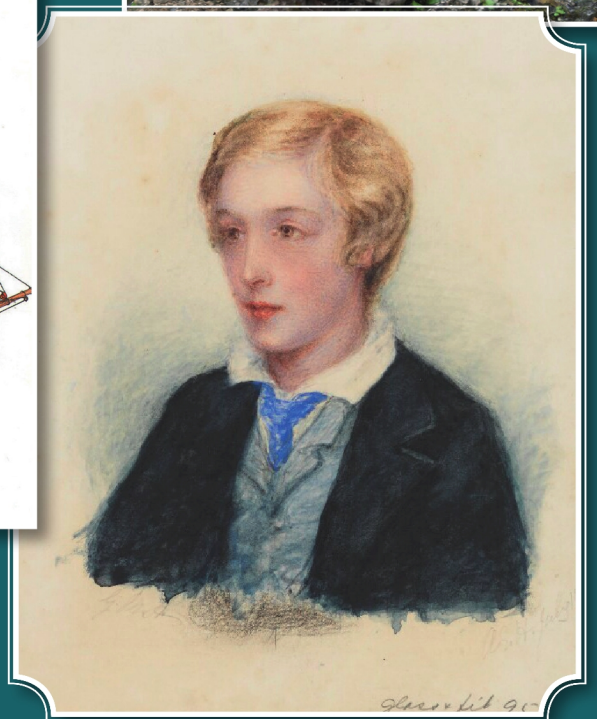


ISLE OF MAN STUDIES

Proceedings of the Isle of Man Natural History and Antiquarian Society

Vol. XVII 2021



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Front cover photographs:

- Female grayling (*Hipparchia semele*) – see page 5 ff. *Photograph*: Katja Schäfer (CC BY-NC-ND 3.0)
- Architectural fragment from the Nunnery excavations – see page 173 ff.
- Spanish *Patache* of the Armada period - see page 73 ff.
- Gerard Manley Hopkins, watercolour portrait by his aunt Ann Eleanor Hopkins in 1859 - see page 77 ff. *Image*: © National Portrait Gallery NPG 4264 (CC BY-NC-ND 3.0)

