queen's Chamber in the Great Pyramid. This could then be used to suggest there was no replan. However there is no precedent for a serdab or any other chamber lying *so* far away from the centre point of its pyramid. And even more critical to this argument is the existence of a *recess* cut into the east wall of the original passage, the layout of which I have reproduced in Figure 4. I have encountered no explanation for this in the work of Egyptologists, but of course there would be one very good reason for its existence - it was needed to manoeuvre a coffer around the corner and into the chamber. We can see from the figure that in fact this would be impossible without the recess. And we should remember that all the other chambers in the Giza Pyramids (with the exception of the Subterranean Chamber in the Great Pyramid which is a special case anyway) at least butt up to ground level so that their coffers could be placed in situ during construction without being carried down passages. This is the case with the "replanned" main chamber of the Second Pyramid. However the "original" main chamber is entirely carved from the subterranean bedrock, so the descending passage *had* to be used.



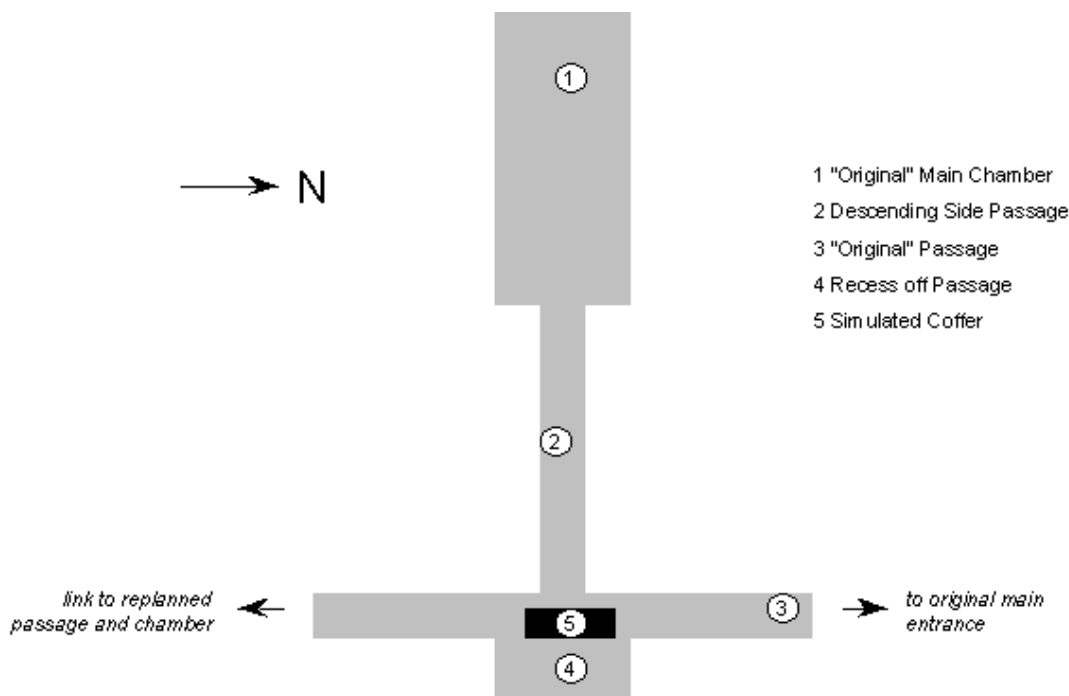


Figure 4: The Original Main Chamber in the Second Pyramid from Above

Furthermore, if we consult Edwards again, he is in little doubt.⁵

... the ["original"] chamber is situated very near the entrance to the pyramid and the entrance itself lies beyond the limits of the superstructure. In other contemporary pyramids, the tomb-chamber is located approximately beneath the apex and the entrance is situated in the northern face. If, however, it be supposed that, when the chamber and corridor were constructed, it was planned to build the pyramid some 200 feet further north, both the chamber and the entrance would have occupied their customary positions. A possible reason for the change in plan was the discovery of a suitable rock foundation for the causeway concealed beneath the sand on a line south of the one originally chosen.

He therefore supports the replanning argument for the Second Pyramid as well, although he does not consider at all the possibility that the pyramid may have originally been considerably smaller rather than just repositioned. He, like others, finds the fact that the two passage systems were internally linked something of an enigma in a replanning context, and rejects, as do I, the argument that it allowed the coffer to be transported from the lower to the upper chamber. One suggestion is that it is not impossible that there was a ventilation purpose to this linkage, as can be at least partly argued for the "well shaft" in the Great Pyramid. Whatever its purpose, I do not feel that it essentially undermines the replanning argument which, above all, is arguably the most valid explanation for the offset lower chamber once the evidence of the Third Pyramid is evinced to indicate that significant replanning was clearly *not* an unusual occurrence.

We should also consider which is the more likely scenario for the Second Pyramid - wholesale repositioning or a huge increase in size? I do not find Edwards' suggestion regarding the foundations for the causeway particularly convincing. On the other hand, there is every reason to suppose that Khafre might have started out with only limited pyramid ambitions. His predecessor, Djedefre, had forsaken the Giza Plateau to build his pyramid at Abu Roash to the north. Since this edifice was clearly unfinished, and he only ruled for eight years, it is assumed that his life ended ahead of time - indeed perhaps even deliberately terminated in a coup by Khafre himself. This all tends to suggest political mixed in with religious upheaval.⁶ Since Khafre clearly knew from his own actions that there was no guarantee that his pyramid would be completed in appropriate style by his successor, and was initially uncertain about how long he might last, there would have been every reason for him to start small and then become more ambitious once his tenure of the throne looked more secure.

As for Menkaure and the Third Pyramid, not only may he have had an even more jaundiced view of the political climate, but we know that he died even before his relatively small complex was finished. At the very least his valley temple and causeway - excavated by George Reisner in the early 1900's - were found to have been hastily completed using mud bricks, his early death from whatever cause suggesting that he was right to be generally conservative with his pyramid plans.

I have reconstructed the various possible configurations of original and replanned layouts in Figure 5. It seems inconceivable that such large-scale replanning, to the extent that the Second Pyramid was increased in base area by as much as nine times or shifted a long way south, and the Third Pyramid quadrupled in base area, *after construction had begun*, could have occurred on the Plateau if the representation of the relative size and position of Orion's belt stars was so important from the *outset* as part of a master plan. In particular, we can see that:

a) if the Second Pyramid was originally positioned considerably to the north the layout would have destroyed the 45 degree diagonal relationship between it and the Great Pyramid which is so essential to Robert Bauval's sky maps of 10,500 BC

b) if the Second Pyramid was originally significantly smaller then it would be far closer to the Great Pyramid than to the Third, thereby totally failing to replicate the relatively equidistant relationship between the three

than to the Third, thereby totally failing to replicate the relatively equidistant relationship between the three belt stars of Orion

c) when the Third Pyramid was originally planned to be much smaller, the already huge discrepancy in its size relative to that of Mintaka would have been even more exaggerated.

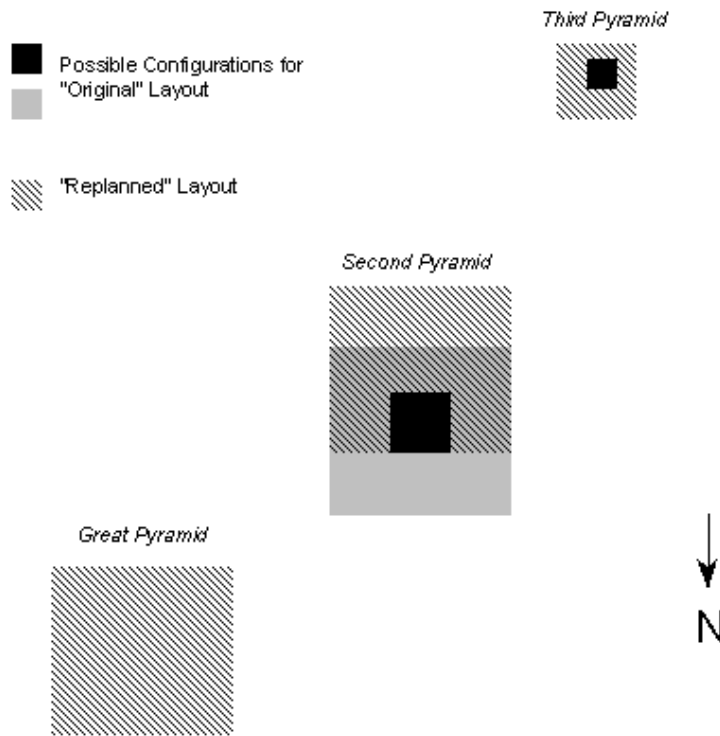


Figure 5: The Original and Replanned Layouts of the Giza Pyramids

Conclusion

I would argue that the *combination* of the relative sizing and the replanning arguments provide incontrovertible proof that the Orion-Giza Correlation Theory is fundamentally flawed. Indeed in my view the replanning argument contains a broader implication for anyone who suggests that the whole Plateau was laid out to express sacred geometric knowledge, or to act as a decodable map to locate further secrets or even the so-called Hall of Records itself. However I welcome correspondence from any supporters of these theories who can find fault with my own line of reasoning.

