

# A unique astronomical heritage place: the 28 May 585 BCE solar eclipse

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**Abstract.** Probably the only reliably recorded solar eclipse event during a day-time war is the 28 May 585 BCE event, famous also for several other reasons. It has a credible written record, mentioned by the ancient historian Herodotus and his *History* notes that the eclipse was predicted by Thales of Miletos (the Ionian capital city in Western Anatolia). The location of the war between Lydians and the Medes is now firmly located as the plain in front of ancient city of Pteria, the Anatolian capital of the Medes. The historical record mentions that the war stopped and a peace treaty was signed, with the wedding of a prince and a princess from rival kings. All these features make the event and place an excellent candidate for a World Astronomical Heritage site to be preserved.

**Keywords.** Eclipses, Thales, heritage

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## 1. Introduction

Over the last several hundred thousand years humankind has witnessed many events of cosmic phenomena, which may have had very important effects on our social, cultural and material (and even genetic) evolution. Such events include: solar and lunar eclipses, unusual (low latitude) auroral events, appearance/disappearance of comets, the “new” stars, (i.e., records of possible novae and supernovae), the unusual alignment of “stars” or planets and also, a number of strikes of comets and meteorites on Earth. Detailed rigorous study of unambiguously known or materially-evidenced records of such events, although quite rare, are expected to shed further light on the course of our history. For some of them (mostly for novae, supernovae and cometary visits), historical records (written documents, pictures, stone carvings etc.) of various degrees of authenticity and reliability are at the disposal of science and scientists (i.e., Clark & Stephenson 1977). For many others, however, some geological and sometimes astrophysical evidences along with solid scientific theories would be our only guide for the ‘final’ truth. In this respect, solar and lunar eclipses (total or partial) form a special class themselves, since modern computer technologies allow us to calculate reliably the exact reconstruction of events including accurate dates and places of such events. These events (especially total eclipses) are considered as ‘very impressive’ and sometimes ‘fearful’ events; i.e., *everywhere the solar and lunar eclipses caused pandemonium* (Verdet 1987). However, they may still not have the proper share of records when compared with their frequency of occurrences and level of possible impacts. It may partly be due to the widespread of such events geographically, totally independent of any human affairs, while relevant human enterprises that may have been affected and would have recorded it –centers with religious and/or scientific scholars and localities with political power– had an entirely different and unrelated distribution over world geography. In modern times, solar eclipses are probably the occasions of

recollection of such occurrences (Todd 1900; Zirker 1995; Littmann et al. 1999; Stavischii et al. 2007; Popescu & Dumitrache 2007; Rovithis-Livanou & Rovithis 2007).

## 2. Eclipse during the war

In this paper, an example of such an event –the solar eclipse of 28 May 585 BCE in central Anatolia– is given as a good example of possible results. The event is mentioned and accounted by the ancient historian Herodotus (about 150 years later) as the occasion of a war between Medes and Lydians. War between Lydians and Medes had continued for 5 years. In his words, “[...] *As however, the balance had not inclined in favor of either nation, another combat took place in the sixth year, in the course of which, just as the battle was growing warm, day was on a sudden changed into night. This event had been foretold by Thales, the Milesian, who forewarned the Ionians of it ... The Medes and Lydians, when they observed the change, ceased fighting, and were alike anxious to have terms of peace agreed upon*”. This war took place over the plain by the ancient city of Pteria, the regional capital of the Medes. A peace treaty was quickly reached and sealed by a marriage between a Median prince and a Lydian princess ...

## 3. Prediction by Thales

Herodotus also gives the credit of foretelling an eclipse for the first time to Thales. How could this have happened? One possible explanation is that Thales learned about the “saros cycle” of eclipses from the Egyptians during his visits there (Littmann et al. 1999). The earlier eclipse in the same saros that preceded 585 event was May 18, 603 BCE. It happened on a path crossing Egypt, the Red Sea and the Persian Gulf. Thales could have heard reports of this eclipse and used it to calculate the May 28, 585 BCE event. However, saros calculations would not have told him where the eclipse would be visible. He could have just warned the possibility of a solar eclipse that could be visible in Asia Minor since *there is no evidence that he had the celestial knowledge or the mathematics to calculate it* (Littmann et al. 1999).