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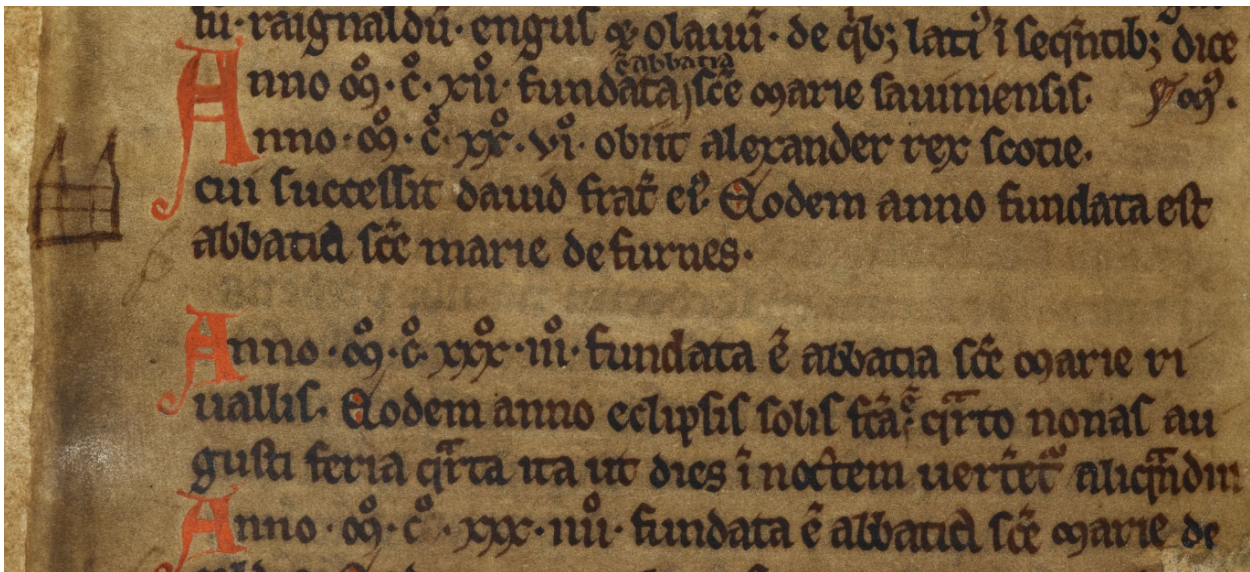
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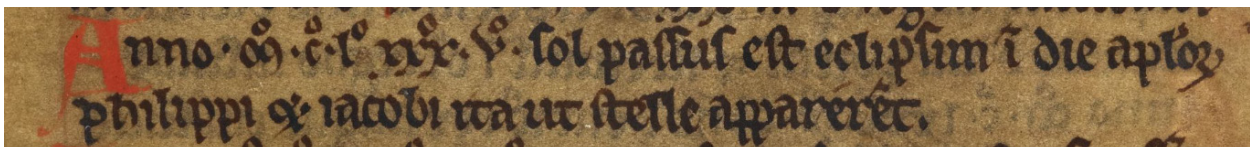
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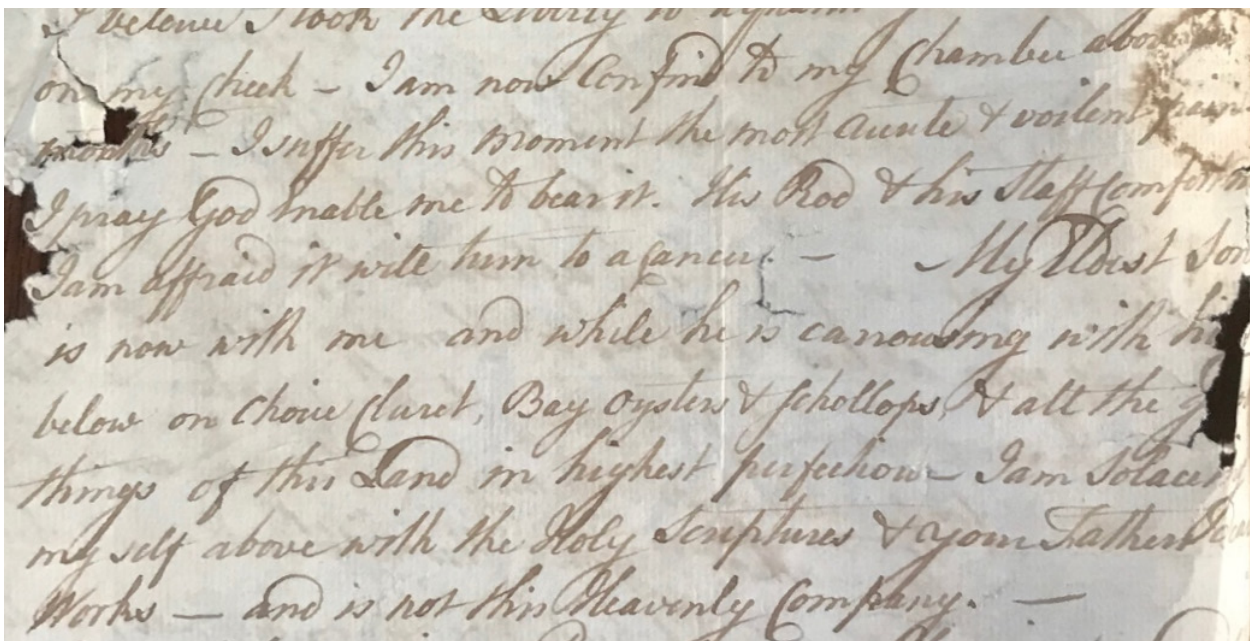
Published by the Isle of Man Natural History and Antiquarian Society



(a)



(b)



(c)

Frontispiece: (a) [tr] '... / In the year 1133, the abbey of St. Mary of Rivaulx was founded. In the same year there was an eclipse of the sun, on Wednesday 2nd of August, so that for some time day was converted into night. / ...'
 (b) [tr] 'In the year 1185, on the day of the apostles Philip and James, the sun was eclipsed, so that the stars appeared.'
 Eclipse reports from the Chronicles of the Kingdom of Mann and the Isles. See 'Manx Reports of Eclipses: What scientific analysis can tell us about the Chronicles of Mann' by Richard Holme on p67 ff

(c) '...I am now confined to my chamber above for months. I suffer this moment the most acute & violent pain. I pray God enable me to bear it. His rod & his staff comfort me. I am afraid it will turn to a cancer. My eldest son is now with me and while he is carousing with friends below on choice claret, bay oysters & schollops & all the good things of this land in highest perfection. I am solacing myself above with the Holy Scriptures & your Father's dear works ...'. Letter sent in 1781 by John Lewhellin of Ramsey to Revd Dr Thomas Wilson (son of Bishop Wilson). See 'Bishop Wilson's Works : Two associated letters' by John Tuck on p103 ff

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Manx Reports of Eclipses: What scientific analysis can tell us about the Chronicles of Mann

Richard Holme

The Chronicles of Mann provides references to two eclipses of the sun, from 1133 and 1185. Modern astronomical modelling confirms the dates of the reports, but suggests that the eclipses would not have been total on the Isle of Man as the Chronicles report. However, totality was visible further north, suggesting that the reports are motivated by primary sources, but of observations elsewhere within the Kingdom of Mann and the Isles.