Notes

1 Nor is it in the photograph reproduced in Bauval and Gilbert, *The Orion Mystery*, Plate 8. Meanwhile, although I am no expert, the highly magnified shot reproduced in *ibid.*, Plate 7, appears to be distorting the relative magnitudes due to some sort of reflective “halo” effect.

2 By contrast, the “absolute magnitude” attempts to take this into account, so a larger star which was further away might have the same visual but a larger absolute magnitude. Meanwhile the “photographic magnitude” can differ again because the eye deals with the colours of the spectrum differently from a lens, and stars have different colours dependent on their temperature. However this potential distortion of photographic images as against human vision can in this case be discounted because the three belt stars have a very similar colour index—varying between minus 0.19 and minus 0.22. We should also note that in the Orion constellation only Betelgeuse has a magnitude which varies significantly over time; and further that the two outer stars are “doubles”.

3 Data taken from the *Bright Star Catalogue*.

4 Edwards, *The Pyramids of Egypt*, Ebury Press, 1972, Chapter Four, pp. 119-20.

5 *Ibid.*, Chapter Four, pp. 113-4.

6 As an example of politics, celebrated Egyptologist Selim Hassan suggests that Djedefre was Khufu’s son by a Libyan wife, and this caused succession problems (Hassan, *The Sphinx: Its History in the Light of Recent Excavations*, Cairo Government Press, 1949, p. 91, Note 1). Alternatively from a religious perspective, Djedef-re was the first Fourth Dynasty king to place significant emphasis on the re-emerging Sun-cult by adopting the title “son of *ra*”.

Giza pyramid complex

The **Giza pyramid complex**, also called the **Giza Necropolis**, is the site on the Giza Plateau in Egypt that includes the Great Pyramid of Giza, the Pyramid of Khafre, and the Pyramid of Menkaure, along with their associated pyramid complexes and the Great Sphinx of Giza. All were built during the Fourth Dynasty of the Old Kingdom of Ancient Egypt. The site also includes several cemeteries and the remains of a workers' village.

The site is at the edges of the Western Desert, approximately 9 km (5 mi) west of the Nile River in the city of Giza, and about 13 km (8 mi) southwest of the city centre of Cairo.

The Great Pyramid and the Pyramid of Khafre are the largest pyramids built in ancient Egypt, and they have historically been common as emblems of ancient Egypt in the Western imagination.^{[1][2]} They were popularised in Hellenistic times, when the Great Pyramid was listed by Antipater of Sidon as one of the Seven Wonders of the World. It is by far the oldest of the ancient Wonders and the only one still in existence.

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- East Field
- Cemetery GIS
- Central Field
- South Field
- Tombs of the pyramid builders

New Kingdom and Late Period

See also

References

The Great Pyramids of Giza



The three main pyramids at Giza, together with subsidiary pyramids and the remains of other structures



Shown within Egypt

Location	Giza City, Giza, Egypt
Region	Middle Egypt
Coordinates	29°58′34″N 31°7′58″E﻿ / ﻿29.97611°N 31.13278°E﻿ / 29.97611; 31.13278
Type	Monument
History	
Periods	Early Dynastic Period to Late Period
Site notes	
Website	
 UNESCO World Heritage Site	
Part of	"Pyramid fields from Giza to Dahshur" part of <i>Memphis and its Necropolis – the Pyramid Fields from Giza to Dahshur</i>
Includes	Great Pyramid of Giza • Pyramid of Khafre • Pyramid of Menkaure • Great

External links

Sphinx of Giza · Giza West Field · Giza East Field · Cemetery GIS · Central Field, Giza

Pyramids and Sphinx

The Pyramids of Giza consist of the Great Pyramid of Giza (also known as the Pyramid of Cheops or Khufu and constructed c. 2580 – c. 2560 BC), the somewhat smaller Pyramid of Khafre (or Chephren) a few hundred meters to the south-west, and the relatively modest-sized Pyramid of Menkaure (or Mykerinos) a few hundred meters farther south-west. The Great Sphinx lies on the east side of the complex. Current consensus among Egyptologists is that the head of the Great Sphinx is that of Khafre. Along with these major monuments are a number of smaller satellite edifices, known as "queens" pyramids, causeways and valley pyramids.^[3]

Criteria	Cultural: i, iii, vi
Reference	86-002 (http://whc.unesco.org/en/list/86-002)
Inscription	1979 (3rd Session)
Area	16,203.36 ha (62.5615 sq mi)

Khufu's pyramid complex

Khufu's pyramid complex consists of a valley temple, now buried beneath the village of Nazlet el-Samman; diabase paving and nummulitic limestone walls have been found but the site has not been excavated.^{[4][5]} The valley temple was connected to a causeway which was largely destroyed when the village was constructed. The causeway led to the Mortuary Temple of Khufu. Of this temple the basalt pavement is the only thing that remains. The mortuary temple was connected to the king's pyramid. The king's pyramid has three smaller queen's pyramids associated with it and five boat pits.^{[6]:11–19} The boat pits contained a ship, and the two pits on the south side of the pyramid still contained intact ships when excavated. One of these ships has been restored and is on display.

Khufu's pyramid still has a limited number of casing stones at its base. These casing stones were made of fine white limestone quarried from the nearby range.^[3]

Khafre's pyramid complex

Khafre's pyramid complex consists of a valley temple, the Sphinx temple, a causeway, a mortuary temple and the king's pyramid. The valley temple yielded several statues of Khafre. Several were found in a well in the floor of the temple by Mariette in 1860. Others were found during successive excavations by Sieglin (1909–10), Junker, Reisner, and Hassan. Khafre's complex contained five boat-pits and a subsidiary pyramid with a serdab.^{[6]:19–26} Khafre's pyramid appears larger than the adjacent Khufu Pyramid by virtue of its more elevated location, and the steeper angle of inclination of its construction—it is, in fact, smaller in both height and volume. Khafre's pyramid retains a prominent display of casing stones at its apex.^[3]

Menkaure's pyramid complex



Giza pyramid complex (map)



Aerial view from north of cultivated Nile valley with the pyramids in the background

Menkaure's pyramid complex consists of a valley temple, a causeway, a mortuary temple, and the king's pyramid. The valley temple once contained several statues of Menkaure. During the 5th Dynasty, a smaller ante-temple was added on to the valley temple. The mortuary temple also yielded several statues of Menkaure. The king's pyramid has three subsidiary or queen's pyramids.^{[6]:26–35} Of the four major monuments, only Menkaure's pyramid is seen today without any of its original polished limestone casing.^[3]



The Great Sphinx partially excavated, photo taken between 1867 and 1899

Sphinx

The Sphinx dates from the reign of king Khafre.^[7] During the New Kingdom, Amenhotep II dedicated a new temple to Hauron-Haremakhnet and this structure was added onto by later rulers.^{[6]:39–40}

Tomb of Queen Khentkaus I

Khentkaus I was buried in Giza. Her tomb is known as LG 100 and G 8400 and is located in the Central Field, near the valley temple of Menkaure. The pyramid complex of Queen Khentkaus includes: her pyramid, a boat pit, a valley temple and a pyramid town.^{[6]:288–289}



Pyramids of Ghizeh. 1893. Egypt; heliogravures after original views. Wilbour Library of Egyptology. Brooklyn Museum

Construction

Most construction theories are based on the idea that the pyramids were built by moving huge stones from a quarry and dragging and lifting them into place. The disagreements center on the method by which the stones were conveyed and placed and how possible the method was.

In building the pyramids, the architects might have developed their techniques over time. They would select a site on a relatively flat area of bedrock—not sand—which provided a stable foundation. After carefully surveying the site and laying down the first level of stones, they constructed the pyramids in horizontal levels, one on top of the other.