## 4. Excavations at Pteria

There are indications that the two armies had met in the plain by Kerkenez Dag mountain (Krupp 2000) near the modern city of Sorgun (Yozgat province of Turkey) located about 200 km East of Ankara. The location of the city of Pteria (with approx. coordinates: 34°14'E; 39°46'N) on the same mountain is presently a site of archaeological excavations supported mainly by the British Council in Turkey and the Middle East Technical University, Dept. of Architecture at Ankara. A general view of the site of excavations and Kerkenez Dag in the form of a digital terrain model is given by Summers et al. (2003). The Pteria city walls as well as the inner fortress area are visible.

The city is described as *the Iron Age capital in central Turkey on the Kerkenez Dag, founded by Medes circa 600 BCE and destroyed by Croesus, King of Lydia some 50 years later ... The discovery of the ‘Palace Complex’ –a type of building with clear Iranian antecedents– lend further weight to identification of Kerkenes with the Pteria of Herodotus.* (Summers et al. 2000).

## 5. The March 29, 2006 eclipse observations

Since the coverage area of total eclipse of March 29, 2006 (JD 2453823.96) event largely overlaps with that of 28 May 585 BCE (JD 1507900.35), it presented a unique chance to look at the war event with a renewed interest in its probable physical and topographical conditions, development and end results. It may constitute a strong reason for contemplation: How could a full eclipse might have affected other or similar occasions? This is a prime example of changing the course of our actions when events of cosmic proportions affect our mundane humanely interactions. It is an interesting opportunity to feel and guess about what may have had happened at the time as well as how we humans behave under cosmic events of unmanageable proportions.

Descriptions of solar eclipses in general show that each event is almost unique and has its own peculiarities. On March 29, 2006, near Kerkenes Dag, the weather was very favourable for naked eye and telescopic observations. Not only people from surroundings and far away regions gathered at Kerkenes Dag, but also many of the local government members and municipalities were present during the 'show'.

The development of the event was witnessed by at least a thousand people just at the summit. The eclipse itself was magnificent with one of the best solar coronal views captured recently.

The plain in which the ancient war took place had also its moments of climax during movement of the Moon's shadow in the area.

## 6. Conclusion

There are two different issues under consideration related to the eclipse: (1) Its discussion and evaluation as a celestial event and (2) its possible consideration as a UNESCO Astronomical Heritage site to be preserved. For the first point we can consider the following: After almost 2,590 years, or, more precisely 945,923.6 days later, another eclipse occurred at the same spot where an ancient war had taken place. Sheer occurrences of the eclipse makes the calculation of this interval so precise. This is an indication that such celestial events may even help us to build up very precise historical chronologies. Much discussion and details were provided for the unique 585 BCE event by several authors, not to mention the fact that the same area would observe another eclipse in March 29, 2006. If this was properly advertised, more observers at Pteria site would be expected. One small detail in the 585 BCE event is that, according to one of the popular astronomy software (**Red Shift**) there indeed existed an eclipse on May 28, 585 BCE observable from the coordinates of Kerkenes Dag mentioned above; however, the start of eclipse is not precisely at the time one assumes to be, i.e., around the local noon. The time of the event is rather late in this respect: the eclipse seems to start at around 17:00 local time and darkness of full eclipse sets in at around 18:00 for about 3 minutes. Actually, the evening Sun completely sets below the horizon around 19:00 local time. Could this shift of the event towards the sunset be an artefact of the software at hand (which was checked by the use of another commercial software –**The Starry Night**– which agrees with present results), or, rather, another detail not mentioned in Herodotus' records? May it even shed further light on the war event itself? For example, could it be that soldiers were already over-tired by the time of sunset and therefore, ready to stop fighting, so that a truce was much more easily achieved? This point needs to be checked with other software and probable historical records (if any) in the future. It may also provide another check on the accuracy level of such software if carefully applied.

For the potential designation of the site as an historical astronomical heritage place, it has a number of advantages. To start with, this is already an interesting site by itself archaeologically: it is the capital city of a different tradition and customs in Anatolia in many respects. As further parts of the city will be revealed by the on-going excavations, archaeology and astronomy will have a chance to jointly enhance each other, being able to reach people for the scientific thought itself! Therefore, the site should be considered one of such sites with a plate and emblem of UNESCO telling the story in its full glory !

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