A thousand years ago, a powerful sea kingdom was formed encompassing the Outer Hebrides, Skye, the Inner Hebrides, Argyll and the Irish Sea.¹ The seat of power was the Isle of Man. From this small island, the Kings of Man and the Isles ruled both the lands and the vital sea route that ran through the heart of what we now know as the British Isles. A primary source of information for the history of this kingdom is provided by the Chronicles of the Kingdom of Mann and the Isles, believed to have been written at Rushen Abbey to commemorate the (re)dedication in 1257 of St Mary's Church.²

The 'Chronicles of Mann',³ in addition to outlining the history of the Kingdom of Mann and the Isles from the tenth to the thirteenth centuries,⁴ also include references to significant natural events, including a major earthquake and the appearance of two comets (see Appendix 1). Perhaps of most interest are references to two solar eclipses, one in 1133 and the second in 1185. Solar eclipses have fascinated people throughout history, and receive frequent reference in historical chronicles. There is a long history of scholarship relating to these records, driven in part by their scientific application. Here, I reverse the process, and consider what scientific modelling of the records of the eclipses might tell us about the writing of the Chronicles of Mann, and possibly even about Manx history.

An eclipse of the sun occurs when the moon's orbit passes directly in front of the Sun. That such an event is both possible and noteworthy is an enormous coincidence: the size of both bodies as viewed from the Earth is almost identical, so that over a limited geographical range, the moon can just completely block direct sight of the sun. However, whether the eclipse can be total depends on the position of the Earth in its orbit of the sun,

and the moon in its orbit of the Earth. Both orbits are not circular but elliptical. As a result, both the moon and the sun are at some points further away from the Earth, and so appear slightly smaller, and at times closer, so appearing larger. If the moon is closer, the eclipse can be total, so that the sun is fully obscured. If the moon is further, so appearing smaller, the eclipse is annular, so that a ring of light from the sun remains around the moon. Eclipses happen on a yearly or more frequent basis, but for each eclipse the geographical range over which it can be observed is very restricted, leading to observations of eclipses being rare, and hence for historical observers very noteworthy – hence their recording in historical chronicles.

The occurrence of an eclipse can be modelled with great accuracy by astronomical calculation. The positions of the bodies can be modelled fully by Newtonian dynamics, and so the orbits of the moon and Earth are fully predictable, and thus the occurrence of eclipses can be both predicted thousands of years into the future, and modelled thousands of years into the past. The calculations are complicated by variations in the orbits over time. In particular, the moon is gradually receding from the Earth – direct observations from mirrors left by the Apollo missions demonstrate a rate of 3.8 cm per year (comparable to the rate of movement of tectonic plates). As a result of this recession, in the future (if a billion years hence), a total eclipse of the sun will no longer be possible – the moon will be too small as seen from the Earth to fully obscure the sun. The recession arises primarily due to tidal drag of the moon on Earth's rotation, simultaneously slowing the rate of rotation of the Earth, such that the length of day increases by about 2.6 ms per century. Our definition of the length of a day – 86,400 seconds – is actually the length of day in 1900 (when it was used to define the magnitude of a second) – now the length of a day is slightly longer.

1. Wilson 2008, 134 fig 60
2. Broderick 2004, vii; McDonald 2019, 9
3. Cotton; Broderick 2004
4. Broderick 2004, vii-xvi; McDonald 2019