For the Great Pyramid of Giza, most of the stone for the interior seems to have been quarried immediately to the south of the construction site. The smooth exterior of the pyramid was made of a fine grade of white limestone that was quarried across the Nile. These exterior blocks had to be carefully cut, transported by river barge to Giza, and dragged up ramps to the construction site. Only a few exterior blocks remain in place at the bottom of the Great Pyramid. During the Middle Ages (5th century to 15th century), people may have taken the rest away for building projects in the city of Cairo.^[3]

To ensure that the pyramid remained symmetrical, the exterior casing stones all had to be equal in height and width. Workers might have marked all the blocks to indicate the angle of the pyramid wall and trimmed the surfaces carefully so that the blocks fit together. During construction, the outer surface of the stone was smooth limestone; excess stone has eroded as time has passed.^[3]

Purpose

The pyramids of Giza and others are thought to have been constructed to house the remains of the deceased pharaohs who ruled over Ancient Egypt.^[3] A portion of the pharaoh's spirit called his *ka* was believed to remain with his corpse. Proper care of the remains was necessary in order for the "former Pharaoh to perform his new duties as king of the dead." It's theorized the pyramid

not only served as a tomb for the pharaoh, but also as a storage pit for various items he would need in the afterlife. "The people of Ancient Egypt believed that death on Earth was the start of a journey to the next world." The embalmed body of the King was entombed underneath or within the pyramid to protect it and allow his transformation and ascension to the afterlife.^[8]

Astronomy

The sides of all three of the Giza pyramids were astronomically oriented to the north-south and east-west within a small fraction of a degree. Among recent attempts^{[9][10][11]} to explain such a clearly deliberate pattern are those of S. Haack, O. Neugebauer, K. Spence, D. Rawlins, K. Pickering, and J. Belmonte. The arrangement of the pyramids is a representation of the Orion constellation according to the disputed Orion correlation theory.

Workers' village

The work of quarrying, moving, setting, and sculpting the huge amount of stone used to build the pyramids might have been accomplished by several thousand skilled workers, unskilled laborers and supporting workers. Bakers, carpenters, water carriers, and others were also needed for the project. Along with the methods utilized to construct the pyramids, there is also wide speculation regarding the exact number of workers needed for a building project of this magnitude. When Greek historian Herodotus visited Giza in 450 BC, he was told by Egyptian priests that "the Great Pyramid had taken 400,000 men 20 years to build, working in three-month shifts 100,000 men at a time." Evidence from the tombs indicates that a workforce of 10,000 laborers working in three-month shifts took around 30 years to build a pyramid.^[3]

The Giza pyramid complex is surrounded by a large stone wall, outside which Mark Lehner and his team discovered a town where the pyramid workers were housed. The village is located to the southeast of the Khafre and Menkaure complexes. Among the discoveries at the workers' village are communal sleeping quarters, bakeries, breweries, and kitchens (with evidence showing that bread, beef, and fish were staples of the diet), a hospital and a cemetery (where some of the skeletons were found with signs of trauma associated with accidents on a building site).^[12] The workers' town appears to date from the middle 4th Dynasty (2520–2472 BC), after the accepted time of Khufu and completion of the Great Pyramid. According to Lehner and the AERA team:

"The development of this urban complex must have been quite rapid. All of the construction probably happened in the 35 to 50 years that spanned the reigns of Khafre and Menkaure, builders of the Second and Third Giza Pyramids".

Without carbon dating, using only pottery shards, seal impressions, and stratigraphy to date the site, the team further concludes;

"The picture that emerges is that of a planned settlement, some of the world's earliest urban planning, securely dated to the reigns of two Giza pyramid builders: Khafre (2520–2494 BC) and Menkaure (2490–2472 BC)".^{[13][14]}



The Giza pyramid complex at night



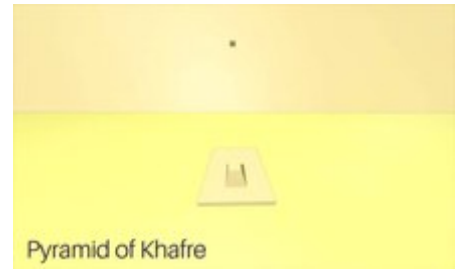
One face of the Pyramid of Khafre in Giza, showing a nearby archaeological site



Giza pyramid complex seen from above

Cemeteries

As the pyramids were constructed, the mastabas for lesser royals were constructed around them. Near the pyramid of Khufu, the main cemetery is G 7000, which lies in the East Field located to the east of the main pyramid and next to the Queen's pyramids. These cemeteries around the pyramids were arranged along streets and avenues.^[15] Cemetery G 7000 was one of the earliest and contained tombs of wives, sons and daughters of these 4th Dynasty rulers. On the other side of the pyramid in the West Field, the royals sons Wepemnofret and Hemiunu were buried in Cemetery G 1200 and Cemetery G 4000 respectively. These cemeteries were further expanded during the 5th and 6th Dynasties.^[6]



Pyramid of Khafre

[Play media](#)

3D overview of the Giza complex

West Field

The West Field is located to the west of Khufu's pyramid. It is divided into smaller areas such as the cemeteries referred to as the Abu Bakr Excavations (1949–50, 1950–1,1952 and 1953), and several cemeteries named based on the mastaba numbers such as Cemetery G 1000, Cemetery G 1100, etc. The West Field contains Cemetery G1000 – Cemetery G1600, and Cemetery G 1900. Further cemeteries in this field are: Cemeteries G 2000, G 2200, G 2500, G 3000, G 4000, and G 6000. Three other cemeteries are named after their excavators: Junker Cemetery West, Junker Cemetery East and Steindorff Cemetery.^{[6]:100–122}

Cemeteries in the West Field at Giza^{[6]:47–179}

Cemetery	Time Period	Excavation	Comments
Abu Bakr Excavations	the 5th and 6th <u>Dynasty</u>	(1949–53)	
Cemetery G 1000	the 5th and 6th Dynasty	Reisner (1903–05)	Stone built mastabas
Cemetery G 1100	the 5th and 6th Dynasty	Reisner (1903–05)	Brick built mastabas
Cemetery G 1200	Mainly 4th <u>Dynasty</u>	Reisner (1903–05)	Some members of <u>Khufu's</u> family are buried here; <u>Wepemnefert</u> (King's Son), <u>Kaem-ah</u> (King's Son), <u>Nefertiabet</u> (King's Daughter)
Cemetery G 1300	the 5th and 6th Dynasty	Reisner (1903–05)	Brick built mastabas
Cemetery G 1400	the 5th Dynasty or later	Reisner (1903–05)	Two men who were prophets of Khufu
Cemetery G 1500		Reisner (1931?)	Only one mastaba (G 1601)
Cemetery G 1600	the 5th Dynasty or later	Reisner (1931)	Two men who were prophets of Khufu
Cemetery G 1900		Reisner (1931)	Only one mastaba (G 1903)
Cemetery G 2000		the 5th and 6th Dynasty	Reisner (1905–06)
Cemetery G 2100	the 4th and 5th Dynasty and later	Reisner (1931)	G 2100 belongs to Merib, a King's (grand-)Son and G2101 belongs to a 5th Dynasty king's daughter.
Cemetery G 2200	Late 4th or early 5th Dynasty	Reisner ?	Mastaba G 2220
Cemetery G 2300	5th Dynasty and 6th Dynasty	Reisner (1911–13)	Includes mastabas of Vizier Senedjemib-Inti and his family.
Cemetery G 2400	5th Dynasty and 6th Dynasty	Reisner (1911–13)	
Cemetery G 2500		Reisner	
Cemetery G 3000	6th Dynasty	Fisher and Eckley Case Jr (1915)	
Cemetery G 4000	4th Dynasty and later	Junker and Reisner (1931)	Includes tomb of the vizier <u>Hemiuunu</u>
Cemetery G 6000	5th Dynasty	Reisner (1925–26)	
Junker Cemetery (West)	Late Old <u>Kingdom</u>	Junker (1926–27)	Includes mastaba of the dwarf <u>Seneb</u>
Steindorff	5th Dynasty	Steindorff	

Cemetery	and 6th Dynasty	(1903–07)	
Junker Cemetery (East)	Late Old Kingdom	Junker	

East Field

The East Field is located to the east of Khufu's pyramid and contains cemetery G 7000. This cemetery was a burial place for some of the family members of Khufu. The cemetery also includes mastabas from tenants and priests of the pyramids dated to the 5th Dynasty and 6th Dynasty.^{[6]:179–216}

