

# Astronomical references in the *Anglo-Saxon Chronicles*

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## Introduction

The *Anglo-Saxon Chronicles* were originally compiled on the orders of King Alfred the Great in about 890 AD. They were then maintained and added to by mainly anonymous scribes until 1154 AD. The idea of having backup copies of things in case of disaster is not new. There are several copies of the *Chronicles* in existence. Manuscripts were maintained in Winchester, Abingdon, Worcester, Peterborough and Canterbury. The manuscripts are not identical however and events which are mentioned in one or more manuscripts are not necessarily mentioned in all of them. They naturally have a local perspective on some things. The appointment of a new bishop in Winchester, for example, would clearly have been more important to the Winchester scribe than the Peterborough scribe.

In addition to being a chronicle of major events concerning abbeys, bishops and kings, and other events in social history, various astronomical events are mentioned. The purpose of this paper is to collect together the astronomical events and provide modern calculated details of the eclipses which are mentioned. Naked eye observations such as these are inevitably of low precision. However, they are still important and can be useful to modern research. The visibility or otherwise of a solar eclipse from a particular location may be

very useful in determining the value of  $\Delta t$  for that epoch. Sightings of comets can be used to refine orbit calculations and to help to date events accurately where other methods only yield approximate dates.

There are numerous examples of the *Anglo-Saxon Chronicles* available on the Internet, but the current paper makes use of the recent translation by Swanton.<sup>1</sup> This has two main advantages over the web-based versions. Firstly, the dates are converted in the translation to modern date format rather than being expressed relative to the kalends of a month for example, which saves the current author from making the conversions. Secondly, and more significantly, the Swanton translation provides details of which manuscript a given section of text is derived from. The web-based versions generally seem to be an amalgamation of all of the texts. Whilst this is adequate for the general reader, it is useful in an astronomical context to know where a particular sighting was made.

## Dates in the *Anglo-Saxon Chronicles*

Since the dating of astronomical events from the *Anglo-Saxon Chronicles* is of vital importance to this paper, it is worthwhile explaining a few of the problems in this regard.

The chronicles are inconsistent as to when a year starts. Years do not only start on January 1 or December 25. Some entries during the 11th century seem to be based on a year starting on March 25, the date of the Annunciation. Several 9th century entries are based on a year starting on September 1, using a system derived from the Roman Indiction, a cycle of tax assessment made on September 1 every 15th year. To make matters worse, there are mistakes in the chronicles themselves. The Worcester manuscript, for example, missed the year 1044. This makes the entries for 1045 to 1052 in error by one year and this is only corrected when 1052 is entered twice. This type of mistake was repeated elsewhere in the chronicles, sometimes with years being missed and sometimes with years being duplicated. It was also easy for copiers to misread the strokes used on Roman numerals. The two strokes for a *v* could easily be misread as *ii*.

The translation of the *Chronicles* used for this paper<sup>1</sup> indicates not only the chronicle year but also the 'corrected' year for events where this is possible. Dates discussed in this paper make use of the corrected dating of the events in the chronicles.

### ► Continued from previous page

- 13 *ibid.*, p.233
- 14 *The Bury and Norwich Post and Suffolk Herald*, Bury News, 1858 October 19
- 15 *The Bury and Norwich Post and Suffolk Herald*, 1858 October 12
- 16 *The Bury and Norwich Post and Suffolk Herald*, 'Miscellaneous', 1858 October 19
- 17 Folder of letters from Airy to Hervey stored in the Oxford Bodleian library under reference: MS Eng lett c297, folders 1–47.
- 18 *Bury Free Press*, 1859 November 5
- 19 *The Bury and Norwich Post and Suffolk Herald*, 1859 November
- 20 *The Bury and Norwich Post and Suffolk Herald*, 1860 January 21
- 21 *The Bury and Norwich Post and Suffolk Herald*, 1860 March 6 and *Bury Free Press*, 1860 March 10
- 22 Found by MPM in a very old book marked 'Bury Athenæum and Suffolk Institute of Archeology and Natural History 1861', located in the Bury Public Records Office.
- 23 Information on the Rev Buckton was located by KJG after talking with Buckton's descendants, David and Dr Christine Buckton.
- 24 The letter was found by MPM in a box file marked 'Athenæum' in the Bury Public Records Office.
- 25 Fulcher's research into astronomy in Suffolk is stored in the Suffolk Records Office at Ipswich, archive ref. GC14/B1/1,2.
- 26 *Bury Free Press*, 1954 May 8
- 27 *Bury Free Press*, 2004 April 30

