Mediterranean Archaeology and Archaeometry, Vol. 12, No 1, pp. 63-76

THE TROJAN WAR DATED BY TWO SOLAR ECLIPSES

Göran Henriksson

Department of Physics and Astronomy, Uppsala University
S-751 20 Uppsala, Sweden

Received: 17/11/2011
Accepted: 4/12/2011
Corresponding author:goran.henriksson@astro.uu.se

ABSTRACT

The Trojan War was very significant for the ancient Greeks and they dated historical events according to the number of years after the fall of Troy. However, there was already in antiquity no consensus as to the exact date of the war when compared with different epochs. Even after the modern discovery of the ancient city, there has been disagreement among different excavators as to which layer corresponds to the city mentioned in the Iliad attributed to Homer.

In this paper an attempt is made to identify the strange obscuration of the sun that occurred during the final battle of the Iliad as a total solar eclipse close to the southern border of the zone of totality. There exists only one solar eclipse that corresponds to the description in the text and this is the total solar eclipse of June 11, in 1312 BC.

When I first presented this date in 1986, there was a difference of about 60 years compared with the most common archaeological dating at that time. My date is now fully supported by the latest results from the German-American excavation that identifies the fall of Homer's Troy with the destruction of the archaeological layer Troy VIh, dated to about 1300 BC.

Further independent support is provided by another solar eclipse that dates the reign of the Hittite king Muwatalli II. This king wrote a letter to king Alaksandu in Wilusa, identified as the Hittite name for Ilios, the most frequently used name for Troy in the Iliad. Alexander was another name for Paris who abducted Helen, the crime that resulted in the war. Muwatalli II was king 1315-1297 BC, according to the chronology for the Hittite Kingdom based on a solar eclipse in 1335 BC, during the tenth year of King Mursili II (1345-1315 BC), the father of Muwatalli II.

KEYWORDS: Iliad, Homer, Trojan War, Total Solar Eclipse, Achilles, Patroclus, Troy VI, Wilusa, Muwatalli II and Mursili II.

INTRODUCTION

New progress has been made in the research on Troy by the German-American excavations that began in 1988. The important new results from the first ten years of this investigation have been presented by the different specialists in *Troia, Traum und Wirklichkeit* written in 2001 for an exhibition in Berlin, with the director of the excavation, Manfred Korfmann as the main editor. After his investigation of the site's many buried layers of occupation from about 3000 BC to AD 1200, Korfmann concluded that Troy was a prosperous and powerful centre of commerce in the late Bronze Age, the centuries around the time of the legendary Trojan War. Its geographical position made it possible to control shipping and collect duties on all goods passing through the Dardanelles. The most important new discovery is the lower city, where the ordinary citizens lived.

The *Iliad*, according to ancient Greek tradition, was used as a history book in ancient Greece. Most modern scholars place the author Homer in the 8th century BC and his birthplace in either Chios or Smyrna, both in Ionia on the western coast of Asia Minor. It may be possible that he actually visited the impressive ruins of Troy and it is certain that he had heard of its glorious history. There are many indications that Homer's work is a compilation of an old oral tradition (Parry 1971), which dates back to the Bronze Age and is a mixture of fact and fantasy. The fact that the *Iliad* is written in hexameter is a clear indication that it had been preserved as an oral tradition.

Although the *Iliad* is written in Greek, it is a Greek with many anachronisms. For example, the name Achaeans was no longer used during the time of Homer. Some of the names used may be of Luwian origin, but the preserved texts in this language have unfortunately not been interpreted so far. Great progress has now been made, however, in the identification of the place names mentioned in the Hittite texts written before 1200 BC (Starke 2001).

THE BACKGROUND TO THIS PAPER

In November 1985, a private person contacted the Astronomical Observatory in Uppsala and said that he had heard a popular lecture on Troy given during the 1940s by the Swedish astronomy professor Knut Lundmark, an early cosmologist with a great knowledge of the history of astronomy. In his lecture Lundmark had dated the Trojan War by a total solar eclipse that, according to his interpretation, had taken place during a battle. He identified this eclipse as the total solar eclipse that took place in the middle of the day in May, 1145 BC. The interested listener to this lecture visited Troy during the summer of 1985 and promised the guide there that he would find out and let him know the exact date for this solar eclipse, which he had forgotten. He called the Astronomical Observatory in Uppsala and was referred to me, as I had recently finished a computer program for the calculation of ancient solar eclipses.

At first I was sceptical because Lundmark used *Canon der Finsternisse* (Oppolzer 1887), which is no longer considered reliable. On the other hand, I was interested in this opportunity to test my new computer program and asked him to tell me how the solar eclipse was described in the text. However, he never called me again and after a week I decided to read the *Iliad* myself and look for a description of an unusual darkness in connection with the sun and the moon.