Cemeteries G 7000 – Royalty^{[6]:179–208}

Tomb number	Owner	Comments
G 7000 X	Queen <u>Hetepheres I</u>	Mother of <u>Khufu</u>
G 7010	<u>Nefertkau I</u>	Daughter of <u>Sneferu</u> , half-sister of <u>Khufu</u>
G 7060	<u>Nefermaat I</u>	Son of <u>Nefertkau I</u> and Vizier of <u>Khafra</u>
G 7070	<u>Sneferukhaf</u>	Son of <u>Nefermaat II</u>
G 7110–7120	<u>Kawab</u> and <u>Hetepheres II</u>	<u>Kawab</u> was the eldest son of <u>Khufu</u>
G 7130–7140	<u>Khufukhaf I</u> and <u>Nefertkau II</u>	King's Son and Vizier and his wife
G 7210–7220	<u>Djedefhor</u>	King's Son of <u>Khufu</u> and <u>Meritites</u>
G 7350	<u>Hetepheres II</u>	Wife of <u>Kawab</u> and later wife of <u>Djedefre</u>
G 7410–7420	<u>Meresankh II</u> and <u>Horbaef</u>	<u>Meresankh</u> was a king's daughter and king's wife
G 7430–7440	<u>Minkhaf I</u>	Son of <u>Khufu</u> and <u>Vizier</u> of <u>Khafra</u>
G 7510	<u>Ankhhaf</u>	Son of <u>Sneferu</u> and Vizier of <u>Khafra</u>
G 7530–7540	<u>Meresankh III</u>	Daughter of <u>Kawab</u> and <u>Hetepheres II</u> , wife of <u>Khafra</u>
G 7550	<u>Duaenhor</u>	Probably son of <u>Kawab</u> and thus a grandson of <u>Khufu</u>
G 7560	<u>Akhethotep</u> and <u>Meritites II</u>	<u>Meritites</u> is a daughter of <u>Khufu</u>
G 7660	<u>Kaemsekhem</u>	Son of <u>Kawab</u> , a grandson of <u>Khufu</u> , served as Director of the Palace
G 7760	<u>Mindjedef</u>	Son of <u>Kawab</u> , a grandson of <u>Khufu</u> , served as Treasurer
G 7810	<u>Djaty</u>	Son of Queen <u>Meresankh II</u>

Cemetery GIS

This cemetery dates from the time of Menkaure (Junker) or earlier (Reisner), and contains several stone-built mastabas dating from as late as the 6th Dynasty. Tombs from the time of Menkaure include the mastabas of the royal chamberlain Khaemnefert, the King's son Khufudjedef was master of the royal largesse, and an official named Niankhre.^{[6]:216–228}

Central Field

The Central Field contains several burials of royal family members. The tombs range in date from the end of the 4th Dynasty to the 5th Dynasty or even later.^{[6]:230–293}

Central Field – Royalty^{[6]:230–293}

Tomb number	Owner	Comments
G 8172 (LG 86)	<u>Nebemakhet</u>	Son of <u>Khafre</u> , served as vizier
G 8158 (LG 87)	<u>Nikaure</u>	Son of <u>Khafre</u> and <u>Persenet</u> , served as vizier
G 8156 (LG 88)	<u>Persenet</u>	Wife of <u>Khafre</u>
G 8154 (LG 89)	<u>Sekhemkare</u>	Son of <u>Khafre</u> and <u>Hekenuhedjet</u>
G 8140	<u>Niuserre</u>	Son of <u>Khafre</u> , Vizier in the 5th Dynasty
G 8130	<u>Niankhre</u>	King's Son, probably 5th Dynasty
G 8080 (LG 92)	<u>Iunmin</u>	King's Son, end of 4th Dynasty
G 8260	<u>Babaef</u>	Son of <u>Khafre</u> , end of 4th Dynasty
G 8466	<u>Iunre</u>	Son of <u>Khafre</u> , end of 4th Dynasty
G 8464	<u>Hemetre</u>	Probably daughter of <u>Khafre</u> , end of 4th Dynasty or 5th Dynasty
G 8460	<u>Ankhmare</u>	King's son and vizier, end of 4th Dynasty
G 8530	<u>Rekhetre</u>	King's daughter (of <u>Khafre</u>) and Queen, end of 4th Dynasty or 5th Dynasty
G 8408	<u>Bunefer</u>	King's daughter and Queen, end of 4th Dynasty or 5th Dynasty
G 8978	<u>Khamernernebt</u> <u>I</u>	King's daughter and Queen, middle to end of 4th Dynasty. Also known as the Galarza Tomb

Tombs dating from the Saite and later period were found near the causeway of Khafre and the Great Sphinx. These tombs include the tomb of a commander of the army named Ahmose and his mother Queen Nakhtubasterau, who was the wife of Pharaoh Amasis II.^{[6]:289–290}

South Field

The South Field includes mastabas dating from the 1st-3rd Dynasties as well as later burials.^[16] Of the more significant of these early dynastic tombs are one referred to as "Covington's tomb", otherwise known as Mastaba T, and the large Mastaba V which contained artifacts naming the 1st Dynasty pharaoh Djet.^{[17][16]} Other tombs date from the late Old Kingdom (5th and 6th Dynasty). The south section of the field contains several tombs dating from the Saite period and later.^{[6]:294–297}

Tombs of the pyramid builders

In 1990, tombs belonging to the pyramid workers were discovered alongside the pyramids, with an additional burial site found nearby in 2009. Although not mummified, they had been buried in mud-brick tombs with beer and bread to support them in the afterlife. The tombs' proximity to the pyramids and the manner of burial supports the theory that they were paid laborers who took great pride in their work and were not slaves, as was previously thought. Evidence from the tombs indicates that a workforce of 10,000 laborers working in three-month shifts took around 30 years to build a pyramid. Most of the workers appear to have come from poor families. Specialists such as architects, masons, metalworkers and carpenters, were permanently employed by the king to fill positions that required the most skill.^{[18][19][20][21]}

New Kingdom and Late Period

During the New Kingdom, Giza was still an active site. A brick-built chapel was constructed near the Sphinx during the early 18th dynasty, probably by King Thutmose I. Amenhotep II built a temple dedicated to Hauron-Haremakhet near the Sphinx. The future pharaoh Thutmose IV visited the pyramids and the Sphinx as a prince and in a dream was told that clearing the sand from the Sphinx would be rewarded with kingship. This event is recorded in the Dream Stela, which he had installed between the Sphinx's front legs. During the early years of his reign, Thutmose IV, together with his wife Queen Nefertari, had stelae erected at Giza. Pharaoh Tutankhamun had a structure built, which is now referred to as the king's resthouse. During the 19th Dynasty, Seti I added to the temple of Hauron-Haremakhet, and his son Ramesses II erected a stela in the chapel before the Sphinx and usurped the resthouse of Tutankhamun.^{[6]:39–47}

During the 21st Dynasty, the Temple of Isis Mistress-of-the-Pyramids was reconstructed. During the 26th Dynasty, a stela made in this time mentions Khufu and his Queen Henutsen.^{[6]:18}

See also

- Egyptian pyramids
- List of archaeoastronomical sites by country
- List of Egyptian pyramids
- List of largest monoliths in the world includes section on calculating weight of megaliths
- Outline of Egypt

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External links

- [Pyramids in Giza \(https://web.archive.org/web/20060902142719/http://egypt.travel-photo.org/cairo/pyramids-in-giza.html\)](https://web.archive.org/web/20060902142719/http://egypt.travel-photo.org/cairo/pyramids-in-giza.html) Pictures of Giza Pyramids published under Creative Commons License
- [3D virtual tour explaining Houdin's theory \(http://www.3ds.com/introduction/revealed/\)](http://www.3ds.com/introduction/revealed/) (plug in needed)
- [The Giza Archives \(Gizapyramids.org\) \(http://www.gizapyramids.org\)](http://www.gizapyramids.org) Website maintained by the Museum of Fine Arts in Boston. Quote: "This website is a comprehensive resource for research on Giza. It contains photographs and other documentation from the original Harvard University - Boston Museum of Fine Arts Expedition (1904 to 1947), from recent MFA fieldwork, and from other expeditions, museums, and universities around the world."

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Orion's Belt

Orion's Belt or the **Belt of Orion**, also known as the **Three Kings** or **Three Sisters**,^[1] is an asterism in the constellation Orion. It consists of the three bright stars Alnitak, Alnilam and Mintaka.

Looking for Orion's Belt in the night sky is the easiest way to locate Orion in the sky. The stars are more or less evenly spaced in a straight line, and so can be visualized as the belt of the hunter's clothing. They are best visible in the early night sky during the Northern Winter/Southern Summer, in particular the month of January at around 9:00 pm.^[2]

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Component stars

- Alnitak
- Alnilam
- Mintaka

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See also

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Component stars

The names of the three stars come from Arabic; *Alnilam* (النظام) means "string of pearls" or is related to the word *nilam* ("sapphire"); with the spellings *Alnihan* and *Alnitam*,^[3] all three variants are evidently mistakes in transliteration or copy errors.^[4] *Mintaka* (منطقة) meanwhile has the same root as *Alnitak* (النطاق).

