

Sheetlines

The Journal of the Charles Close Society
for the Study of Ordnance Survey Maps

41

Number 119

December 2020

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Chairman Gerry Zierler introduces this special birthday edition

Welcome to The Charles Close Society's fortieth year! The ruby red cover of *Sheetlines* celebrates the anniversary of its foundation in November 1980, under the chairmanship of Peter Clark. Peter was to be ably followed by Dr Yolande Hodson and later by Chris Board OBE, to all of whom our warmest greetings and grateful thanks.

As an appreciative member for 25 years beforehand, it was and is still a great honour for me to chair our illustrious Society. My distinguished three predecessors had set the bar rather high, from the very founding of such a society to its achieving such a high reputation by 2012.

The Society's membership and prowess in research and publishing has continued to flourish, as has its programme of talks, tours and meetings, and latterly its successful development of our online presence. Our website has been vastly enhanced, we have online sales and membership renewal, and now social media too, with our own Facebook presence. Our finances, or at least our reserves, are strengthened.

Then came 2020. Earlier this year, the comprehensive publishing and meetings effort was developing apace when, with lockdown, suddenly everything - including no less than 10 events - had to be cancelled or postponed. Tragically, we even lost to the dreaded virus the leader of our first spring event, bringing matters close to home.

But as you might expect from a Society named after Colonel Sir Charles Close, CCS is made of stern stuff and has proved adaptable to the new battle conditions. Our speedy uptake of videoconferencing meant that we were able to adapt so that our famous social side was not entirely lost – even with visits more than a little 'furloughed'. You might say that CCS 'zoomed' into action, with a virtual AGM replacing the much-missed annual event, and even with a very welcome guest speaker. Online, 'show and tell' map meetings were quickly tested and have proved increasingly popular. My thanks to all involved, though we still need more! (Please try it - CCS provides the hosting technology).

So, here's to the next forty years of The Charles Close Society. Let's all hope that it will not be too long before we can start to meet up again and enjoy our social side, as we enjoy our mutual love of the study of Ordnance Survey maps. Floreat CCS!

A very short questionnaire for members will be found with the Index. It can be completed on a web page, or responses can be sent to the Hon Sec by email, phone or post. It has been kept short and easy-to-complete because we really would like as full a response as possible.

CCS is forty

Mike Parker wishes the Society Happy Anniversary:

There's no denying it – forty is firmly middle-aged. Happily, though, I suspect that that will be no problem for the Charles Close Society. The CCS was born middle-aged, as were most of us, its gentle band of warriors. There will be no mid-life crisis, no startling new hair colour, no squeezing itself into inappropriate leathers and roaring off on a Harley Davidson.

And that is precisely why it means so much to us all. It is what it is, with no whistles or bells; a meeting of minds, around a meeting of maps. My first encounter with the society was when I was planning and researching what eventually grew into my book *Map Addict*. I'd been unaware that there even was an OS 'fan club', but it was an instant fit, and I've never looked back.

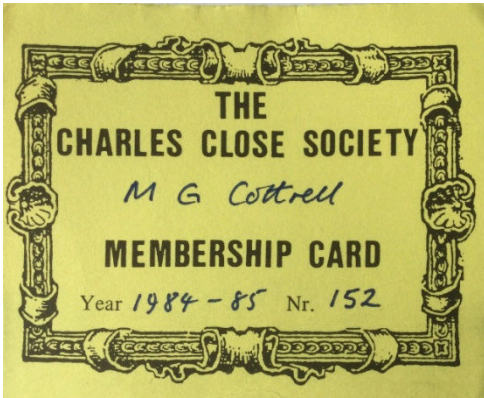
It is always a joy to spend time with CCS people, whether in person, online or in *Sheetlines*. I have been bowled over by how helpful my fellow members are, how generously they share their knowledge and enthusiasms, and how patiently they explain their specialisms to a confirmed generalist. I hope that I've helped bring a few people into the fold, for if there's one thing that I've learned in the twelve years since *Map Addict* was first published, it is that there are so many more of us out there than I ever realised. Maps – and OS maps in particular – occupy a unique place in our collective life and identity; so many people love them, and so fiercely, and for all manner of different reasons.

In my latest book, *On the Red Hill*, I wrote of having “a faith rooted in the outdoors and the divine within, in the elements and seasons, and in the urge to honour them. Its holy scriptures are poetry, music, art – and Ordnance Survey maps.” So many people have told me that this is their credo too. The Charles Close Society is perhaps then our General Synod! I wish it – and us – a very happy birthday.

Yolande Hodson, writing in 1991 in the introduction to her book Popular Maps describes the background to the formation of the Society:

By 1979, it was apparent that a series of guides to the Ordnance Survey collections of the British Library would prove invaluable to the readers of the Map Library. While these did not emerge at the time, another plan did crystallize. This resulted from the realisation that some of the readers who consulted the Map Library holdings were avid collectors of Ordnance Survey maps. Perhaps they would have in their own collections copies of states of maps which were missing from the national collection. If so, a knowledge of their holdings would be essential to any serious study of, for example, the small-scale maps. With this in mind, Peter Clark and I suggested the formation of a Society, with the principal object of pooling resources to produce authoritative records of what had been published by the Ordnance Survey.

Alan Godfrey attended the inaugural meeting: I remember it well because, to my surprise, I ended it as Membership Secretary, thus forming one of the triumvirates with the far better qualified Yolande Hodson and Peter Clark. I suspect the reason was that, as a dealer in second-hand OS maps, I had access to



a good mailing list and could drum up some membership. I also became Treasurer, which wasn't especially onerous as we had no money. My first tasks, then, were to design and print some little yellow membership cards and open a bank account at my Dunston branch, a much easier task then that it would be today. Later came many enjoyable meetings with Yo and Peter, but I think my most important contribution (in my eyes at least) was to insist we have some events outside London, something that bore fruit in 1981 with a

gathering in Bradford, followed by one in Edinburgh.

Because of my then business I was confident that we would find an enthusiastic membership, though I had no idea that the society would still be so active forty years later.

Chris Board, another founder member, later became chairman: Until the late 1970s I was a collector of OS maps, a user and began to envisage a development of changing designs of the common scales encountered. But these fell outside my research interests in thematic mapping, where the Ten-mile planning maps were familiar and used in teaching first at Cambridge in the early 1960s.

On a trip to Taunton in 1978, I was attracted by a box of second-hand OS maps at a bookshop. From that came sheet 9A of the third edition of the quarter-inch map: but why 9A? No obvious explanation for what was a redesigned map, an improvement on that in the Atlas for England and Wales 1924 a copy of which my uncle possessed. Extensive enquiries prompted a substantial working paper, privately circulated (later printed in *Sheetlines*). Probably as a result, I was included in the letter inviting some 25 individuals to what was to become the Charles Close Society.

I became a serious collector aiming to create a catalogue raisonné of the quarter-inch map, and entered a newly established research group with some clear objectives and a business-like approach, appealing to the professionals and many non-academics fascinated by OS maps. I had found a pastime already tapped by several who had been engaged in writing Seymour's History of the OS. I had been introduced to the consultative meetings at OS where I was the representative of the IBG, and where we were shown experimental and provisional mapping and asked for comments. The interaction between OS, still military headed, as the map makers and their users was fascinating.

Barbara Bond saw us as the OS fan club and Vanessa Lawrence regarded us as the historians of the OS. But Yolande Hodson we thank for seizing the

opportunity of her post in the BM supported by Helen Wallis to bring the CCS founders together.

David Archer soon joined: Before the society was formed, I had an accumulation of Ordnance Survey maps, and a thousand questions I wanted answered. I did not know anyone else who was interested in OS maps. Brian Harley's *Historian's guide to Ordnance Survey maps* was the only publication available to help me, and this barely scratched the surface of the subject.

By 1981, the first issue of *Sheetlines* had arrived. Those eight small pages were just so exciting. Chris Board's article on the quarter-inch was notable. Not only was it the first piece I had read about OS maps, other than Harley, but it showed that others were taking a serious interest in the subject, and that the subject merited such interest. On the final page, a meeting was advertised, hosted by Chris Board, with themes for the meeting being the Half-inch, 3rd and 4th Editions of the Quarter-inch map and Ten-mile maps. An early Christmas, I thought, and promptly applied to attend. To me, that meeting was probably the most significant and enjoyable society event in the last 40 years. Why were these few hours so memorable? Because they promised so much: the passing on of knowledge and of friendship. Without exception, all attending were nice easy-going people, eager to discuss Ordnance Survey maps, and to share what they knew.

My hopes and expectations on that day have been more than fulfilled by the Charles Close Society and its members. Thank you.

CCS at large: Some of the most memorable occasions have been on the Society's meetings and visits, with the opportunity for spending time together, discussing maps, examining maps, questioning map-makers and talking to librarians, as well as socialising, dining, exploring, travelling and enjoying new experiences and gaining new knowledge. *Photos by Chris Higley, John Davies, Alex Kent, Gerry Zierler.*



Above: Gotha, Germany, 2011

Opposite page, top left to bottom right:

Malmö, Sweden, 2008; Piran, Slovenia, 2007; Baltic Sea, Latvia, 2006; Great Orme copper mine, North Wales, 2008; Dublin, 2011; Dunluce Castle, Northern Ireland, 2015



Gerry Jarvis, seen in the three top left pictures, for many years an enthusiastic member of the Society and one-time visits organiser, died on 6 October. An obituary will appear in April *Sheetlines*.

The Ordnance Survey and Airy's figure of the earth

David L Walker

The initial triangulation of Great Britain was marred by flawed estimates for the lengths of degrees that were used to calculate latitudes and longitudes.¹ For about thirty years, the Ordnance ignored criticism of its 1795 estimate of the length of a degree perpendicular to the meridian, as described below.

New estimates became available with the publication in 1830 of Airy's figure of the earth (ie its shape and dimensions) and these were fairly soon adopted by Ordnance officers. However, in 1838 Captain Robe RE had to apologise to the Admiralty's Hydrographer that "he must not communicate Col Colby's formula" for the length of a degree and ellipticity of the earth (*figure 1*). The relaxation of this prohibition in 1841 marked Colby's acceptance of 'Airy's spheroid', and this still provides the basis for the projection of Ordnance Survey maps.

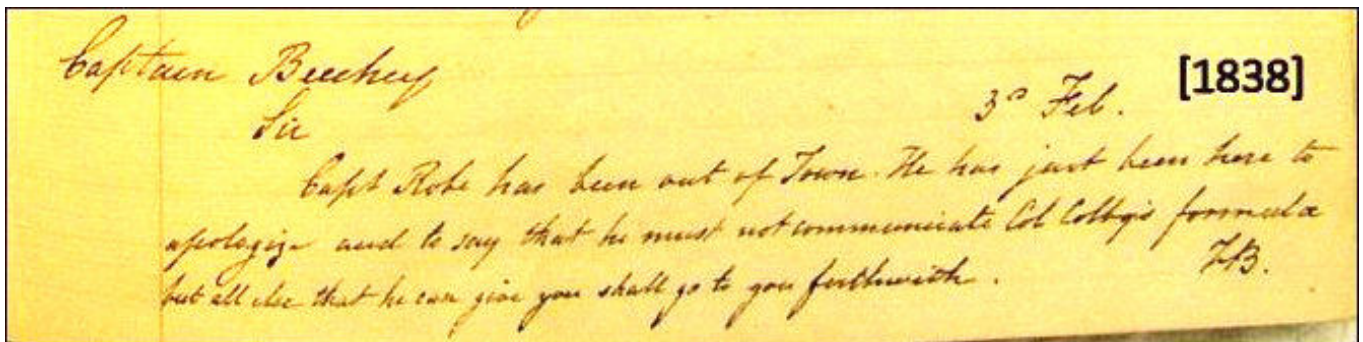


Figure 1: Letter from Capt F Beaufort, Admiralty Hydrographer, to Capt FW Beechey RN (UK Hydrographic Office (UKHO), LB 8, 93, Capt Beaufort to Capt Beechey, 3 Feb 1838)

The context

Isaac Newton postulated that the figure or shape of the earth was necessarily an oblate spheroid,² due to its adjustment to the effective reduction in gravity between the pole and the equator that arises from the increase in the offsetting centripetal force. In the first half of the early eighteenth century, this figure was sharply debated in the French Academy of Sciences until, after observations in Sweden and Peru, members agreed upon the model of an oblate spheroid.

In London the Astronomer-Royal in 1787 regarded "the true figure and dimensions of the Earth" as still uncertain.³ However, William Roy in 1790 used a figure not very different from that adopted by the French, and concluded that it was 'sufficiently obvious that the earth ... must be an oblate spheroid'.⁴

¹ David L Walker, *A fresh look at the initial Ordnance triangulation etc.*, *Sheetlines* 117, 9-22.

² An oblate spheroid is an ellipse rotated on its minor axis. If rotated on its major axis, it is a prolate spheroid. All spheroids are ellipsoids but not all ellipsoids are spheroids.

³ Sir Charles Close, *The early years of the Ordnance Survey*, 1926; republished with an introduction by JB Harley, Newton Abbot: David & Charles, 4, 1969.

⁴ Maj.General William Roy, *An Account of the Trigonometrical Operation, whereby the Distance between the Meridians of the Royal Observatories of Greenwich and Paris has been determined*, Phil. Trans. Roy. Soc. London, vol. 80, 212, 1790.

After Roy's death, William Mudge effectively took charge of the Survey, with Isaac Dalby still providing mathematical advice. In 1795 (by which time Britain was at war with France), they published their determination of 61,182 fathoms for the length of a degree perpendicular to the meridian at latitude 50 degrees 41' N.

The distance between the meridians of Dunnose and Beachy Head was calculated from the triangulation, which included observations extending up to 64 miles. This was divided by the difference in longitude calculated from the spheroidal triangle PDB, which was dependent upon only a few observations of the pole star.

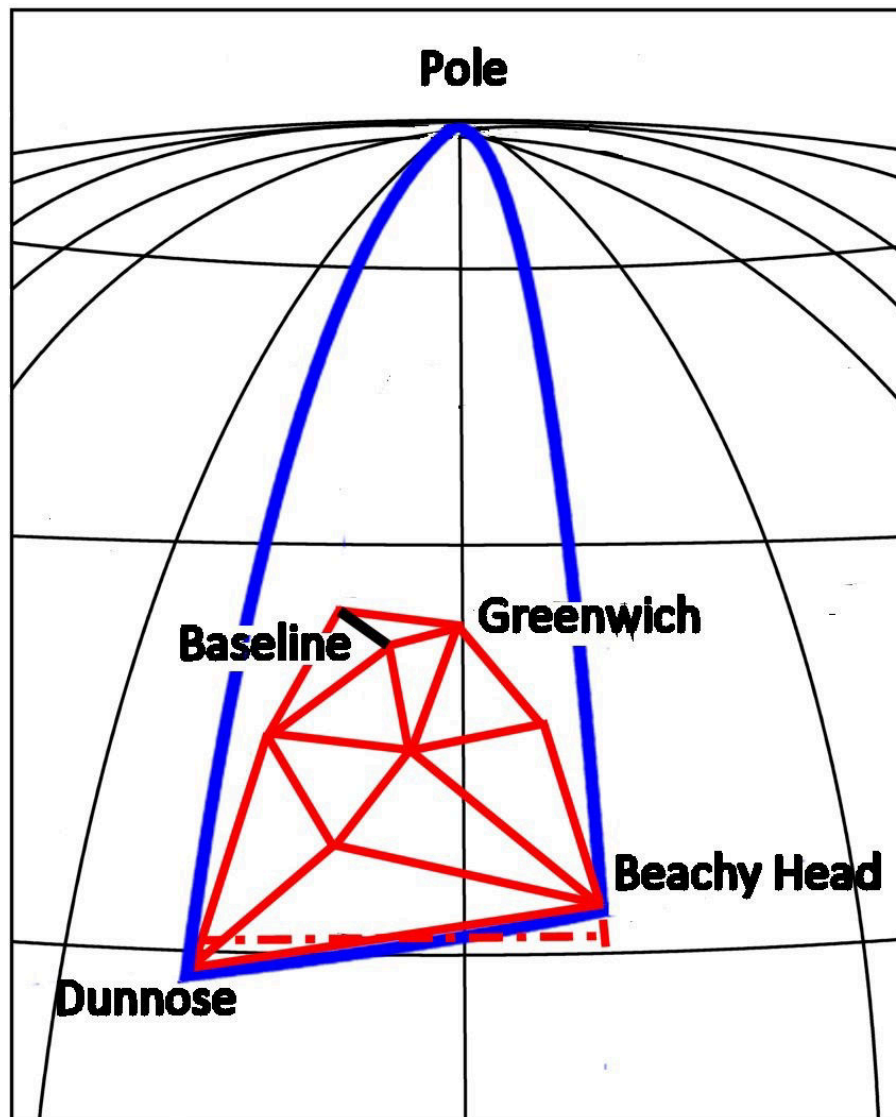


Figure 2 Determination in 1795 of length of a degree (exaggerated scale)

Yet Mudge and Dalby felt sufficiently confident to declare, in relation to foreign observations, that "This comparison ... sufficiently proves that the earth is not an ellipsoid", and, five years later, for Mudge to declare that there was "great reason

to suppose that the earth is not any regular figure".⁵ Charles Close concluded that, in the absence [as they saw it] of an accepted figure of the earth, "in practice the officers of the Ordnance Survey, at the end of the eighteenth century, measured the curvature of the earth in two directions as they went along".⁶ But it seems illogical that Mudge, having rejected a regular figure of the earth, adopted a constant length of a degree of longitude across the country.

