

# ANCIENT EGYPTIAN ASTRONOMY 2026

## PROGRAM

### Day 1

09:30: Registration

10:00: Opening remarks

10:20: **Rita Gautschy:** On the Potential Use of Sundials and Water Clocks in Ancient Egypt

10:40: **Juan Antonio Belmonte & Jose Lull:** When and Why the Winter Solstice Became Important in Egyptian Culture: A Travel through Time and Space

11:00: **Luna Zagorac and Sarah Symons:** On the Observational Method Behind Ramesside Star Clocks: Contextualizing Relevant Factors & Simulating Observations

11:20: **Giulio Magli:** The End of the IV Dynasty: Eclipse and Return of the Sun God

11:40: **Alicia Maravelia:** Making of Ancient Egyptian Astronomy a Scientific Documentary or the Quest for Immortality under the Starry Firmament of Gods: An Ongoing Project of the Hellenic Institute of Egyptology, under the Auspices of the IAU

12:00 – 13:30 – lunch

13:40: **Yossra Ibrahim:** Structuring the Sky: Design and Layout in Egyptian Celestial Diagrams

14:00: **Bernadette Brady:** Cardinality and the Step Pyramid: The Sky Embedded in Stone

14:20: **Marla Szvec:** Theban Skywatchers during the Eighteenth Dynasty: A Professional Profile

14:40: **Alexandra von Lieven:** Studies on the Classical Sky Picture

15:00 – 16:30: Q&A and Discussion: (1) Our own journal and data hosting / replication? (2) 2027 total Solar eclipse.

## Day 2

10:00: **Joachim Quack:** Approaching the Egyptian Decans and their Reception

10:20: **Rolf Krauss:** Morning Star and Evening Star, Mostly According to Early Egyptian Sources

10:40: **Gyula Priskin:** The Star Patterns of Mesehtiu

11:00: **Jose Lull & Juan Antonio Belmonte:** Why Are Egyptian Stars Five-Pointed? A Working Hypothesis

11:20: **Agnes Klische:** The Scene of Separation

11:40: **Or Graur:** The Ancient Egyptian Conceptualization of the Milky Way

12:00 – 13:30 – lunch

13:40: Meeting photograph

14:00: **Elizabeth Leaning:** Cosmic Dust and Dreadful Lakes: Astronomy amongst the *Pyramid Texts*

14:20: **Marina Escolano-Poveda:** New Demotic Sources for the Study of the Astral Sciences in the Graeco-Roman Period

14:40: **Andreas Winkler:** The Early Zodiac in Egypt

15:00 – 16:30: Q&A and Discussion: (1) Conference proceedings / special issue? (2) Student mentorship, networking, and an annual meeting?

## ABSTRACTS

### ON THE POTENTIAL USE OF SUNDIALS AND WATER CLOCKS IN ANCIENT EGYPT

**Rita Gautschy** (University of Basel)

Timekeeping played a crucial role in the religious, administrative, and everyday life of ancient Egypt. Among the devices developed for measuring time were sundials and water clocks. While sundials could only be used during daylight hours, a water clock (clepsydra) enabled time measurement independent of sunlight. Both could have theoretically been used to structure work, regulate temple rituals, and coordinate civic activities. When analysing the instruments which survived, however, one is struck by some puzzling features: scales that do not fit the natural conditions at the time of manufacture, or indication of an uncommon number of hours on sundials. This raises the question whether these instruments were indeed used, or whether they were rather votive gifts to the gods where a proper function of the instrument was only of secondary or no importance at all. Unfortunately, only in rare cases we have information about the find context since most of these instruments stem from the antiquity market. But a huge amount of instruments with known find context were either found in temple contexts or in work contexts such as in quarries. In this talk I will reflect on the potential use of these instruments and what can perhaps be deduced about the use of such instruments from textual sources, particularly those from the 2nd millennium BCE.