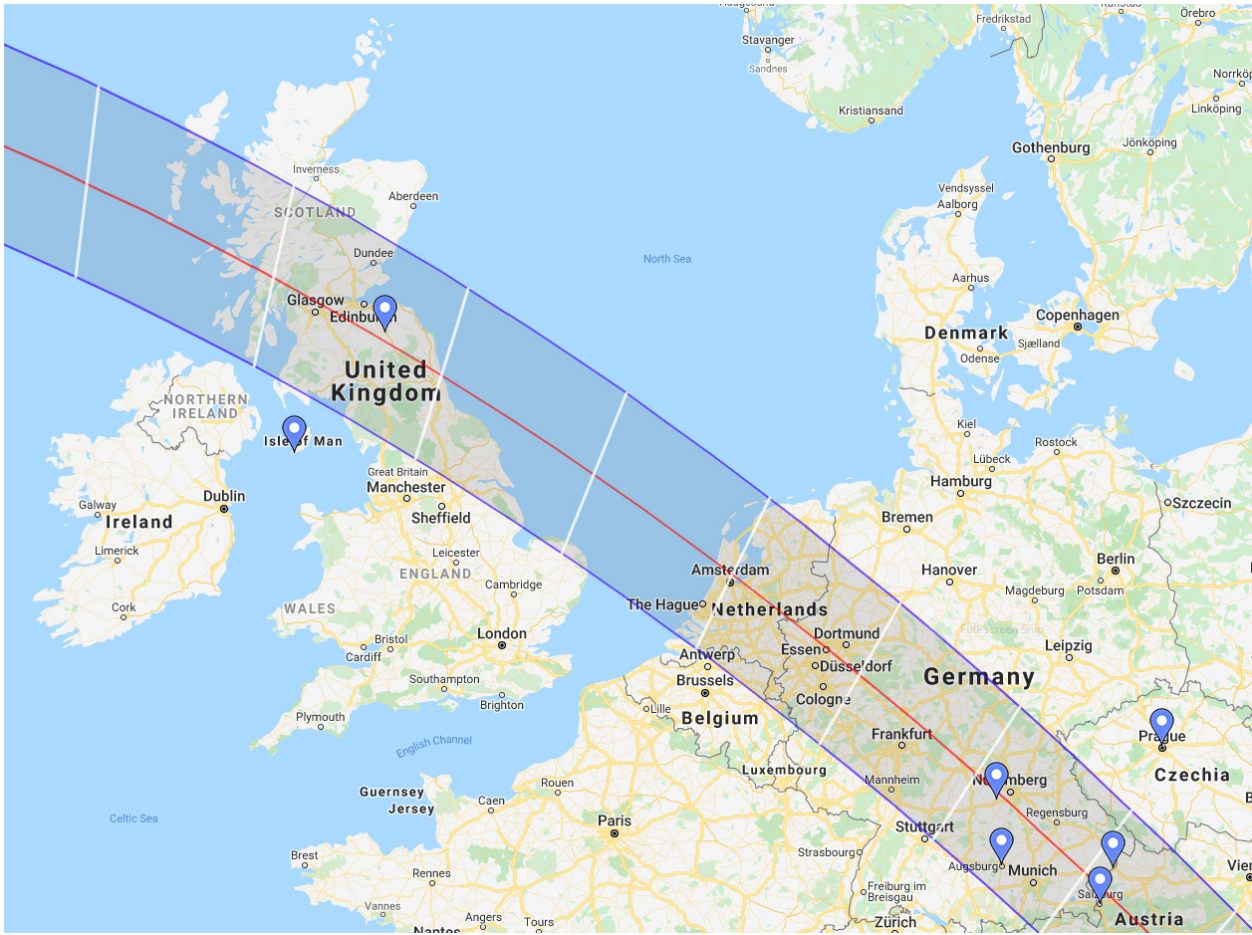


Figure 1: Modelled eclipse track for 4 August 1133. Red line denotes path of greatest eclipse time, and blue lines the boundaries of the region of totality. Position markers are given for monastery records for the Isle of Man (outside region of totality), Prague (location of partial eclipse), and observation points of Melrose, and four reports (west to east) from German/Austrian locations (Heilsbronn, Augsburg, Salzburg, and Reichersberg). Modelled track viewable at <http://eclipsewise.com/solar/SEgmapx/1101-1200/SE1133Aug02Tgmapx.html>

