

Why is Archaeoastronomy Underrepresented in Egyptian Studies?

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Astronomical knowledge forms a valuable component of the assembled body of knowledge for many ancient, stable, socially stratified civilizations. Astronomical analysis is a common and widely accepted avenue of research for specialists in Mesopotamian, Indian, Mesoamerican, Incan, Native American, and Greek studies. However, aside from a few narrowly defined areas, the subject is largely ignored by the majority of researchers in Ancient Egyptian studies. One might suspect some fundamental distrust of the physical sciences were it not for the many profitable collaborations between Egyptologists and geologists, hydrologists, botanists, and chemists.

In considering some of the reasons for this rejection, it is important to recognize that astronomy played an important role in many ancient cultures- perhaps the only physical science to have done so (using the term “science” loosely here). The movement of the stars and planets in the sky must have been recognized by the earliest humans, and played both practical and mythological roles. Thus we have an active discipline of archaeoastronomy, but not archaeogeology, archaeochemistry, etc.

While it is unlikely that any ancient culture approached astronomy as a science in the modern sense, astronomy remains the term used to describe ancient sky studies, regardless of motive. When an archaeologist consults with a geologist or chemist, it isn't generally to ask what knowledge an ancient culture had of geology or chemistry, but rather to place some artifact in context. This is also a valid use of modern astronomy in ancient studies- to ask, for example, which stars would have been useful for determining architectural alignments, or precisely which date to associate with a certain heliacal rising. I think of this as *astroarchaeology* because it isn't astronomy at all. But because any culture is likely to have been highly aware of the heavens, it is also interesting to ask how much astronomical knowledge it actually had. Although this knowledge would naturally present itself in cultural phenomena such as mythology (a traditional area of study by archaeologists), it is also abstractly astronomical, and I therefore consider this more properly termed *archaeoastronomy*. Nevertheless, it remains more the history of astronomy than the science of astronomy.

While there are components of ancient astronomical knowledge of keen scientific interest to modern astronomers, such as the recognition of specific comets and supernovae, these are likely not of much interest or value to archaeologists pursuing more traditional avenues of research (except possibly as a dating tool).

Given the success of archaeoastronomy in explaining aspects of many ancient civilizations, why do we see so little attention paid to the subject by Egyptologists? I propose four reasons: (1) the relative lack of unambiguous artifactual evidence of sophisticated astronomy in ancient Egypt, (2) the failure of astronomers to recognize the

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nature of archaeology and present their concepts appropriately, (3) the failure of astronomers to assess their own findings in light of other, non-astronomical data, and (4) a concern on the part of Egyptologists to have their own work associated with the large body of astrology, bad science and pseudoscience that dominates channels the public has easy access to. I will examine each of these reasons in more detail.

The artifactual evidence of astronomical knowledge represents only a small fraction of the total body of knowledge of ancient Egypt. We have philological evidence of a mythic connection between various deities and the stars, and a number of representations of the sky in the form of calendars, zodiacs, and religious art. But we don't have the kind of unmistakable evidence of regular astronomical observation and calculation seen in Babylonian tablets or Mayan codices. Nor do we see the range of complex alignments encountered in New World and Neolithic structures. This makes it easy to overlook Egyptian astronomy, or to suggest that it was simplistic. But evidence of observation and analysis of the night sky is seen so often in cultures from the prehistoric to the modern that we have to seriously question whether this lack of evidence can really be interpreted as a lack of astronomical knowledge.

There persists a common belief that the relative shortage of explicit astronomical data from ancient Egypt (compared with other cultures, e.g. Babylonian and Mayan) reflects a genuine lack of interest in astronomy on the part of these people. But we know that the position of the stars in the sky played an important role in Egyptian calendrics and ritual, and we know of relationships between some stars and constellations and religious and mythological characters. It is often stated that the mathematical and geometrical tools available to the Egyptians were insufficient to allow significant astronomical analysis^{1,2}. But this viewpoint is unsubstantiated. We have papyri documenting arithmetic methods used in commerce and bureaucratic practice which demonstrate calculations of similar complexity to those required for many astronomical functions³. Other cultures have also demonstrated that sophisticated calculations are possible even using cumbersome arithmetic techniques. A lack of evidence of astronomical calculation in ancient Egypt must not be taken as evidence of a lack of ability or practice. Thousands of years of simple observation alone make it difficult to see how many basic astronomical facts could have remained unknown. The Egyptians should have been aware of the cycles of lunar eclipses and standstills. They should have been aware of the precession of the pole and of the equinoxes. They should have witnessed many supernovae and comets. Certainly there is strong evidence that these facts were known by other cultures of lesser stability and duration. Is this knowledge actually lacking in the Egyptian historical record, or are we failing to interpret that record correctly? This is not a trivial question. While the answer is of interest to astronomers, it should be of even greater interest to Egyptologists, for whom subtle differences in interpretation represent sometimes large differences in cultural understanding and can lead to dramatic new insights.

