

{ ARCHAEOASTRONOMY }

# Stargazing in ancient Egypt

The sky inspired Egyptians in science, art, and architecture. /// BY PATRICIA BLACKWELL GARY AND RICHARD TALCOTT

MENTION THE WORD “PYRAMID,” and thoughts immediately turn to exotic locales and ancient civilizations. Several thousand years ago, people along the Nile River in Egypt built some of the world’s most impressive monuments and temples to honor their rulers and gods. Their efforts continue to inspire and intrigue us today. But

THE GREAT PYRAMIDS CLIMB toward the night sky, where they meet what may have been their astronomical inspiration: the pyramid-shape zodiacal light. ASTRONOMY: JAY SMITH



**AN OBELISK STANDS GUARD** over the sacred lake of the Temple of Amun in Karnak. HEIDI GRASSLEY

what inspired the art and architecture of the ancient Egyptians?

Unfortunately, the origins of the Egyptians' religious beliefs and how they were translated into art and architecture remain lost in the mists of prehistory. Most Egyptologists think observations of the natural world played a key role — after all, the sun-god Re was their greatest deity. We believe two icons of Egyptian architecture — the pyramid and obelisk — were inspired by previously overlooked astronomical phenomena connected with sunrise and sunset: the zodiacal light and Sun pillars, respectively.

To the ancient Egyptians, keen observers of nature during the day, it was natural to extend their observations to the one aspect of nature conspicuous at night — the star-filled sky. In the clear desert air of ancient Egypt, before the modern scourge of light pollution, the starry realm would have commanded the attention of any inquisitive person. Phenomena that typically go unnoticed today would have been obvious to anyone who looked. As in all primitive cultures, the sky was

Patricia Blackwell Gary is an Egyptologist at New York University. Richard Talcott is a senior editor of Astronomy.

both an integral part of daily life and a presence of cosmic power.

The early Egyptians saw in the Sun, Moon, and stars patterns of continuity: birth, death, and resurrection. Symbolically, the religious values assigned to these celestial objects inspired awe and adoration, but knowledge of them also had practical applications. The sky served as map, clock, and calendar.

### The Dog Star

Confirmation of the ancient Egyptians' skygazing comes from their observations of the bright star Sirius, known to them as Sothis. Around 3000 B.C., Sirius disappeared in the Sun's glow at solar conjunction in late spring. It then reappeared in the eastern sky before dawn near the time of the summer solstice. This so-called heliacal rising heralded the coming flood of the Nile. The annual inundation deposited thick, rich mud, an event upon which agriculture — and all life in Egypt — depended. The Egyptians memorialized Sirius' heliacal rising by making that date the start of their calendar year.

The appearance of Sirius in the sky had practical benefits. But the solar cult developed by the Egyptians extended far beyond the life-giving qualities of our star. Even in the Neolithic period (about 7000–4000 B.C.), Egyptian graves were erected to face the rising Sun, perhaps to provide energy for the dead.

By the fourth dynasty, which ran from approximately 2575–2465 B.C., Re had ascended to chief god. Egyptian kings held the title “Son of Re.” The Pyramid Texts — a collection of prayers, hymns, and spells inscribed in the pyramids' inner chambers — tell of how the Sun's rays would transport the king to heaven. That held extreme importance to the Egyptians, who believed life on Earth was but a brief interlude compared with the eternal life ahead.

The center of the solar cult was at Heliopolis in Lower Egypt. Worship in the great temple there, and at other Sun temples throughout

Egypt, centered on a sacred icon known as the *benben*, a squat, cone-shaped stone placed in full sunlight. The word *benben* also signified the capstone of a pyramid and the tip of an obelisk. Clearly, this was a culture devoted to sunlight, and whose monuments incorporated aspects of that Sun worship.

The Egyptians held reverence for the places where the Sun rose and set. The hieroglyph for their word *akhet*, typically translated as “horizon,” shows the Sun's disk between two mountains. But to the Egyptians, this told only part of the story. *Akhet* was the place where the Sun was reborn each day, and, by extension, the location where the king would be reborn after death. The *akhet's* shape even found its way into temple art and construction.

Associated with the *akhet* was “Lightland,” a luminous hill of light depicted in ancient Egyptian art and lying within the region of the *akhet*. According to New York University Egyptologist Ogden Goelet, Lightland likely represented twilight, as seen both before sunrise and after sunset.

Most Egyptologists think the symbolic principles underlying the



**EGYPTIAN CIVILIZATION** arose along the life-giving waters of the Nile River. ASTRONOMY: JAY SMITH



**GODDESSES ISIS AND NEPHTHYS**, who participated in Egyptian ceremonies of the dead, bless a blue heart scarab. This piece probably originated in Memphis during the 19th dynasty (about 1320–1190 B.C.). BRITISH MUSEUM

mythological and architectural aspects of the *akhet* pertain almost exclusively to the points along the horizon where the Sun rises and sets. In looking at this from an archaeoastronomy perspective, however, we suggest that while the Sun's appearance and disappearance were the central acts, dramatic opening and closing scenes added to the reverence Egyptians held for these sky regions.