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**Table 1. Dates of lunar eclipses mentioned in the Anglo-Saxon Chronicles**

[C] Abingdon manuscript; [D] Worcester manuscript; [F] Canterbury manuscript

Winchester	Peterborough	Others
734	734	
	796 Mar 28	[F] 796
	800 Jan 16	
	802 Dec 20 (May 21)	
	806 Sep 01	
828 Dec 25	828 Dec 25	
		[C] 904
		[D] 1077
	1110 May 05	
	1117 Dec 11	
	1121 Apr 04	

## Lunar eclipses

Eleven lunar eclipses are mentioned in the *Anglo-Saxon Chronicles*, as shown in Table 1. The Winchester and Peterborough manuscripts are the most intact and contain most of the references, but there are also references to the other manuscripts which mention lunar eclipses. Separate columns are given for references occurring in the Winchester and Peterborough manuscripts, and the others are in the third column. The choice of the lettering for the manuscripts is so as to be consistent with Reference 1 and other sources.

Details for the eclipses mentioned in Table 1 were calculated and the results are shown in Table 2. Eclipses where there are disagreements between the *Chronicles* and the actual eclipses are now discussed.

The Peterborough manuscript for 800 AD starts ‘Here the moon grew dark at the second hour of the night on 16 January.’ There was no eclipse on that night, so this dating must be in error. It may be that the scribe started the days at midday rather than at midnight so that 16 January would have started on 15 January at 12:00. Starting days at midday rather than midnight was common practice especially for dealing with astronomical phenomena, so that the date did not change during a night.

The eclipse of 802 is dated in the Peterborough manuscript as Dec 20. There was no lunar eclipse on this date, so Swanton<sup>1</sup> suggests that the scribe mistook xiii kal Jun for xiii kal Jan. If this is the case, then the date for the eclipse becomes May 21, when there was a total lunar eclipse.

The Abingdon manuscript is the only one which mentions a lunar eclipse in 904 AD. It merely states ‘Here the moon grew dark’. There is no indication as to the date of the eclipse. In 904, there were two total lunar eclipses both of which were visible from England. It is therefore impossible to tell from the data provided which eclipse was being referred to. As a result, details of both eclipses are given in Table 2.

The eclipse quoted as 1077 is interesting. The Worcester chronicle states ‘Here the moon was eclipsed three nights before Candlemas’. This would put the date of the eclipse as January 30. There was no lunar eclipse on that date in 1077, but in 1078 there was. Numerous web-based translations as well as Swanton<sup>1</sup> date this eclipse as 1077. Since the date in

**Table 2. Actual details for the lunar eclipses given in Table 1**

Eclipse date	Magnitude	Time of maximum eclipse (UT)
734 Jan 24	1.59	03:19
796 Mar 28	1.06	06:06
800 Jan 15	0.83	20:47
802 May 21	1.02	04:19
806 Sep 01	1.34	22:44
828 Dec 25	1.03	02:22
904 May 31	1.81	23:37
904 Nov 25	1.23	21:22
1078 Jan 30	1.57	20:20
1110 May 05	1.76	22:55
1117 Dec 11	1.64	00:36
1121 Apr 04	1.70	21:29

the text is given relative to Candlemas, which is used throughout the chronicles as a fixed date and which would be well known to the scribes, the current author gives more credence to the quoted date than the year. It is known that the years quoted for several events are wrong by several years. As a result, Table 2 gives details for the 1078 Jan 30 eclipse.

## Solar eclipses

Eight solar eclipses are mentioned in the chronicles. Table 3 lists these as they are dated in the chronicles.

As with Table 1, separate columns are used for the Winchester and Peterborough manuscripts and the others are grouped into the third column. In fact, the ‘others’ only contains references from the Canterbury manuscript.