Far-sighted criticism from Professor John Playfair in 1798

Although the improved assumptions eventually adopted by the Ordnance are known as 'Airy's spheroid', his approach was described thirty years earlier in a little recognized paper by John Playfair⁷ that provides a useful introduction to this topic. Playfair's eclectic output benefited from his friendships with the revolutionary geologist James Hutton and the Astronomer-Royal, Neville Maskelyne, whom he had assisted at the measurement of Schiehallion in 1774.

The argument of Playfair's paper is remarkably clear, succinct and far-sighted. From the eighteenth century research (and his own planetary observations?), he firmly regarded the earth as an oblate spheroid. In his view, variations in the ellipticity (or eccentricity) of around 1 in 300 deduced by various observers resulted from irregularities in gravitational attraction on a plumb-line (or a spirit level) arising from variations in the density of underground strata as well as the surface terrain. From his geological knowledge, he calculated that these variations could distort a plumb line by 10 or 12 seconds. As they were unavoidable, he concluded that errors in observing latitudes could be contained only by confining comparisons to arcs of at least several degrees.

Playfair nicely demonstrated the equation for the observed length L of an arc of an elliptical meridian between two observed latitudes λ and λ' in terms of the earth's equatorial semi-axis ' a ' (or its polar semi-axis ' b ') and its eccentricity ' e ' (defined as $(a-b)/b$). Another arc observed on any meridian (preferably at a very different latitude) could provide a second equation. Hence a and e (or b and e) could be determined from two equations containing two unknowns. This was also the basis for the approaches to the figure of the earth adopted by Lambton in 1818 and Airy in 1830.⁸

⁵ Lt Col Edward Williams, Capt William Mudge RA and Mr Isaac Dalby, *An Account of the Trigonometrical Survey carried on in the years 1791, 1792, 1793, and 1794*, Phil. Trans. Roy. Soc. Lond., vol 85, 511-527, 1795; Capt William Mudge RA, *An Account of the Trigonometrical Survey carried on in the years 1797, 1798, and 1799 etc*, Phil. Trans. Roy. Soc. Lond., vol 90, 636, 1800.

⁶ Sir Charles Close, *The early years etc.*, 149, republished 1969.

⁷ John Playfair, Professor of Mathematics in the University of Edinburgh, *Investigation of certain theorems relating to the figure of the earth [read 5 Feb 1798]*, Trans. Roy. Soc. Edinburgh, Vol V, 1805. <https://archive.org/details/transactionsofro05murr/page/n11/mode/2up>

⁸ The equation for the length of an arc, using Airy's notation, is shown in the Appendix.

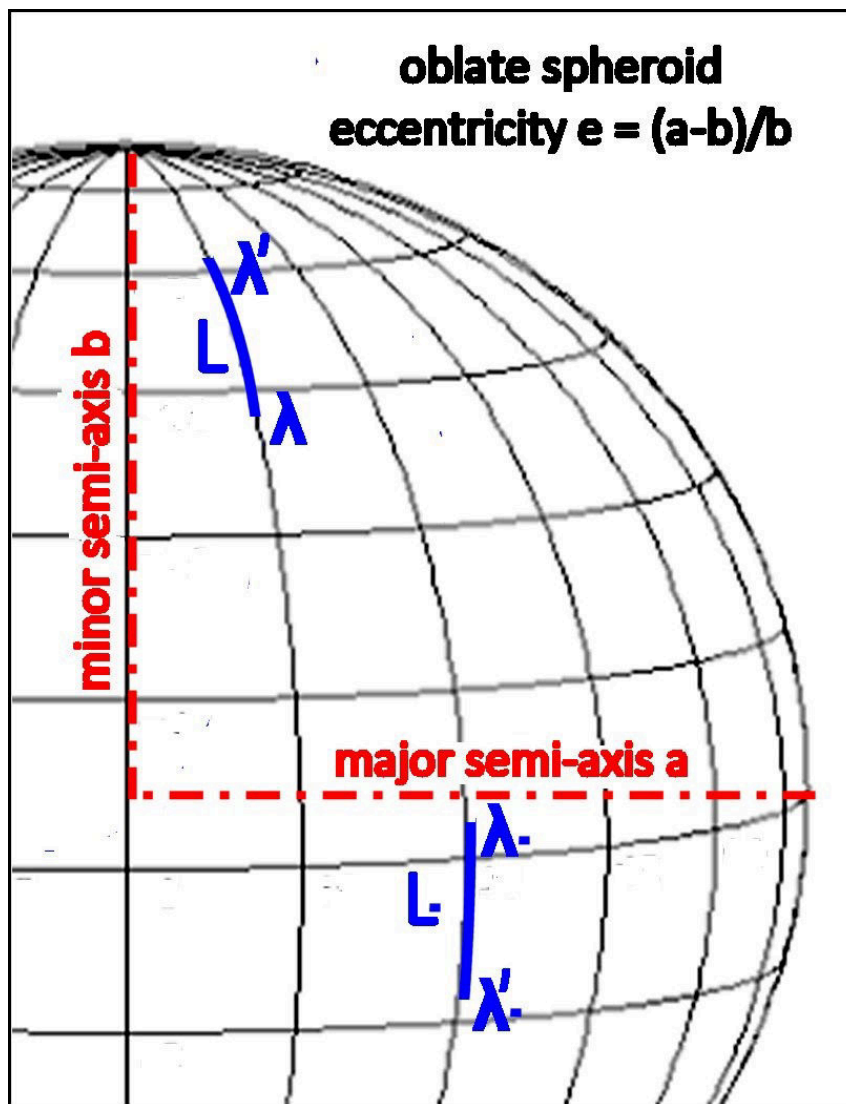


Figure 3 : Approach to determining the figure of the earth from two observed arcs of the meridian

Playfair found it “not easy to account for” the ellipticity of the earth implicit in the 1795 paper by Mudge and Dalby. He did not question their trigonometry, but, significantly, warned that, if the difference in longitude observed between Beachy Head and Dunnose had been affected by the reduced gravitational attraction of the lighter underground strata between them, other longitudes derived from these observations “[would] appear less than they ought to do”.

Without any further validation, the Ordnance somewhat rashly used the length of a degree of longitude estimated in 1795 to determine the longitudes of the various meridians adopted for the initial triangulation, as it reported from 1795 until 1811. In 1813, Mudge advised Colby that “Mr Playfair is a man of great natural sagacity and much acquired information”,⁹ but unfortunately they had paid more attention to Playfair’s compliments than to his tactful criticism.

⁹ Mudge to Colby, 9 Sept 1813, quoted in Sir Charles Close, *The early years etc.*, 59, 1969.

Figure of the earth published by William Lambton in 1818

Lambton's talent for mathematics and his surveying experience enabled him in 1800 to take the opportunity, when serving under Colonel Arthur Wellesley, to commence the great triangulation of India that he led until his death in 1823. Under-rated in London, it was not until Lambton was honoured by the French Academy of Sciences in 1817 that he was elected a Fellow of the Royal Society.

Lambton's triangulation was published in this country in 1818.¹⁰ As it was at a low latitude, it provided a well-placed arc of the meridian. From his own triangulation, taken with that by Legendre in France, he firmly deduced a spheroidal figure of the earth. This was tabulated very usefully in terms of the lengths of degrees on and perpendicular to a meridian, at three-degree intervals from the equator to the pole. By reference to later figures of the earth, Lambton's estimates proved more accurate than previous figures.

A general defect in the Ordnance longitudes found by John Tiarks in 1824

On the recommendation of Sir Joseph Banks, John Lewis Tiarks became British Astronomer to the Boundary Commission for the border between the United States and Canada. From there, he was appointed by the Admiralty to measure the longitude of Falmouth, first from Greenwich in 1822 using 15 chronometers, and then from Dover in 1823 using 26 chronometers.

His report to the Board of Longitude, published by the Royal Society,¹¹ boldly concluded that "it is a general and proportionate defect of all longitudes deduced from the [Ordnance Trigonometrical] Survey, and not the erroneous longitude of any particular station, which has caused the disagreement between the results of the chronometers and of the Survey." Supposing his final result to be correct, "all the longitudes in the Account of the Survey must therefore be increased" in the proportion 4.92" to 25' 23.5" [of time]. It is a tribute to his accuracy that this is exactly the same as the increase of 11.6 seconds per degree that was later adopted by the Ordnance.¹²

Tiarks also was sceptical of any determination of the length of degree perpendicular to the meridian by geodetical measurement "independently of any hypothesis respecting the figure of the earth." If the Ordnance figure was correct, he argued, the ellipticity of that part of England must be very different from the earth as a whole and therefore unreliable for the country as a whole. As degrees of latitude could be determined more accurately than degrees of longitude, it was preferable to determine the figure of the earth from two well-separated arcs of latitude, and to use this figure to calculate the length of a degree of longitude.

¹⁰ Lt Col William Lambton, 33rd Regiment of Foot, *An abstract of the results deduced from the measurement of an arc on the meridian ... being an amplitude of 9° 53' 45.2"*, Phil. Trans. Roy. Soc. London, vol. 108, 486-517, 1818.

¹¹ Dr John Lewis Tiarks, *A Short Account of Some Observations Made with Chronometers, in Two Expeditions Sent Out by the Admiralty, at the Recommendation of the Board of Longitude, for Ascertaining the Longitude of Madeira and of Falmouth*, Phil. Trans. Roy. Soc. London, vol. 114, 360-371, 1824.

¹² WA Seymour (ed), *A history of the Ordnance Survey*, 39, Dawson, 1980.

Doubts published by Captain Kater in 1828

Having assisted Lambton on the trigonometrical survey of India, Henry Kater retired from the army in 1814 and enjoyed an independent scientific career over the next twenty years. As the Royal Society nominee on the re-triangulation between Paris and London, he enjoyed considerable independence but relied on the support of the Ordnance surveyor James Gardner.

Unlike the Ordnance, Kater assumed that the earth was a spheroid with an eccentricity of about 1 in 300. He found the length of a degree perpendicular to the meridian significantly less than the Ordnance figure (and much closer to later figures) but rejected his own estimate. Instead, after discussing the unavoidable inaccuracies in making observations of the pole star, he concluded that such observations, “for the purpose of determining the length of the perpendicular degree in our latitude, are wholly unworthy of credit ...”¹³

The brief adoption by the Ordnance of Lambton’s figure of the earth

After ‘the three volumes’ of the initial triangulation were published in 1811, Thomas Colby, who was promoted to Superintendent of the Survey in 1820, proceeded with the triangulation of Scotland until he was diverted to the Irish survey from 1823. However, no survey results were published by the Ordnance after 1811, although they supplied a few latitudes and longitudes to the Admiralty.

In 1812, Don Rodriguez had strongly criticized the uneven estimates by the Ordnance of lengths of degrees on the Dunnose meridian. After his criticisms were disputed by other geodesists, this issue seems to have come to rest. However, by 1828 no fewer than four Fellows of the Royal Society, as mentioned above, had separately expressed doubts over the determination by the Ordnance of the length of a degree perpendicular to the meridian. There is no sign in the various histories that Colby responded to these doubts. Nevertheless, the Hydrographer’s files show that Lt Hastings Murphy of the Ordnance, with Captain Robe’s knowledge, did recalculate some latitudes and longitudes for the Admiralty. In April 1830, he provided Lt Slater RN with positions for five stations on the Northumberland coast and three stations near the Scottish border. These three figures differed by about 10 seconds (south) in latitude and 30 seconds (west) in longitude from those published in 1811. Another letter from Murphy demonstrates that these figures were calculated “on the spheroid of Lambton & Delambre” (as published in 1818).

Lambton’s figure of the earth was also adopted by Lt Denham RN in April 1830 in making a comparison for four stations in Pembrokeshire between the latitudes and longitudes published in 1811 and his own figures “as recomputed on the spheroid of Delambre & Lambton”.¹⁴

¹³ Capt Henry Kater, *An account of trigonometrical operations in the years 1821, 1822 and 1823, for determining the difference of longitude between the Royal Observatories of Paris and Greenwich*, Phil. Trans. Roy. Soc. London, vol. 118, 188-189, 1828.

¹⁴ David L Walker, *A fresh look etc., Sheetlines* 117, 20, 2020 provides a fuller account of the Don Rodriguez, Murphy and Denham episodes, with references.

Professor George Biddell Airy 1801-1891

Having regard to the enduring use of Airy's spheroid, it is surprising to find that in 1830 it was published not in an academic journal but as an article in the little-known *Encyclopaedia Metropolitana*.¹⁵ Planned by the poet Samuel Taylor Coleridge to provide a systematic approach to all knowledge, this ran to thirty volumes but failed to compete with the *Encyclopaedia Britannica*. As well as the figure of the earth, Airy provided articles on trigonometry, waves and tides.

In 1824, at the age of 23, the impecunious Airy had a proposal of marriage refused by the lady's father. The fee of £100 for the figure of the earth was worth half his initial stipend at Cambridge, and even after securing the well-remunerated Plumian chair in astronomy his autobiography reveals continuing financial concerns. His recollection that in November 1829 he "wrote some (perhaps much)" of his article is followed by a brief note of the acceptance of his marriage proposal.¹⁶ That he specifically recalled receiving his £100 fee in 1831 suggests that this motivated the publication of his figure of the earth in an encyclopaedia.

Airy's article on the figure of the earth

Although Airy's autobiography reveals little evidence of field experience in trigonometrical surveying, his article demonstrates a mastery of the subject gained from his extensive reading, useful site visits and voluminous overseas correspondence. Moreover, his article was not confined to determining a figure of the earth from geodetical measurements. He analysed the theory and practice of pendulum observations to deduce the shape of the earth from the variation in gravity between the pole and the equator. He also considered its determination from his understanding of the earth's precession and nutation, and used these alternative methods to support but not to modify his geodetic conclusions.