### Egyptian icon

The pyramids represent the epitome of Egyptian art and architecture, and were certainly seen as symbols of the Sun. The first pyramids were not the fully formed, flat-sided objects we've come to know. Instead, they were step pyramids, built in layers, where the top of one layer was broader than the bottom of the layer above it. Most were constructed during the third dynasty, between about 2650 and 2575 B.C. The style evolved quickly, however, and the three great pyramids at Giza were built during the fourth dynasty. The largest was the burial chamber for the king Khufu, and the two smaller ones belonged to Khafre and Menkaure.

What relationship do the pyramids — and the similarly shaped

*benben*, for that matter — have to the Sun's appearance in the sky? Many Egyptologists claim the pyramids' inspiration may have been an atmospheric phenomenon known as crepuscular rays. These rays of sunlight appear to spread out from a point. Intermittent clouds can break sunlight into separate beams of light, and perspective effects make them appear to fan out from the Sun. (The same effect causes parallel railroad tracks seemingly to converge in the distance.)

Crepuscular rays can occur with the Sun at or just below the horizon, in which case they open upward, or with the Sun higher in the sky, when they can point down. Anyone who has seen a good display of crepuscular rays knows they can mimic a pyramid's shape. But whether that's what motivated the ancient Egyptians, no one can say.

### Pyramid of light

We decided to seek other possible explanations. Judging from evidence presented in records at the Edfu temple, the *benben* seems to be linked to the radiance that brought the Sun-god into existence. So, we looked more closely at events taking place near the times of sunrise and sunset.



**HIEROGLYPHS** cover these obelisks. The Egyptians invented this form of writing around 3000 B.C. and used it on their monuments. JOHN ROSS




**HIEROGLYPHS TELL THE STORY** of an Egyptian falcon-god who dwelled in a thicket of reeds. This scene appears on the Temple of Horus at Edfu in Upper Egypt. TOBY WILKINSON

A SUN PILLAR would have been a dazzling sight to the ancient Egyptians — as it is to us today. The shape could have inspired the creation of obelisks.

RANDALL WEHLER



**THE ZODIACAL LIGHT** shows a distinct pyramidal shape when seen against a pitch-black sky — conditions that would have been common in the desert air of ancient Egypt. CHRIS SCHUR



**CREPUSCULAR RAYS** have also been seen as a possible celestial inspiration for the great pyramids. MONTANARI ENRICO

One phenomenon quickly caught our attention. The zodiacal light has the right shape and appears both shortly before morning twilight in the east and just after evening twilight in the west. The light is a beautiful, ethereal glow that rises from the horizon in the shape of a huge pyramid or cone. The soft white light appears widest at the horizon and tapers slowly to a width of only 5° to 10°. Under the best conditions, the zodiacal light reaches halfway to the zenith.

At its most intense, the light shines slightly brighter than the central regions of the Milky Way. However, the zodiacal light appears diffuse, so any haze or background light from the Moon or a nearby city will mask its glow. That's why most people today have never seen it — even avid observers. From the dark desert skies of ancient Egypt, however, the zodiacal light would have been conspicuous.

As its name implies, the zodiacal light tracks along the zodiac, the menagerie of constellations that encompasses the apparent path of the Sun and planets across our sky, also known as the ecliptic. (Any bright planets offer a convenient guide to finding the ecliptic and seeking out the light.) The Egyptians recognized both the ecliptic and the constellations the Sun traversed, so they could have connected the zodiacal light with the Sun's annual track.

The light appears most prominent when the ecliptic makes a steep angle to the horizon. This orients the pyramid's apex higher in the sky and makes the glow easier to see. From the latitude of Egypt, which lies just north of the Tropic of Cancer, the ecliptic typically meets the horizon at a steep angle. Viewing conditions are slightly better on spring evenings and autumn mornings, but the difference doesn't amount to much. (At mid-latitudes, the discrepancy grows greater, and the zodiacal light becomes difficult to see except at the favored times.)

The light may remind you of twilight — the morning vista is sometimes called the “false dawn” — but you usually can tell the difference because the zodiacal light comes to a sharper peak.

The light originates with dust particles in the inner solar system. Some of that dust comes from material ejected from comet nuclei as the Sun's heat sublimates cometary ices. The rest of it derives from the hundreds of thousands of asteroids that inhabit the solar system between the orbits of Mars and Jupiter. Collisions among these rocky objects grind down their surfaces and release lots of fine dust.