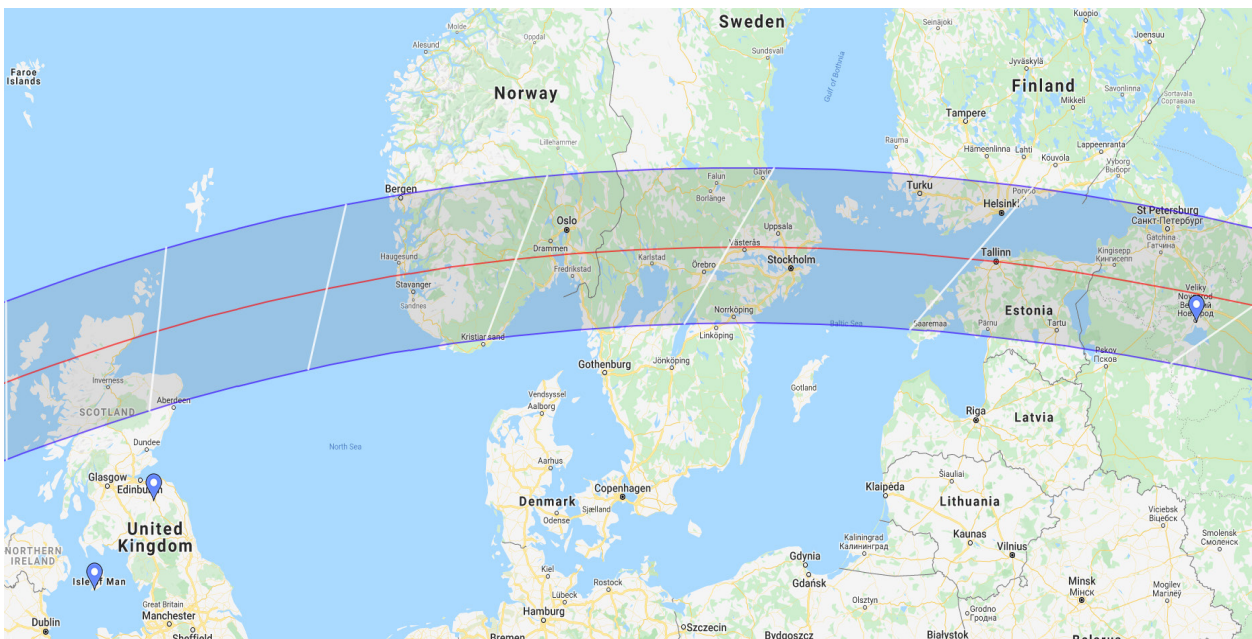


Figure 2: Modelled eclipse track for 1 May 1185. Red line denotes path of greatest eclipse time, and blue lines the boundaries of the region of totality. Both the Isle of Man and Melrose (two markers to left) are clearly outside totality. The most detailed reports originate from Novgorod, Russia (marker to right). Modelled track viewable at <http://eclipsewise.com/solar/SEgmapx/1101-1200/SE1185May01Tgmapx.html>

The evolution of the Earth's rotation brings an additional complication in the prediction of eclipse locations. The latitude at which the eclipse can be seen is well defined, but the longitude depends on changes in the rotation rate of the Earth. Variations arise not only from tidal interactions, but also changes in Earth's shape (for example from the melting of glaciers and the rebound of the land from the removal of their weight), and also forcing from atmospheric winds and pressure on yearly and shorter time scales, and interactions between the solid Earth and the fluid iron core on timescales of decades and longer. Imagine that the length of day were to increase suddenly by 1ms. This means that in one standard day, the Earth does not rotate fully, but falls short by $0.001/86400$ of a full rotation, a difference of approximately 4×10^{-6} degrees. In 100 years, this gives a cumulative offset of approximately 0.1 degrees, a distance of approximately 11 kilometres at Earth's equator, and around 6.5 kilometres at the latitude of the Isle of Man. The longitude at which an eclipse is observed depends on the evolution of Earth rotation; therefore, the locations at which eclipses have been observed allow modelling of variations in Earth rotation, in turn providing a probe of the Earth processes which give rise to them.⁵ Such studies go back almost 200 years; for this paper two works are of particular significance, the compendium of historical eclipse records compiled by Newton,⁶ and the monograph of Stephenson⁷ which combines historical and geophysical analysis. It might appear that the records of the eclipses in the Chronicles of Mann could contribute to such studies, but in practice the records are neither sufficiently detailed, nor sufficiently reliable, for such work. Instead, we examine here what the modelled variation in rotation implies for the interpretation of the eclipse records, and the writing of the Chronicles.

In translation,⁸ the two eclipse reports are:

In the year 1133, the abbey of St. Mary of Rivaulx was founded. In the same year there was an eclipse of the sun, on Wednesday 2nd of August, so that for some time day was converted into night.

In the year 1185, on the day of the apostles Philip and James, the sun was eclipsed, so that the stars appeared.

We first note that these dates are fully accurate (the day of the apostles being identified as May 1st),

consistent with astronomical modelling. From this we have full confirmation of the dating of these entries the Chronicles, of particular significance as prior to (and even shortly after) the earlier date, the dates of entries in the Chronicles are inconsistent with other historical records. However, eclipse tracks corrected for modelled variations in Earth rotation do not pass through the Isle of Man. These paths are shown in Figures 1 and 2 opposite.

For 1133, modelling predicts a maximum eclipse for the Isle of Man of 98.3% coverage, which would leave a thin sliver of the sun visible, equivalent to that seen for the moon a day after new moon; for 1185, the eclipse would be less. The modelling suggests that the eclipses could have been observed in Britain, but were not total on the Isle of Man.

Could the offset from the location of the eclipse be accounted for by incorrect modelling of Earth rotation? To achieve totality on the Isle of Man for 1133 would require a rotational shift of almost 2.5° , which would be physically unreasonably large (the uncertainty in the model is estimated at 0.167° – about 10km EW on the Isle of Man).⁹ For 1185, an even larger shift is required, and in the opposite direction. Between the two epochs, the change in Earth rotation required is certainly unphysically large. Further, the record of the 1133 event is particularly rich. In Britain, this includes both the Anglo-Saxon Chronicle:

In this year King Henry went over sea at Lammaas, and the second day as he lay and slept on the ship the day darkened over all lands; and the Sun became as it were a three-night-old Moon, and the stars about it at mid-day.