In his article of 76 pages, the geodetical analysis occupied only 6 pages and does not involve much more than sixth form mathematics. His approach was much the same as that outlined thirty years earlier by John Playfair, and endorsed by Lambton and Tiarks. However, Airy could now draw upon fourteen measurements of arcs of the meridian (*figure 4*), although his article does not seem to express any thanks for this hard-won body of work.

A notable feature of Airy's mathematics, as described in the Appendix to this article, is that he firmly rejected an apparently objective least squares analysis of the data. Given that any pair of arcs was sufficient to calculate values of the earth's diameter and its ellipticity, he simply examined the values calculated from selected pairs of arcs or groups of arcs. After also applying his opinions of their accuracy and of gravitational disturbance, he discarded some arcs, used others more than once and finally averaged the results from two groups of arcs.

¹⁵ GB Airy, *Figure of the Earth*, *Encyclopaedia Metropolitana*, vol V, 165-239, revd. 1848.

¹⁶ Wilfred Airy ed., *Autobiography of Sir George Biddell Airy*, Camb. Univ. Press, 89, 1896.

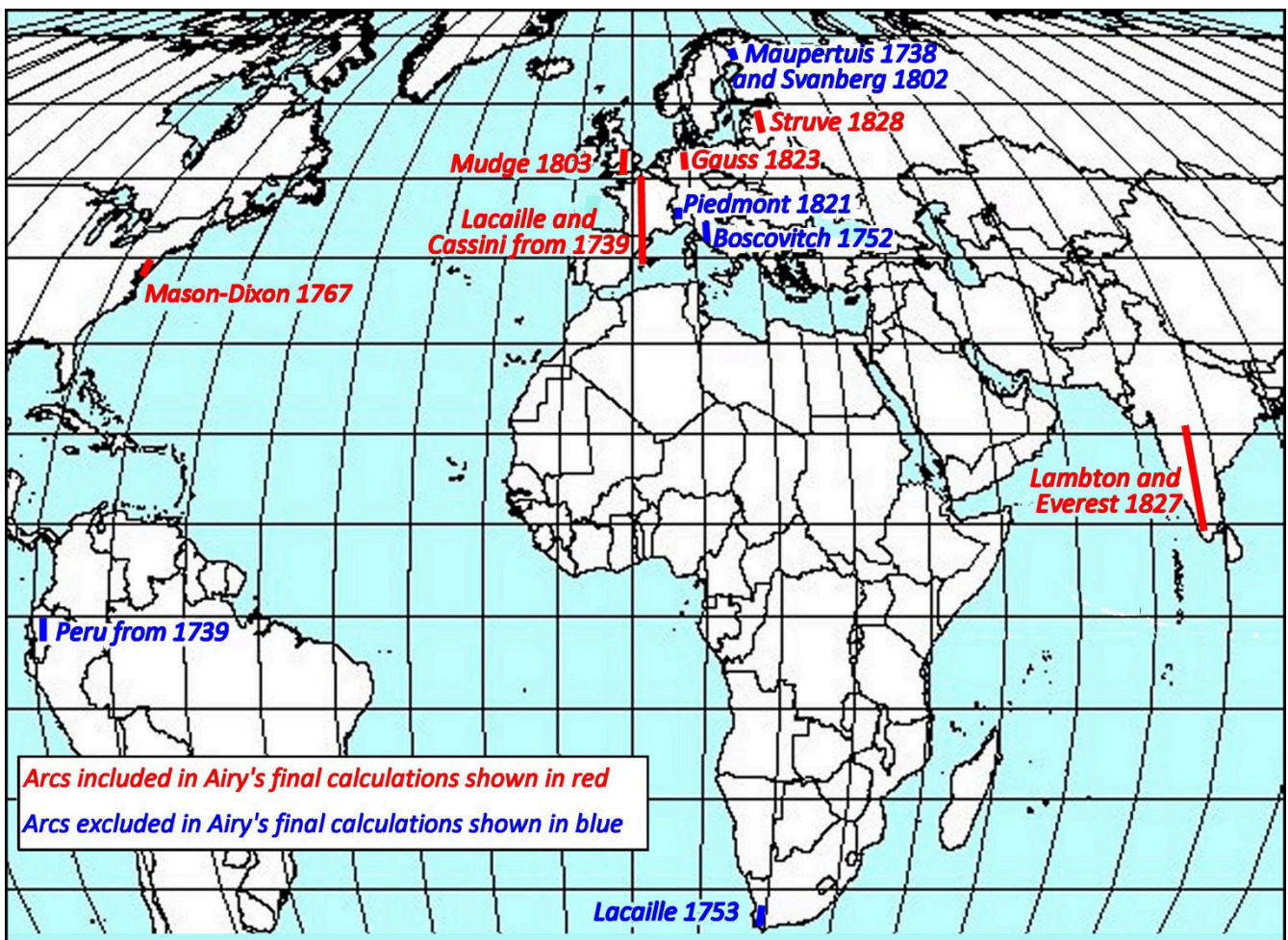


Figure 4 : Measured arcs referred to in Airy's paper
(and listed in the Appendix to this article)

The hesitant adoption by the Ordnance of Airy's figure of the earth

Ordnance papers, scarce before 1840, do not appear to record when Airy's figure of the earth was adopted for calculations of latitude and longitude. His article was dated 17 August 1830 and there is a note in TNA 2/616¹⁷ that "Stations in this volume said to be on Airy's figure are computed from elements supplied by the late Professor Airy in the year 1830-31." But, as Airy died in 1891, this note must have been written many years later.

The earliest clue found in the Hydrographer's letter books is Murphy's letter of 6 December 1834 that provided revised positions in eastern Scotland that can be shown to be based on Airy's figure of the earth.¹⁸ On the other side of the country, Captain Alexander Henderson RE was working independently on his impressive triangulation of the coasts of the Irish Sea.¹⁹ Although his calculation

¹⁷ TNA, OS 2/616, *Latitudes and longitudes of the Principal Stations on Airy's 1830 Figure and the British Figure of 1858*, 1856-1867.

¹⁸ David L Walker, *A fresh look etc.*, *Sheetlines* 117, 20, 2020 describes Murphy's advice.

¹⁹ David L Walker and Adrian Webb, *Some collaboration between the Ordnance Survey and the Hydrographic Office etc.*, *Sheetlines* 102, 10-13, 2015; UKHO, L2944, Criffell 54° 56' 28" N, 3° 37' 37.2" W, 1836; L2944a, Bengairn, 54° 52' 14.6" N, 3° 54' 56.7" W, 1836.

books have not survived, his triangulation diagrams show latitudes and longitudes for Criffell and Bengairn that definitely were recorded in 1836 and can be shown to be calculated on Airy's figure of the earth.

Captain Beechey, now responsible for the Admiralty survey of the Irish Sea, had worked in the Pacific and clearly understood the figure of the earth. Unhappy about differences between latitudes and longitudes supplied by Henderson and those published in the 'three volumes', Beechey sought a quantified explanation from the Ordnance. This in 1838 provoked the strange response from Captain Robe, referred to at the start of this article, that "he must not communicate Col Colby's formula" for the length of a degree and ellipticity of the earth.

So why was Colby unwilling to explain that these differences arose from the adoption of Airy's figure of the earth? Was he hesitant over abandoning figures inherited from Mudge? Or, having devoted more than ten years to the survey of Ireland, was he simply out of touch? The reader must decide.

However, Colby was ready to accept advice from Airy, by then the Astronomer Royal, on the calculation of latitudes and longitudes using polar co-ordinates taken directly from trigonometrical observations (instead of calculating latitudes and longitudes from Ordnance 'Cassini' co-ordinates).

As a test of this method (not of Airy's spheroid), Captain Portlock used data from the Scottish triangulation to calculate the latitudes and longitudes of a closed chain of a dozen stations.²⁰

Soon after this, in a letter dated 15 June 1841, Yolland provided the lengths of degrees that Robe had been forbidden to provide in 1838.²¹ Thus it seems that Colby by 1841 had accepted that the Ordnance should adopt Airy's figure of the earth.

The survival of Airy's figure of the earth

Despite international improvements to the figure of the earth, 'Airy's spheroid' is still, after nearly two centuries, recognised on current Ordnance sheets as the basis for the National Grid (and for sheetlines). So how has it survived for so long?

The first potential change came in 1858 when Captain Alexander Ross Clarke RE calculated a figure of the earth that provided a best fit to British observations, and slightly revised latitudes and longitudes for the Ordnance stations using this 'British figure'.²² These were listed, followed by a longer list of latitudes and

²⁰ David L Walker, *Troubled progress of the Scottish triangulation etc.*, *Sheetlines* 104, 11-12, 2015.

²¹ UKHO, LP 1857 Y, 15 June 1841. The lengths of degrees match those tabulated for Airy's spheroid in Yolland, *Measurement of the Lough Foyle base etc.*, 115, Ordnance Survey, 1847.

²² Capt Alexander Ross Clarke under the direction of Lt Col H James, *Account of the Observations and calculations of the Principal Triangulation and of the Figure, Dimensions and Mean Specific Gravity of the Earth as derived therefrom*, Ordnance Survey, 1858.

longitudes on Airy's figure, in the Ordnance file mentioned above. But an unsigned note inside the cover decrees "Airy's Figure only to be used".²³

By then the Ordnance was showing a marginal scale of latitudes and longitudes on its large-scale plans, calculated on a sheet by sheet basis using Airy's figure of the earth. As there was financial pressure from the Treasury, as usual, perhaps it was decided that the cost of revising Ordnance tables and recalculating these scales on Clarke's spheroid would exceed the potential benefits.

Reflecting on this policy much later, Charles Close noted that a change to the spheroid favoured at that time (1926) would alter the latitude of Cape Wrath by about $3\frac{1}{2}$ seconds and he endorsed the view that "no practical or theoretical purpose would be served by re-computing the geographical positions."²⁴

The procedure adopted in 1936 for the re-triangulation of Great Britain was to re-observe a central network of eleven former stations, and then to adjust the position, scale and direction of the combined figure "so as to give a best mean [least squares] fit with the Principal Triangulation co-ordinates at the eleven points, the shape of the combined figure remaining undisturbed." As a consequence, Airy's figure of the earth remained as the basis for the projection of Ordnance maps, now using the Transverse Mercator Projection. Thus 'Airy's spheroid' also became the basis for the National Grid (and for sheetlines).

A more recent justification for the retention of Airy's figure is that "The ellipsoid used for mapping in Britain, the Airy 1830 ellipsoid, is designed to best-fit Britain only, which it does better than GRS80 (Geodetic Reference System 1980), but it is not useful in other parts of the world."²⁵ It is difficult to reconcile this 'best-fit' justification with Airy's conclusion (described in the Appendix).

Conclusions

Confident in the quality of their instruments, their observations and their calculations, Superintendents of the Survey were slow to recognize the effect of gravitational variations attributable to underground strata as well as hills and mountains. If they had paid more attention to outsiders, they might sooner have appreciated these crucial influences on the plumb line and the spirit level.

Nevertheless, the Ordnance had the wisdom, however cautiously, to adopt the figure of the earth published by Professor Airy in 1830. As unnecessary changes to this 'near enough' figure were avoided over subsequent years, the role of the 'Airy spheroid' is still recognised on every Ordnance sheet.

Acknowledgement

For encouragement and advice, the writer thanks Rob Wheeler; Jim Smith, author of *From Plane to Spheroid*, 1986; and Adrian Webb, Archive Services Manager at UKHO; and UKHO is thanked for permission to reproduce *figure 1*.

²³ TNA, OS 2/616, *Latitudes and longitudes of the Principal Stations on Airy's 1830 Figure and the British Figure of 1858, 1856-1867*.

²⁴ Sir Charles Close, *The early years of the Ordnance Survey etc.*, 149, republished 1969.

²⁵ *A guide to coordinate systems in Great Britain*, Ordnance Survey, 6, 2015.

Appendix : Airy's method for determining the figure of the earth²⁶

1. Airy assumed the earth's surface to be an oblate spheroid, with a major (equatorial) semi-axis = **a** (in feet), minor (polar) semi-axis = **b** (in feet) and ellipticity **e** = **(a-b)/b** (as in *Figure 3*). For a spheroidal earth, meridians of longitude form ellipses and the latitude λ of a point is defined as the angle between the perpendicular through that point (not the radius) and the equatorial axis.

2. Using symbols as above (and supposing **e** to be small enough to neglect **e**²), Airy demonstrated:

radius of a parallel = **b** cos λ (1+ **e** + **e** sin² λ) (page 193)

radius of curvature of a meridian = **b** (1 - **e** + 3 **e** sin² λ) (page 194)

3. Using this radius of curvature, Airy (like Playfair and Lambton) integrated elements of an elliptical meridian from latitude λ to latitude λ' to define the length of an arc of the meridian $L = \mathbf{b} ((1 + 0.5 \mathbf{e})(\lambda' - \lambda) - 1.5 \mathbf{e} \cos(\lambda' + \lambda) \sin(\lambda' - \lambda))$ (page 194). Using this formula for the length of an arc of the meridian, he formed 'equations of condition' from the observed latitudes and lengths of each of the 14 arcs shown in *figure 4*, thereby forming 14 equations from the data in Table 1.

Airy 1830	Date	Ascribed	Latitude	Amplitude	Length	Kater's remarks (some abbreviated)				Final
Location approx		to	mid point	English feet					weighting	
Arcs of Meridian									/48	
1	Peru	1751	Bouguer etc	-1°31'00"	3°07'03.1"	1,131,057	Mountainous. Amplitude probably good.			-
2	Sweden	1739	Maupertuis	66°19'37"	57'30.4"	351,832	Mountainous. A little doubt re amplitude			-
3	French 1	1798	Lacaille etc	46°52'02"	8°20'00.3"	3,040,605	Apparently very good.			2
4	Roman	1752	Boscovitch	42°59'00"	2°09'47.0"	787,919	Mountains mid arc. Determination good.			-
5	The Cape	1753	Lacaille	-33°18'30"	1°13'17.5"	445,506	Mountainous. Determination good.			-
6	America	1767	Mason Dixon	39°12'00"	1°28'45.0"	538,100	Favourable country: apparently good.			2
7	French 2	1806	Biot Arago	44°51'02"	12°22'12.6"	4,509,402	Latitudes: inadequate observations.			5
8	Sweden	1802	Svanberg	66°20'10"	1°37'19.3"	593,278	Mountainous. Latitudes doubtful.			-
9	English	1803	Mudge	52°35'45"	3°57'13.1"	1,442,953	Excellent.			5
10	Indian 1	1823	Lambton	12°32'21"	1°34'56.4"	574,368	Excellent.			12
11	Indian 2	1829	L'ton Everest	16°08'22"	15°57'40.2"	5,794,599	Excellent.			12
12	Piedmont	1821	Plana etc	44°57'30"	1°07'31.1"	414,657	Determination excellent: mountainous.			-
13	Hanover	1823	Gauss	52°32'17"	2°00'57.4"	736,426	Excellent but doubt re standard.			5
14	Russian	1822	Struve	58°17'37"	3°35'05.2"	1,309,742	Excellent.			5
Arcs of Parallel										
15	Rhone	1740	Lacaille etc	43°31'50"	1°53'19.0"	503,022	Pretty good.			-
16	Dunnose	1795	Mudge	50°44'24"	1°26'47.9"	336,099	Apparently very good.			-
17	Falmouth	1824	Tiarks	50°44'24"	6°22'06.0"	1,474,775	Apparently good.			-
18	Padua	1824	Beccaria etc	45°43'12"	12°59'03.8"	3,316,976	Accumulated errors in circumstances.			-

Table 1 Measured arcs considered by Professor Airy in 1830

²⁶ GB Airy, *Figure of the Earth*, Encyclopaedia Metropolitana, vol V, 165-239, revd. 1848.