Alnitak

Alnitak (ζ Orionis) is a triple star system at the eastern end of Orion's belt and is 1,260 light-years from the Earth. Alnitak B is a 4th-magnitude B-type star which orbits Alnitak A every 1,500 years. The primary (Alnitak A) is itself a close binary, comprising Alnitak Aa (a blue supergiant of spectral type O9.7 Ibe and an apparent magnitude of 2.0) and Alnitak Ab (a blue dwarf of spectral type O9V and an apparent magnitude of about 4). Alnitak Aa is estimated as being up to 28 times as massive as the Sun, and to have a diameter 20 times greater. It is the brightest star of class O in the night sky.

Alnilam

Alnilam (ε Orionis) is a supergiant, approximately 2,000 light-years away from Earth and magnitude 1.70. It is the 29th-brightest star in the sky and the fourth-brightest in Orion. It is 375,000 times more luminous than the Sun.^[5] Its spectrum serves as one of the stable anchor points by which other stars are classified.



Orion's Belt and nebulosity, including the Flame Nebula (left) and Horsehead Nebula (lower left) named after a relatively small dark cloud, rotated 90° somewhat resembling a seahorse

Mintaka

Mintaka (δ Orionis) is 1,200 light-years away and shines with magnitude 2.21. Mintaka is 90,000 times more luminous than the Sun. Mintaka is a double star. The two stars orbit around each other every 5.73 days.^[6]

References in history and culture



Dunhuang Star Atlas – Orion

Richard Hinckley Allen lists many folk names for the Belt of Orion. English ones include: Jacob's Rod or Jacob's Staff; Peter's Staff; the Golden Yard-arm; The L, or Ell; The Ell and Yard; the Yard-stick, and the Yard-wand; the Ellwand; Our Lady's Wand; the Magi / the Three Kings; the Three Marys; or simply the Three Stars.^[7]

The passage "Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion?" is found in the Bible's Book of Job^[8] and Book of Amos.^[9] Tennyson's poem The Princess describes Orion's belt as:

...those three stars of the airy Giant's zone,
That glitter burnished by the frosty dark.^[10]

The three stars of the belt are known in Portugal and South America as Las Tres Marías in Spanish, and as "As Três Marias" in Portuguese.^[11] They also mark the northern night sky when the Sun is at its lowest point, and were a clear marker for ancient timekeeping. In the Philippines and Puerto Rico, they are called the Los Tres Reyes Magos.^[12] The stars start appearing in early January around the time of Epiphany, the Christian holiday commemorating the visit of the Magi to the Child Jesus.

In Finnish mythology, the Belt of Orion is called Väinämöisen vyö (Väinämöinen's Belt). The stars which appear to "hang" off the belt form an asterism called Kalevanmieikka (Kaleva's sword). In pre-Christian Scandinavia, the belt was known as Frigg's Distaff (Friggerock) or Freyja's distaff.^[13] Similarly Jacob's Staff and Peter's Staff were European biblical derived terms, as were the Three Magi, or the Three Kings. Väinämöinen's Scythe (Kalevala) and Kalevan Sword are terms from Finnish mythology.^[14]

The Seri people of northwestern Mexico call the three belt stars Hapj (a name denoting a hunter) which consists of three stars: Hap (mule deer), Haamoja (pronghorn), and Mojet (bighorn sheep). Hap is in the middle and has been shot by the hunter; its blood has dripped onto Tiburón Island.^[15]

In the film Men in Black (1997) the protagonists look for "the galaxy", a massive energy source which according to an alien "is on Orion's Belt". The celestial Orion's Belt is searched but no galaxy is found there. Eventually they understand that the galaxy is hidden in a jewel on the neck of the alien's cat, named Orion.



In this broader view, the belt (the three stars in the center) is seen in relation to nearby features in the Orion constellation.

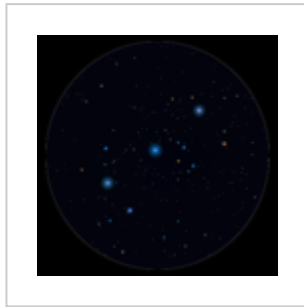


Orion's belt at top left, Orion's sword at bottom right

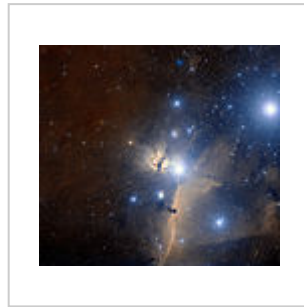
Gallery



Map of Orion



Simulated image of Orion's Belt



The region of Alnitak and Alnilam (upper right) and the Flame Nebula

See also

- Orion's Sword
- Thornborough Henges
- Orion Correlation Theory

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Orion (constellation)

Orion is a prominent constellation located on the celestial equator and visible throughout the world. It is one of the most conspicuous^[1] and recognizable constellations in the night sky.^[2] It was named after Orion, a hunter in Greek mythology. Its brightest stars are the supergiants: blue-white Rigel (Beta Orionis) and red Betelgeuse (Alpha Orionis).

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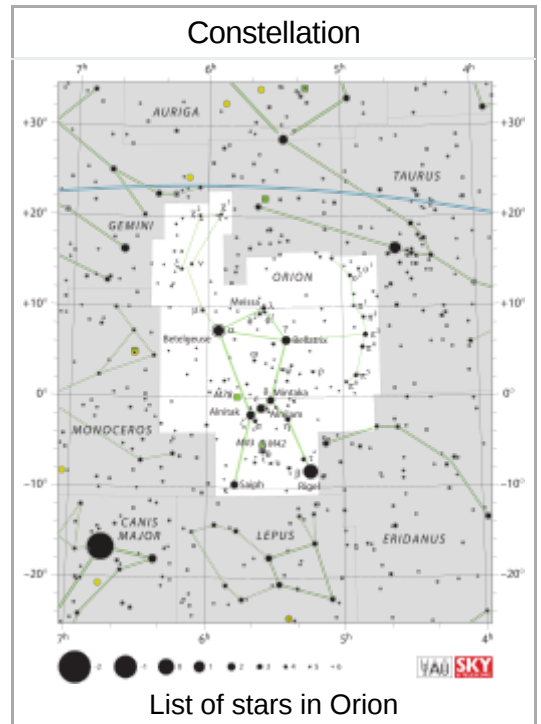
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History and mythology

Orion



Abbreviation	Ori
Genitive	Orionis
Pronunciation	/ɒˈraɪ.ən/
Symbolism	Orion, the Hunter
Right ascension	5 ^h
Declination	+5°
Quadrant	NQ1
Area	594 sq. deg. (26th)
Main stars	7
Bayer/Flamsteed stars	81
Stars with planets	10
Stars brighter than 3.00^m	8
Stars within 10.00 pc (32.62 ly)	8
Brightest star	Rigel (β Ori) (0.12 ^m)

The earliest depiction linked to the constellation of Orion is a prehistoric (Aurignacian) mammoth ivory carving found in a cave in the Ach valley in West Germany in 1979. Archaeologists estimate that it was fashioned approximately 32,000 to 38,000 years ago.^{[3][4][5]} The distinctive pattern of Orion is recognized in numerous cultures around the world, and many myths are associated with it. Orion is used as a symbol in the modern world.

Ancient Near East

The Babylonian star catalogues of the Late Bronze Age name Orion *MULSIPA.ZI.AN.NA*,^[note 1] "The Heavenly Shepherd" or "True Shepherd of Anu" – Anu being the chief god of the heavenly realms.^[6] The Babylonian constellation is sacred to Papshukal and Ninshubur, both minor gods fulfilling the role of 'messenger to the gods'. Papshukal is closely associated with the figure of a walking bird on Babylonian boundary stones, and on the star map the figure of the Rooster is located below and behind the figure of the True Shepherd—both constellations represent the herald of the gods, in his bird and human forms respectively.^[7]

In ancient Egypt, the stars of Orion were regarded as a god, called Sah. Because Orion rises before Sirius, the star whose heliacal rising was the basis for the Solar Egyptian calendar, Sah was closely linked with Sopdet, the goddess who personified Sirius. The god Sopdu is said to be the son of Sah and Sopdet. Sah is syncretized with Osiris, while Sopdet is syncretized with Osiris' mythological wife, Isis. In the Pyramid Texts, from the 24th and 23rd centuries BC, Sah is one of many gods whose form the dead pharaoh is

said to take in the afterlife.^[8]



Star formation in the constellation Orion as photographed in infrared by NASA's Spitzer Space Telescope

The Armenians identified their legendary patriarch and founder Hayk with Orion. *Hayk* is also the name of the Orion constellation in the Armenian translation of the Bible.^[9]