After three days of exciting reading I found what I was looking for in book 17, lines 366-377:

"So they fought like blazing fire, *nor would you say that sun or moon still remained intact, for with darkness were shrouded in the fight all the chief men who stood around the slain son of Menoetius.* But the rest of the Trojans and the well-greaved Achaeans fought unimpeded under clear air, and over them was spread the piercing brightness of the sun, and on all the earth and the mountains was no cloud

seen; (my italics) and they fought resting themselves at times, avoiding one another's shafts laden with groans, and standing far apart. But those in the middle suffered woes because of the darkness and the war, and were worn down with the pitiless bronze, all they who were chief men." (Wyatt 1999).

My identification of the darkness mentioned there with the total solar eclipse on June 11, 1312 BC, was presented to the postgraduate seminar at the Department of Classical Archaeology and Ancient History at Uppsala University in the spring of 1986. This description of a remarkable darkness during daytime, without any obscuring clouds seen over the mountains or on all the earth, and in which the sun and the moon no longer were shining normally, can in my opinion be explained most simply and naturally as a non-technical description of a total solar eclipse in which the moon completely covers the solar disc. Moreover, the information that the piercing brightness of the sun was spread over the Achaeans who fought in the outer parts of the battlefield can easily be explained if the outer parts of the battlefield lay just outside the zone of totality.

As chariots were used in the battle, the central parts of the battlefield must have been situated in the dry area to the south or south-east of the lower city of Troy, and the outer parts of the battle must have taken place further to the south.

The slain son of Menoetius was Patroclus, the best friend of Achilles, the greatest warrior among the Achaeans. To frighten the Trojans, Patroclus used Achilles' armour, and Hector, the greatest Trojan hero, thought that he had defeated and killed Achilles himself.

I have discussed the original Greek text with Dr Johan Flemberg, Department of Classical Archaeology and Ancient History, Uppsala University. In his opinion the mention of the sun and the moon and the strong emphasis on the contrast between the darkness in the middle and the brightness outside it makes it conceivable that this passage contains the memory of a solar eclipse. The word for darkness in the passage quoted above is *aer* (mist, haze), which is not unique, whereas the episode itself is. According to Edward, commenting on lines 370-377 (1991: 98): "This amplification of the mist theme is unique; nowhere else is the darkness localized like this, and much of the language is innovative and vivid". Edward has found several unique features in these lines, and this strengthens the opinion that it is a genuine description of an unusual phenomenon and not just a poetic expression.

We are therefore looking for a total solar eclipse during the Bronze Age with the southern limit of the total zone situated some kilometres to the south of Troy.

TOTAL SOLAR ECLIPSES IN TROY

In Table 1 all solar eclipses, between 1000-2000 BC, with a magnitude in Troy of more than 0.990 of the sun's diameter, can be found. The calculations were performed in 1986 with the original formulas by Carl Schoch (1931). (All dates in the Gregorian calendar).

Table 1

All solar eclipses in Troy, with magnitude greater than 0.990, between 1000-2000 BC. The calculated time has an uncertainty of about one minute, but the seconds are presented to make it possible for other authors to compare this calculation with results from different computer programs.

Year BC	Date	Local mean solar time in Troy	Magnitude in Troy	of the eclipse 4' (7.4 km) south of Troy	Comments
1014	14/11	$17^t\ 13^m\ 01^s$	0.998	0.999	Partial
1312	11/6	$12^t\ 35^m\ 24^s$	1.002	1.000	Total, southern limit
1341	26/12	$10^t\ 23^m\ 50^s$	1.009	1.010	Total
1406	30/6	$14^t\ 43^m\ 11^s$	0.994	0.996	Partial

The coordinates for Troy used in this calculations have been measured from a map:

longitude = 26° 14' 21" E and latitude = 39° 56' 54" N.

Only two of the four solar eclipses were total in Troy. The only interesting eclipse here is the one in 1312 BC, June 11, at 12.35.24 local mean solar time in Troy, whose southern limit of the zone of totality is situated only 4' (7.4 km) to the south of Troy (Fig. 1). The fight over Patroclus' dead body must have taken place some kilometres south or south-east of Troy where it was possible to use chariots as described in the *Iliad*.

A new calibration made by the author in 2011 of the lunar secular acceleration in longitude, based on 33 total solar eclipses back to 3653 BC and the use of coordinates for Troy from Google Earth, longitude = 26° 14' 20" E and latitude = 39° 57' 27" N, shifted the limit of the total zone just about 400 m further south, and the time of maximum eclipse became 12.36.08 local mean solar time in Troy.