4. For example, using $(\lambda' - \lambda)$, measured in radians, the reader may verify the 'equation of condition' for arc no.9 as $0.0690040\mathbf{b} + 0.06160\mathbf{be} = 1442953$ and using eg arc no 10 may calculate a figure of the earth from these two equations.

5. To combine his 14 equations, Airy firmly rejected the method of least squares (although this was developed by Legendre, Gauss and later Bessel specifically for their analyses of the figure of the earth). Instead Airy formed simultaneous equations between selected pairs of these equations (or the sums of several equations), and applied his own judgement to the variations between the results. Having chosen and solved nine equations, he discarded six meridians that in his view gave discordant results, for reasons that he explained (mostly by reference to nearby mountains).

6. Next he 'thought best to use the method commonly employed in astronomy viz. to take the sum of groups of the equations of condition, and to consider each sum as one equation: the groups being selected so as to make the coefficient of e large and positive in one sum, and large and negative in the other.' On this basis, he finally gave equal weighting to two simultaneous equations:

- (a) sum of six 'higher latitude' equations v sum of two Indian equations; and
- (b) sum of the recent four out of above six v sum of two Indian equations.

The chosen arcs and their effective weighting are shown in Table 1.

7. Hence, he concluded, "[the] measured arcs may be represented nearly enough *on the whole* by supposing the Earth's surface (at the level of the sea ...) to be an ellipsoid of revolution, whose polar semi-axis is 20,853,810 English feet ... and whose equatorial semi-axis is 20,923,713 feet ..." (and with ellipticity 1:298.33).

8. Airy also formed equations of condition from the observations of the four arcs of parallel shown in Table 1. Having described some of these rather uncritically as good, he decided from the results that arcs 15 and 16 had been disturbed by the attraction of hills at both extremities. He regarded the results from arcs 17 and 18 as compatible with his results from arcs of meridian.

9. Thus Airy's well-regarded and lasting work used relatively simple mathematics. Although Charles Close described his technique as 'arbitrary',²⁷ Airy's subjective decisions allowed a more thoughtful approach than least-squares analysis.

10. In 1837-41, Bessel applied least-squares analysis to fit a meridian arc to 38 points from a similar set of measured arcs and his results were little different from Airy's.²⁸ Apparently Bessel's figure is still used in some parts of Europe where, as for Airy's figure in Britain, the benefits of a change have been judged not worthwhile compared with the costs.

²⁷ Sir Charles Close, *The early years of the Ordnance Survey etc.*, 148, republished 1969.

²⁸ Airy is closer to the modern figure of the earth for \mathbf{a} and \mathbf{b} , and Bessel for \mathbf{e} .

St Agnes Beacon

Ann Preston-Jones

David L Walker's paper on the initial Ordnance triangulation of 1795-1811¹ referred to the significant part played by the trig point at St Agnes Beacon. Here, Ann Preston-Jones delves more deeply into the history of this popular and familiar Cornish landmark.²

The starting point for this investigation was a proposal by the St Agnes Improvements Committee to convert the trig point on top of St Agnes Beacon to a topograph or location-finding device. At first, I was under the mistaken impression that making a topograph might involve completely demolishing the trig pillar – that familiar landmark against which anybody who has ever walked up the Beacon leans, to admire the stupendous view. That also led me to wonder what, if any, disturbance might be caused to the very prominent mound upon which the trig point is located, and then I began to wonder precisely what that mound might be. Is it, as the Ordnance Survey maps indicate, a Bronze Age *tumulus* or barrow, perhaps modified for the purposes of lighting a beacon fire on top, or might it rather be the remains of the tower which once stood on top of the Beacon?



*Figure 1: St Agnes Beacon seen on the horizon from Godrevy, some nine miles to the SW.
(Photograph : Andrew Darling)*

¹ *Sheetlines* 117, 9.

² Ann Preston-Jones is Heritage at Risk project officer with Historic England. This is a revised and updated version of a paper first published in the *Journal of the St Agnes Museum Trust*, No 13, 1997

St Agnes Beacon stands 628 feet (192 metres) above sea level, and has fine views in all directions. For this reason it was chosen by the Ordnance Survey as one of their earliest trigonometrical stations. The earliest triangulation or trigonometrical station on St Agnes Beacon appears *not* to have been in the location of the present trig point, but in a position on slightly lower ground to the south. This is indicated in a description of the station made in 1912,³ and in a plan of 1846 which similarly appears to show the station to the south of the summit (*figure 2*).

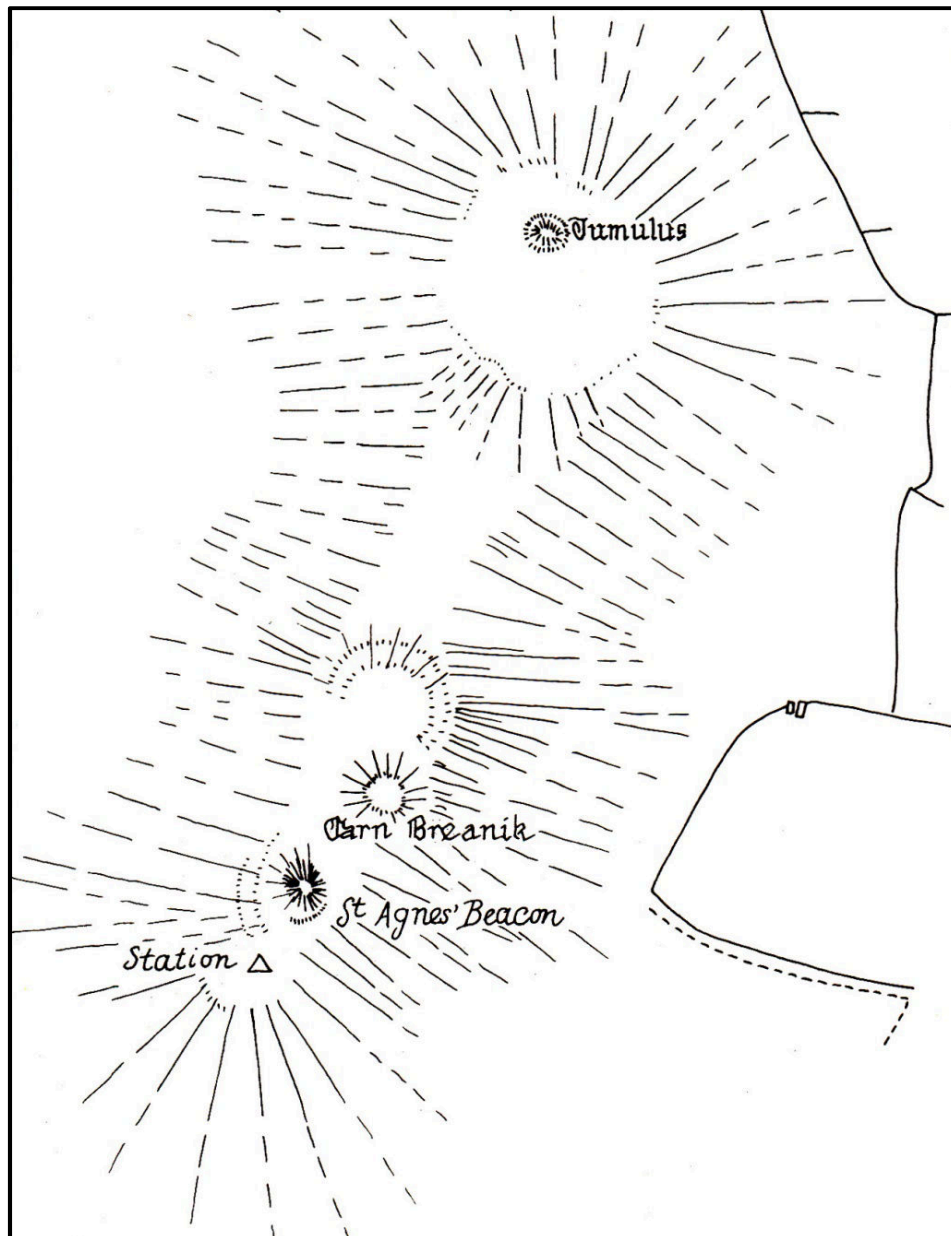


Figure 2: re-drawn from a map of the Assessionable Manor of Tywarnhaile, 1847 (map at Kresen Kernow QSPDD/33).

³ OS records: the description of the Trigonometrical Station on St Agnes Beacon 1912, and records quoted below were kindly supplied by the Ordnance Survey when the original research for this paper was undertaken.

It is suggested below that this location was chosen because there was some other structure there in 1796, preventing use of the more logical, higher, point. However, from the lower position, which lay roughly half-way between the summit and the rocky outcrop to the south, there were nevertheless excellent views in all the directions that could be required by the surveyors – that is, over the land to other trigonometrical stations on other prominent hilltops. Only the view to the north was hindered by the hill behind; but only the sea lies in this direction.

The major triangles measured from St Agnes Beacon were: St Agnes Beacon-Trevose Head - Hensbarrow; St Agnes Beacon – Hensbarrow – Dodman (Gorran); St Agnes Beacon – Dodman – Carmenellis (Wendron); and St Agnes Beacon – Carmenellis – Trendrine Hill (Zennor). Once the distances between the major landmarks had been established, there existed an accurate framework on which to build the more detailed mapping. ‘Interior triangles’ were surveyed, from St Agnes Beacon to landmarks including Castle an Dinas, Probus ‘steeple’, Veryan Beacon, St Teath Windmill, Stithians Down, Carn Brea, Camborne and Gwinear Steeples. Heights of selected stations were calculated by using the Great Theodolite to measure angles of elevation and depression. St Agnes Beacon was calculated to be 599 feet above sea level; the difference from the modern value may be partly due to the fact that the earliest survey point was below the position of the present trig point, rather than to any inaccuracy in calculation.

In the second half of the nineteenth century, a triangulation point was also established on the summit of the Beacon, where the trig pillar / topograph now stands. From a description of the trigonometrical station on St Agnes Beacon made in 1912,⁴ this new station appears to have been established in 1876 and must relate to the 1:2500 survey of the country taking place at the time. This is the position marked on the first edition 25-inch map of 1880 (*Figure 5*). The same document records that the original triangulation station was marked with ‘a pile of stones 5 feet high and 25 feet in circumference’ and a ‘hole drilled in [a] brass bolt and set in [a] 2' concrete cube and covered with [an] iron protection box’, set at a depth of 2 ft 0 ins.⁵ There is now no sign of this feature, unless a scatter of stones visible in the path due south of the topograph represents its remains.

In October 1936, the Ordnance Survey wrote to Mr Coulter Hancock, who by then was the owner of the hill: “I am desired by the Director General to state that during the course of restoration and re-observation of the basic triangulation of Great Britain, it will be necessary to erect a small concrete pillar on the site known as St Agnes Beacon, which I understand is owned by you.” Coulter Hancock, perhaps at first a little suspicious, replied on 7 December that “I am prepared to grant permission for the erection of the pillar ... in exchange for an undertaking that the Department will remove it at any time by my request or at the request of my successors in title.”

⁴ OS records

This response prompted a reply from Major Martin Hotine, Head of the Trigonometrical and Levelling Division: "I am desired by the Director General to furnish you with the required undertaking that the pillar will be removed at six months' notice, if so desired ... he is prepared to rely on your continued goodwill and co-operation to allow the pillar to remain standing unless in fact its removal should in the future prove to be absolutely necessary."

On 17 December 1936, Coulter Hancock finally gave his consent and soon after, a Triangulation Reconnaissance Report found that the new station was to be set over the 1876 survey point, "on a large flat-topped mound on the highest part of the hill, and known as St Agnes Beacon." It also noted that in St Agnes was the nearest Post and Telegraph Station, that the nearest cement was obtainable from Perranporth and the nearest water from Cannon Ball Farm.

The pillar was eventually erected in March 1937. The report on the construction of the survey station stated: "It was placed on the highest part of the hill, on the original survey site, although no mark was found. A base 3' by 3' was dug, and at a depth of 2' 3" a firm foundation was found, being mostly rock – a brass bolt with hole drilled in the centre was inserted in a 1' concrete cube at this depth. The pillar was then constructed in the usual way." The pillar builder was one LJ Dawson, and the total cost, including materials, labour and transport, £6 16s 9d. After leaving a suitable period for the new pillar to settle down, the trig point was occupied by the surveyors. The theodolite used, the five or five-and-a-half inch Geodetic Tavistock, weighed thirty two pounds and was considerably smaller than the Great Theodolite used in the first survey. Observations were made at night to electric lamps maintained on other stations by solitary light-keepers whose contact with the observing party was via morse code light signals or if necessary telegrams. Thereafter, the survey station has been used (or 'occupied') twelve times by the Ordnance Survey, at approximately three to four yearly intervals.⁶ In 1953, when it was to be occupied for astronomical observations, the OS wrote to Coulter Hancock: "While observations will be taken at night, the equipment, which is very valuable, must be protected during the day. I would be grateful, therefore, if you would give permission for our surveyors to erect two medium size tents and a small wireless pole near the pillar. The work is to be carried out during the coming summer and will take about one week to complete."

Routine inspection and maintenance was also carried out. In March 1958, Station Inspector H Court found that, although the general condition of the pillar was good, it was cracked on three sides from the top of the sighting tubes to the top of the flush bracket, probably as a result of frost. The centre pipe was filled with stones, soil etc, damage attributed to vandalism. Having cleaned out the centre pipe, the inspector chiselled out the crack on three sides and filled in with cement. He also sealed three sighting holes, greased and fitted new Allen screws and split pin and greased and replaced the spider cap. As a finishing touch, the pillar was given a new coat of Snowcem and the large depression around the

⁶ as at 1997.

base filled with stones, soil, and turf.

In 1993 the pillar was officially ‘adopted’ by the Camborne School of Mines who use this and other trig points in Cornwall for teaching surveying.

Summer-house on St Agnes Beacon

For a short time at the end of the eighteenth and beginning of the nineteenth centuries, there was a tower on top of the Beacon. At the time, it must have been a striking and dominating feature of the landscape, yet little is known of it nowadays. This may be because, although reasonably well-documented in antiquarian literature, there are no published drawings and no obvious surviving remains, and it had crumbled into near oblivion by the time the first detailed maps of the parish were produced in the 1840s.

The tower is not mentioned by Thomas Tonkin in his account of the parish made between 1710 and 1720, and since he gives a full account of features on the Beacon at that date, it is probably safe to assume that it had not at that time been built. Likewise, a map of 1778 (Kresen Kernow EN/1381) shows three cairns or tumuli, but no tower. However, it may have been standing by 1796, for the original triangulation point appears not to have been in the location of the present trig point, as discussed above, but on slightly lower ground to the south. This was perhaps because there was some structure preventing use of the more logical, higher position and a schedule of the property of Isaac Donnithorne Harris of St Agnes of 1797 confirms this, for it includes mention of ‘Unwin’s Castle erected on St Agnes Hill in memory of the contract made with the East India Company on a piece of ground on lease to Mr Donnithorne.’⁷ Donnithorne was one of the wealthiest men in St Agnes parish at the time, with considerable interests in mining. As chairman of the Cornish Association of Tinnerns he was responsible for striking a deal with George Unwin of the East India Company for supply of tin to China; the summerhouse commemorated their contract. Although initially beneficial to Cornish miners, before long it resulted in financial loss. This may explain events leading to the tower’s destruction soon after it had been built.