The Bible mentions Orion three times, naming it "Kisil" (כִּסִּיל, literally – fool). Though, this name perhaps is etymologically connected with "Kislev", the name for the ninth month of the Hebrew calendar (i.e. November–December), which, in turn, may derive from the Hebrew root

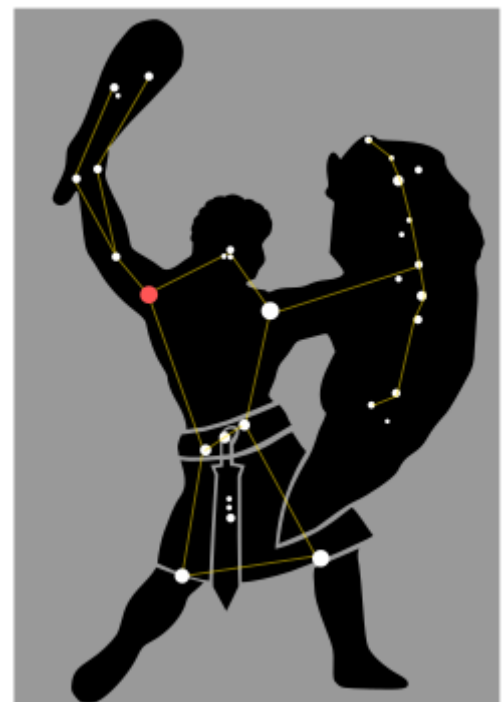
Messier objects	3
Meteor showers	Orionids Chi Orionids
Bordering constellations	Gemini Taurus Eridanus Lepus Monoceros

Visible at latitudes between +85° and −75°.

Best visible at 21:00 (9 p.m.) during the month of January.



[Click on to see large image](#)



Orion (constellation) Art

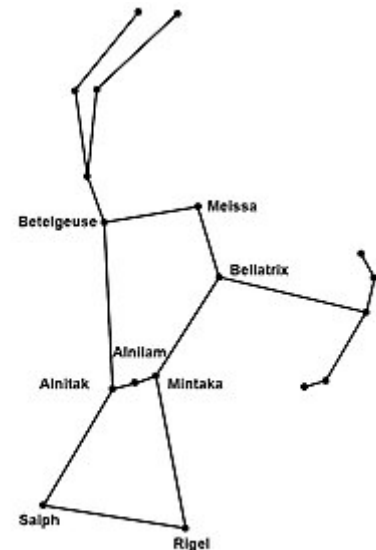
K-S-L as in the words "kesel, kislā" (כֶּסֶל, כִּסְלָה, hope, positiveness), i.e. hope for winter rains.: Job 9:9 ("He is the maker of the Bear and Orion"), Job 38:31 ("Can you loosen Orion's belt?"), and Amos 5:8 ("He who made the Pleiades and Orion").

In ancient Aram, the constellation was known as *N^ephîlā'*, the Nephilim are said to be Orion's descendants.^[10]

Greco-Roman antiquity

Orion's current name derives from Greek mythology, in which Orion was a gigantic, supernaturally strong hunter of ancient times,^[11] born to Euryale, a Gorgon, and Poseidon (Neptune), god of the sea in the Graeco-Roman tradition. One myth recounts Gaia's rage at Orion, who dared to say that he would kill every animal on the planet. The angry goddess tried to dispatch Orion with a scorpion. This is given as the reason that the constellations of Scorpius and Orion are never in the sky at the same time. However, Ophiuchus, the Serpent Bearer, revived Orion with an antidote. This is said to be the reason that the constellation of Ophiuchus stands midway between the Scorpion and the Hunter in the sky.^[12]

The constellation is mentioned in Horace's Odes (Ode 3.27.18), Homer's Odyssey (Book 5, line 283) and Iliad, and Virgil's Aeneid (Book 1, line 535)



Major stars in Orion constellation (connected and labelled)

Middle East

In medieval Muslim astronomy, Orion was known as *al-jabbar*, "the giant".^[13] Orion's sixth brightest star, Saiph, is named from the Arabic, *saif al-jabbar*, meaning "sword of the giant".^[14]

Asian antiquity

In China, Orion was one of the 28 lunar mansions *Sieu* (*Xiu*) (宿). It is known as Shen (參), literally meaning "three", for the stars of Orion's Belt. (See Chinese constellations)

The Chinese character 參 (pinyin shēn) originally meant the constellation Orion (Chinese: 參宿; pinyin: shēnxiù); its Shang dynasty version, over three millennia old, contains at the top a representation of the three stars of Orion's belt atop a man's head (the bottom portion representing the sound of the word was added later).^[15]

The Rig Veda refers to the Orion Constellation as **Mriga** (The Deer).^[16] It is said that two bright stars in the front and two bright stars in the rear are *The hunting dogs*, the one comparatively less bright star in the middle and ahead of two front dogs is *The hunter* and three aligned bright stars are in the middle of all four hunting dogs is *The Deer* (The Mriga) and three little aligned but less brighter stars is *The Baby Deer*. The Mriga means Deer, locally known as *Harnu* in folk parlance. There are many folk songs narrating the *Harnu*. The Malay called Orion's Belt *Bintang Tiga Beradik* (the "Three Brother Star").

In India, Nataraja 'the cosmic dancer' (an avatar of Shiva) is seen in the constellation called Orion.^[17]

European folklore

In old Hungarian tradition, "Orion" is known as (magic) Archer (*Íjász*), or Reaper (*Kaszás*). In recently rediscovered myths, he is called Nimrod (Hungarian "Nimród"), the greatest hunter, father of the twins "Hunor" and "Magor". The "π" and "o" stars (on upper right) form together the reflex bow or the lifted scythe. In other Hungarian traditions, "Orion's belt" is known as "Judge's

stick" (*Bírópálca*).^[18]

In Scandinavian tradition, "Orion's belt" was known as Frigg's Distaff (*friggerock*) or Freyja's distaff.^[19]

The Finns call Orion's belt and the stars below it Väinämöisen viikate (Väinämöinen's scythe).^[20] Another name for the asterism of Alnilam, Alnitak and Mintaka is Väinämöisen vyö (Väinämöinen's Belt) and the stars "hanging" from the belt as Kalevanmieikka (Kaleva's sword).

In Siberia, the Chukchi people see Orion as a hunter; an arrow he has shot is represented by Aldebaran (Alpha Tauri), with the same figure as other Western depictions.^[21]

Americas

The Seri people of northwestern Mexico call the three stars in the belt of Orion *Hapj* (a name denoting a hunter) which consists of three stars: *Hap* (mule deer), *Haamoja* (pronghorn), and *Mojet* (bighorn sheep). *Hap* is in the middle and has been shot by the hunter; its blood has dripped onto Tiburón Island.^[22]

The same three stars are known in Spain and most of Latin America as "Las tres Marías" (Spanish for "The Three Marys"). In Puerto Rico, the three stars are known as the "Los Tres Reyes Magos" (Spanish for The three Wise Men).^[23]

The Ojibwa (Chippewa) Native Americans call this constellation Kabibona'kan, the Winter Maker, as its presence in the night sky heralds winter.

To the Lakota Native Americans, Tayamnicankhu (Orion's Belt) is the spine of a bison. The great rectangle of Orion are the bison's ribs; the Pleiades star cluster in nearby Taurus is the bison's head; and Sirius in Canis Major, known as Tayamnisinte, is its tail. Another Lakota myth mentions that the bottom half of Orion, the Constellation of the Hand, represented the arm of a chief that was ripped off by the Thunder People as a punishment from the gods for his selfishness. His daughter offered to marry the person who can retrieve his arm from the sky, so the young warrior Fallen Star (whose father was a star and whose mother was human) returned his arm and married his daughter, symbolizing harmony between the gods and humanity with the help of the younger generation. The index finger is represented by Rigel; the Orion Nebula is the thumb; the Belt of Orion is the wrist; and the star Beta Eridani is the pinky finger.^[24]

Polynesian

The seven primary stars of Orion make up the Polynesian constellation Heiheionakeiki which represents a child's string figure similar to a cat's cradle.

Contemporary symbolism

The imagery of the belt and sword has found its way into popular western culture, for example in the form of the shoulder insignia of the 27th Infantry Division of the United States Army during both World Wars, probably owing to a pun on the name of the division's first commander, Major General John F. O'Ryan.

The film distribution company Orion Pictures used the constellation as its logo.^[25]

In fiction



Constellation Orion as it can be seen by the naked eye

In J. R. R. Tolkien's mythology surrounding Middle-earth, Orion is known as *Menelvagor*, which is Sindarin for "The Swordsman of the Sky".^[26]

In Star Trek, Orion is famous for its green Orion slave girls.