Details for the eclipses mentioned in Table 3 were calculated and these data are presented in Table 4. The dates in

**Table 3. Solar eclipses mentioned in the Anglo-Saxon Chronicles**

Winchester	Peterborough	Others
538 Feb 16	538 Feb 16	
540 Jun 20	540 Jun 20	
664	664 May 03	
733	733	[F] 733
		[F] 809 Jul 16
878	878	
	1135 Aug 02	
	1140 Mar 20	

**Table 4. Types and timings for the solar eclipses given in Table 3**

Eclipse	Type	Time of maximum eclipse at Winchester (UT)
538 Feb 15	Total	08:33
540 Jun 20	Total	08:10
664 May 01	Total	17:35
733 Aug 14	Annular	08:58
809 Jul 16	Annular	09:49
878 Oct 29	Total	13:31
1133 Aug 02	Total	11:34
1140 Mar 20	Total	14:54

**Table 5. Solar eclipse details at various locations**

Eclipse date	Abingdon	Canterbury	Peterborough	Winchester	Worcester
538 Feb 15	0.68	0.69	0.68	0.69	0.68
540 Jun 20	0.67	0.70	0.65	0.69	0.65
664 May 01	0.96	0.95	0.98	0.93	0.96
733 Aug 14	0.98	0.97	0.98	0.96	0.99
809 Jul 16	0.70	0.69	0.72	0.69	0.72
878 Oct 29	1m34s	1m34s	1m48s	0.997	1m45s
1133 Aug 02	0.94	0.95	0.97	0.92	0.95
1140 Mar 20	0.999	0.97	3m22s	0.98	3m27s

Table 4 do not all match those in Table 3. In order to assist with the discussion which follows, the local circumstances of the eclipses were calculated for the locations where the manuscripts were maintained. These details are shown in Table 5. The table shows the eclipse magnitude at the locations unless totality was observed, in which case it shows the duration of totality as seen from that location. The eclipses of particular interest or disagreement are now discussed further.

The first two eclipses, those of 538 Feb 15 and 540 Jun 20, are interesting. Both were only visible as partial eclipses from England with magnitudes of about 0.7. Because of the relatively small eclipse magnitudes as seen from England, it is probable that these are reports of eclipse observations made elsewhere. It has been suggested<sup>2</sup> that the eclipses were actually observed in Rome. The eclipse of 538 Feb 15 had a magnitude of about 0.81 as seen from Rome and the eclipse of 540 Jun 20 was total for over 5 minutes at Rome. Since the *Anglo-Saxon Chronicles* were written in monasteries, it seems logical to assume that Rome would be the source of these eclipse reports, since the monasteries were in frequent contact with Rome at this time. In fact, the reports in the *Anglo-Saxon Chronicle* were probably copied from Bede's *Ecclesiastical History*, which was completed about 732 AD. The translation of the texts from book 5 chapter 24 of the *Ecclesiastical History*<sup>3</sup> and the *Anglo-Saxon Chronicles*<sup>1</sup> are essentially the same.

The eclipse of 664 is dated as May 03 in the Peterborough manuscript, but actually occurred on May 01. This eclipse is generally accepted as the first solar eclipse recorded from genuine observations in England. The eclipse track is shown in Figure 1.

It has long been recognised that the dating of May 03 in the *Anglo-Saxon Chronicles* is in error. James Ussher (1581–1656) suggested that the error might be due to Bede having calculated the date of the new moon using the ecclesiastical calendar. Irish contemporary sources, such as the *Annals of Ulster*, do correctly date the eclipse. The eclipse was not total at any of the locations where the chronicles were written, but it must have been a clearly observed eclipse and reports from other areas of the country must have reached the monasteries.

The duration of totality along the centre line of the eclipse as it crossed England ranged from about 2m27s on the west coast to 2m22s on the east coast. The eclipse started at about 16:30 UT with totality at about 17:30 UT. The eclipse ended at about 18:30 UT.

The eclipse with the largest discrepancy in date is that given as 1135 Aug 02 in the chronicles. This actually refers to the eclipse of 1133 Aug 02. There were no solar eclipses visible from England in 1135. The text of the manuscript is as follows: '1135. In this year, at the Lammas, the king Henry went across the sea, and the next day, while he slept, the day darkened over all lands, and the sun became as if it were a three-night-old moon

– and stars around it at midday.' Lammas occurs on Aug 01, so the date of the eclipse is Aug 02. It is known from other historical references that the king's trip actually occurred in 1133. It was not uncommon in writings of the time to change the dates of things so that two significant events occurred at the same time.