The first published reference to the tower is in a plan of secondary and tertiary triangulation stations for west Cornwall, which notes that “St Ann’s Summer House and St Agnes Beacon are so near each other that they cannot both be shown on this scale.”⁸ Similarly in 1806 Lysons mentions the ancient cairn with a beacon on it and the summer-house built near “from which there is a fine view of St Ives.” The summer-house or ‘castle’ is actually shown on two maps. On the Ordnance Survey’s first edition one-inch map of 1813 (*figure 3*), a tiny circular dot at the southern end of the Beacon is probably it; and in the *Plan of Sundry Lands in St Agnes, the Property of the Late John James of Rosemundy*, made in 1814, a pen and ink drawing of the Beacon forms a backdrop to the plan of fields and cottages from Mingoose to Rosemundy (*figure 4*). On top of the Beacon is a rather squat but two-storied tower with crenellations, doors, and

⁷ Information from Philip Mitchell of St Agnes.

⁸ Referenced in H Margary (ed), *The Old Series Ordnance Survey Maps of England and Wales, Vol II, Devon, Cornwall, and West Somerset*, 1977.

windows. Sadly the building survived for a few years only. On 13 and 20 March 1812, the *West Briton* published the following notice:

‘10 guinea reward offered by Matthew Sylvester for anyone supplying information on the persons who broke open the summer-house called Donnithorne and Unwin’s Castle, broke and carried off the window frames, and broke floors and doors.’

Matthew Sylvester had been one of the subscribers to the original construction of the tower.⁹ This vandalism seems to have initiated the dereliction of the building, for although an entry in the *Cornwall Gazetteer* of 1817 refers to a summer-house lately erected on the Beacon, a footnote records that it had been “blown or taken down since that account was printed.” Evidently it was only partly ruined at this date, for a sketch made in 1819 still shows a tall building on top of the Beacon with a ragged uneven top suggesting that the roof had collapsed and the tops of the walls started to crumble.¹⁰ Despite the fact that it clearly exaggerates the vertical element in the interests of dramatic effect, the sketch also indicates that the summer-house stood at the southern end of the Beacon. This is the point where the trig pillar now stands on top of a substantial flat-topped mound, perhaps the remains of the tower.



Figure 3 : Ordnance Survey 1st edition one-inch map. 1813

⁹ Information from Philip Mitchell of St Agnes.

¹⁰ Unpublished sketch by F.W.L. Stockdale in the Courtney Library of the Royal Institution of Cornwall.

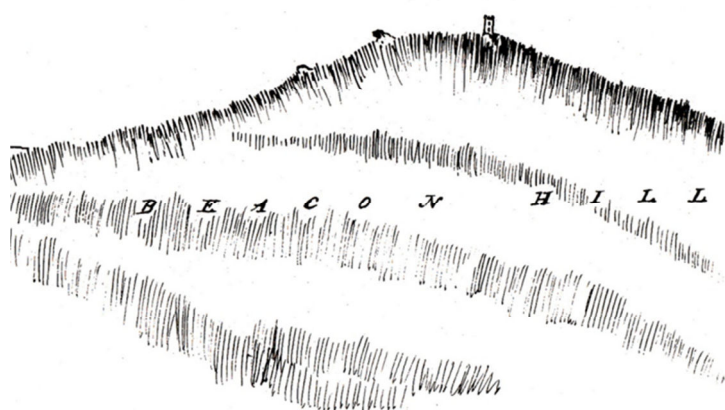
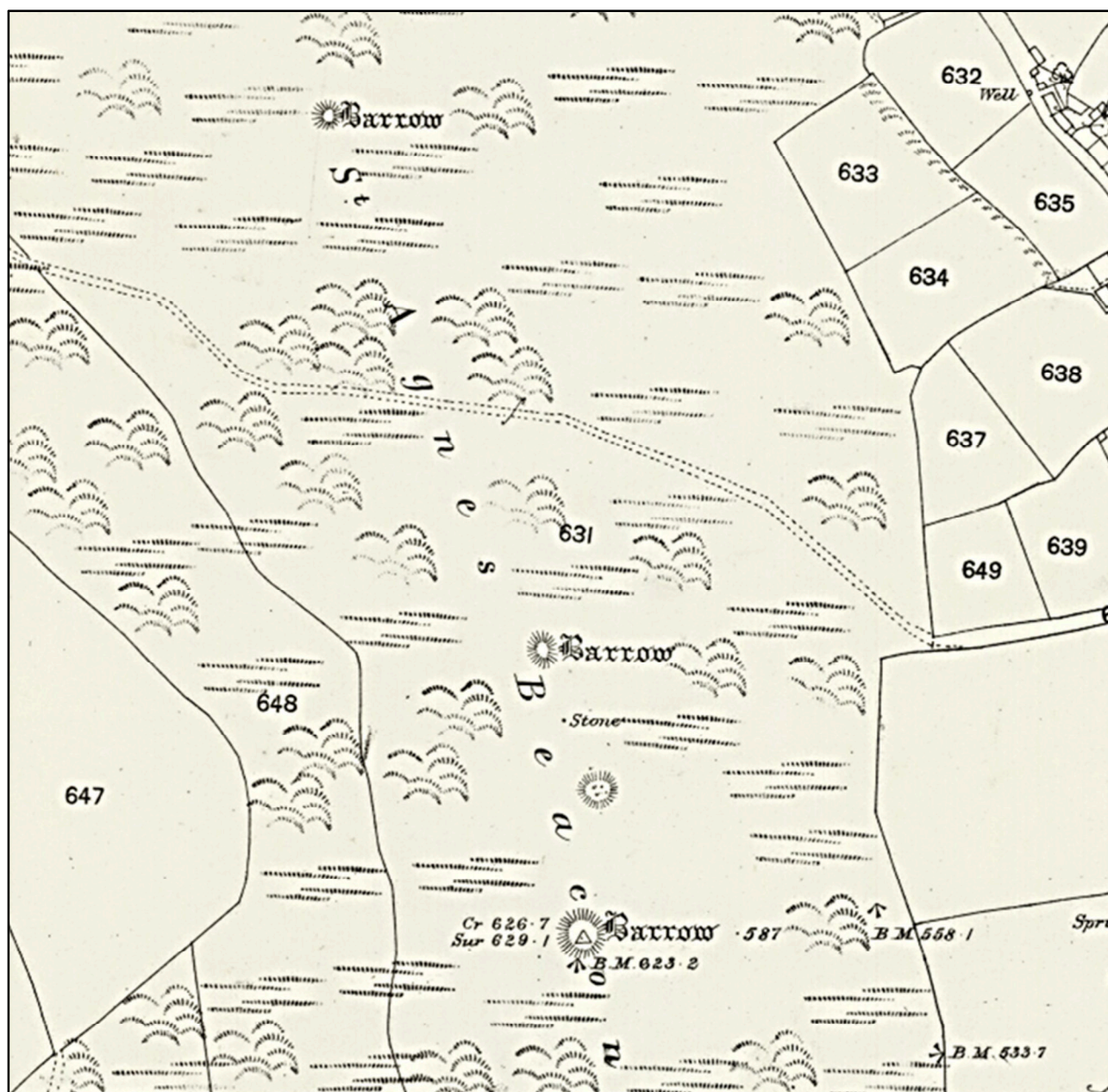


Figure 4 (left): sketch from plan of lands 'the Property of the Late John James of Rosemundy', 1814. Reproduced by kind permission of the Courtney Library of the Royal Institution of Cornwall (catalogue number CAR/1/23).

Figure 5 (below): Ordnance Survey 1st edition 1:2500 map, 1880 (Courtesy NLS).



By the 1840s, the summer-house must have deteriorated or been robbed to little more than a pile of rubble, for neither the Tithe Map of 1841 nor the more detailed map of the Assessionable Manor of Tywarnhayle of 1846 (*figure 2*) show any building up here. In 1876 the Ordnance Survey was able to use the top of the pile of rubble for its triangulation station, and it appears as a ‘barrow’ on the subsequent first edition twenty-five inch (1:2500) map (*figure 5*).

Fortunately, a little more is known of the summer-house. In JT Tregellas’ story of Mousey Cock,¹¹ “the great round pleasure-house” up “Bickin Hill” is one of the sights of St Agnes shown by Mousey to any visiting gentry. By the time Tregellas (1792-1863) was writing, the pleasure house can have been no more than a memory, and so in a footnote he added that “a round white tower stood on the top of Beacon Hill within the writer’s remembrance, which was called the Pleasure House; it was used by picnic parties.” This is a small but precious fragment; it is the only description known to exist.

Is there anything left of the summer-house to be seen now? I believe that there is. Careful consideration of all the evidence, a search of the top of the Beacon, and a survey of any significant piles of stone up there have led to the conclusion that the prominent mound on which the trig pillar is set may represent the ruined summer-house, itself perhaps built on the site of a Bronze Age barrow and beacon also occupying this commanding position.

Such a tower on St Agnes Beacon would not have been unique; it fits well with contemporary concepts of landscape design. The eighteenth century was particularly notable for the introduction of eye-catching architectural elements into landscapes and parks surrounding the houses of the wealthy. Towers broadly contemporary with that on St Agnes Beacon were also built at Cotehele (the Prospect Tower); on Doyden Point, St Endellion; at Castle an Dinas in Ludgvan; and on Kit Hill. The last two, like the tower on St Agnes Beacon, were not set within a designed parkland landscape but stood on prominent heathy hilltops. Compared to these, ‘Unwin’s Castle’ may have proved a fleeting and ephemeral feature but both it and the trig point had important roles in the landscape and the history of the Beacon and Cornwall.

¹¹ JT Tregellas 1879. *Peeps into the Haunts and Homes of the Rural Population of Cornwall*, 86.

Corpse roads: an enigma and a preserved error?

Stuart Dunn

‘Corpse roads’ were pathways, usually footpaths, associated with the transport of the bodies of the deceased from the place of death to the place of burial. The need to transport the body – sometimes long distances in remote rural areas – arose from so-called ‘mother churches’ preserving for themselves the right to conduct properly-sanctioned burials for the wider area in their own consecrated grounds, and to charge for the right to do so. Corpse roads are sometimes preserved in the naming of footpaths, such as the two-mile bridleway connecting the eleventh century mother church of St Michael and All Angels at North Otterington in North Yorkshire with the outlying hamlet of Thorton-Le-Beans (*Figure 1*).

In some cases, corpse roads were accorded special, if unwritten, status in local folklore. In his *Odd Yarns of English Lakeland* (1915), William T Palmer recorded that in Cumbria, “[s]ome of our mountain hamlets are far from the parish church, which has given rise to the ‘corpse road,’ which goes straight as a lance to the



*Figure 1: Corpse road bridleway,
North Otterington, North Yorkshire*

village centre ... But the official who dared to meddle with the corpse road, even though it might not be used once in twenty years, was in for dire trouble” (p. 37). This brief commentary in *Sheetlines* is best read as a footnote to a longer article on the subject of corpse roads due to appear in a forthcoming edition of the journal *Time and Mind*.¹ While researching this, I discovered that corpse roads are recorded on Ordnance Survey maps. One example is a short stretch of footpath at Castleford, near Pontefract. The first sheet of the area in the Six Inch series (Yorkshire 234), surveyed 1846-1848 and published in 1852, labels this as the “Old Corpse Road”, which was preserved in the later map, revised in 1938

¹ www.tandfonline.com/toc/rtam20/current. Any CCS members who cannot access it for any reason are welcome to contact me and I will gladly supply them with a copy.

and published in 1947 (figures 2-3) – as the area grew more built up, and the “Old Coal Pits” gave way to the “Miners’ Sports Ground”.



Figure 2: Ordnance Survey Six inch sheet Yorkshire 234, surveyed 1846, published 1852

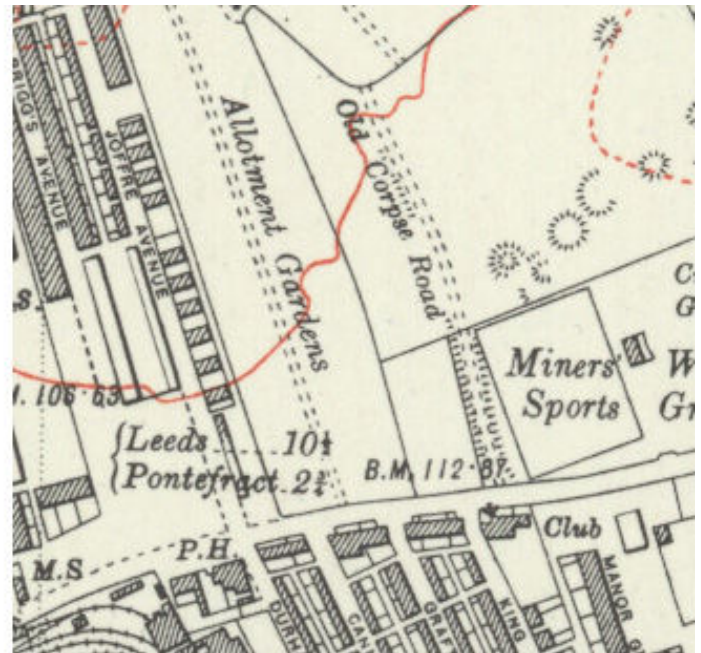


Figure 3: Ordnance Survey Six inch sheet Yorkshire 234, revised 1938, published 1947

The corpse path at North Otterington is preserved in the Ordnance Survey First Series; indeed it is also labelled as such on contemporary OS maps (figures 4 and 5). The “Corpse Road” is identified as following the course of a bridleway, which crossed both the Newcastle and Berwick Railway (now the modern East Coast Mainline) and a further, now-disused, railway line to the west.



Figure 4: Corpse road at North Otterington depicted on OS Six-inch sheet Yorkshire 71, surveyed 1854, published 1857

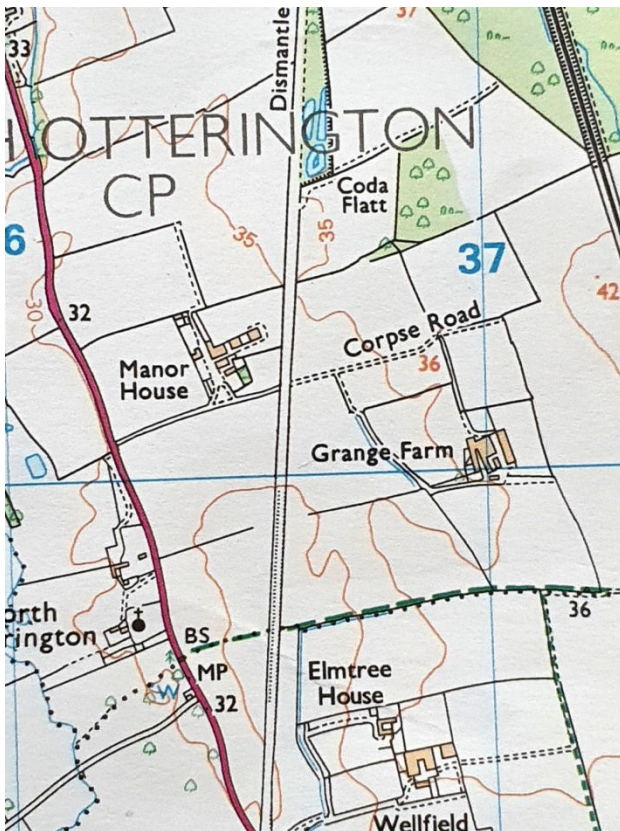


Figure 5 (left): the Corpse road at North Otterington on today's 1:25,000 OS Explorer (sheet 302). Compare with Figure 4 on previous page.

However, this labelling appears to contain – and has preserved – an intriguing error. Just to the west of the railway, the “Corpse Road”, as labelled, dog-legs northwards, before continuing west towards the main Northallerton road, to the north of Otterington Grange (now Grange Farm). The 1965 definitive Right of Way map, which shows rights of way as of May 1956 indicates that this was not recorded as a public right of way, although the path running directly west to the road and the church, marked as a bridleway on the 1857 map is (figures 6 and 7). The private track, avoiding the farm, is marked in white on figure 6, and the bridleway in green on figure 7. Yet it is the former, marked as the “Corpse road” on both the 1857 and the contemporary map which is shown avoiding the farm/Grange to the north. There are faint crop marks in the present-day field to the immediate west of the railway which might indicate an earlier field boundary that a non-metalled trackway could have followed

(figure 8), which would be consistent with the path following this route at some time, but there is otherwise no reason for the path to diverge in this way.