**WHEN AND WHY THE WINTER SOLSTICE BECAME IMPORTANT IN EGYPTIAN CULTURE: A  
TRAVEL THROUGH TIME AND SPACE**

**Juan Antonio Belmonte** (Instituto de Astrofísica de Canarias)

and

**Jose Lull** (Universitat Autònoma de Barcelona)

Winter solstice is seldom considered as the moment of the birth of the solar deity by many cultures around the world, including the Christian sun of justice. However, in the case of ancient Egypt, the story seems furthermore complicated. Today, the month of Misore (the Birth of Ra, sic) of the Coptic Christian church is equivalent to late-August / early-September in the Gregorian proleptic calendar. Therefore, this is far from the day of the winter solstice around December 21st. However, since the first campaign of the Archaeoastronomy Mission of ancient Egypt in 2004, it became clear that winter solstice orientation of Egyptian temples was among the most important and statistically significant ways of astronomically orienting a sanctuary. This apparently happened for different periods of Egyptian history, but with a special incidence in the area of Thebes. Further campaigns, including the observation of solstitial phenomena at several sites, confirmed this impression, culminating with the temple of Sobek-Ra at Qsar Qarun, today considered by the people of Cairo as a sort of northern Abu Simbel. With the advances of research, these winter solstice orientations became nuanced and some of them were re-interpreted within the wandering nature of the Egyptian calendar, as far as winter solstice coincided with Wepet Renpet in two occasions in the Pharaonic period, during the 11th Dynasty and in the Persian period. New phenomena, such as the Venustices has also to be taken into account. In this presentation, we will introduce all the variables at play and will try to offer a coherent interpretation of winter solstice phenomenology in ancient Egypt, which is much more complicated, and at once sophisticated, than we could have ever imagined.

**ON THE OBSERVATIONAL METHOD BEHIND RAMESSIDE STAR CLOCKS:  
CONTEXTUALIZING RELEVANT FACTORS & SIMULATING OBSERVATIONS**

**Luna Zagorac** (McGill University)

and

**Sarah Symons** (McMaster University)

In this paper, we focus on the observational method that produced the Ramesside star clock. The content of the star clocks provides a dataset of observations, while their format informs the observational models we construct. The crux of this paper lies in the enumeration and discussion of observational factors that will significantly impact the results of our model. Roughly, these factors can be split into those for which we can make reasonable assumptions (motivated by the context and provenance of the Ramesside star clock), those which we can test for, and ‘human’ factors which we cannot straightforwardly predict or assume. Crucially, we are not attempting star identification as a first priority, though it is a potential emergent property after complete analysis. We propose an experimental approach whereby we can probe the impact of such factors on our observational model using a Python module called `decanOpy`. Given the number of unknowns we are dealing with, we considered it unproductive to make a model that would produce a realistic Ramesside star clock only under a narrow set of circumstances particular to the real sky. Instead, we wanted to test observational methods under a set of sky states that would account for variability in star densities. For this purpose, we will include, alongside a model of the real sky, models of procedurally generated skies. In contrasting results from the two simulated skies, we may be able to identify features that cannot be accounted for by mere statistics of stellar distribution; these will likely be consequences of human choice.

## **THE END OF THE IV DYNASTY: ECLIPSE AND RETURN OF THE SUN GOD**

**Giulio Magli** (Politecnico di Milano)

On April 1, 2471 BC, an impressive, unpredictable phenomenon occurred over the Delta of the Nile: a total solar eclipse, with the totality band almost centered on the sacred city of Buto, and Memphis on the verge of totality. This date is compatible with existing chronologies for the reign of Pharaoh Shepseskaf, who adopted a clamorous symbolic break with respect to the tradition of “solarized” kings started by Khufu. Indeed, his tomb was not built in view from Heliopolis and was not a pyramid, but a kind of unique monument resembling the symbolic shrine at Buto. We investigate in a systematic way the possibility that the origin of this historical passage, which marks the end of the 4th Dynasty, can be identified precisely in the 2471 BC eclipse, therefore also furnishing a new astronomical anchor for the chronology of the Old Kingdom.

**MAKING OF ANCIENT EGYPTIAN ASTRONOMY A SCIENTIFIC DOCUMENTARY OR THE  
QUEST FOR IMMORTALITY UNDER THE STARRY FIRMAMENT OF GODS: AN ONGOING  
PROJECT OF THE HELLENIC INSTITUTE OF EGYPTOLOGY, UNDER THE AUSPICES OF THE  
IAU**

**Alicia Maravelia** (Hellenic Institute of Egyptology)

In December 2023, after a formal lecture of the author at the premises of NOESIS (Science Centre and Technology Museum, Thessaloniki, Hellas), she was approached by a producer in order to cooperate for the creation of a special documentary film on the Astronomy of ancient Egyptians. The project started immediately under the direction, guidance, and responsibility for public relations of the author. This unique documentary is a prolific and fascinating presentation of an exciting topic, on a purely scientific basis, however in a way that the general public can also understand. In its >12 parts, it contains splendid and sophisticated graphics, briefly discussing all aspects of ancient Egyptian astronomy and it has been placed under the auspices of the International Astronomical Union (C. C4). It also features scholarly interviews from 11 international scientists (both astronomers and Egyptologists). The first premiere of this feature film took place successfully at the premises of NOESIS on the 22nd of November 2025. Currently the documentary's team (scientific director and coordinator: Dr Dr Alicia Maravelia; producer: Sotirios Bisaltis; narrator: Niki Kapari) are finalizing the film, in order to be distributed in planetaria, educational institutes, and scientific TV channels, accordingly. At this stage, funding is extremely crucial for its completion and further success. I will present this project and show characteristic parts and interviews from this scholarly documentary.

