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A Cooking Pot Lit by Fire

Giles E. M. Gasper and **Brian K. Tanner** discuss a newly identified twelfth-century report by an English chronicler in which solar prominences appear to be described.

Recent research into the records of eclipses in the *Chronicle* of the English monk, Gervase of Canterbury, has indicated that an entry for the year 1187 C.E. may contain a description of solar prominences being visible during the total eclipse of that year. As such it is not only the earliest report of the phenomenon from England, but also reveals that a British Library manuscript contains the earliest surviving contemporary record of such an observation.

The years 1185 and 1187 were unusual in that two total solar eclipses were visible from the continent of Europe in a very short space of time. That of 1 May 1185 has attracted attention because of Sviatsky's (1923) identification of the appearance of solar prominences from accounts in various chronicles from medieval Russia. Stephenson (1997) is more circumspect, attributing the description to the chromosphere and being much more certain that a 'fiery aperture' in the sun's disc during the total eclipse of 3 June 1239, recorded in the annals of Cesena, in north-eastern Italy, referred to a solar prominence. In all three eclipses, the apparent diameters of the sun and moon were almost equal (Stephenson 1997), that of the moon being slightly greater than that of the sun in each case. Nevertheless, there seems to be general acceptance that the first description of prominences was of what, in Sviatsky's translation, 'came out somewhat like live embers' in 1185.

The total eclipse of 4 Sept 1187 has received much less attention, partly because of ambiguity about its identity in the medieval European chronicles. However, there is an entry in the *Chronicle*, begun in about 1180 by Gervase of Canterbury (c.1145-c.1210), a Benedictine monk who spent most of his adult life in the priory connected to Christ Church Cathedral at Canterbury in England, which is indisputably of the eclipse of 1187. For that year, Gervase wrote that:

> 'On the day before the nones of September [4 September] and at the sixth hour, the twenty-eighth [day of] the moon, there appeared a partial eclipse of the sun in England. However, in the Lombard city of Verona, where Pope Urban, of venerable memory, was staying at that time, it appeared total, like a cooking pot lit with fire.'

[Translation from the Latin edition of Stubbs (1879) by G.E.M.G.]

Medieval cooking pots tended to be round (fig 1a) and when a wood fire is forced into flame with bellows, there are prominences of flame around some parts of the pot (Jaine, 1989). These look very similar to the red prominences featured in a coloured engraving made of the total eclipse of 8 July 1842 by the French astronomer Eugene Bouvard (Vial 2014) and those drawn by François Arago of the 28 July 1851 eclipse (fig 1b).

Gervase's description has not been recognized previously as relating to solar prominences. Accuracy of translation – there is to date no English translation of the *Chronicle* – has a part to play. Thomas Short, for example, in his *General Chronological History of the Air, Weather, Seasons, Meteors etc.*, published in 1749, quoted from the medieval text, without attribution, to note that in 1187:

> 'The day before the Nones of September, the Moon being 28 days old, appeared a partial Eclipse of the Sun in England; at Verona it was total and was like a red hot Kettle or Copper.' (Short 1749)

Unfortunately, the translation of the Latin 'ad modum cacabi igniti' as 'like a red hot Kettle or Copper' totally loses the sense that it might be describing prominences.

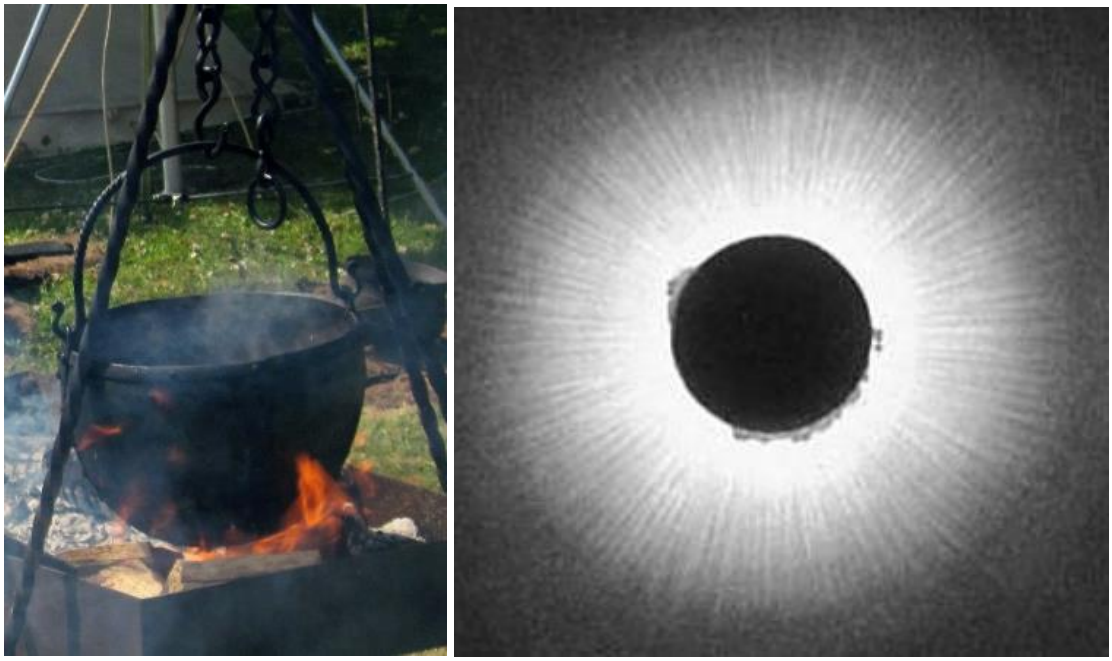

Fig.1 (a) Reconstruction of a medieval cooking pot on a wood fire, showing flames licking around the edge of the round-bottomed vessel. [Photograph: G.E.M.G.] (b) Arago's drawing of the solar prominences seen by him in the total eclipse of 1851. [Image: NASA. Reproduced in accordance with NASA's Media Usage Guidelines, https://www.nasa.gov/multimedia/guidelines/index.html]

