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The fall of a meteorite at Aegos Potami in 467/6 BC

E Th Theodossiou, P G Niarchos, V N Manimanis
Department of Astrophysics-Astronomy and Mechanics, School of Physics, University of Athens, Panepistimioupoli Zographou, 157 84, Greece
E-mail: etheodo@scc.uoa.gr

and

W Orchiston
Anglo-Australian Observatory, PO Box 296, Epping, NSW 2121, Australia
E-mail: wo@aaoepp.aao.gov.au

Abstract
Cosmic catastrophes have been associated from time to time with the fall of celestial objects to Earth. From the writings of ancient Greek authors we know that during the second year of the 78th Olympiad, that is the year corresponding to 467/6 BC, a very large meteorite fell at Aegos Potami, in the Gallipoli Peninsula (in Eastern Thrace). This event was predicted by Anaxagoras, and the meteorite was worshipped by the Cherronesites until at least the first Century AD. The fall of the Aegos Potami Meteorite was not associated with any cosmic catastrophe, but it was believed to have foretold the terminal defeat of the Athenians by the Spartans in 405 BC near Aegos Potami, which brought to an end the Peloponnesian War in favour of Sparta.

In addition, according to the Latin author Pliny the Elder, during the first century AD the inhabitants of Avydus in Asia Minor worshipped another meteorite that was displayed in the city's sports centre. The fall of this meteorite is also said to have been predicted by Anaxagoras.

Keywords: *Aegos Potami, Avydus, meteorite, Anaxagoras*

1 INTRODUCTION

Aegos Potami, a name meaning in Greek 'Rivers' *(=Potami)* 'of the Goat' *(=Aega)* – although the Greek prefix 'aeg' means a place generally near water – was a stream with an ancient small town built next to its estuary on the eastern shore of the Gallipoli Peninsula in Eastern Thrace, opposite Lampsacus and Avydus. Today the Turkish village of Kara-kova occupies this site.

On the shore of Aegos Potami in the autumn of 405 BC the Athenian and the Spartan fleets faced each other, and the Spartan Admiral, Lysander, succeeded in conquering the Athenian fleet. The catastrophe was complete for the Athenians: 170 ships were seized by the Spartans and 3000 men were captured and then killed (Xenophon, 1918). This disastrous encounter virtually signified the end of the great Peloponnesian War. The Spartans, under King Agis and Lysander, then besieged Athens, which was finally forced to capitulate under humiliating terms.

Plutarch (1916:260) mentions that ancient writers were of the opinion that this catastrophe had been foretold by the fall of a very large meteorite at Aegos Potami in 467/6 BC. Furthermore, according to Pliny the Elder (AD 23-79), Plutarch (AD 45-120), Philostratus (2nd century AD), Diogenes Laertius (3rd century AD), and other authors, the philosopher Anaxagoras even predicted the fall of this meteorite. For example, Philostratos (1912:9) writes: "... we might also accuse Anaxagoras because of the many things which he foretold.

[including] ... that day would be turned into night, and stones would be discharged from heaven round Aegos Potami, and of how his predictions were fulfilled."

Anaxagoras certainly was a remarkable man, and he was very knowledgeable about astronomy. He held the view that meteorites were celestial bodies that from time to time happened to fall to Earth, and he also held equally progressive views about meteors and the composition of stars (Diels, 1996). Born near Smyrna about 500 BC, he

> ... took the more materialist Ionian ideas of philosophy with him to Athens forty years later. To Anaxagoras matter was a crowd of different entities each with different qualities or accidents as the sences suggest. However far division is carried, the parts contain things like the whole, though differences may arise from different proportions in the ingredients. Motion was originally started by Mind, a subtle fluid causing rotation which spreads and so makes and orders the world. The heavenly bodies are matter of the same nature as the Earth; the Sun is not the God Helios, but an ignited stone; the Moon has hills and valleys. Besides these speculations Anaxagoras made some real advance in exact knowledge. He dissected animals, gained some insight into the anatomy of the brain, and discovered that fishes breathe through their gills. (Dampier, 1946:22-23)

Because of these views and others, Anaxagoras was so unpopular in Athens that he almost lost his life, and he was even accused of atheism (see Diogenes Laertius, 1925; Heath, 1981; Plato, 1914; Sextus Empiricus, 1933).