## **STRUCTURING THE SKY: DESIGN AND LAYOUT IN EGYPTIAN CELESTIAL DIAGRAMS**

**Yossra Ibrahim** (American University in Cairo)

The term “celestial diagram” is used here to designate Egyptian visual compositions that depict decans, planets, constellations, and associated deities within structured spatial frameworks. The term does not refer to a scientific diagram in the modern sense, but to a visual system through which celestial bodies were arranged and conceptualised in both funerary and non-funerary contexts. These representations articulated relationships among celestial bodies, indicating which stellar entities were recognised and how they were arranged, grouped, and hierarchised within a coherent visual field. While individual elements of these compositions have been extensively catalogued and analysed, the question of their design and layout merits further consideration. This paper therefore examines the visual strategies by which celestial elements were arranged and structured. It argues that layout and design played an active role in organising and conveying astronomical knowledge, shaping how celestial and temporal cycles were presented and understood. Diagonal tables, bipartite panels, and circular schemes represent distinct diagrammatic formats, each structuring celestial material according to different organisational principles.

## **CARDINALITY AND THE STEP PYRAMID: THE SKY EMBEDDED IN STONE**

**Bernadette Brady** (University of Wales Trinity Saint David)

The pyramid complex of Netjerikhet (Djoser) at Saqqara represents an amalgamation of architecture and astronomy. Egyptologists agree that its orientation is described in terms of cardinal alignment, yet such terminology risks imposing a modern geographical abstraction onto an ancient theological framework. This position leaves unexamined a more fundamental question: why were these directions significant in the first place? In the Third Dynasty Step Pyramid, the structure's orientation was associated with concepts of permanence, renewal, and royal transformation, mirroring the movement of the stars and the sun. This lecture examines the theology which may be behind the astronomy of the cardinal points, as well as the solar role in spatial logic, placement, and proportions of Netjerikhet's Heb-Sed course, which is bisected by the east-west axis.

## THEBAN SKYWATCHERS DURING THE EIGHTEENTH DYNASTY: A PROFESSIONAL PROFILE

**Marla Szwec** (University of Toronto)

Period-specific investigations of astronomers before the first millennium BCE are largely absent from Egyptology. Consequently, modern understandings are heavily informed by later periods. The surge of technical and conceptual developments in Eighteenth Dynasty timekeeping, however, prompts a closer inspection of the professional worlds of Theban skywatchers. By moving beyond the traditional text-centred approach for examining ancient science, a dynamic characterization of tradition and its practitioners is provided. This study's methodology presents a series of strategies for period-specific research to facilitate the identification and analysis of Egyptian skywatchers. It consists of four analytic components: (1) private titles, (2) specialized texts, (3) instruments of timekeeping and observation, and (4) architectural alignments to celestial referents. Applying this framework reveals insights into ritual literacy, technical innovation, social networks, and didactic transmission. It is clear that the nucleation of astronomical titles in major political and cultic centres indicates a direct relationship between state centralization and office continuity. Titles and inscriptions demonstrate that skywatching was institutionally embedded across temple and palace administrations to reinforce the ruling elite's control over temporality. It is also apparent that timekeeping instruments and celestially oriented monuments were sites of professional praxis that helped to construct time as a sacred and political reality by coordinating collective action, synchronizing human activity with celestial cycles, and symbolically materializing ideologies of cosmic order and divine kingship. Ultimately, what emerges is a portrait of a rich intellectual milieu of experimentation, in which specialization was visualized to divine and elite audiences to encourage adoration in life and death.