If indeed the Egyptians had a low level of interest in the heavens, then that by itself raises important questions that need answering. What other literate, pre-technological culture (for which we have a broad range of data) has not left a rich record of their relationship with the sky in myths, literature, bureaucratic records, art, and architecture?

As previously noted, it is more meaningful to view astronomy as an ancient discipline than it is other physical sciences. It is common for astronomers to take a strong interest in

the astronomy of ancient cultures, while a modern geologist or chemist probably would not examine his own specialty in an ancient context. There is purely astronomical information to be gleaned from the archaeological record: the recognition of specific transient events such as meteor showers or supernovae remains scientifically useful. But such information will probably be of little use or interest to the archaeologist unless it serves to amplify some historical or cultural detail. An astronomer may not understand why his information fails to produce excitement because he does not fully grasp that archaeology is a social science. Few astronomers have the training to completely understand that distinction. The astronomer will generally fail to consider how little value an isolated astronomical fact may have to an archaeologist in the absence of a cultural context. The different languages of astronomy (a “hard” science) and archaeology (a social science) foster a lack of attention on the part of the Egyptology community for ideas presented by astronomers.

A different, but related problem, is that many of the ideas presented by astronomers are of poor quality. I’m not referring here to simple artifactual interpretations, but rather to complex analyses that place too much weight on astronomical evidence and too little on more well established, reliable sources (literature, linguistics, etc.)

There is a long history of this sort of misanalysis, going back at least to the late 18th Century. When archaeological information was first returned to Europe during and after the Napoleonic expedition of 1798, the French *savants* were quick to attempt analysis. Some of the greatest scientists of the time, including Fourier, Laplace, and Biot seized upon the recently returned Dendera zodiac as a tool for dating the culture that produced it. Astronomically, their analyses were interesting; culturally, they completely failed to see this artifact in the context of its discovery. They assumed that astronomical evidence alone could answer the questions of where and why the zodiac was made. Their analyses led to vigorous debates, with all the calculations in substantial error. Apparently, it occurred to none of these scientists that the symbols on the zodiac might have religious or symbolic meanings largely unrelated to the physical sky. The Dendera zodiac was correctly dated as Greco-Roman by Champollion⁴ (based, ironically, on false linguistic evidence!) The exact dating was determined years later by recognition of the significance of empty cartouches surrounding the zodiac. It is interesting to note that the public debates between Champollion and the *savants* were quite acrimonious- as are some modern ones.

These problems of communication between astronomers and archaeologists are unfortunate, but are relatively easy to deal with. Astronomers have useful analyses to provide, but the Egyptological community needs to guide them and to improve their understanding of archaeology. In general, it is much easier for an archaeologist to understand astronomical data than vice versa. Certainly the trained Egyptologist is far better equipped to evaluate astronomical data alongside the ancient Egyptian art, mythos, language, and literature than most astronomers.

Far more serious for the acceptance of archaeoastronomy by Egyptologists is the risk of association with outlandish claims based on astronomical arguments. While this is true for all archaeologists, it is especially so for those specializing in ancient Egypt. Of the many cultures studied by archaeologists, Egypt is of the greatest interest to the non-

specialist public. This is easily seen by performing a web search on the astronomy of various ancient cultures and counting sites⁵:

Culture	WWW Pages
Egypt	193,000
Maya	57,300
Babylon	31,600
Aztec	24,600
Mesopotamia	19,200
Inca	15,000
Mesoamerica	6,410

Clearly, there is far more public interest in ancient Egyptian astronomy than in the astronomy of many cultures for which we have more evidence of a well developed knowledge of the sky. The result is a large audience for information- an audience largely incapable of distinguishing between material of high quality and material of poor quality. The latter is increasingly dominated by pseudoscientific presentation, with books and videos promoting claims of technological cultures existing over 12,000 years ago, Atlantis theories, catastrophism, ancient astronauts, and other “alternative” viewpoints with essentially no acceptance in the academic community. In many cases, the primary “evidence” offered is astronomical- interpretations of data that, in isolation, might seem reasonable, but when viewed in the context of other data sources is seen to be very unlikely. Again using the World Wide Web as an indicator of popular interest, a search on “Dendera zodiac” returns nearly 3000 pages, with less than 5% appearing to approach the subject in anything close to a manner that a trained archaeologist would consider sound⁶. Most of the site authors are either making astrological claims, or are following in the footsteps of Biot in attempting to portray the zodiac as a highly accurate physical representation of the sky at a particular epoch in an effort to justify “alternative” chronologies quite at odds with what better evidence supports.

One strategy employed by pseudoscientific authors to bolster their arguments (and their book sales!) is to include references to the work of reputable researchers, often with quotes taken out of context. More than one academic has been placed in the embarrassing position of having to defend herself from such associations⁷. Naturally, the exciting claims of the pseudoscientists are much more accessible to the lay public than the difficult, refereed publications produced by professional archaeologists. It is no surprise that serious researchers choose to distance themselves as widely as possible from this.

The growth of pseudoscientific claims over the last 30 years has resulted in a powerful antipathy towards archaeoastronomy on the part of many Egyptologists. Of course, ignoring or actively rejecting potentially valid astronomical interpretations without good cause is also bad science.