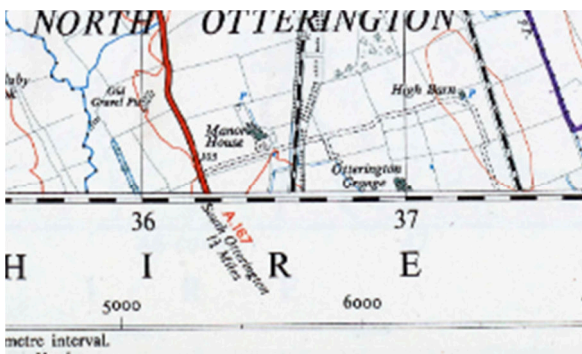


Figure 6 (left): Public Rights of Way Definitive Maps (provisional), sheet SE39 (North Otterington).



Figure 7 (below): Public Rights of Way Definitive Maps (provisional), sheet SE38 (North Otterington).

North Yorkshire Record Office NRCC/C/8/6/2.

Indeed, this diversion would add a good couple of miles on to the journey to St. Michael and All Angels from Thornton-Le-Beans. An error by the OS surveyors perhaps, or disquiet on the part of the landowners about the passage of corpses over their property?



Figure 8: possible field boundary/markings

I am most grateful to the staff at the North Yorkshire Record Office for their assistance with this work which, even in the time of Covid-19, could not have been more swift, efficient, and helpful.

Charles Close Society AGM, 2021

It is intended that the 2021 AGM will take place at the National Library of Wales, Aberystwyth, on 15 May, with formal business commencing at 1200. Nominations for officers or committee members, duly proposed and seconded, should be received by the Hon Sec at least 60 days beforehand.

It is anticipated that Carto Cymru, with an OS focus, will take place the previous day. Fuller details will be sent out nearer the time. A decision on whether it is practicable for these events to go ahead in this form will be taken in February.

A preliminary study of the Soviet topographic maps of the UK and their sources

John L Cruickshank

At the end of 1996 David Archer circulated his now-celebrated sales catalogue of Red Army Maps of the United Kingdom. Suddenly many CCS members became familiar with the existence and appearance of the large number of maps of this country produced by the USSR. Like many other members, I bought items from this catalogue and puzzled over their features. Since then, a succession of progressively more detailed studies of the large-scale town plans of Britain and elsewhere in the World have been carried out. These have culminated in the publication of *The Red Atlas* by John Davies and Alex Kent. They have demonstrated that the sources used for the town plans were very diverse, and included not only a range of cartographic materials, but also written sources, and furthermore (particularly for the more recent plans) remote sensing data obtained from orbital satellites.¹

Yet while the town plans have thus received considerable attention, the Soviet topographic maps of the country, and their source materials, have been much less studied. Well over a decade ago Desmond Travers examined the Soviet 1:100,000 maps of Ireland, and went on to write an introductory account to the maps of the whole of the British Isles. Many of his observations are still pertinent, but with hindsight his general account can now be seen to have overlooked some important features and characteristics of the series as a whole.² The present study attempts to begin the process of updating this. It focusses on the maps at the scales of 1:50,000, 1:100,000 and to a lesser extent 1:200,000, and will not consider the small-scale maps at 1:500,000 and 1:1,000,000 which require their own study. Nor will it repeat the descriptions of the general characteristics and nomenclature of Soviet topographic maps that have been given by Davies and Kent, amongst others. It is based upon a limited number of sheets in private collections. These have provided extensive, but nevertheless incomplete, coverage of southern and northern England. Fewer sheets were available covering Wales and the English Midlands. A large number of sheets covering Scotland are known to exist, but very few of these were available for this study. The present account must therefore necessarily be considered provisional until

¹ David Archer and Alison Brown, *Red Army Maps of the United Kingdom and other countries* (Winter 1996), cover + 24 pp. John Davies and Alex Kent, *The Red Atlas; How the Soviet Union Secretly Mapped the World* (University of Chicago Press, 2017).

² Desmond Travers, 'Soviet Military Mapping of Ireland during the Cold War', Parallel History Project on Cooperative Security (hosted at Eidgenössische Technische Hochschule, Zurich); <http://www.php.isn.ethz.ch/lory1.ethz.ch/publications/areastudies/sovmilmap.html> (site accessed 22 August 2020). Desmond Travers, 'Soviet Military Mapping of Ireland during the Cold War: Galway and the Western Littoral', *Journal of the Galway Archaeological and Historical Society* 60 (2008), 178-193. Desmond Travers, 'Soviet Military Mapping of the British Isles and Ireland During the Cold War', (in) Dagmar Unverhau (ed), *Geheimhaltung und Staatssicherheit: Zur Kartographie des Kalten Krieges* (Münster/Berlin: Lit Verlag, 2009), vol. 1, 293-309; vol. 2, figs. 13.1-6.

such time as more extensive collections of these sheets have been examined.

By the end of the Second World War the Soviet Union was playing the role of a Great Power, alongside Britain and the USA, and as Britain's pretensions to that status faded during the 1950s and 1960s, the USSR became one of just two states aspiring to political and military world-dominance. Mapping the world was a symbol and an assertion of the country's status, even if many of the maps made were never publicly revealed, and were seldom (if ever) used in the field. There are clear signs that the idea of mapping Britain to Soviet standards was under consideration from the 1950s. In 1950 a 1:200,000 map covering Norwich and its hinterland was produced.³ Although its sheet-lines conformed to the standard Soviet system, its drawing specification was utterly non-standard, and indeed rather primitive. The justification for its making is now unclear, and it may simply have been a propaganda exercise. Nevertheless, since the First World War Russian and Soviet policy had always been whenever possible to prepare Cyrillic-script maps of potential areas of military action.⁴ During the 1930s, 40s and 50s successive editions of the principal Soviet officer-training manual in Military Topography recognised that this might not always be possible, and included example plates showing the appearances of various foreign maps. In the 1950s these plates included a British one-inch map with an abbreviated OS conventional signs table, and in 1957 the Military Topographic Directorate (VTU) of the Soviet General Staff produced a first edition of their manual giving complete tables of equivalent conventional signs on Soviet, British and American topographic maps.⁵

Составлено в 1957 г. и исправлено в 1964 г.
по карте масштаба 1:63 360 издания 1947 г.
и 1959,60 гг.
Подготовлено к изданию и отпечатано
в 1964 г.

Исправила М.Н.Смирнова
Редактор Г.М.Манаров

Fig. 1. Compilation note from Soviet 1:100,000 sheet P-30-129,130, Муд-Йелл (Mid Yell), issued 1964. The text states: 'Compiled in 1957 and corrected in 1964 from 1:63,360 maps published in 1947 and 1959-60. Prepared for issue and printed in 1964. Corrected by M.N. Smirnova. Editor G.M. Makarov.'

In the early 1960s the presumption that Soviet troops might in some circumstances need to use foreign maps was abandoned. In the first instance, small- and medium-scale topographic maps of Britain were produced by some other East-bloc countries. These were substantially reliant on Bartholomew's maps for their source material. Whether these had been truly independent initiatives by the satellite members of the Warsaw Pact alliance, or whether they were commissioned by the Soviets as feasibility studies, is presently obscure, but at the very least the Soviet authorities must have been aware of them.⁶

The Soviets themselves seem to have

³ Images of this map, with some others mentioned in this article, can be viewed on-line at <http://redatlasbook.com>.

⁴ VV Glushkov, EI Dolgov & AA Sharavin, *Korpus Boennikh Topografov Russkoy Armii v Godi Pervoy Mirovoy Boyni* (Moscow, 1999), 143.

⁵ John L Cruickshank, 'Виды из Москвы – Views from Moscow', *Sheetlines* 82 (2008), 37-49. I A Bubnov, A I Kremp and S I Folimonov, *Voennaya Topografiya* (fifth edition, Moscow, 1959).

⁶ John L Cruickshank, 'Khrushchev Preferred Bartholomew's Maps', *Sheetlines* 87 (2010), 31-34.

conducted some preliminary trials. For example, the Soviet 1:100,000 sheets of the Shetlands were initially compiled in 1957-58 from the post-war Popular Edition of Scotland of 1947-8, and subsequently revised from Seventh Series maps before they were printed and issued in 1964 (*see figure 1*). 1964 was the year the topographic mapping of Britain by the USSR took off. During that year over three hundred 1:100,000 sheets were compiled and printed. They covered the whole of Britain from the south coast of England to the Hebrides, Orkney and the Shetland Islands. A small part of the Antrim coast also appeared on sheet N-30-25 Саутенд (Southend, Kintyre). The sheet-lines were those based on the International Map of the World that were standard for all Soviet maps. The drawing specification likewise corresponded to the then-current Soviet standards.⁷ While the majority of the sheets of this series did not survive to become public after the break-up of the Soviet Union, because by then they had been superseded by later issues, a considerable number have nevertheless become available. In particular, many sheets from the area covered by IMW sheets M-31 and N-31 (England east of the Greenwich meridian, including Spurn, eastern Lincolnshire, East Anglia, Kent and East Sussex) have been preserved, as have those of Mull and Shetland. Subsequently, during 1965-67, this 1:100,000 series was used for the compilation of a 1:200,000 series of Britain. The surviving 1:200,000 sheets of this date carry compilation notes that explicitly state this relationship, and confirm the country-wide extent of the 1:100,000 series. In turn, the 1:200,000 series was used to prepare 1:500,000 and 1:1,000,000 maps. Each smaller scale series was issued slightly later than the series from which it had been generalised.⁸

The compilation notes on the surviving 1:100,000 sheets from 1964 are detailed and very specific. These maps were all compiled from 1:63,360 maps of specified dates in the 1950s and very early 1960s. For coastal sheets, hydrographic charts of specified scales and dates were also used. Only the OS produced one-inch maps of the whole country during that time, and so the maps providing the source material for the 1964-7 Soviet compilations appear to have been early states of the Ordnance Survey One-Inch Seventh Series. None of the surviving sheets examined mention any use of the OS 1:25,000 Provisional Edition. I have not attempted to check the hydrographic sources, but I assume that these were British Admiralty charts, although some independent Soviet surveys also seem to exist. The compilation notes for two sheets are different. The 1964 editions of sheets M-31-1 Харлоу (Harlow, in Essex) and M-31-2 Колчестер (Colchester) each declare that they were derived not from 1" maps, but from 1:50,000 maps corrected to 1963. Since no British publisher at that time was producing 1:50,000 scale maps, it seems clear that for the area of these two sheets the Soviets had made their own 1:50,000 maps from an unspecified source, presumably as an

⁷ The present author hopes shortly to publish an account of the evolving characteristics of Soviet and Russian topographic maps from 1917 to the present.

⁸ For details of Soviet methods and procedures for the generalisation of maps at this time see: A.M. Komkov, S.A. Nikolaev & N.I. Shilov, *Sostavlenie u Redaktirovanie Kart, Chasti Pervaya i Vtoraya* (Izdanie Voenno-Inzhenernaya Krasnoznamennaya Akademiya: Moscow, 1958), chapters 5-10.

experimental exercise.

In 1966, when the 1:100,000 series was complete and the subsequent processes of generalisation to smaller scales were well advanced, the VTU published the second edition of their manual of the conventional signs on Soviet, British and American topographic maps. It should be noted that similar editions were likewise published in the 1960s for a number of other countries. This makes clear that by then the Soviet project to map the world at topographic scales was well under way.⁹

When the Soviet maps of Britain first became public, the Ordnance Survey published a statement that they all breached OS copyright and should not be imported or traded without OS licence. 'Technical examinations of examples' had supposedly made this clear. I am told that this assertion was justified by the OS having recognised their own depictions of coastal sandbanks on some of the Soviet maps. Whether they had looked any further than Southampton Water and the Solent is unclear.¹⁰ Concerning the 1:100,000 series of 1964, and the smaller-scale series derived from it, the OS claim to be the data source was true: the compilation notes are perfectly clear about this. Nevertheless the maps had been entirely redrawn to a different drawing specification, and when they emerged in the 1990s the OS material concerned was already 30 years or more out of date. The passage of a further quarter-century has now made this material well over 50 years out of date, and so out of copyright. For the subsequent Soviet map issues the copyright question is much more complex.

A complete renewal of the Soviet topographic maps of Great Britain took place in the 1980s. This was preceded in 1979 by the production of 1:100,000 sheets of Northern Ireland, as part of a series covering the whole of the island of Ireland.¹¹ For Britain, an entirely new series of 1:50,000 maps was begun in 1980, and production continued through 1981 and 1982 until the whole of England, Wales and Scotland had been completed. The maps of this series were not all produced in the same way, and only limited parts of the series have become public. In all, 240 of these sheets have emerged from Soviet stores and have entered public and private collections here. Almost all are within IMW sheets M-30 and M-31 (that is to say, England and Wales south of the 52° N parallel, or roughly speaking, a line between Fishguard and Felixstowe). North of this line only a group of twenty 1:50,000 sheets in N-31 covering coastal and off-shore

⁹ John L Cruickshank, 'Teaching OS Map-Reading as a Foreign Language', *Sheetlines* 94 (2012), 23-32.

¹⁰ Ordnance Survey Statement (signed by Robin Knights, Intellectual Property Manager), 10 September 1997. This document threatening litigation has now (September 2020) been removed from the OS website, but see https://s3.eu-west-2.amazonaws.com/redatlas/OS_Statement.pdf. It was sufficiently poorly drafted that the official names of the Soviet producer organisations were incorrectly given, and so was probably void and of no legal effect at the time it was issued.

¹¹ Desmond Travers, *op. cit.*, (2008). The 1:100,000 sheets of Northern Ireland were compiled from the OSNI 1" sheets of the early 1960s, updated to the 1970s using written sources.

areas of East Anglia have been revealed.¹² The 1:50,000 sheets of the rest of the country are only known from their citations in the compilation notes of the subsequent smaller-scale derived series.

All the 1:50,000 sheets that have been revealed bear compilation notes indicating that various Ordnance Survey maps were the source materials used. Nevertheless these notes indicate that the sheets had been compiled in two different ways (see figure 2). The first group comprises sheets covering Oxford,



Fig. 2. Fragment of Soviet 1:50,000 Index Diagram Sheet 1 (1st ed. 1954, prepared for reprinting 1957, second printing 1961, print code K-11 VI 61-Д), overdrawn in black with the boundary line between the two groups of 1:50,000 sheets of southern England. The 52° N parallel is the Fishguard – Felixstowe northern limit of the publicly revealed sheets. Soviet 1:50,000 sheets in group 'A' (west of the black line) were compiled from 1:25,000 OS maps, updated from OS 1:50,000 maps. Sheets in group 'B' (east of the black line) were compiled from OS 1:50,000 maps with limited revision from 1:25,000 maps.

Southampton and all the sheets between and to the east of these, including the London area.¹³ Of these, some were compiled directly from OS 1:50,000 maps of 1974, without later revision. Others were compiled from OS 1:50,000 maps of the same date, but their content had been updated (either wholly or in part) using OS 1:25,000 maps (see figure 3).¹⁴ In contrast, the sheets to the west of this group were compiled from OS 1:25,000 maps of various specified dates, with updated content added from more recent 1:50,000 maps. The two blocks appear to have been planned in order to compare the results of different compilation and generalisation procedures.