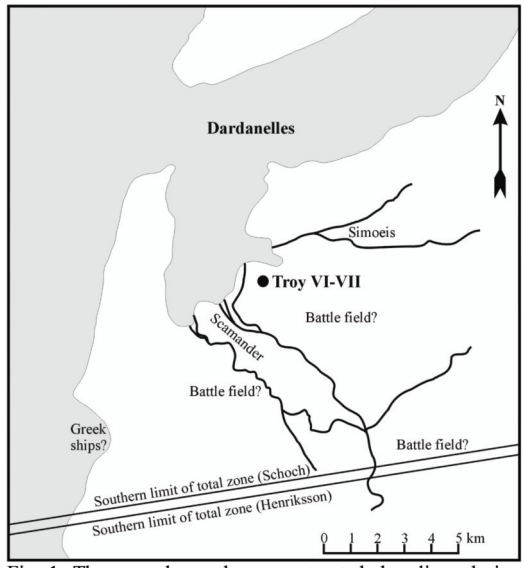

Fig. 1. The map shows the reconstructed shorelines during Troy VI-VII, ca 1300 BC, drawn after Korfmann (2001).
The southern limit of the zone of totality for the solar eclipse on June 11, 1312 BC, at 12.36 local mean solar time in Troy. The upper line, 7.4 km south of Troy, corresponds to the position of this limit according to the original formulas by Schoch (1931) and the lower line, 7.8 km south of Troy, is the position according to the new calibration by Henriksson in 2011.

The most difficult problem in the calculations of ancient solar eclipses is the correction for the braking of the rotation of the earth. As can be seen in Fig. 3 the rotation of the earth has been delayed by about 10 hours since the fourteenth century BC. If this effect is not taken into account the calculated zone of totality will be shifted by 150° westwards and there seems to have been no solar eclipse at all for instance in Troy. To get useful results the clock error in the calculations should be just a few minutes.

The German astronomer Carl Schoch solved this problem in 1926 and his theory was used in my computer program in combination with modern astronomical parameters until July of 2011 when I made the new calibration. Unfortunately Schoch died in 1929, but his important work was published after his death by P. V. Neugebauer (Schoch 1931). The apparent rotation of the earth is the fundamental clock in these formulas, and therefore corrections for the braking of its rotation must be included in the formulas for the motion of the sun, the moon and the planets. These corrections are proportional to the mean motion of these celestial bodies and are easy to apply.

I started to develop my computer program in 1977, but it did not work sufficiently well until 1985, after many improvements in the calculation methods and the introduction of about 450 periodic terms in the perturbation formulas for the orbit of the moon (Hansen 1857).

After June 1985, the agreements between my computations and the ancient sources have been excellent. These sources include five solar eclipses observed by Copernicus, notations in medieval monastery chronicles, observations by ancient Greek astronomers such as Thales and Hipparchos, Late Babylonian

cunei-form texts, Hittite annals by King Mursili II and interpretations of depictions of total solar eclipses on Swedish Rock-carvings from the Bronze Age (Henriksson 1999, 2005).

The most important and conclusive test of my computer program was the identification of two total solar eclipses in Babylon in 1859 BC and 1558 BC that fit very well with the details in the written sources and also with the interval between the eclipses of 301/300 years (Henriksson 2006). Six solar eclipses have been used to determine an absolute chronology for the pharaohs from the 18th, 19th and 20th dynasties in Egypt, and two solar eclipses date the exodus from Egypt by the People of Israel (Henriksson 2007). The Xia, Shang and Western Zhou dynasties have been dated by identification of important Chinese total solar eclipses preserved in later historical chronicles (Henriksson 2008).

The sky on Achilles' new shield

The famous "Shield of Achilles" is the shield that Achilles used in his fight with Hector described in a passage in Book 18, lines 478-608 of the *Iliad*. The description of the shield falls between the fight over Patroclus' body and Achilles' re-entry into battle. Achilles had lost his armour after lending it to his friend and companion Patroclus who was killed by Hector and his weapons taken as spoils. Thetis, Achilles' mother, asked the god Hephaestos to make new armor for her son. Homer gives a detailed description of the imagery which decorates the new shield, which may be considered as a physical encapsulation of the entire world. It starts from the shield's centre and moves outwards in circles. The central motif is the earth, sky and sea, the sun, the moon and the constellations, *ILIAD*, BOOK 18: 484-489:

"On it he fashioned the earth, on it the heavens, on it the sea, and the unwearied sun, and the moon at the full, and on it the constellations with which heaven is crowned – the Pleiades and the Hyades and mighty Orion and the Bear, that men call also the Wain, that circles ever in its place, and watches Orion, and alone has no part in the baths of Ocean." (Wyatt 1999). (The Wain is also called the Big Dipper.)

It may not be just a coincidence that all the celestial objects mentioned in these lines were visible in the sky during the total phase of the solar eclipse on June 11, in 1312 BC, at 12h 36m, during the fight over Patroclus' body. This part of the sky is the winter sky, not visible during the summer except during the total phase of a solar eclipse (Fig. 2).