2 THE FALL OF THE METEORITE ACCORDING TO THE ANCIENT SOURCES

Let us see now how the ancient writers and doxographers (writers who record the theories of older philosophers) describe the fall of the Aegos Potami Meteorite. In his *Lives of Lysander and Sulla,* Plutarch (AD 45-120) states:

> There were some who declared that the Dioscuri (Castor and Pollux) appeared as twin stars on either side of Lysander's ship just as he was sailing out of the rudder-sweeps. And some say that the falling of the stone was also a portent of this disaster; for, according to the common belief, a huge stone had fallen from heaven at Aegos Potami, and it is shown to this day by the Cherronesites, who hold it in reverence. It is said that Anaxagoras had predicted that if the heavenly bodies would be loosened by some slip or shake, one of them might be torn away, and might plunge and fall down to earth, and he said that none of the stars remained in its original position; because, as they are compact as stones and heavy, they shine due to friction with the revolving aether, and they are forced along in fixed orbits by the whirling impulse which gave them their circular motion, and this was what prevented them from falling to our earth in the first place, when the cold and heavy bodies were separated from the whole universal matter...
>
> But there is a more plausible opinion than this, and its advocates hold that shooting stars are not a flow or emanation of aetherical fire, which the lower air quenches at the very moment of its kindling, nor are they an ignition and blazing up of a quantity of lower air which has made its escape into the upper regions; but they are plunging and falling heavenly bodies, carried out of their course by some relaxation in the tension of their circular motion and falling, not upon the inhabited region of the earth, but for the most part outside of it and into the great sea; and this is the reason why they are not noticed....
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> However, the theory of Anaxagoras is supported by Daïmachus in his treatise Peri Eusebias (On Religion); he says that prior to the fall of the stone, for seventy-five days continually, there was seen in the heavens a huge fiery body similar to a flaming cloud, not resting in one place but moving along with intricate and irregular motions, so that fiery fragments broken from it by its plunging and erratic course were carried in all directions and flashed fire, just as shooting stars do. But when it had fallen in that part of the Earth and the inhabitants, after recovering from their fear and amazement, were assembled around it, no action of fire was seen, nor even so much as trace thereof, but a stone lying there, of large size, it is true, but one which bore almost no proportion at all to the fiery mass seen in the heavens. Well, then, that Daïmachus must have indulgent readers, is clear; but if his story is true, he utterly refutes those who affirm that a rock, which winds and tempests had torn from some mountain top, was caught up and borne along like a spinning top, and that at the point where the whirling impetus given to it first relaxed and ceased, there it plunged and fell. Unless, indeed, what was seen in the heavens for many days was really fire, the quenching and

> extinction of which produced a change in the air resulting in unusually violent winds and agitation, and these brought about the plunge of the stone. However, the minute discussion of this subject belongs to another kind of writing. (Plutarch, 1916:260-265).

According to Pliny (1938, II:149) the meteorite fall occurred in the year 467/6 BC, while Aristotle (384-22 BC) records that the event took place during daylight hours and that a comet was visible in the evening sky at the time: "... when the stone fell from the air at Aegos Potami it had been lifted by the wind and fell during the daytime; and its fall coincided with the appearance of a comet in the west." (Aristotle, 1952:55). In another account, Aristotle provides more details:

> On the occasion when the (meteoric) stone fell from the air at Aegos Potami, it was caught up by a wind and was hurled down in the course of a day; and at that time too a comet appeared from the beginning of the evening. Again, at the time of the great comet (373/2 BC) the winter was dry and arctic, and the tidal wave was caused by the clashing of contrary winds; for in the bay the north wind prevailed, while outside it a strong south wind blew. Further, during the archonship of Nicomachus at Athens (341/0 BC) a comet was seen for a few days in the neighbourhood of the equinoctial circle; it was at the time of this comet, which did not rise with the beginning of the evening, that the great gale at Corinth occurred. (Heath, 1981:246).

These accounts by Aristotle appear to be the earliest mention of the Aegos Potami Meteorite by any writer whose works has survived, while the second century BC doxographer, Aetius, also reports this event:

> Diogenes says that the stars are like pumice stones, and he considers them as pores through which the world breathes; and that they are red-hot. In addition to the visible stars, invisible stones also wander through the heavens, having no name. They frequently fall on Earth and their fire gets extinguished, like the stony star which fell in flames at Aegos Potami. (Aetius, 1879:342).