Over the last twenty (and more) years the missing 1:50,000 sheets to the north of the Fishguard – Felixstowe line have been much sought for, but despite occasional rumours that they might eventually appear in electronic form, they have not so far come to light. The re-imposition of cartographic secrecy in Putin's Russia, and its increasingly effective enforcement, probably mean that there is now little chance that these maps will appear in the West at any time soon.¹⁵ It has generally been assumed that the failure of these maps to appear in

¹² Two further sheets, N-30-144-B (*Bedford*) and N-30-144-Г (*Royston*), appear on indexes, but I have not seen them.

¹³ These are all the 1:50,000 sheets within 1:100,000 sheet M-30-10, and to the east and south of it.

¹⁴ It should be noted that 1974 is significant for being the date that the OS published the first tranche of its own 1:50,000 maps.

¹⁵ The Law (*Zakon*) of the Russian Federation of 21 July 1993 (N 5485-1) 'On State Secrets' was modified as of 6 October 1997 and again from 11 November 2003. See also the 'Decree of the President of the RF on the List of Information Concerning State Secrets' of 11 February 2006, No. 90, which replaced a similar decree of 30 November 1995, No. 1203, with its modifications of 24 January 1998, 6 June 2001, 10 September 2001, and 29 May 2002. I have

the West had been a chance effect arising from the uneven survival of the contents of former Soviet map stores after the break-up of the Soviet Union. However examination of the smaller-scale maps derived from the missing 1:50,000 maps strongly suggests that this assumption is incorrect.

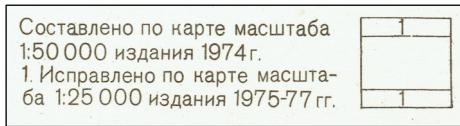


Fig. 3. Compilation note from 1:50,000 sheet M-30-46-A, Саутгемптон (Southampton), issued 1981. The text states: 'Compiled from a map at 1:50,000 published in 1974, [Areas marked 1 on the diagram] corrected from maps at 1:25,000 published 1975-77.'

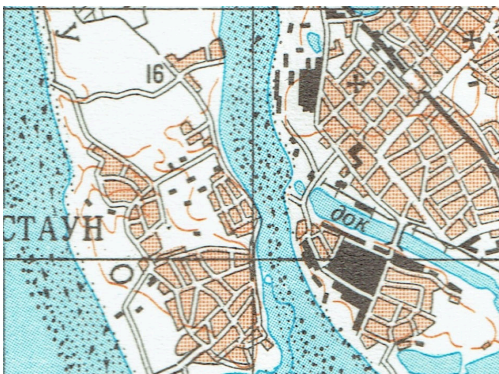


Fig. 4. Fragment of Soviet sheet N-30-66 Барроу-ин-Фернесс (Barrow in Furness), issued 1984, condition of the terrain 1973-80, showing the town of Barrow. Note the absence of any bridge between the town and Walney Island.

During the 1980s the whole of Britain was covered with 1:100,000 sheets derived the Soviet 1:50,000 series.¹⁶ At first sight, these 1:100,000 maps appear to be a uniform series throughout England, Wales and Scotland. Each sheet states that it is derived from the corresponding (Soviet) 1:50,000 maps of 1980-82. However closer inspection of the sheets north of the Fishguard – Felixstowe line reveals that they differ

from those to the south. To the north of this line, each sheet gives within its upper border a date or date-range for the 'condition of the terrain', which we might term the revision date of the materials used. To the south of the line, where the maps were derived from OS materials, this date is not always given. Furthermore, a detailed examination of the sheets of northern England reveals a number of errors and oddities indicating that Ordnance Survey materials were not used for this part of the country.

One such error appears on the 1984 *Barrow in Furness* 1:100,000 sheet (N-30-66, condition of the terrain 1973-1980), (see figure 4). A prominent feature of Barrow, right beside the shipyard, is the Jubilee Bridge which carries the A590 trunk road across the shallow channel between Barrow Island and Vickerstown on Walney Island. The bridge is a bascule (lifting) bridge, built between 1905 and 1908.¹⁷ The bridge and the road have been prominently shown on successive OS maps since it was first opened, yet it is entirely missing from the Soviet map. The roads at either side are likewise shown without any suggestion that they are main roads. This error is the more surprising, because the bridge is shown with accurate detail on the 1:10,000 Soviet Military-topographic town plan of Barrow compiled from unspecified sources in 1973 and issued in 1975.

not checked for more recent legislation.

¹⁶ The possible exceptions are the Shetland Islands, Islay, and some (but not all) of East-Anglia, for which I have not so far seen 1:100,000 sheets issued in the 1980s.

¹⁷ Wikipedia, sub 'Walney Bridge'; site accessed 22 Aug 2020.



On the same 1:100,000 sheet a different oddity appears at Hodbarrow haematite mine near to Millom on the Duddon estuary (NGR SD 173779), (see figures 5, 6, 7). The ore deposit here extended under the sea-bed, and to protect the workings as the sea-bed subsided, a long curving sea wall and dam was built to protect the mine. As long as the mine remained open, the area within the sea-wall was pumped dry. The mine closed in 1968, and the area within the sea wall very slowly flooded. It has now become an RSPB wildlife reserve.¹⁸ The OS First Series 1:50,000 sheet 96 *Barrow-in-Furness* (print-code A, 1974) shows the site as dry except for two small ponds. The OS Second Series 1:50,000 sheet (print code A, revised 1980) shows the site fully flooded. The Soviet sheet shows neither of these conditions; the site is shown partially flooded. This does not seem to have been a drawing accident, since the outline of the part shown flooded corresponds to an existing subdivision of the site.

Fig 5 (top) Fragment of OS First Series 1:50,000 sheet 96 *Barrow in Furness* (edition A, 1974), showing Hodbarrow Mine at Haverigg before flooding.

Fig. 6. Fragment of Soviet sheet N-30-66 *Барроу-ин-Фернекс* (*Barrow in Furness*), issued 1984, condition of the terrain 1973-80, showing Hodbarrow Mine. Note partial flooding of the site.

Fig. 7. Fragment of OS Second Series 1:50,000 sheet 96 *South Lakeland* (edition A, revised 1980, major roads revised 1981) showing Hodbarrow Mine. Note complete flooding of the site

¹⁸ For the history of the site see <http://www.engineering-timelines.com/scripts/engineeringItem.asp?id=876>.

See also

<https://www.rspb.org.uk/globalassets/downloads/documents/reserves/hodbarrow-trail-guide.pdf>. Sites accessed 2 September 2020.

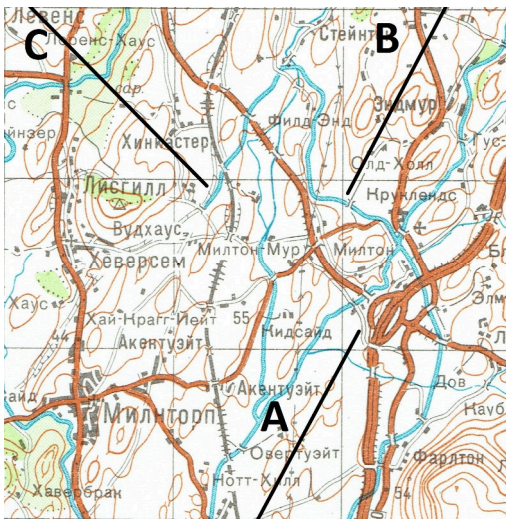


Fig. 8. Fragment of Soviet sheet N-30-67 Lancaster issued 1984, condition of the terrain 1981, with annotations in black. 'A' marks the junction between the A65, A590 and M6. 'B' marks the course of the Lancaster Canal near the M6. 'C' marks the erroneous extension of the canal southwards.

This Soviet map appears therefore to show a condition of the terrain intermediate between OS revisions. To me the only plausible explanation for this is that the map was made from Soviet satellite imagery. Whether this might also explain the missing bridge in Barrow is less clear. It is perhaps possible that the bascule bridge was lifted when the photographs were taken, or perhaps more likely that a cloud or local pollution obscured the available images of the area. What seems quite certain is that no twentieth-century OS map was consulted before the Soviet map was signed off for printing.

Further errors can be seen on the adjacent Soviet 1:100,000 sheet, N-30-67 (*Lancaster*, 1984, condition of the terrain 1981), (see figure 8). The junction between the M6 motorway, the A65 and the A590 is shown in what appears to be a half-built condition. While the long slip roads from the M6 are shown quite plausibly, the roundabout over the motorway, essential for traffic to and between the A-roads, is absent. As represented, the junction is completely unusable.

The motorway here was opened in 1970, but heavy traffic volumes through this junction soon led to its reconstruction. It seems that the Soviet image records either the construction or reconstruction of this junction, not its working reality. Again, this was not compiled from any OS map. A further feature nearby that the Soviet map-makers clearly had difficulty understanding was the course of the (already derelict) Lancaster Canal as it passed through this area. The canal had been culverted where it was crossed by the M6, but the map-makers failed to spot the aqueducts at Crooklands and Stainton just to the north of this, and so drew impossible junctions between the canal and other watercourses there. They likewise failed to appreciate that the canal had formerly passed through a tunnel near where it had recently been blocked by the building of the A590. They therefore interpreted a minor road as a continuation of the canal and drew an entirely false course southwards across the A590 and the west coast main railway line to a termination at a disused railway junction. While poor mapping of disused canals might not have been important to a Soviet commander in the field, this is a further example of detail on the Soviet map that was not derived from the OS.

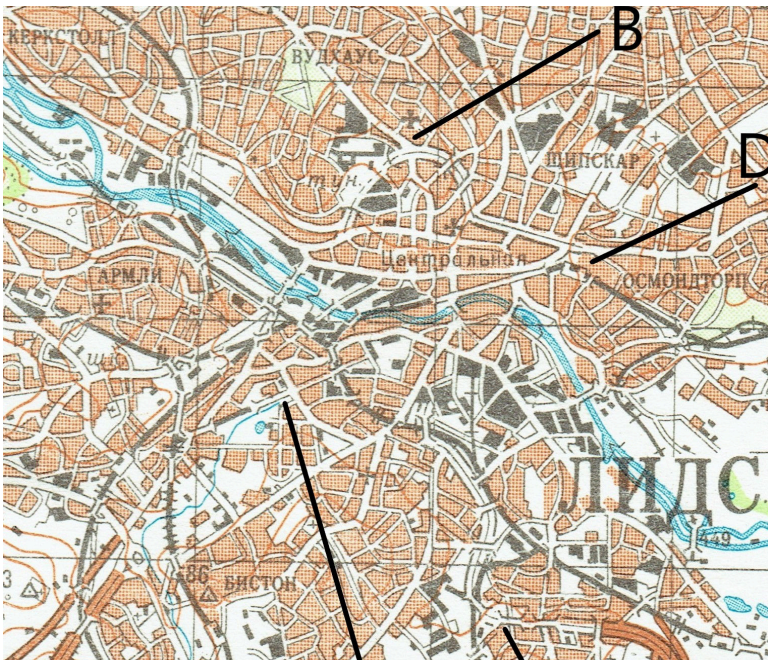


Fig. 9. Fragment of Soviet sheet N-30-81 Лудс (Leeds) issued 1984, showing central Leeds, with annotations in black. 'A' marks the railway viaduct beside its erroneous junction with Domestic Street, Holbeck. 'B' marks the erroneous cross-roads between the A660 and the Inner Ring Road. 'C' marks the M1 motorway reduced to a single carriageway road where it crosses the Middleton Railway. 'D' marks the former Marsh Lane railway station, closed in 1958.

time, the city's rail connections were being rationalised in the light of changing rail traffic patterns following the Beeching cuts and coal-mine closures. The Soviet 1:100,000 map (N-30-81, *Leeds*, 1984, condition of the terrain 1973) shows most of the elements of this changing pattern, but fails to show their interconnections coherently (see figure 9). In particular, junctions are shown between incompatible elements, particularly where they cross at different levels. Thus the unlabelled radial road from Otley to Leeds (actually Woodhouse Lane, the A660) is shown to meet the inner ring road at a cross-roads. In reality the inner ring road here is in a deep trench, and the A660 crosses it on a bridge. To the south of the city centre there is a complex network of rail lines that includes a line built on a high viaduct by the LNWR to allow their trans-Pennine services through Morley to by-pass the junctions associated with Leeds Central railway station before wiggling directly into Leeds City station. By the date of this map Leeds Central station, prominently named on the map, had been closed following the Beeching Report, while Leeds City station, which is not named, is only shown as buildings beside the railway. The Soviet map shows part of the by-pass railway and its viaduct, but then shows a cross-roads junction between the viaduct and an urban street (Domestic Street,

In many other places across the north of England motorway junctions are also poorly represented. Those drawing the maps seem to have had no intuitive 'feel' for how such junctions work, and for how different traffic streams passing through them are separated and merged. Even simple junctions in open countryside are erroneously shown. In crowded urban areas this problem becomes worse.

Leeds branded itself as 'The Motorway City of the 1970s', and even sponsored the publication of a book by the Cement and Concrete Association to celebrate the construction of its Inner Ring Road.¹⁹ During the 1970s the final elements of the complex motorway links between the city, its inner ring road, and the M1 and M62 to the south were still being completed. At the same

¹⁹ The Cement and Concrete Association, *Leeds Inner Ring Road* (June 1966).

Holbeck, which in fact passes below the viaduct) beyond which the railway viaduct is shown as a straight-line road joining others and without its wiggle into the station. Some common factors can be recognised here. Firstly, the source materials available to the map-makers did not make differences in the elevations of roads and railways obvious. This suggests a reliance by the map makers on high-altitude vertical photographs. Secondly, in making a 1:100,000 map of a crowded urban area such as central Leeds, choices have to be made during the processes of compilation and generalisation about what features to prioritise, and which to allow to be lost in the generalisation. On this sheet the Soviet map-makers tried to show a bit of everything, and so ended up with an incoherent jumble. Comparison with an OS map of the city might have assisted them in prioritising what to show. As it is, the eighteenth-century Middleton Railway (preserved by a student railway society and run at the weekends to entertain small children and their parents) is given greater prominence than the newly built M1 motorway which is shown as a single carriageway road, kinked where it crosses the preserved railway.²⁰

All these instances indicate that the Soviet topographic sheets of northern England compiled and issued in the 1980s were not derived from OS originals, but were primarily based on Soviet high-altitude (satellite) images. That the errors arising from this process went forward to appear on the printed maps strongly suggests that OS maps were not even used for the final proof-reading of these sheets. The implications of this are considerable. By the 1990s Soviet and Russian remote sensing technology had reached the point that it could be used for extensive topographic mapping of the USSR itself.²¹ A decade earlier, the 1:50,000 mapping of the UK seems to have represented a significant trial stage in the development of this technology. The maps produced of southern England using different variants of conventional copying techniques could be compared to those produced from satellite images. That the area mapped by copying was only a

²⁰ There are many other errors and inadequacies in the representation of Leeds on this map. These include the labelling of the M621 as the M62, and the placing of a station symbol at Marsh Lane. That station was closed in 1958. The Soviet 1:10,000 town plan of Leeds (4 sheets, compiled 1971, printed and issued 1972) incorporates some material from satellite images, and was made before the M1 had been extended into the city centre, but the viaduct by-passing Leeds Central station is shown correctly, as is the A660 bridge over the inner ring road. There are however different errors on this 1:10,000 town plan that also suggest misreading of high-altitude images: see John L Cruickshank, 'Military Mapping by Russia and the Soviet Union' (in) Mark Monmonier (ed.), *The History of Cartography, volume 6, Cartography in the Twentieth Century* (Chicago, 2015), 932-942.