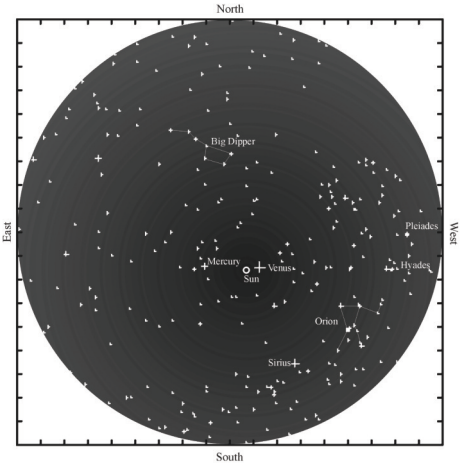

Fig. 2. The sky above Troy during the total solar eclipse on June 11, in 1312 BC, at 12h 36m local mean solar time, during the fight over the body of Patroclus. This date corresponds to Skirophorion 1, in 1312 BC, according to the much later Attic calendar.

The memory of this unique situation may have been considered as a proof of the interference from the gods in the battle and may have been the inspiration to the central motif of the new shield that Hephaistos made for Achilles.

This independent evidence supports the hypothesis that the total solar eclipse was the explanation for the darkness described so dramatically in book 17.

CALCULATIONS OF ANCIENT SOLAR ECLIPSES

Unfortunately all modern computer programs for the calculation of ancient solar eclipses are based on the so-called Ephemeris Time (ET) (Stephenson and Morrison 1984). It is defined by the mean motion of the planets, but a conversion table to calculate the Universal Time (UT) necessary in the calculation of ancient solar eclipses must be established. This method has not been successful for calculation of early solar eclipses. John Steele (2000) admits that it is completely useless for epochs before 700 BC. However, there exist problems also with some critical solar eclipses before 500 AD (Morrison and Stephenson 2002) (Fig. 3).

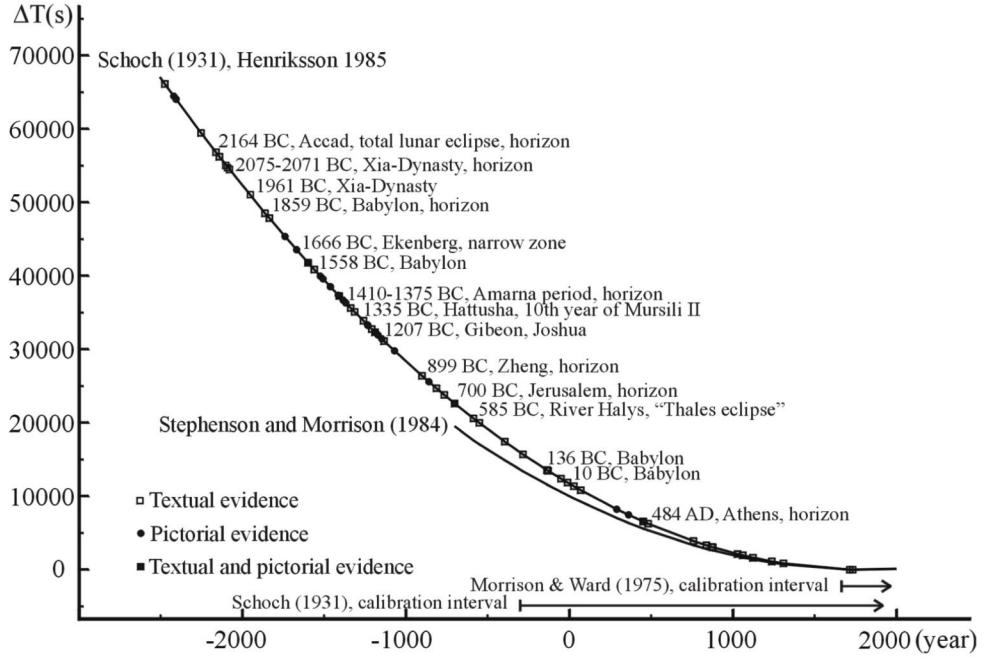

Fig. 3. The parabolic time-shift, ΔT=ET-UT, due to the deceleration of the rotation of the Earth as a function of time with the coefficient 36.28 from Schoch(1931) and 31.0 from Stephenson and Morrison (1984). The unit for the coefficients is seconds/(century)^2 and the time is reckoned from 1800.0. The symbols correspond to identified solar eclipses, mostly total or annular. Most of the identified eclipses can be found in Henriksson (1999, 2005, 2006, 2007, 2008, 2009 and 2010).

Today the results of the determinations of the lunar secular acceleration from ancient solar eclipses can be tested by comparison with the Lunar Laser Range (LLR)-measurements. Before the observed lunar sidereal secular acceleration can be used in the calculations of the LLR-measurements, by the Third Law of Kepler, it must be corrected for the precession of the geodesic predicted in the General Theory of Relativity by Albert Einstein (1916). Such a test was in practice not possible until during the 1970s when astronauts from the Apollo project placed laser reflectors on the surface of the Moon. Modern calculations give the value for the precession of the geodesic as -2 x 1.92"/cy^2 = -3.84"/cy^2 (Nordtvedt 1996).