In the movie *Blade Runner*, the dying replicant Roy Batty introspectively delivers his "Tears in Rain" soliloquy: "I've seen things you people wouldn't believe. Attack ships on fire off the shoulder of Orion. I watched C-beams glitter in the dark near the Tannhäuser Gate. All those moments will be lost in time, like tears in rain. Time to die."

In the sci-fi comedy *Men In Black*, the last words of a dying alien disguised as a human were 'To prevent war, the Galaxy is on Orion's belt'. It was later revealed that 'Orion's belt' referred to the collar of a cat named 'Orion'.

In the sci-fi television series *Haven*, the Orionid meteor shower is known as the *Hunter Meteor Shower*. It comes to Haven once every twenty-seven years when the Barn, a space between two worlds, comes to take the mysterious woman away. When the Barn leaves, the Hunter passes safely overhead and The Troubles end, making the town of Haven a haven for the Troubled again.

Depictions



Orion in the 9th century Leiden Aratea

In artistic renderings, the surrounding constellations are sometimes related to Orion: he is depicted standing next to the river Eridanus with his two hunting dogs Canis Major and Canis Minor, fighting Taurus. He is sometimes depicted hunting Lepus the hare. He sometimes is depicted to have a lion's hide in his hand.

There are alternative ways to visualise Orion. From the Southern Hemisphere, Orion is oriented south-upward, and the belt and sword are sometimes called the saucepan or pot in Australia and New Zealand. Orion's Belt is called *Drie Konings* (Three Kings) or the *Drie Susters* (Three Sisters) by Afrikaans speakers in South Africa^[27] and are referred to as *les Trois Rois* (the Three Kings) in Daudet's *Lettres de Mon Moulin* (1866). The appellation *Driekoningen* (the Three Kings) is also often found in 17th- and 18th-century Dutch star charts and seaman's guides. The same three stars are known in Spain, Latin America, and the Philippines as "Las Tres Marías" (The Three Marys), and as "Los Tres Reyes Magos" (The three Wise Men) in Puerto Rico.^[23]

Even traditional depictions of Orion have varied greatly. Cicero drew Orion in a similar fashion to the modern depiction. The Hunter held an unidentified animal skin aloft in his right hand; his hand was represented by Omicron² Orionis and the skin was represented by the 5 stars designated Pi Orionis. Kappa and Beta Orionis represented his left and right knees, while Eta and Lambda Leporis were his left and right feet, respectively. As in the modern depiction, Delta, Epsilon, and Zeta represented his belt. His left shoulder was represented by Alpha Orionis, and Mu Orionis made up his left arm. Lambda Orionis was his head and Gamma, his right shoulder. The depiction of Hyginus was similar to that of Cicero, though the two differed in a few important areas. Cicero's animal skin became Hyginus's shield (Omicron and Pi Orionis), and instead of an arm marked out by Mu Orionis, he holds a club (Chi Orionis). His right leg is represented by Theta Orionis and his left leg is represented by Lambda, Mu, and Epsilon Leporis. Further Western European and Arabic depictions have followed these two models.^[21]

Characteristics

Orion is bordered by Taurus to the northwest, Eridanus to the southwest, Lepus to the south, Monoceros to the east, and Gemini to the northeast. Covering 594 square degrees, Orion ranks twenty-sixth of the 88 constellations in size. The constellation boundaries, as set by Eugène Delporte in 1930, are defined by a polygon of 26 sides. In the equatorial coordinate system, the right

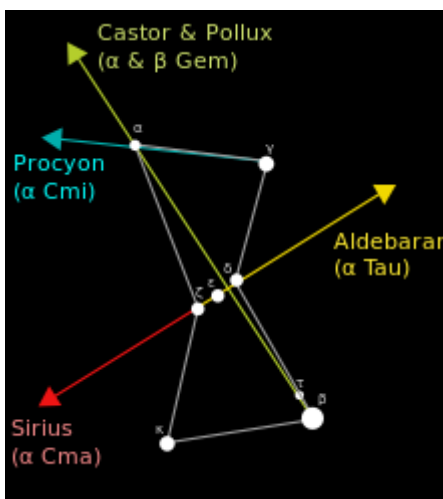
ascension coordinates of these borders lie between $04^{\text{h}} 43.3^{\text{m}}$ and $06^{\text{h}} 25.5^{\text{m}}$, while the declination coordinates are between 22.87° and -10.97° .^[28] The constellation's three-letter abbreviation, as adopted by the International Astronomical Union in 1922, is "Ori".^[29]

Orion is most visible in the evening sky from January to March,^[30] winter in the Northern Hemisphere, and summer in the Southern Hemisphere. In the tropics (less than about 8° from the equator), the constellation transits at the zenith.

In the period May–July (summer in the Northern Hemisphere, winter in the Southern Hemisphere), Orion is in the daytime sky and thus not visible at most latitudes. However, for much of Antarctica in the Southern Hemisphere's winter months, the Sun is below the horizon even at midday. Stars (and thus Orion) are then visible at twilight for a few hours around local noon, low in the North. At the same time of day at the South Pole itself (Amundsen–Scott South Pole Station), Rigel is only 8° above the horizon, and the Belt sweeps just along it. In the Southern Hemisphere's summer months, when Orion is normally visible in the night sky, the constellation is actually not visible in Antarctica because the sun does not set at that time of year south of the Antarctic Circle.^{[31][32]}

In countries close to the equator (e.g. Kenya, Indonesia, Colombia, Ecuador), Orion appears overhead in December around midnight and in the February evening sky.

Navigational aid



Using Orion to find stars in neighbor constellations

Orion is very useful as an aid to locating other stars. By extending the line of the Belt southeastward, Sirius (α CMa) can be found; northwestward, Aldebaran (α Tau). A line eastward across the two shoulders indicates the direction of Procyon (α CMi). A line from Rigel through Betelgeuse points to Castor and Pollux (α Gem and β Gem). Additionally, Rigel is part of the Winter Circle asterism. Sirius and Procyon, which may be located from Orion by following imaginary lines (see map), also are points in both the Winter Triangle and the Circle.^[33]

Features

Orion's seven brightest stars form a distinctive hourglass-shaped asterism, or pattern, in the night sky. Four stars—Rigel, Betelgeuse, Bellatrix and Saiph—form a large roughly rectangular shape, in the centre of which lie the three stars of



Orion as depicted in *Urania's Mirror*, a set of constellation cards published in London c.1825

Orion's Belt—Alnitak, Alnilam and Mintaka. Descending from the 'belt' is a smaller line of three stars, Orion's Sword (the middle of which is in fact not a star but the Orion Nebula), also known as the hunter's sword.

Many of the stars are luminous hot blue supergiants, with the stars of the belt and sword forming the Orion OB1 Association. Standing out by its red hue, Betelgeuse may nevertheless be a runaway member of the same group.

Stars

- Betelgeuse, alternatively by its Bayer designation Alpha Orionis, is a massive M-type red supergiant star nearing the end of its life. When it explodes it will even be visible during the day. It is the second brightest star in Orion, and is a semiregular variable star.^[34] It serves as the "right shoulder" of the hunter it represents (assuming that he is facing the observer), and is the eighth brightest star in the night sky.^[35]
- Rigel, also known as Beta Orionis, is a B-type blue supergiant that is the sixth brightest star in the night sky. Similar to Betelgeuse, Rigel is fusing heavy elements in its core and will pass its supergiant stage soon (on an astronomical timescale), either collapsing in the case of a supernova or shedding its outer layers and turning into a white dwarf. It serves as the left foot of Orion, the hunter.^[36]
- Bellatrix was designated Gamma Orionis by Johann Bayer, but is known colloquially as the "Amazon Star". It is the twenty-seventh brightest star in the night sky.^[37] Bellatrix is considered a B-type blue giant, though it is too small to explode in a supernova. Bellatrix's luminosity is derived from its high temperature rather than its radius,^[38] a factor that defines Betelgeuse.^[34] Bellatrix serves as Orion's left shoulder.^[38]
- Mintaka garnered the name Delta Orionis from Bayer, even though it is the faintest of the three stars in Orion's Belt.^[39] Its name means "the belt".^[33] It is a multiple star system, composed of a large B-type blue giant and a more massive O-type main-sequence star. The Mintaka system constitutes an eclipsing binary variable star, where the eclipse of one star over the other creates a dip in brightness. Mintaka is the westernmost of the three stars of Orion's Belt,^[39] as well as the northernmost.^[33]
- Alnilam is designated Epsilon Orionis, a consequence of Bayer's wish to name the three stars in Orion's Belt (from north to south) in alphabetical order.^[40] Also called Al Nathin, Alnilam is named for the Arabic phrase meaning "string of pearls".^[33] Alnilam is a B-type blue supergiant; despite being nearly twice as far from the Sun as Mintaka and Alnitak, the other two belt stars, its luminosity makes it nearly equal in magnitude. Alnilam is losing mass quickly, a consequence of its size; it is approximately four million years old.^[40]
- Alnitak, meaning "the girdle",^[33] was designated Zeta Orionis by Bayer, and is the easternmost star in Orion's Belt. It is a triple star some 800 light years distant, with the primary star being a hot blue supergiant and the brightest class O star in the night sky.
- Saiph was designated Kappa Orionis by Bayer, and serves as Orion's right foot. It is of a similar distance and size to Rigel, but appears much fainter, as its hot surface temperature (46,000 °F / 26,000 °C) causes it to emit most of its light in the ultraviolet region of the spectrum.