Although astronomers are not archaeologists, neither are archaeologists astronomers. As an astronomer, I'd like to suggest some things that the Egyptians were in principle capable of detecting. In none of these cases am I suggesting that such knowledge was actually present (although in some of the cases most would agree it was) but only that these phenomena represent interesting avenues of research, or suggestions that might be used in the interpretation of other data. I break this astronomical knowledge into three areas: cosmology, dealing with the physical shape of the world and the Universe, cyclic phenomena, things with a repetitive nature detectable by observation alone, and non-cyclic phenomena, generally rare events known to be significant to many cultures.

Cosmology	Cyclic Phenomena	Non-cyclic Phenomena
Celestial sphere	Equinoxes and solstices	Comets
Celestial equator	Lunar eclipses	Fireballs (bolides)
Celestial pole	Solar eclipses	Meteorite impacts
Pole star	Motion of inferior planets	Meteor storms
Ecliptic	Motion of superior planets	Supernovae
Pole of the ecliptic	Heliacal risings and settings	Auroras
Constellations	Achronal risings and settings	
Cardinal directions	Meteor showers	
Spherical Earth	Comets	
	Precession of the pole	
	Precession of the equinoxes	
	Length of year (non-integral)	
	Lunar standstills	

It is important to realize that recognition of phenomena is different from understanding causes. Furthermore, related phenomena might be seen as unrelated: precession of the pole and precession of the equinoxes might be seen as separate phenomena; the connection between comets and meteor showers might not be made.

It is also important to realize that many of these areas of knowledge may be referred to only obliquely. We must look not only for direct evidence, but for evidence of the *use* of this knowledge. It is already accepted that important calendar elements were based on the heliacal rising of Sirius, that time keeping methods utilizing both the Sun and night sky were used, that highly accurate cardinal directions were probably identified using astronomical means, and that at least some shaft alignments correspond to seasonal events and stellar positions⁸. Other signs of astronomical knowledge might be detectable in references to navigation. The boundaries of ancient Egypt were of great enough north-south extent to make an easily noticeable difference in the altitude of stars and constellations, and the stars make a convenient compass even during times when there is no pole star. Non-cyclic events are typically given great spiritual significance (in most

cultures, such phenomena are usually recognized as ominous). Overlooked in the surviving literature and art may be references to great comets, supernovae (new stars appearing in the night or even daytime sky), auroras (occurring several times per century at Egyptian latitudes), and stories of rocks falling from the sky. Here again, the extensive knowledge of the trained Egyptologist is necessary- few others are qualified to offer reasonable interpretation of the highly stylized Egyptian literary and liturgical forms. Finally, there is the very real possibility of major decisions based on astrological data. When and where to go to war, to erect temples, to perform ceremonies, and other actions that we have today an evidentiary record of may in some cases be correlated to astronomical events, particularly to non-cyclic events. Here we have archaeoastronomy at its most valuable: helping to illuminate root causes of events that altered the flow of history.

In summary, Egyptologists have had some cause to ignore or even disparage archaeoastronomy. But clearly this specialized form of archaeology has already proved its value in Egyptian studies, and can only become more useful as the depth of data increases. The sky provides a powerful reference for comparing different cultures across time and space. Humans are incredibly adaptable: our civilizations evolved in high mountains, in jungles, along coasts, on islands, in deserts, and on arctic ice. We lived by hunting, fishing, farming, and gathering. We made tools of wood, stone, metal, and bone. Some crossed paths, some rose and fell in isolation. But over everyone was a similar sky- a common element of nature binding all together. Understanding the role astronomy played in ancient Egyptian culture will provide an absolute point of reference that little else can. Egyptologists must embrace archaeoastronomy or they will close the door on a potentially illuminating source of evidence supplementing and expanding the already rich philological, historical, and artistic database of Egypt.

References

¹ Gillings R. J., 1975. *Mathematics in the Time of the Pharaohs*, The MIT Press.

² Van der Waerden B. L., 1974. *Science Awakening II*, Noordhoff International Publishing.

³ For example, the Rhind Mathematical Papyrus and the Moscow Mathematical Papyrus

⁴ Adkins L., Adkins, R. 2000. *The Keys of Egypt: The Race to Read the Hieroglyphs*, Harper Collins

⁵ April 2004. Google search, *culture* + astronomy

⁶ April 2004. Google search, *dendera* + zodiac. Of 150 pages sampled randomly, 4 pages were on .edu domains, 2 pages referenced journal articles, and 1 page was on a professional society site. 60 pages were astrological in nature. 36 pages analyzed the zodiac numerically. 47 pages referred to the zodiac casually but provided no discussion or analysis.

⁷ See, for example, www.antiquityofman.com/sellers.html. A statement by Jane Sellers correcting misrepresentations of her work by Graham Hancock and Robert Bauval.

⁸ Hoskin M., ed. 1997. *The Cambridge Illustrated History of Astronomy*, Cambridge Press