(note that the eclipse is not total in the sea south of England), and the Chronicle of Melrose:¹⁰

There was an eclipse of the sun on the fourth of the nones of August [2d. Aug.], on the fourth day of the week [Wednesday], so that for some time the day was turned into night.

The model does predict totality at Melrose. Reports are also provided in Dutch and Belgian sources, and particularly detailed reports (with far more detail than seen in the Chronicles, or in other British sources) in various German records, particularly at Augsburg and Heilsbronn, in Bavaria, and Reichersberg and Salzburg just south in Austria, all of which lie close to the modelled line of the eclipse maximum (the red line). Stephenson

5. Stephenson *et al* 2016

6. Newton 1972

7. Stephenson 1997

8. Broderick 2004, fols 35v, 40r

9. Morrison & Stephenson 2004

10. Stevenson 1835

reproduces the report from Reichersberg,¹¹ which states:

.... in the heat of midday the Sun suddenly disappeared and a little afterwards it seemed terribly darkened over like sackcloth of hair; and the stars also appeared in the sky.

This description is unique and vivid. Totality of the eclipse is not possible at both Reichersberg and the Isle of Man.

Could the Chronicles be reporting an eclipse which was partial? From our own recent experience (for example the eclipse of 20 March 2015, which on the Isle of Man reached 91.5% cover), a partial solar eclipse is clearly visible, but does not produce darkness. Therefore, for the historical eclipses, day would not be 'converted into night' for 1133, and for 1185, even the brightest 'stars' (Venus and other planets) would be unlikely to have been visible. There are records of partial observations of both events: for 1133 from the Anglo Saxon chronicle above, and for Prague (*'a crown like a crescent moon proceeded to the south part, afterwards turning round to the east, henceforth to the west At length it was transformed to its original state'*); the detailed description constrains how far Prague could have been from totality, consistent with the model. For 1185, a partial eclipse was observed by Gervase, who was a monk at Canterbury between 1163 and his death around 1200. He wrote:

The following month of May, on the first day of the month, there was a partial eclipse of the sun about the 7th hour.

This record is particularly convincing as it is clearly contemporary, and his writings provide details of other eclipses in his lifetime. Therefore, it is clear that observers of the time were capable of reporting partial eclipses. For the Isle of Man, in addition, there were annular eclipses on 1 January 1180 and 6 July 1191; the latter in particular ran West to East with the centre line close to the Isle of Man. Annular eclipses are more memorable than other partial eclipses, and while the lack of an observation isn't really evidence (the weather could have been foul), nonetheless it further supports the assumption that the reports in the Chronicles of Mann are of a total eclipse at some location.

Many medieval chronicles draw on other sources, so that the observations may have come not from primary sources, but from another report, particularly as the Chronicles were written sometime after the events reported. The record

of particular interest for this is the Chronicle of Melrose. That work is thought to originate with the foundation of Melrose Abbey around 1140, significantly predating the Chronicles of Mann, thought to date from around 1247. Melrose reports both eclipses recorded in Mann; at Melrose, the eclipse in 1133 is modelled to have been total (see Figure 1). We reproduce in Latin a transcription of both sources:

1133:

Melrose: Eclipsis solis facta est iiij nonarum Augusti iiij ita ut dies in noctum verteretur aliquandiu.

Mann: Eodem anno eclipsis solis facta est quarto nonas Augusti, feria quarta, ita ut dies in noctem verteretur aliquamdiu

1185:

Melrose: Eclipsis solis facta est kalendas Maij feria iiij post noman et stelle apparuerunt.

Mann: Sol passus est eclipsim in die apostolorum Phiippi et Jacobi ita ut stelle apparerent.

The records are clearly so similar (in 1133 close to identical) that it is highly likely that the Chronicles of Mann drew directly from those of Melrose. It would be possible at this point to assume that the Manx records are entirely derivative, and therefore have nothing to say except for confirming Melrose as a source. However, the nature of the similarity between the records is interesting: for both eclipses, the description of the eclipse is identical. However, the description of the dating (the first half of each entry) differs, particularly significantly for the 1185 record. From all known records for 1185, the wording is unique, and its form (the relation to the day of apostles Philip and James) seems likely to be original (for the time, this is clearly a memorable feature of the day) rather than converted from a day and month designation. What is interesting here is that Melrose reports three other eclipses from this time range (in 1140, 1178 and 1191) which the Chronicles of Mann do not mention. If the author is drawing all information from Melrose, why copy only two events and not the other three?