The lunar secular acceleration -25.85"/cy^2 determined from the LLR-measurements by Williams *et al.* (2008) is only valid in the earth-moon inertial system. The followers of Stephenson, for example John Steele (2000),

have taken the value -25.85"/cy^2 from the determinations by LLR as a confirmation of their own value, -26 ± 2"/cy^2, determined by Morrison and Ward (1975). However, this determination was considered by Williams *et al.* (2008) as "not accurate to the number given" and useless because the value from LLR must be *corrected* for Einstein's precession of the geodesic to get the sidereal lunar secular acceleration used in the calculations of the solar and lunar eclipses.

This means that Stephenson's method to calculate eclipses is based on a too approximate value for the lunar secular acceleration and is without physical relevance. The great deviations from the observations are explained as non-tidal effects of unknown origin. A detailed discussion of the problems with Stephenson's method to calculate eclipses can be found in Henriksson (2009 and 2010).

The real sidereal lunar secular acceleration determined by the LLR-measurements, including the Einstein effect, is: -25.85"/cy^2 - 3.84"/cy^2 = -29.69"/cy^2. This value is very close to the value -29.68"/cy^2 determined by Schoch (1931) from ancient solar eclipses. This seems to be a very good confirmation of Einstein's prediction. However, Schoch's theory has an undefined third-order term in his formula for the lunar longitude. It has probably been used as a final correction to his theory to get a closer fit to the observed ancient solar eclipses. This means that the lunar secular acceleration is time-dependent in Schoch's theory, and the constant -29.68"/cy^2 is only valid around the year 1800 AD. The main purpose for Schoch was to get the best set of formulas for calculation of ancient solar eclipses. He was probably less interested in the real acceleration of the Moon.

In July 2011, the present author found a constant value for the sidereal secular acceleration of the Moon without the third-order term. The new constant value corresponds to the true secular acceleration of the Moon caused by the tidal acceleration by the earth.

DIFFERENT ATTEMPTS TO DATE THE TROJAN WAR

There were two generations between the fall of Troy and the Dorian invasion, according to Eratosthenes. His date, 1184 BC, is based on the traditional year 1104 BC for the Dorian invasion and two generations set equal to 80 years. The date for the Dorian invasion, however, is a reconstruction and cannot be used as a fixed point for an absolute chronology. If we instead accept my date 1312 BC as the year of the fall of Homeric Troy, then the Dorian invasion should have taken place about 1232 BC, which fits very well with the introduction of the ceramic style LHIIICb, or about 1230 BC according to the classification by the archaeologist Arne Furumark (1941) of Uppsala University, see Table 2.

Table 2

The Trojan war dated by ancient sources and modern investigations

Year BC	Author/reference	Ceramic period	Comment
1135	Ephoros from Cyme*		
1184	Eratosthenes*		1104+2x40
1209	Parian Marble#		Chronicle from Paros
1250	Blegen (1964)	VIIa	Furumark IIIBb
1300	Dörpfeld (1902)	VI	Furumark IIIBb - IIIAs
1300	Starke (2001)	VIh	Furumark IIIBb - IIIAs
1312	Henriksson (1986)		Total solar eclipse
1334	Douris from Samos*		

* Blegen (1964), # Jacoby (1929)

The Parian Marble is preserved as two fragments, one of which gives the traditional dates for the kings of Athens from the legendary Kekrops, beginning as far back as 1581/80 BC, down to events of 355/4 BC, and the other fragment covers the period 336/5 - 299/8 BC. The date 1209/8 BC is determined as "24 From when Troy was taken, 945 years, in the <2>2nd year that [Menesthe]us was king of Athens, on the 7th day before the end of the month Th[argelio]n", translated by Gillian Newing (2001).

When Heinrich Schliemann started his investigation of Troy in 1871, he was looking mainly for the treasure of King Priam. In 1878 he made a deep trench through the mound and at the bottom of this he found a collection of valuable vessels and jewellery made of gold and other objects made of bronze that he identified as the treasure of Priam (Schliemann 1880, 1884). This level is now called Troy II and dated ca 2500 BC, which means that it belongs to an epoch 1200 years before the Homeric Troy.

After the more careful excavation lead by Wilhelm Dörpfeld (1902), nine different main layers could be identified. Dörpfeld argued that Troy VI, now dated ca 1300 BC, corresponds to the Homeric Troy. Schliemann realized in 1890, the last year he lived, that he had been mistaken and admitted that Dörpfeld was right.

The University of Cincinnati sponsored the next large investigations, those of 1932-38, led by Carl Blegen. His conclusion was that the city walls of Troy VI had been damaged by an earthquake and not by the Achaeans and he identified the Homeric Troy as level VIIa, with a date of ca 1250 BC.

Fritz Schachermeyr (1983) considers the "Trojan war" to be a combination of two wars: the fall of Troy VI, 1300-1280 BC, and the fall of Troy VIIa, 1220-1200. He calls the pottery of type LHIIIC in Troy VIIb1 Barbarian Ware, and the pottery of Troy VIIb2 is called Buckel-pottery.