## STUDIES ON THE CLASSICAL SKY PICTURE

**Alexandra von Lieven** (Universität Münster)

The Classical Sky Picture is a schematic representation of the night sky occurring quite regularly on ceilings of tombs and temples, as well as on water clocks and coffins. It is positively attested from the Middle Kingdom up to the Roman Period. It depicts the planets, decans and a few other stars in the southern half as well as the circumpolar and further fixed stars in the northern half. All of the astral entities are depicted as deities and textually associated with them. The two halves of the sky are divided by the Milky Way. While the general type of this picture is identical over almost all its attestations, there are nevertheless greater variants in the details. These are not random and erratic, though, but can clearly be ordered into groups, which thus represent different strands of tradition. This opens up interesting avenues of study. The talk will present some of the results already achieved as well as give an outline of what is planned for the next steps.

## **APPROACHING THE EGYPTIAN DECANS AND THEIR RECEPTION**

**Joachim Quack** (University of Heidelberg)

This talk will summarize my still unpublished habilitation thesis submitted at the Free University of Berlin in 2002. Especially, it will explain its special focus, which is not on astronomical identifications but on questions of cultural history. This includes the question of what the decans meant in which situations for the Egyptians, and how the names of the decans were transmitted in some Greek and Latin texts, and how many Egyptian traditions can still be recognized in later astrological texts.

## **MORNING STAR AND EVENING STAR, MOSTLY ACCORDING TO EARLY EGYPTIAN SOURCES**

**Rolf Krauss** (Independent Researcher)

This paper analyses specific narratives about the Elder Horus and Horus, Son of Isis, as star lore. A basic premise is the identity of Early Dynastic Horus as an important star (Kahl 2009). The fledglings of Osiris are Eyeless Horus and Horus, Protector-of-his-Father. The latter, also known as Horus, Son of Isis, is readily identifiable as the morning star, i.e., Venus. Egyptian texts describe the Elder Horus as a *sehed*-star, travelling to and fro, and as born in the west – characteristics suggesting Venus as the evening star. The following narrative episodes point in the same direction: the Elder Horus losing his eye, the moon bringing it back, and the healing and filling of the eye over a time span.

## THE STAR PATTERNS OF MESEKHTIU

**Gyula Priskin** (University of Szeged)

It is a long-established tenet of ancient Egyptian astronomy that the constellation MeseKhtiu was located around the seven brightest stars of modern Ursa Major, which are today also known as the Plough or Big Dipper. Since Greek testimonies corroborate it, and sometimes seven stars are overlaid on the drawing of MeseKhtiu, this identification seems to be straightforward, yet the issue is complicated by the fact that MeseKhtiu appears in several forms in the Egyptian sources: the foreleg of an ox (diagonal star tables and the round Dendera zodiac), an oval shape that resembles a foreleg with a bull's head (astronomical diagram of Senenmut and descendants), a standing bull (astronomical diagram of Sety I and descendants), and a foreleg with a bull's head (Graeco-Roman astronomical representations). This paper argues that the different images of MeseKhtiu were not inspired by artistic licence, but by actual star patterns that the Egyptians discerned in the area of Ursa Major, reinforcing the view that the Egyptian constellations were based on visual resemblance. The various forms of MeseKhtiu suggest that there was not necessarily a rigid canon dictating the make-up of ancient Egyptian constellations, and within certain limits some adjustments or re-interpretations were tolerated.

## WHY ARE EGYPTIAN STARS FIVE-POINTED? A WORKING HYPOTHESIS

**Jose Lull** (Universitat Autònoma de Barcelona)

and

**Juan Antonio Belmonte** (Instituto de Astrofísica de Canarias)

We present a preliminary interdisciplinary study combining symbolism, epigraphy, archaeology, visual physiology, and palaeontology in order to explore the possible origin of the five-pointed star, a motif that appears with remarkable consistency in Egyptian astronomical iconography from its earliest attestations. The multiple radial symmetry perceived in point light sources such as stars can be explained by the physiology of the human eye and its associated optical aberrations. While this phenomenon accounts for the general tendency to represent stars with radiating points, it does not satisfactorily explain the recurrent preference for a five-pointed form. To address this issue, we introduce palaeontology as an additional interpretative framework, together with the well-documented Egyptian concern for representing objects in an aesthetically harmonious and conceptually appropriate manner, even when dealing with abstract or non-material phenomena. The central hypothesis advanced here is that fossil echinoids with pentaradial symmetry (sea urchins), which are abundant throughout Egypt and particularly within the extensive limestone formations exploited from the earliest phases of monumental construction, may have served as a visual and conceptual model for stellar representations. These naturally occurring objects, readily visible in the geological environment familiar to early Egyptians, could have provided a tangible reference for depicting stars and planets as five-pointed, pentaradial forms as early as the First Dynasties, and possibly even earlier.