Diogenes was a contemporary of Anaxagoras.

Pliny the Elder (AD 23-79) reports the same event in his *Naturalis Historia*, and he also mentions a meteorite that fell at Avydus, again apparently after a prediction by Anaxagoras. An English translation of the relevant passage reads:

> The Greeks say that Anaxagoras of Clazomenes succeeded during the second year of the 78th Olympiad [467/6 BC] with his knowledge in astronomical literature to predict that some days later a stone from the Sun would fall, and this happened during the daytime at the area of Aegos Potami of Thrace – and this stone can be viewed even today, having the size of a chariot and brown color – when a comet was shining during the nights. If one believes in this prediction, he must at the same time accept that the supernatural abilities of Anaxagoras consisted of an even greater miracle, that our understanding of nature is zero and everything is in confusion if it is credible that either the Sun itself is a stone or it ever used to have a stone inside it. Yet it is not doubted that stones do fall frequently. For this reason, in the sports center of Avydus they still worship today a stone, medium-sized to be fair, for which it is said that Anaxagoras had again predicted its falling at the middle of the Earth. (Pliny, 1938:284).

Pliny also describes the Aegos Potami Meteorite as "... the size of a wagon and black in colour." (cited in Brown, 1973:153).

The other meteorite that Pliny refers to above was located at Avydus. This ancient Greek city was located north-east of the present-day Turkish town of Çanakkale, on the Asian shore of Hellespontus and at the narrowest part of the channel. Perhaps it is a coincidence, but in 411 BC, prior to the battle at Aegos Potami, one of the most violent naval battles of the Peloponnesian War took place near Avydus, with victory in this instance going to the Athenians.

3 DISCUSSION

Apart from Pliny the Elder's reference to its size and colour, there are no descriptions of the appearance or physical properties of the Aegos Potami Meteorite, but its brown or black colour suggests oxidation and that it was more likely an iron meteorite rather than a stony or stony-iron. This view is also supported by its size, for large iron meteorites are more commonly

found intact, whereas stony meteoroids often disintegrate prior to impact. Thus, the largest known iron meteorite is the 60 ton Hoba West mass from Namibia, whereas the largest extant stony meteorite currently on record weighs 1.9 tons and was recovered near Jilin in China (Norton, 2002:45). If the Aegos Potami Meteorite really was of chariot- or wagon-like proportions, then it would have weighed an impressive several tons, but it would hardly have rivelled the Hoba West Meteorite.

What became of the Aegos Potami Meteorite is not clear. In the era of the Roman author Pliny the Elder (AD 23-79), it was still visible at its impact site, and was revered by the local population. In 2002 June three of us (E.T., P.N. and V.M.) were in the Turkish city of Çanakkale attending a binary stars workshop, and were able to visit the village of Kara-kova, where Aegos Potami once stood. The present inhabitants of Kara-kova are farmers who knew nothing about the fall of a meteorite there more than two and a half millennia earlier, and we could not find any remains of the ancient settlement. However, in geological terms, estuarine coastal localities like this are subject to rapid change as a result of erosion and/or sedimentation, so it is possible that with the passage of time the Aegos Potami Meteorite was been covered with sediments or may even have weathered away. However, it would be a worthwhile exercise to conduct a systematic geophysical survey of the area just in case it has survived intact.

The current whereabouts of the Avydus Meteorite is also unknown. During the 2002 June Workshop we also had the opportunity to visit this ancient city, which contains many archaeological remains, and we learned that when Sultan Selim III constructed the walls of the Nara Castle in 1807 he used material from the ancient city. The sports centre was apparently destroyed at this time, and the present inhabitants of the city had no knowledge of the meteorite mentioned by Pliny the Elder.