Most of the particles have diameters from a few micrometers up to

## WORDS OF EGYPT

**AKHET** — Egyptian for “horizon”; the place where the Sun was reborn each day.

**BENBEN** — sacred stone with a cone shape; also, a pyramid's capstone or obelisk's tip.

**GIZA** — site in Lower Egypt; home of the great pyramids.

**HELIOPOLIS** — site in Lower Egypt; center of the solar cult.

**LIGHTLAND** — luminous hill of light associated with twilight.

**RE** — Egyptian sun-god.

**SUN PILLAR** — vertical shaft of sunlight visible near sunrise or sunset.

**ZODIACAL LIGHT** — softly glowing pyramid of white light visible before dawn and after dusk.



**THE STARS** played a huge role in the lives of the ancient Egyptians. Here, a man rides a boat on the Wadi Hammamat (a normally dry riverbed), guided by a bright star. TOBY WILKINSON



**WHITE LIMESTONE** once covered the pyramids, so they gleamed in sunlight. ILLUSTRATION BY FRED HOLTZ

about a millimeter. The particles remain close to the ecliptic and spiral slowly toward the Sun, where their density and brightness are highest. They glow by reflecting sunlight, a fact the ancient Egyptians surely would have appreciated.

### Pillar of light

The obelisk's shape also has solar significance. The obelisk represents Egypt's earliest symbolic art and architecture. According to Egyptian mythology, obelisks came in pairs: two in the celestial realm and two on Earth. They were identified as the first manifestation of the primeval god Amun and were thought to correspond to rays of the rising Sun. Traditionally, they were positioned to reflect sunrise and sunset.

Another light show sometimes seen near sunrise or sunset closely

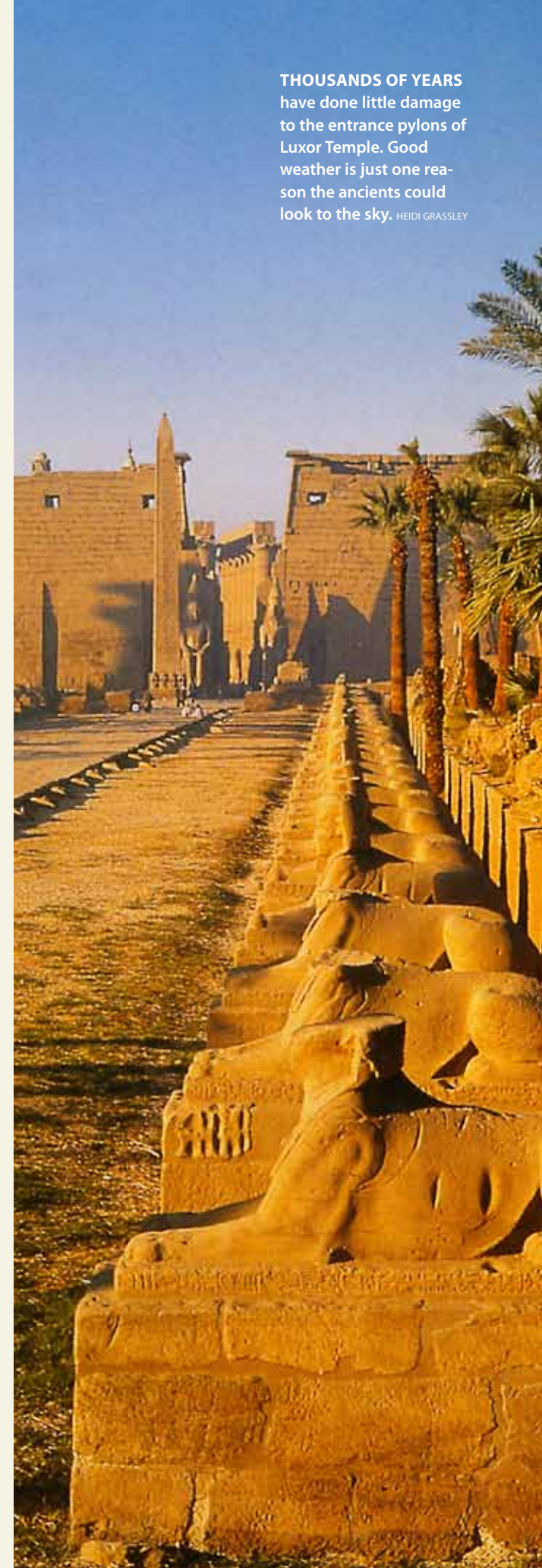
matches the obelisk's shape. A Sun pillar is a vertical shaft of light that either rises above or falls below the Sun's position. It usually ends in a point. Occasionally, a pillar will appear both above and below the Sun simultaneously.

Sun pillars arise from sunlight reflecting off the surfaces of six-sided, plate-like ice crystals that make up thin, high-level clouds in Earth's atmosphere. Although they require ice crystals to form, the pillars aren't confined to cold-weather climates. They can appear anywhere around the world because temperatures remain low at the clouds' high altitude.

The Sun played a huge role in how the ancient Egyptians viewed the world and their position in it. The sun-god Re was born each morning when he broke through the eastern horizon. He then traversed the sky to near the zenith before descending to the western horizon. When each day came to end, Re died at dusk, only to be resurrected again when morning twilight returned. It's a story 5,000 years old, but one keeping researchers engaged at the dawn of the 21st century. ■

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Visit [www.astronomy.com/toc](http://www.astronomy.com/toc) to learn about Egyptian observations of Spica.



**THOUSANDS OF YEARS** have done little damage to the entrance pylons of Luxor Temple. Good weather is just one reason the ancients could look to the sky. HEIDI GRASSLEY