## THE SCENE OF SEPARATION

**Agnes Klische** (Independent Researcher)

The most famous image of the Ancient Egyptian world is that of the separation of the sky goddess Nut from the earth god Geb by their father Shu, god of air and light. It is depicted on coffins and papyri in the Third Intermediate Period (TIP; 1030 BC – 950 BC). The scene was the subject of my doctoral thesis. The most important questions about the material was what kind of character the goddess is and why are there so many different variations of the image. The results of my research are, in short, that the goddess Nut represents the entire upper world, she is definitely not part of the underworld. And the entire path of the sun, i.e., the way by day and its way by night, is strictly connected to the goddess, no matter what the figure of Nut looks like or how the image/scene itself is designed. The high priests of Thebes took over the office of the King, because securing the path of the sun was always the king's responsibility, but in the TIP the king lived in the delta region in the North and the Separation scene - a guarantee that the sun will rise on a new day - was used in Thebes. In my presentation, I would like to show how this view was implemented in many different ways and how it was possible to secure the entire path of the sun even in connection with burial equipment.

## THE ANCIENT EGYPTIAN CONCEPTUALIZATION OF THE MILKY WAY

**Or Graur** (University of Portsmouth)

For more than a century, Egyptologists have attempted to identify the ancient Egyptian name and depiction of the Milky Way. In this presentation, I will first show that the assumption that the Milky Way was a representation of the sky goddess Nut is not supported by textual and visual evidence. Instead, textual descriptions (e.g., from the *Fundamentals of the Course of the Stars*) and visual depictions of Nut on coffins throughout Egyptian history depict Nut as the entire sky: a backdrop for the Sun, Moon, and stars. I will then highlight a specific vignette of Nut, Shu, and Geb in which Nut's body is covered in stars and bisected by a thick, undulating black curve. I will argue that this curve, variants of which appear in several tombs in the Valley of the Kings, may be a visual representation of the Milky Way. Finally, I will raise the possibility that this curve could be interpreted as *mr-nḥa*, the Winding Waterway that ferries the dead king to his rebirth in the east.

## **COSMIC DUST AND DREADFUL LAKES: ASTRONOMY AMONGST THE *PYRAMID TEXTS***

**Elizabeth Leaning** (University of Auckland | Waipapa Taumata Rau)

This paper presents a work in progress, applying archaeoastronomical methods to a translation of the *Pyramid Texts*. It builds on the work of Faulkner (1966) and Krauss (1997) to examine this Old Kingdom religious and mythic text for astronomical data. In doing so, it considers concepts such as the application of technical terms and the encoding of scientific data within a religious framework. It further develops the ancient Egyptian understanding of this data by exploring links between the astronomy of the *Pyramid Texts* and the literary, artistic and architectural evidence present in the broader context of the Old Kingdom. Overall, this paper hopes to illuminate the astronomical knowledge of the Old Kingdom as it was recorded in the *Pyramid Texts* and highlight the importance of viewing religious texts in the broader scientific contexts of their composition.

## **NEW DEMOTIC SOURCES FOR THE STUDY OF THE ASTRAL SCIENCES IN THE GRAECO- ROMAN PERIOD**

**Marina Escolano-Poveda** (University of Liverpool)

This presentation will showcase the latest advances in the study of three textual corpora written in Demotic, which are significantly expanding our knowledge of the practice of the astral sciences in the Graeco-Roman period. First, I will cover the state of the question regarding the known published and unpublished Demotic and Greek astronomical tables. I will then turn to the horoscopic ostraca from Athribis (Atripe), the oldest, largest, and most complex corpus of such texts from Egypt. Finally, I will report on the progress of the edition and study of the Demotic astrological handbooks of decanal astrology, a joint project with Prof. Kim Ryholt (University of Copenhagen). The study of these three textual corpora in conjunction offers us an invaluable opportunity to understand the different aspects of astral practice in Graeco-Roman Egypt, their connections with Greek language astronomy and astrology, and the idiosyncrasies of its practitioners.

## **THE EARLY ZODIAC IN EGYPT**

**Andreas Winkler** (University of Toronto)

While there is broad scholarly consensus that the zodiac was known in Egypt by no later than the third century BC, relatively little attention has been paid to the question of how the concept initially entered Egypt. Although written sources must have reached Egypt during that century, this paper argues that pictorial materials constituted the initial medium through which the Egyptian priesthood became acquainted with the concept. Namely, the names and visual forms of the zodiacal signs and constellations were likely transmitted first through images, while the technical and theoretical aspects arrived somewhat later.