Although the fall of the Aegos Potami Meteorite is one of the most comprehensive that has been documented in the early literature, reference to it is surprisingly rare in books on meteorites or astronomy (but for some exceptions see Bagnall, 1991:1; Brown, 1973:153; Flammarion, 1955:395; Moore, 1971:1). Nor is the Aegos Potami Meteorite fall the earliest on record. According to Bevan and De Laeter (2002:12), "The earliest known record of a meteorite fall comes from around 4000 years ago in Phrygia (now part of Turkey). According to the Roman historian Titius Livius, the celebrated meteorite at Phrygia was later transported in royal procession to Rome where it was worshipped for another 500 years." In 1873 Daniel Kirkwood consulted various sources in order to compile a list of falls, and the following also pre-date the Aegos Potami event:

(1) About 1478 BC an aerolite or thunder stone, as it was called, fell in the Island of Crete.
(2) A number of stones which were anciently preserved in Orchomenos, a town in Boetia, were seen to have fallen from Heaven about 1200 BC
(3) In 1168 BC a mass of iron was seen to descend upon Mount Ida in Crete. (Cited in Nininger, 1952:5).

Meanwhile, Meunier lists 28 different falls that were documented between 1478 BC and 6 BC (ibid.).

In contrast, the earliest fall associated with a known meteorite that is currently in existence occurred on 861 when a meteorite landed at the Suga Jinja Shinto shrine at Nogata, Japan. This treasured fist-sized relic has been preserved there ever since, and the "... date of fall – May 19, 861 AD – is recorded in old literature as well as on the lid of the wooden box in which it has been stored." (McSween, 1987:1-2). But perhaps the best-known early fall took place near Ensisheim (now part of France) on 1492 November 16 (Zanda and Rotaru, 2001:16-19). There is a sizable body of literature about this event (e.g. see Marvin, 1992), and the main mass of this large stony meteorite is still preserved in the town's Palais de Régence.

4 CONCLUSION

Ancient Greek authors and doxographers have documented the fall of a relatively large meteorite at Aegos Potami in the Gallipoli Peninsula in the year 467/6 BC. This fall, which was possibly predicted by the philosopher Anaxagoras, did not cause a cosmic catastrophe or any kind of extended damage, but it was associated with a tragic defeat of the Athenians by the

Spartans during the battle of Aegos Potami in 405 BC, thus bringing to an end the Peloponnesian War. The historical records contain tantalizing little about the nature and appearance of the Aegos Potami Meteorite, which we surmise to be an iron meteorite, and its current whereabouts is unknown.

In addition to recording the Aegos Potami Meteorite, Pliny the Elder also reports the existence of a revered meteorite at the nearby city of Avydus during the first century AD. The current location of this meteorite is also unknown.

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Dr Efstratios Theodossiou is an Assistant Professor of Astrophysics at the University of Athens. His scientific interests included observational astronomy and astrophysics, satellite spectrophotometry of Be stars, variable stars, and history and philosophy of astronomy. He has published more than 40 scientific papers in international journals and proceedings of astronomical conferences, many articles in Greek newspapers and journals, and nine books on history and philosophy of

astronomy and physics. He is member of IAU Commission 41 and Treasurer of the Hellenic Astronomical Society.

Dr Panagiotis Niarchos is an Associate Professor of Astronomy at the University of Athens. His research area is observational astronomy and astrophysics with emphasis on variable stars and interacting binaries, stellar photometry, and photometric data analysis and interpretation. His other research interests include history and philosophy of astronomy and sciences, and the search for extraterrestrial life. He has published more than 150 scientific papers in international journals and proceedings of astronomical conferences, and is a member of IAU Commissions 27, 42, and 51.

Vassilios Manimanis is about to defend his Ph.D. thesis on a photometric study of near-contact eclipsing binary stars at the University of Athens. His other research interests include photometry of cataclysmic variable stars, history and philosophy of astronomy and sciences, popularization of astronomy and bioastronomy. He has published eight research papers in refereed journals and many articles in popular magazines.

Dr Wayne Orchiston is a Research Associate at the Anglo-Australian Observatory and Archivist and Historian at the Australia Telescope National Facility, in Sydney, and has research interests in Cook voyage astronomy, Australian and New Zealand astronomical history, the history of radio astronomy, and meteoritics. He has written more than 160 research papers, and the book *Nautical Astronomy in New Zealand. The Voyages of James Cook* (Wellington, 1998). He is Secretary of IAU Commission 41 (History of Astronomy) and of the Inter-Union Commission for History of Astronomy.