The time of day quoted for the eclipse, midday, is reasonably accurate. As to whether stars could be seen around the Sun, this is probably not very likely given that totality was not achieved at Peterborough or in northern France, which is presumably where the king was. The path of totality crossed parts of Scotland and north-east England before crossing the North Sea into Holland and Germany.

## Miscellaneous astronomical phenomena

Various other astronomical events mentioned in the chronicles are listed in Table 6. The designation given by Kronk<sup>4</sup> is given for those comets which have designations. Some of the events mentioned in Table 6 are not as obvious as they might seem, and the more interesting cases are now discussed further.



**Figure 1.** The track across Europe of the total solar eclipse of 664 May 01.

**Table 6. Other astronomical phenomena mentioned in the Chronicles**

Date	Phenomenon	Comet designation given in ref. 4
678 Aug	A comet was seen	X/676 P1
729	A comet or comets were seen	
744	Many meteors seen	
776	Aurora Borealis seen	
793	Comets seen	
892	Comet seen	X/891 J1
903 Oct 20	Comet seen	
975	Comet seen	X/975 P1
995	Comet seen	1P/989 N1 (Halley)
1066 Apr 24	Comet visible for a week	1P/1066 G1 (Halley)
1095 Apr 03	Many meteors	
1097 Oct 04	Comet seen in SW. Visible for a week	C/1097 T1
1106 Feb 16	Comet in SW	X/1106 C1
1106	Two full moons in the sky!	
1110 Jun	Comet seen	C/1110 K1
1114 May	Comet seen	
1122 Dec 07	Aurora Borealis seen	

The comet dated as 678 Aug actually refers to a comet seen in 676 Aug. This is the earliest comet recorded in English writings. It was mentioned by Bede<sup>3</sup> as well as in the *Anglo-Saxon Chronicles*.

The Winchester chronicle for 776 states ‘Here a red sign of Christ appeared in the heavens after the sun’s setting.’ This is presumed to be some sort of aurora.

The Peterborough manuscript for 793 is even more cryptic. It states ‘Here terrible portents came about over the land of Northumbria, and miserably frightened the people: these were immense flashes of lightening, and fiery dragons were seen flying in the air.’ The Winchester chronicle has text which is very similar. The interpretation often placed on fiery dragons flying in the air is that long-tailed comets were observed. However, Schove & Fletcher<sup>2</sup> state that there were no comets of importance between 774 and 816 and Kronk<sup>4</sup> lists no comets between 776 and 812, so the interpretation of the *Anglo-Saxon Chronicles* is unsure.

The comet reported as 995 in the chronicles is a misdating of the return of Halley’s comet (1P/Halley) in 989. At the return of 989, 1P/Halley never became brighter than about magnitude 1.2. It was visible for about a month starting from mid-August.

The comet seen in 1066 is well known as being 1P/Halley. This was a good return, the comet reaching magnitude –1.3 at the end of April. This is another example of events being misdated so as to coincide with some important event. The comet is shown on the Bayeux Tapestry

as being concurrent with the battle of Hastings. However, the battle was in October 1066 by which time Halley was no longer visible.

Perhaps one of the most unusual entries is in the Peterborough manuscript for 1106. It states ‘the Thursday before Easter, two moons were seen in the heavens before day, one to the east and the other to the west, both full; and the same day the moon was 14 days old’. This is a very confusing entry. Easter Sunday 1106 was on Mar 25, so the preceding Thursday was Mar 22. There was a full Moon on 1106 Mar 21, so the age of ‘the moon’ quoted is correct. What was actually observed and reported in this entry is a mystery to the current author.

## Conclusions

The *Anglo-Saxon Chronicles* are an important historical resource for a number of different lines of research. Astronomically, they provide details of events with at least approximately the correct dates. Using modern calculations, details concerning the lunar and solar eclipses and some of the comets mentioned can be determined and have been presented in this paper. Other astronomical events sometimes have less obvious interpretations.

It should also be noted that the *Anglo-Saxon Chronicles* omit many astronomical events, such as the total solar eclipse of 1023 and the return of comet 1P/Halley in 837, when the comet reached a peak magnitude of –3.9.

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## References

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- 2 Schove D. & Fletcher A., *Chronology of Eclipses and Comets AD 1–1000*, The Boydell Press, 1987
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