The author of this paper dated the fall of the Homeric Troy to 1312 BC through identification of the total solar eclipse mentioned in the *Iliad*, and this was presented at the Department of Classical Archaeology and Ancient History, Uppsala University, in 1986. However no attempt was made to publish the result, as there existed no independent support at that time for such an early date as compared with the archaeological date of ca 1250 BC made by Blegen (1964).

The situation is now completely different after the investigation begun in 1988 by a team of German and American archaeologists lead by Manfred Korfmann. The results from this investigation identify the Homeric Troy once more as Troy VIh, with a date of ca 1300 BC (Starke 2001). In Korfmann (2004) there is a table called "Chronological Table, Troia-project, state April 2004" which repeats the earlier conclusion that the end of Troy VIh may have been an earthquake and a fire catastrophe that took place ca 1300 BC. The end of Troy VIi=(VIIa) was another fire catastrophe perhaps in a lost war 1190/80.

ARCHAEOLOGICAL EVIDENCE USED TO IDENTIFY THE HOMERIC TROY

The impressive city walls of Troy VI were constructed over a period of several hundred years and a development towards stronger walls can be seen. A wider and higher wall successively replaced the older and weaker parts. This work was almost finished, except for about 35 m of the southwestern wall, which has half the thickness of the adjacent parts to the south and north. They do not join because the newer thicker parts of the wall were built outside the thinner, older wall. The thinner wall was built in the middle of the period Troy VI (about 1550 BC) and it was probably intended to be replaced by a new stronger wall like the one that encircled nearly all the city (Fig. 4). The work to rebuild the weakest part was never completed and the gaps between the adjoining parts of the new wall were only provisionally filled up with large stones.

A possible explanation for this interrup-

Fig. 4. Part of the mighty eastern wall of Troy VI (Photo G. Henriksson 2006)

tion in the construction of the new wall is a sudden unexpected attack on Troy during the last part of period VI called Troy VIh (LHIIIBb- IIIAs). There are also traces of destruction by fire of some houses in this substratum but not of a catastrophic fire as expected in a city taken by assault.

Blegen (1964) discovered that the upper parts of the city walls of Troy VI had fallen down on the buildings closest to the inside of the southern part of the wall. His conclusion was that this destruction could not have been caused by attacking enemy troops, but was the result of an earthquake that took place about 1300 BC, and the pottery was LHIIIBb.

After the destruction of Troy VIh by the earthquake, the destroyed houses and parts of the city wall were repaired during Troy VIIa. During this period the same pottery (LHIIIBb - IIIAs) was used and the same people continued to live in the city. Dörpfeld suggested that Troy VIIa should be called Troy VIi, but Blegen wanted to preserve the designation VIIa, as it was widely used by many archaeologists.

The end of Troy VIIa, about 1250 BC, was connected with a great fire; several unburied human bodies were found in the streets. The jaw of one corpse had been cut by a sword. The destruction of Troy VIIa was identified by Blegen as the result of the assault by the Achaeans as told in the *Odyssey*, written in a more fanciful style than in the *Iliad*.

During the following period, Troy VIIb, a completely different kind of less sophisticated handmade pottery was found, similar to that found in excavations in modern Bulgaria and very unlike the pottery from the earlier periods, which was made on the potter's wheel.

Schachermeyr (1950) has related the construction of the Trojan horse to the earthquake that destroyed Troy VIh and helped the Achaeans to take Troy. They believed that Poseidon, the *Earth shaker,* had given them their victory and offered him the wooden horse because his symbol was a horse.

ABSOLUTE CHRONOLOGY FOR THE HITTITE KINGS BASED ON A SOLAR ECLIPSE

When Edwin Forrer (1926) investigated the annals of the Hittite king Mursili II, he found that a very sinister solar omen was mentioned in the beginning of his 10th year of rule. It happened right at the outset of a military expedition against the country of Hayasha in north-western Armenia. Forrer recognized this as a solar eclipse and contacted Carl Schoch, who the same year had developed new improved formulas for the calculation of ancient solar eclipses. Schoch identified this solar omen as the powerful partial solar eclipse on February 28 (March 13 Julian calendar) in 1335 BC, with magnitude 0.89 at the capital city Hattusa.

The absolute years of rule for the Hittite kings (Astour 1989), calibrated by the solar eclipse in the 10th year of Mursili II, correlates perfectly with the Egyptian chronology via the battle at Kadesh 1299 BC, in the fifth year of Ramses II (1304-1238 BC) and the last years of rule of the Hittite King Muwatalli II (1315-1297 BC). The first year of Ramses II, 1304 BC, is independently determined by the date for the new moon during his coronation festival (Parker 1957).

The historical résumé in the next paragraph is mainly based on a paper by Frank

Starke (2001) with Hittite dates corrected by adding 25 years due to the identification of the tenth year of Mursili II as 1335 BC by the solar eclipse. A discussion on the correlation between the Hittite chronology by Schoch (1931), my calibration of the Old Babylonian chronology from identification of two total solar eclipses in Babylon and my calibration of the years of rule for Egyptian pharaohs of the 18th, 19th and 20th dynasties from identification of eight solar eclipses, can be found in Henriksson (2006 and 2007).