It is perhaps significant to consider the nature of other entries in the Chronicles. Williams notes of the writer that 'after 1079, he has no interest in the affairs of other countries unless they actually impinge on the affairs of Man'.¹² In such a case, why would he focus in the Chronicles on astronomical events that have no local relevance? A possible solution can be noted in the title and opening of the work: 'Here begins the Chronicles of the Kings of Man *and the Isles*'. Examination of

11. Stephenson 1997

12. Williams 2015, 310

the maps in figures 1 and 2 show that although totality was not observable on the Isle of Man, it was in more northerly islands making up that kingdom, specifically in Islay, Mull, Skye and the Outer Hebrides for 1143, and the more northerly islands only in 1185. (This more limited range is not of great significance, given that by this date the intermediate islands were no longer part of the Kingdom.) This provides a convenient and attractive solution to the paradox: the author *was* drawing on primary sources, just those relating to the whole kingdom, which indeed is also seen in other entries in the Chronicle. Indeed, with this interpretation, not only are the reports derived from a primary source, but in the case of the 1185 event, a very rare Western European report so derived. It is possible that the writer of the Chronicles of Mann took the existence of the eclipse directly from a source recorded in the Kingdom, but took the 'colour' (the description of the effects of the eclipse) from the Chronicles of Melrose.

In conclusion, the combination of scientific modelling and historical evidence suggests the eclipse observations are motivated by primary sources, although the details draw on other previously published information. The accuracy of the earlier date suggests that the original source of that information is distinct from other sources for the Chronicles, while the nature of the 1185 entry suggests access to a direct observation. If this interpretation is correct, we might extrapolate that physical references, the earthquake and the comet sightings, should also be considered to originate from within the kingdom, although the interpretation then becomes sufficiently broad that this information is less scientifically useful. The origin from elsewhere in the kingdom matches that of other entries, particularly given knowledge of the travelling of the kings, and supports the transmission of information within the Kingdom – indeed, it is likely that a source from the northern Isles would have been physically much more accessible than most of mainland Britain and Ireland, and provides further evidence for the independent rather than purely derivative composition of the Chronicles of the Kings of Mann and the Isles.

Acknowledgements

I thank Frances Coakley for invaluable initial discussions, Dr Fred Espanek for his eclipse path mapping software, the editor for excellent feedback, and Manx National Heritage for a thought-provoking display at the House of Manannan on the Chronicles of Mann that initiated this work.

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< <http://eclipsewise.com/eclipse.html> >
and held at NASA at
< <https://eclipse.gsfc.nasa.gov/> >

Appendix 1: Other physical phenomena:

The Chronicle of Mann makes reference to two appearances of comets, and one occurrence of an earthquake. These phenomena are less well-constrained than the eclipse records, as unlike the eclipses, there is no independent evidence from scientific analysis that the dates are correct. Nevertheless, it is interesting to examine the implications of these reports for understanding of the Chronicle.

Comets in Chronicle of Mann and the Isles:

The Chronicle makes two separate references to the appearance of comets, once in 1098 and once in 1166. Melrose also includes these two references (although giving the year for the second comet as 1165), as well as seven other comets that Mann does not reference (full list 873, 906, 975, 1066, 1098, 1109, 1110, 1165x2, 1181). Transcriptions of the text in each case are presented below:

1098 Melrose: Facta est abbatia sancta Marie Cisterii, Robertus primus abbas. Antiochia a Christianis capta est iij non. Junii, et cometa apparuit.

1098 Mann: Fundata est Abbatia Sanctae Mariae Cistercii. Antiochia a Christianis capta est et cometa apparuit. Cometa est stella, quae non omni tempore, sed maxime autem in obitu regis aut in excidio religionis apparet.

1165 Melrose: Due comete apparuerunt ante solis ortum mense Augusti, una ad austrum, altera ad aquilonem. Cometa est stella qua non omni tempore sed maxime in obitu regis aut in excidio apparet regionis.

1166 Mann: Duo comete apparuerunt ante solis ortum mense Augusti, una ad austrum, altera ad aquilonem.

Analysis: The text in the two sources is identical, but with the description of the nature of a comet transferred from 1166 in Melrose to 1098 in Mann, and *religionis* replaces *regionis* (the destruction of religion rather than a region – a copying error on the part of the scribe?). The only other clear difference is the dating, which for the second event is one year later for Mann than for Melrose.

The dating for the earlier Mann report matches Melrose, although it falls within a time period for which the dates in Mann are consistently in error¹³ – by up to 20 years prior to this entry, and subsequently by 10 years or less.

Discussion: The comet entries in Mann have been taken directly and in their entirety from Melrose. Only two features indicate any independent information. First, as for the eclipse records, there are several more records in Melrose than in Mann. Why are these two events selected if there is no independent evidence, and the others left out?

Secondly, the date for the second comet differs by a year – is this a transcription error (as with the conversion of region to religion), or is it indication that the author has another reason for choosing these events?