There is one major error in Gervase's account of the 1187 eclipse. The eclipse was not total in Verona (fig. 2). Detailed examination of Gervase's reports of natural phenomena, including one which appears to be of ball lightning, in the *Chronicle* has revealed him to be an extremely careful reporter of detail (Gasper and Tanner, 2022). He described unusual phenomena as the natural marvels that they were, rather than being associated with specific human events. In some cases, he appears to have been an eyewitness (Gasper and Tanner, 2020) but here he most certainly was taking information from a third party. Whatever his source concerning the appearance of the eclipse in England, he correctly recorded its date and time. Modern computation (Jubier and Espenak, 2007) predicts that, as seen from Canterbury, the eclipse began at 09:44 UT, reached its maximum at 10:52 UT and ended at 12:01 UT. The medieval day, at least for astronomers, was divided into twelve hours beginning at sunrise and ending of sunset (Dohrn-van Rossum, 1996). Therefore, noting that there was no hour zero, the sixth hour

always ended at noon. As 4 September is quite close to the autumnal equinox, the modern and medieval hours are close; one medieval hour at Canterbury will have been about 1.1 hours UTC. Gervase's statement that the eclipse occurred at the sixth hour is remarkably accurate. Stephenson (2010) has shown that very few eclipses were recorded in the European chronicles below a magnitude of 0.7, so the computed magnitude of 0.74 at Canterbury, (see inset to fig 2), does make it possible that Gervase himself observed the partial eclipse.

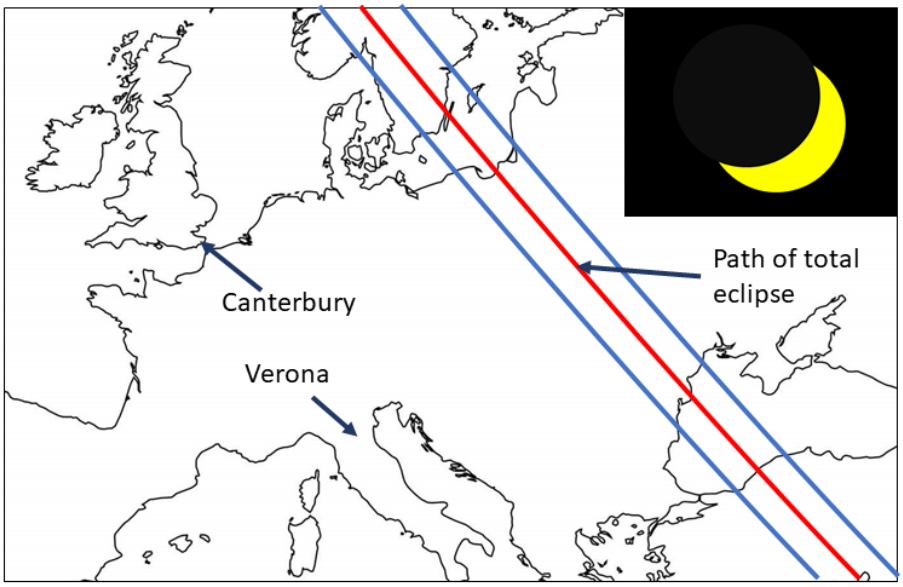

Fig. 2. Map of the computed path across Europe of the total eclipse of 4 Sept 1187. Inset: Appearance of the sun at maximum obscuration as it would have been seen from Canterbury. [Eclipse predictions courtesy of Fred Espenak, NASA/GSFC Emeritus, from eclipse.gsfc.nasa.gov. Inset courtesy of Xavier Jubier and taken from his graphical interface at http://xjubier.free.fr]

It remains a mystery as to why Gervase recorded that the eclipse was total in Verona, where the eclipse would have been partial and of magnitude 0.75, very similar to that in Canterbury. It is argued elsewhere (Gasper and Tanner, submitted to Endeavour) that a long-running dispute between the monastery and the archbishop of Canterbury involved both parties appealing to the Pope, who was resident, in this year, at Verona. It is possible that a messenger from Verona may have conveyed information about the character of the total eclipse to Gervase, although with respect to what location must remain speculative. As the path of the total eclipse passed over modern-day Poland, the south-western lands of medieval Russia, and Antioch (modern-day Antakya), a crusader principality which would remain in Christian hands until 1268 (fig 2), these are possibilities. The broader context for the observation of the total eclipse would include the imminent and anticipated siege of the then Christian city of Jerusalem by the forces of Saladin which began on 20 September, and which might provide sufficient reason for interest and a record.

As with all the eclipses mentioned in this article, the 1187 eclipse was characterized by the apparent diameters of the moon and sun being almost equal; in this case the moon/sun size ratio was 1.06. Conditions for observation of solar prominences were in place and there is no reason to doubt the description in Gervase's *Chronicle*. As discussed elsewhere, the surviving manuscript of the *Laurentian Chronicle*, in which the 1185 sighting of solar prominences is to

be found, dates from 1377 (Guinon 2021). Like many other medieval manuscripts, the original of Gervase's *Chronicle* is lost. It survives in three manuscript copies, the earliest of which, in the British Library in London (Cotton MS Vespasian B.XIX), is regarded to have been made soon after 1200. If Gervase's account can be interpreted as describing solar prominences, the manuscript therefore represents the oldest surviving record of the phenomenon in the world. It is certainly the oldest report from England.

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