Troy/Ilios identified in Hittite cuneiform texts

In the western part of Asia Minor, to the east of the Dardanelles, the Luwian language, related to the Indo-European Hittite language, was spoken at the end of the Bronze Age. The control of the narrow strait of the Dardanelles had long been of great importance, and already around 3000 BC a fortified city was built on a hilltop on its south-eastern side, which later became famous as Troy or Ilios in the *Iliad*.

Homer used the place name Troy 50 times and *Ilios* 106 times in the *Iliad* as names of the city and the country. Starke (2001) has identified this pair of names with the Luwian place names *Truwisa* and *Wilusa* respectively. In fact, these identifications and those discussed below were already suggested by the brilliant Swiss linguistic Edwin Forrer during the 1920s, but they were not accepted by the other authorities of that time (Forrer 1931).

Archaeologists identify nine main levels of the city, built one upon the other with a total of 46 substrata. The main candidate for the Homeric city is Troy VIh or Troy VIIa. However, it is almost impossible to identify details mentioned in an ancient poetic description of historic events with actual archaeological finds from nine superimposed city layers, partly destroyed when consecutive buildings were constructed upon earlier ones and later partly removed by early excavations made by non-specialists, mainly looking for treasures. Even today the site is only partly excavated. One exception is the massive city walls of hard limestone from Troy VI, which are the most dominant construction among the ruins.

It is therefore of the greatest importance that some historical information about ancient Troy can be found in recent studies of the Hittite cuneiform texts. Many place names mentioned in the Hittite annals can now be identified with later Greek place names, and the story told by Homer can to a greater extent be related to historical events before and after the time of the *Iliad*.

The Hittite Kingdom, called Hattusa after its capital, was very well organized, and the different kings preserved important events during their years of rule in archives in the form of annals. Important treaties with friendly and hostile neighbouring countries, diplomatic correspondence and even family problems in the royal families are preserved in these annals.

Wilusija is included among the states belonging to the *Land of Arzawa,* in the earliest form written as *Arzawija*. Its corresponding Luwian name was Wilusa and it was mentioned together with the country of *Taruwisa*/*Truwisa,* identified with the Greek name for Troy. Today the local Turkish name of Troy is Truva.

Frank Starke, according to Joachim Latacz (2001), convincingly solved the problem with the identification of the name Wilusa in 1996 after years of work by him and other scholars.

Rudolf Wachter (2001) describes the development of the earliest Greek alphabet. In that alphabet there existed a letter with the sound of *W*, the *digamma*, but this letter did not exist among the East Ionian letters used by Homer. Thus the Greeks of Homer's time were not able to represent the sound *w* with a letter; the Luwian *Wilusa* became Ilios in Greek.

The Hittite kings led many military campaigns against small neighbouring countries,

mainly along its eastern border. The most powerful of them was the northern Mesopotamian State of Mitanni, but their main enemy were the Egyptians in northern Syria to the south.

The first time Wilusa is mentioned in the Hittite annals was in connection with a military campaign by King Tudhalija I (1445-1425 BC) against his western neighbours the Arzawa states, which included Wilusa; the date corresponds to Troy VIg. The capital of Arzawa was Abasa (Greek Ephesos). The next king of Arzawa, Tarhuntaradu, was very powerful and he wrote two letters in Hittite to the Egyptian king Amenhotep III (1416-1379 BC). These letters have been found in Egypt among the Amarna letters. At that time stratum VIh had begun to appear in Troy, and Tudhalija II (1400-1380 BC) was the Hittite king. The next Hittite king was the powerful Suppiluliuma I (1380-1345 BC), and in the beginning of his rule, Kukkunni became king of Wilusa. He is the first king of Wilusa mentioned in the Hittite sources.

The land of Millawanda (Hittite name) was a southern neighbour to Arzawa along the western coast of Asia Minor. It has now been identified as the Greek place name Miletos, which was a Minoan colony during the 16th century BC and became a Mycenaean colony ca 1400 BC. The archaeological finds belong to Late Helladic (LH) IIIA2. The Hittite sources tell us that it was dominated by the land Ahhijawa, whose main area was situated on the islands in the Aegean Sea, probably including Crete. Ahhijawa appears for the first time in the Hittite sources ca 1425 BC, LH IIIA1, with the oldest form of the name Ahhija, close to the original Luwian name that can be identified as the Achaeans mentioned in the Iliad under the command of King Agamemnon from Mycenae.

Millawanda was destroyed by the Hittite king Mursili II in his third year, 1342 BC. This destruction is clearly discernable as a fire horizon, and above it the archaeological finds are classified as LH IIIB1. After the destruction of Millawanda, Mursili II conquered Arzawa, and Abasa fell without a fight. King Uhhazidi and the royal family fled to the territory of Ahhijawa "over the sea to the islands", according to the annals by Mursili II. After that, Arzawa lost its sovereignty and the federation of states was dissolved. The former members of the federation were forced to enter a new federation with Hattusa ca 1340 BC. The westernmost among the former Arzawa States, Wilusa, had friendly relations with Hattusa and was not forced to be a member of the federation.