Orion constellation map.

Of the lesser stars, Meissa (or Lambda Orionis) forms Orion's head, whilst Hatsya (or Iota Orionis) forms the tip of Orion's sword. Iota Orionis is also called Nair al-Saif, Arabic for "the brightest in the sword".^[33]

Proper name	Apparent magnitude	Approx. distance (Light years)	Radius (R_{\odot})
<u>Betelgeuse</u>	0.0–1.3	643	887
<u>Rigel</u>	0.05–0.18	860	78.9
<u>Bellatrix</u>	1.659–1.64	250	5.75
<u>Mintaka</u>	2.23 (3.2/3.3)	1,200	16.5
<u>Alnilam</u>	1.64–1.74	2,000	42
<u>Alnitak</u>	1.77 (2.08/4.28/4.01)	1,260	20
<u>Saiph</u>	2.09	650	22.2

Belt

Orion's Belt or The Belt of Orion is an asterism within the constellation. It consists of the three bright stars Zeta (Alnitak), Epsilon (Alnilam), and Delta (Mintaka). Alnitak is around 800 light years away from earth and is 100,000 times more luminous than the Sun; much of its radiation is in the ultraviolet range, which the human eye cannot see.^[41] Alnilam is approximately 1340

light years away from Earth, shines with magnitude 1.70, and with ultraviolet light is 375,000 times more luminous than the Sun.^[40] Mintaka is 915 light years away and shines with magnitude 2.21. It is 90,000 times more luminous than the Sun and is a double star: the two orbit each other every 5.73 days.^[39] In the Northern Hemisphere, Orion's Belt is best visible in the night sky during the month of January around 9:00 pm, when it is approximately around the local meridian.^[2]

Just southwest of Alnitak lies Sigma Orionis, a multiple star system composed of five stars that have a combined apparent magnitude of 3.7 and lying 1150 light years distant. Southwest of Mintaka lies the quadruple star Eta Orionis.

Sword

Orion's Sword contains the Orion Nebula, the Messier 43 nebula, the Running Man Nebula, and the stars Theta Orionis, Iota Orionis, and 42 Orionis.

Head

Three stars comprise a small triangle that marks the head. The apex is marked by Meissa (Lambda Orionis), a hot blue giant of spectral type O8 III and apparent magnitude 3.54, which lies some 1100 light years distant. Phi-1 and Phi-2 Orionis make up the base. Also nearby is the very young star FU Orionis.

Club

Stretching north from Betelgeuse are the stars that make up Orion's club. Mu Orionis marks the elbow, Nu and Xi mark the handle of the club, and Chi¹ and Chi² mark the end of the club. Just east of Chi¹ is the Mira-type variable red giant U Orionis.

Shield

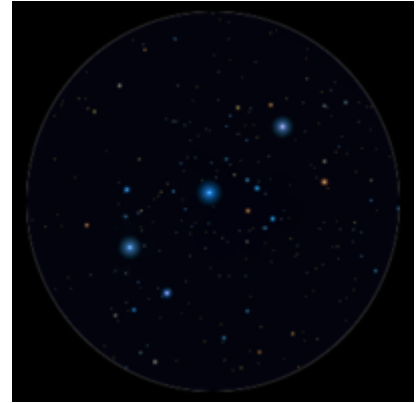
West from Bellatrix lie six stars all designated Pi Orionis (π^1 Ori, π^2 Ori, π^3 Ori, π^4 Ori, π^5 Ori and π^6 Ori) which make up Orion's shield.

Meteor showers

Around 20 October each year the Orionid meteor shower (Orionids) reaches its peak. Coming from the border with the constellation Gemini as many as 20 meteors per hour can be seen. The shower's parent body is Halley's Comet.^[42]

Deep-sky objects

Hanging from Orion's belt is his sword, consisting of the multiple stars $\theta 1$ and $\theta 2$ Orionis, called the Trapezium and the Orion Nebula (M42). This is a spectacular object that can be clearly identified with the naked eye as something other than a star. Using binoculars, its clouds of nascent stars, luminous gas, and dust can be observed. The Trapezium cluster has many newborn stars, including several brown dwarfs, all of which are at an approximate distance of 1,500 light-years. Named for the four bright stars that form a trapezoid, it is largely illuminated by the brightest stars, which are only a few hundred thousand years old. Observations by the Chandra X-ray Observatory show both the extreme temperatures of the main stars—up to 60,000 kelvins—and the star forming regions still extant in the surrounding nebula.^[43]



Orion's Belt



Closeup Image of Orion's Belt

M78 (NGC 2068) is a nebula in Orion. With an overall magnitude of 8.0, it is significantly dimmer than the Great Orion Nebula that lies to its south; however, it is at approximately the same distance, at 1600 light-years from Earth. It can easily be mistaken for a comet in the eyepiece of a telescope. M78 is associated with the variable star V351 Orionis, whose magnitude changes are visible in very short periods of time.^[44] Another fairly bright nebula in Orion is NGC 1999, also close to the Great Orion Nebula. It has an integrated magnitude of 10.5 and is 1500 light-years from Earth. The variable star V380 Orionis is embedded in NGC 1999.^[45]



This view brings out many fainter features, such as Barnard's Loop.

Another famous nebula is IC 434, the Horsehead Nebula, near ζ Orionis. It contains a dark dust cloud whose shape gives the nebula its name.

NGC 2174 is an emission nebula located 6400 light-years from Earth.

Besides these nebulae, surveying Orion with a small telescope will reveal a wealth of interesting deep-sky objects, including M43, M78, as well as multiple stars including Iota Orionis and Sigma Orionis. A larger telescope may reveal objects such as Barnard's Loop and the Flame Nebula (NGC 2024), as well as fainter and tighter multiple stars and nebulae.

All of these nebulae are part of the larger Orion Molecular Cloud Complex, which is located approximately 1,500 light-years away and is hundreds of light-years across. It is one of the most intense regions of stellar formation visible within our galaxy.

Future

Orion is located on the celestial equator, but it will not always be so located due to the effects of precession of the Earth's axis. Orion lies well south of the ecliptic, and it only happens to lie on the celestial equator because the point on the ecliptic that corresponds to the June solstice is close to the border of Gemini and Taurus, to the north of Orion. Precession will eventually carry Orion further south, and by AD 14000 Orion will be far enough south that it will become invisible from the latitude of Great Britain.^[46]

Further in the future, Orion's stars will gradually move away from the constellation due to proper motion. However, Orion's brightest stars all lie at a large distance from the Earth on an astronomical scale—much farther away than Sirius, for example. Orion will still be recognizable long after most of the other constellations—composed of relatively nearby stars—have distorted into new configurations, with the exception of a few of its stars eventually exploding as supernovae, for example Betelgeuse, which is predicted to explode sometime in the next million years.^[47]



Animation showing Orion's proper motion from 50000 BC to 50000 AD. As you can see, π^3 Orionis moves the most rapidly.

See also

- EURion constellation
- Orvandil
- Urania
- Orion Nebula in fiction
- Orion correlation theory
- Hubble 3D (2010), an IMAX film with an elaborate CGI "fly-through" of the Orion Nebula

References

Explanatory notes

1. The determiner glyph for "constellation" or "star" in these lists is **MUL** (𐎢𐎣). See Babylonian star catalogues.

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External links

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- [Melbourne Planetarium: Orion Sky Tour](https://web.archive.org/web/20080730024847/http://museumvictoria.com.au/DiscoveryCentre/Infosheets/Planets/Sky-Tour-for-Binoculars---Orion/) (<https://web.archive.org/web/20080730024847/http://museumvictoria.com.au/DiscoveryCentre/Infosheets/Planets/Sky-Tour-for-Binoculars---Orion/>)
- [Views of Orion from other places in our Galaxy](https://web.archive.org/web/20130421003231/http://old.orionsarm.com/galactography/views_of_Orion.html) (https://web.archive.org/web/20130421003231/http://old.orionsarm.com/galactography/views_of_Orion.html)
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