Conclusion: As for the eclipse records, the writer of Mann draws heavily (and in this case almost exclusively) from Melrose, although only for two events. In order to explain to a reader what a comet is, he brings the description intact from the second entry to the first so that it accompanies his first description of a comet. The second date could be a mistake, but could also be evidence of the author's attempt to match another source.

As with the eclipses, it is possible that the author has other sources from which he identifies the choice of comets and their dates, and uses Melrose for all the "colour". However, because of the similarity of the text, this argument is definitely (even?) weaker than the case made for the eclipses. However, the inclusion of the Fall of Antioch in the reference is additionally interesting – was this included in the Chronicle of Mann only because that entry was utilised to extract the comet information?

Earthquake: Again, there are a number of earthquakes (6) described by Melrose (974, 1048, 1089, 1117, 1170, 1185), and only one in Mann. Comparing the closest entries:

Melrose (1048): Terre motus extitit magnus

Mann (1029): (1048?) Eodem anno terrae motus magnus extitit

Conclusion: The text is taken from Melrose for the closest event to the date for Mann, which allowing for the mistakes in dates for early records in Mann¹⁴ is actually the same date. The history of large Earthquakes in the UK, summarised by Musson,¹⁵ gives no indication that a sizable Earthquake is likely to have occurred on the Isle of Man. However, strong earthquakes have occurred in south-west Scotland (Arran, Islay and Mull), and so within the Kingdom of Mann and the Isles: such an event might be reported by, or even observed at, Melrose. Thus, the two reports are likely of the same earthquake; interestingly, the author of the Chronicles could have adopted the description given by Melrose for an apparently different event closest in time, which in fact was the same event! The mistake in dating curiously provides confidence that this earthquake record was derived from an independent source.

13. Williams 2015

14. Williams 2015

15. Musson 2004



About the Isle of Man Natural History and Antiquarian Society

The Isle of Man Natural History and Antiquarian Society was founded in 1879 by a small group of amateur scholars led by P M C Kermodé who was to serve the Society tirelessly until his death in 1932. Kermodé, a typical nineteenth-century polymath, was a distinguished natural history scholar (the logo above shows *Nassa Kermodéi*, one of his discoveries) but his antiquarian interests became even better known, particularly his study of the outstanding series of Celtic and Norse cross-slabs of the Island culminating in his seminal book *Manx Crosses* (1907). As the Society grew in size and importance it played a significant role in the campaign to persuade the Government of the Isle of Man to establish the Manx Museum, an aim which was envisaged in the first Manx Museum and Ancient Monuments Act of 1886 (which commenced protection of the Island's monuments), and became reality in 1922.

In the words of the Society's constitution, the objects of IoMNHAS are 'the advancement of knowledge of Natural History and Human History and Cultural Development, especially in the Isle of Man and countries related thereto. The Society shall seek to promote its objects by practical investigations in the field, by the furthering of cultural and documentary studies, by lectures, by the issue of publications for the benefit of the public, and in other such ways as may be determined by the Committee.'

From its inception, the Society has arranged a series of summer excursions to sites of antiquarian or natural history interest, and winter meetings at which papers have been read covering these fields of study.

The publication of relevant papers advancing the academic disciplines covered by the Society has also been an important part of its work, through a succession of journals - the *Transactions* 1879 to 1882, *Yn Lioar Manninagh* (the Manx Book) 1880 to 1906, the *Proceedings* (1906 to 2013), and now *Isle of Man Studies* since 2014. All contain many contributions of lasting significance to Manx studies, and the excursion reports in these volumes provide a valuable snapshot of the condition of monuments and buildings. The Society also publishes monographs (most recently on Rushen Abbey), and previously published the *Manx Archaeological Survey, Peregrine* (1941-1976), and *The Antiquarian* (2009-2013).

The Society works to promote knowledge, awareness, and conservation of our Cultural, Natural and Built Heritage via diverse lectures, excursions, study visits to areas around the Irish Sea region, symposia and conferences. Members contribute to research, mainly on-Island but also in relation to wider research topics. The Society promotes collaborative research, and to encourage younger researchers offers up to two bursaries a year to students in full-time education whose research relates to Manx subjects within the Society's aims and objectives.

Membership is not limited to Manx residents, and the Society has a significant number of members resident in the British Isles and worldwide who are interested in matters Manx.

On the Society's web site www.manxantiquarians.com can be found:

- Further information about the Society
- Details of events organised by the Society
- Details of its publications
- Details of the Marshall Cubbon bursary scheme
- Membership details, including discounted rates for families and students in full-time education
- Contact details

News on the Society's events can also be found via the Society's Facebook page:

www.facebook.com/IsleOfManNaturalHistoryandAntiquarianSociety

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