If the final battle of Troy took place during the total solar eclipse in 1312 BC and the Trojan War really lasted for ten years, the war started around 1322 BC, at the end of the reign of the Hittite King Mursili II. As Wilusa was not a member of the federation, there was no formal reason for Mursili II to help the city against the attacking army from Ahhijawa.

On the other hand it is more reasonable to suppose that the ten years duration of the war is just "a nice number" used to enhance the magnitude of the struggle and the suffering of the heroes. The *Iliad* relates only what happened during the last 51 days of the fighting, whereas the war may have lasted just one summer or at most a few years. After their bad experience in the war against the powerful King Mursili II, the leaders of Ahhijawa may have waited until the king died in 1315 BC before they started an attack on the small and independent but rich country of Wilusa.

It is known from Hittite texts that in 1315 BC, Prince Pijamaradu, a grandson of the defeated King Uhhazidi of Arzawa, was supported by the king of Ahhijawa in military operations from his islands to gain influence in *Mira*, one of the former Arzawa states. After that, when Pijamaradu attacked the coast of *Seha*, the neighbouring country to Wilusa in the south, the king in Wilusa, Alaksandu, was ordered by the Hittite king to send military help. However, Pijamaradu,

supported by the king of Ahhijawa, was victorious and conquered the island Lazba (Greek Lesbos) belonging to Seha and caused great military losses for Seha and Wilusa. King Manabatarhunta from Seha finally asked for military help from the Hittite army to restore order in Wilusa after the trespass of Pijamaradu. But King Muwatalli II did not send military help until later, when the situation in Wilusa threatened the stability of the whole Hittite federation of states.

After the intervention in Wilusa by the Hittite army to stabilize the rule of the country, Wilusa lost its sovereignty and became an integrated part of the Hittite Kingdom.

THE TROJAN WAR DATED BY A HITTITE LETTER

According to the *Iliad*, King Priam of Troy had two sons, Hector and Paris (Alexander). Priam and Hector were killed at the end of the war, but Paris survived and became king in Troy after the war.

There exist six copies in the archives in Hattusa of a cuneiform letter from the Hittite King Muwatalli II (1315-1297 BC) to King Alaksandu in Wilusa. It contains an agreement that regulated the status of the Wilusian kingdom after the intervention by the Hittite troops. King Muwatalli II dictated the agreement and it limits the sovereignty of the country because it was not capable of defending its borders.

Alaksandu is Luwian for the Greek name Alexander; an early Mycenaean feminine form Alexandra is recorded.

The *Iliad* describes only 51 days during the last year of the war, and one of these days was June 11, in 1312 BC, if my identification of a total solar eclipse in book 17 is correct. This date is in perfect agreement with the only possible interval, 1315-1297 BC, for the letter from King Muwatalli II to King Alaksandu.

The fight over Patroclus' body took place on June 11, in 1312 BC, which corresponds to Skirophorion 1, the first day of the last month that year in the Attic calendar, used by the Greek authors. The Trojan War ended according to Eratosthenes on Skirophorion 23, but Ephoros and the Parian Marble give the same date one month earlier, on Thargelion 23. There is an uncertainty of one month at the end of the year because of intercalation.

The story of the attack on Troy/Ilios by the Achaeans in the *Iliad* may be the poetic account of a successful attack by the king of Ahhijawa and his allied forces on Wilusa to get compensation for their loss of influence in Milliwanda and Arzawa.

CONCLUSIONS

If the passage quoted above from book 17 of the *Iliad* describes the total solar eclipse in Troy in 1312 BC, the battle at Troy may be connected to historical events in the Hittite archives. These, in turn, can be related to an absolute chronology by the solar eclipse in 1335 BC, in the tenth year of Mursili II. Therefore we know that there was an attack at Wilusa/Ilios/Troy by Ahhijawa/Achaeans shortly after the death of Mursili II in 1315 BC. In the Hittite archives a prince Pijamaradu from Arzawa was the commander of the forces from Ahhijawa that took the island Lazba, identified as Lesbos, and in the *Iliad* the Achaean hero Achilles and his men conquered Lesbos before they attacked Troy, both taking place at the same time.

ACKNOWLEDGEMENTS

I want to express my gratitude to Dr Johan Flemberg, Department of Classical Archaeology and Ancient History at Uppsala University, for his help in 1986 in finding Edwin Forrer's handwritten German translation from Hittite of the annals by Mursili II in the great collection of books in *Carolina Rediviva,* the University Library in Uppsala. He also helped me with the reading of the original Greek text in book 17. Finally, I want to thank my research college associate professor Mary Blomberg, also of the Department of Classical Archaeology and Ancient History in Uppsala, for useful discussions and the correction of my English.

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