²¹ In 1999 it was stated that [Russian Federation] maps at the scales of 1:10,000 and 1:25,000 were still generally made by conventional aerial photographic survey, but maps at the scales of 1:50,000 and smaller were made using photographic images from satellites. A.V. Dontsov, *Kartografirovaniye Zemel' Rossii: Istoriya, Nauchnie Osnovi, Sostoyaniye, Perspektivi* (Moscow: Kartgeotsentr-Geodezizdat, 1999), 205. The number and capability of Russian orbital platforms substantially declined after 1993, so I interpret this to be a statement of the situation around the end of the Soviet period. Under V.V. Putin's leadership Russia's satellite programmes and capabilities have sharply recovered once more.

small proportion of the whole country suggests that the area mapped from satellites may itself have been subdivided in order to trial different variants of the techniques being developed. In the absence of the missing 1:50,000 sheets this may have to remain a matter for speculation. Nevertheless detailed examination of the sheets covering Scotland may yet prove revealing. It certainly must not be assumed that all the sheets of Scotland were made in the same way as those of England.

In any case, whatever the details of the Soviet project of the 1980s, the Ordnance Survey claim to copyright in the Soviet topographic maps produced from 1980 onwards is unsustainable north of the Fishguard to Felixstowe line.

As in the 1960s, the 1:100,000 sheets of the 1980s were used to compile corresponding 1:200,000 sheets of both Britain and Ireland, which in turn were used for the compilation of smaller-scale maps. The known sheets are dated from 1985 to 1987. Although it is assumed that this 1:200,000 series was completed, since derived 1:500,000 map sheets are known, collections of the maps at this scale often comprise mixtures of sheets from the 1960s and 1980s, and are often incomplete. Examples of many sheets are difficult to find; for example, I have only seen two of the Irish sheets.²²

There are some elements of topographic maps which cannot be registered using remote sensing technology. Most obviously, place-names and road numbers cannot be sourced from high-altitude photographs. Some other source has to have been used. A brief comparison of one 1964 1:100,000 sheet (unfortunately including a very large sea area) with the same sheet in the 1984 edition suggests that the place-names could have been copied from one edition to the next. While there are small shifts in the positions of most minor place-names, the same names appear in roughly the same places on both editions.²³ However this tells us nothing about sources for the place names shown. And unless differences can be found in the names recorded on the two editions, no firm conclusions can be drawn about whether additional or different sources were used in the 1980s. It would of course be fascinating to know whether the place-name sets on the missing 1:50,000 sheets were limited to those appearing on the older 1:100,000 sheets.

Soviet topographic maps routinely show population data for towns by small numbers immediately below the place-name. Accordingly, the Soviet maps of Britain provide this information. In addition, the Soviet 1:50,000 maps of southern England also differentiate towns with more than 50,000 inhabitants (for which the building infill is orange) from those with fewer (for which the infill is in grey).²⁴

²² N-29-XXVIII (*Ennis*, 1985). N-29-XXXIV (*Limerick*, 1985). Note however that these 1:200,000 sheets of Ireland were compiled directly from the Irish 1:127,260 maps, not from the derived Soviet 1:100,000 sheets.

²³ Comments based on 1:100,000 sheet N-31-73 (*Withernsea*). Examples of sheets N-31-136 (*Leiston*) and M-31-1 (*Harlow*) are known in both editions, but for each of these the component 1:50,000 sheets were compiled from OS maps.

²⁴ This distinction is not a standard feature of Soviet 1:50,000 maps, so the English sheets carry a note in the right margin explaining this.

This creates some contrasts that to us seem disconcerting. Thus, on sheet M-30-46-A, *Southampton*, the buildings of Southampton itself (population 213.0 thousand) are shown in orange, while those of Eastleigh (population 45.3 thousand) are shown in grey. On sheet M-30-24-B, *London South-West*, Harmondsworth, on one side of Heathrow Airport, is shown with orange infills, while West Bedfont, on the other, has grey infills. It should be noted that while census data for Britain is freely available, it does not routinely appear on OS topographic maps.

A further additional element also appears on some of these maps. Desmond Travers pointed out that a few of the Soviet sheets of northern England and of Scotland include data on motorway surfaces that he assumed to be the result of ground reconnaissance. For example the width and surface material of the M62 motorway is recorded at two places on sheet N-30-91 (*Liverpool*, 1986).²⁵ He also recognised a small number of sheets with data on the materials and dimensions of bridges, however seven of the ten bridges he identified in England with such data were in the university city of Oxford. While he felt that this data might have been derived from 'air photo appreciation', it seems more likely that this information was likewise the result of ground reconnaissance, perhaps by a visiting Russian academic.²⁶

The showing of place names, road numbers, population figures, and occasional ground reconnaissance data all indicate that various written sources were used in the compilation of the Soviet topographic maps of Britain, even though cartographic sources seem not to have been used for England north of the Fishguard to Felixstowe line. Whether the compilation of the sheets still further north used the same procedures remains to be established. Travers noted that the Gaelic place-names of the west of Ireland had been phonetically recorded in Cyrillic script, and felt that this had been done well.²⁷ How well this was done in Scotland and the Western Isles requires investigation.

A prominent feature of all Soviet topographic maps is their security classification. The default security classification of any Soviet topographic map was 'Secret' (Секретно). This classification applied to all accurate maps of the USSR itself and of the other Warsaw Pact nations. In contrast, most topographic maps of western countries, including Britain and Ireland, were only classified as 'For official use' (Для служебного пользования).²⁸ This presumably reflected the derived character of the content of these maps. Higher security classifications, of course, also existed. Their existence was itself secret, but by common repute an upper tier exists called 'Absolutely secret' (Совершенно секретно). The existence

²⁵ Travers noted such data for the 'E33' (M6) on sheets N-30-117, N-30-142 and N-30-143, and for the M11 on sheets N-31-133 and M-31-1. In Scotland he noted equivalent data for the M90 on sheet O-30-138 (*Kirkcaldy*).

²⁶ Desmond Travers, *op. cit.* (2009).

²⁷ Desmond Travers, *op. cit.* (2008), 184-5.

²⁸ It is therefore significant that the Soviet Military Topographic Town Plans of Britain were classified as 'Secret', rather than 'For official use'.

of such tiers was revealed most explicitly after the fall of the Berlin Wall and the opening of the East German security archives and stores. In the German Democratic Republic the equivalent of ‘Secret’ was ‘VVS’ (Vertrauliche Verschlusssache), while the higher tier was ‘GVS’ (Geheime Verschlusssache). In addition to the many ‘VVS’ topographic maps, numerous maps classified as ‘GVS’, usually those with additional politically or strategically sensitive information, became public after the reunification of Germany.²⁹ To my knowledge, while very many Soviet maps classified as ‘Secret’ have become public since the break-up of the USSR, no Soviet or Russian maps classified in any higher tier have done so. The nature of the missing 1:50,000 maps of Britain, as the primary maps created by a highly-secret space-based experimental mapping programme, almost certainly required them to be classified in a higher tier, and thus required them to be stored in more secure facilities. Their higher security classification is the most likely reason why we have never seen them, and may never do so.

In conclusion, the Soviet topographic maps of the United Kingdom merit much closer attention than they have so far received. They do not have a uniform basis. Their source materials illuminate the remote sensing and imaging capabilities of the USSR during the 1970s and 1980s. On the one hand this enables an appreciation of the longer-term evolution of these technologies in the Soviet Union and Russia. On the other, and closer to home, the Ordnance Survey claims to copyright over the content of these maps are only valid for the southernmost part of England and Wales. For the bulk of the country these maps provide an image of the nation that is independent of any other survey. They should be appreciated as such.

The implications of this are not trivial. The Ordnance Survey’s blanket claim to copyright in all the Soviet maps of the UK now appears to have been not only mistaken, but actually harmful to Britain’s national interest. By declaring that these maps were all derived from OS material, based on what was (at best) a slap-dash and incomplete investigation, they have inhibited the detailed evaluation of these maps for over twenty years. As Russia has steadily become more ready to act as a hostile power, it has become clear that its actions have been facilitated, sometimes actively assisted, by the casual actions, or inactions, of numerous government and private agencies.³⁰ The Ordnance Survey must be included in the list of such agencies. Now that we appreciate that a hostile power has twice prepared its own topographic mapping of the whole of our country, and knowing that that power has the present capability to revise and improve on its satellite-based mapping of forty years ago, we must assume that Russia has by

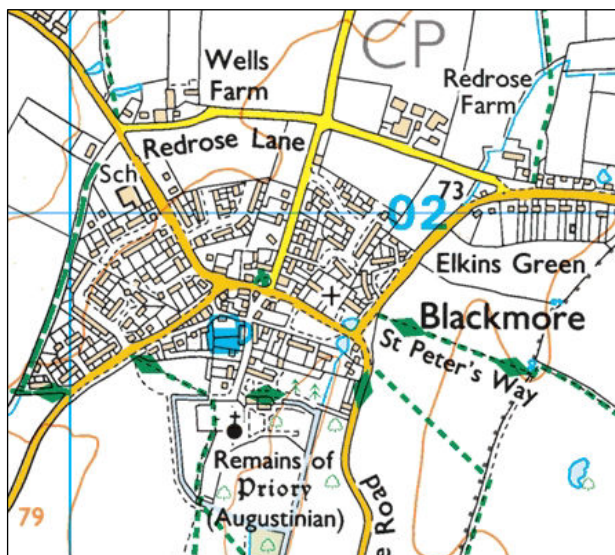
²⁹ Examples of maps and documents classified as GVS are cited in John L Cruickshank, “‘German-Soviet friendship’ and the Warsaw-Pact mapping of Britain and Western Europe”, *Sheetlines* 79 (2007), 23-43. See also Gerhard Fasching (ed), *Militärisches Geowesen ... der DDR von den Anfängen bis zur Wiedervereinigung* (Wien: Bundesministerium für Landesverteidigung, 2006).

³⁰ There is a large literature on this topic, much of it written by highly engaged individuals. For a recent relatively dispassionate account see Gordon Corera, *Russians Among Us; Sleeper Cells, Ghost Stories and the Hunt for Putin’s Agents* (William Collins, 2020).

now prepared updated and improved military maps at 1:50,000 (or larger) of the whole of this country from their own remote sensing and intelligence data. The errors in the maps that I have identified must have been picked up by the Russians themselves when they obtained newer images, became more used to motorways in their own country, and permitted many Russian citizens to live and travel legally in this country. It would be fascinating to be permitted to see the current Russian military-topographic maps of the UK. It's unlikely to happen soon.

Acknowledgements:

I am grateful to John Davies, Alex Kent and David Watt, amongst others, for innumerable conversations over many years about these maps. These have contributed greatly to my understanding of them. David Watt also provided the image that is figure 7, and commented on an early draft of this article.



I was surprised to see how differently the Explorer (sheet 183) and Landranger (sheet 167) depict the village of Blackmore, Essex (TL 603 019). These images are taken from the current mapping on the OS website at <https://osmaps.ordnancesurvey.co.uk/> and can thus be assumed to be the latest version.

Note, for example, how the names Wells Farm and Redrose Farm differ. Also, that the 1:50,000 map shows a roundabout in the village centre, the spot height of 75m on the road to the south and includes the name Jericho Priory. The 1:25,000 map omits all these, but has a 73m spot height.

One would expect in these days of a single MasterMap database that the information would be consistent across both scales.

Incidentally, the village is something of a hidden gem. Not on the tourist trail, but a real delight of local traditional pastel-coloured pargetted and weatherboard cottages.



John Davies

Reprints of the First Edition 1:2500

Rob Wheeler

The First Edition 1:2500 maps were produced by taking a tracing of an MS drawing in litho ink and transferring that tracing to a plate. Outside a few high-demand areas, the plates were not kept; if more copies were needed, the process was repeated. This was explained nearly four years ago, with a comparison of Stirlingshire 32.2 in its original form against an 1893 reprint.¹ This article enlarges on the differences between reprints visible on the face of the map; it also draws attention to the scope for errors.

Motivation

Since 1857, Wigston Magna had been on the Midland Railway's main line to London. In the early 1870s, after the Midland had acquired its own London terminus, separate goods lines were built from Knighton South Junction to Wigston station; extensive sidings, along with a locomotive shed and a wagon repair shop, were built just north of that station. Together they employed some 200 men ² and this led to the building of terraced housing adjacent to the works. Why Wigston? I have not seen any account of the rationale for this work but I would hypothesise that:

1) The divergence of two lines at Wigston North junction had resulted in congestion between that point and Leicester and this justified the quadrupling work as far as Wigston.

2) Coal traffic south of Wigston ran on lines shared with express passenger trains and therefore needed to run predominantly at night; coal traffic north of Wigston was mostly on dedicated lines so could run both by day and night. There was therefore a tendency for coal trains to accumulate at Wigston during the day.

3) The ruling gradients south from Wigston were more severe; coal trains therefore needed more powerful engines or needed to be shorter. Consequently it made sense to change engines at Wigston.

4) Although the run to Wigston was only about 40 miles from the Nottinghamshire/Derbyshire coalfield, and much less from the Leicestershire coalfield, if private-owner wagons were prone to develop hot axle-boxes, this would become apparent in the early stages of the run to London, and Wigston might be a convenient place to hold them and, after due correspondence, undertake repairs.

5) Wigston was a green field site and would take pressure off Leicester, where space was expensive.

The track layout at a place like this provides a lot of information about its intended function. Unfortunately the 1:2500 First edition sheet (Leics 37.11)

1 Richard Oliver & Paul Bishop, Redrawing of OS First Edition 1:2500 sheets for a later First Edition printing, *Sheetlines*, 106, 43-49.

2 *Wright's Directory of Leicester & Six Miles Round*, 1878, 297.

available on the NLS website offer a very imperfect depiction of the track layout. In particular, the goods lines simply terminate just north of the station, with no connection to the passenger lines which provide the only way of continuing south.

Two printings compared

The NLS specimen is from the OS Record Maps collection, being a reprint of 1897. It shows street names in a Roman font, with serifs. This is unusual and suggested there had been something odd about the redrawing that took place in 1897. It therefore seemed worth comparing it against the first printing of about 1885. As it happened, the Record Office of Leicestershire, Leicester & Rutland (ROLLR), which is at Wigston, was able to supply a specimen which appeared to be of the original printing, having simply 'Surveyed in 1885' in the lower margin.

Comparing the two specimens, it seemed worth treating the differences in four categories:

- 1) changes to linework to reflect revised specification;
- 2) errors introduced;
- 3) errors corrected; and
- 4) changes to ornament and lettering.

Changes in the first category seem limited to the removal of the broken lines between sidewalks and carriageway on the side streets. Normal practice for the Leicestershire survey was that broken lines marked the carriageways; when the road was not bounded by a fence, the outer edge of any sidewalk was unmarked. Wigston had been unusual in that unfenced projected streets were treated as lying outside the built-up area and were given parcel numbers. Those parcels will have included the sidewalks. (It was an established convention that area-braces were unnecessary between a carriageway and the rest of the road.) So in this case the outer line of the road could not be deleted and it was decided to delete the lines between sidewalks and carriageway.

An example of errors introduced is at *Figure 1*. Several outbuildings have been omitted. They are no smaller than other outbuildings; it appears that the tracer failed to spot them.

The same figure shows an example of errors corrected. Subdivisions have been introduced in two buildings. They are entirely plausible and it seems likely that the tracer in 1897 spotted them, whereas the tracer in 1886 missed them out. They provide a useful demonstration that reprints were traced from the original MS, not from a printed copy.

Lettering was stamped, not traced. Presumably names were written on the MS drawing, but the draughtsman in 1897 tended to follow current convention rather than reproduce what had been done before. For example, 'Station' appears in Roman rather than Italic (as in 1886); this had been usual since 1895 and probably since 1894. The font size used for this sheet in 1886 had been unusually large; the draughtsman in 1897 used a smaller font and this led to changes in positioning. One feature was not changed: the street names were in Roman font

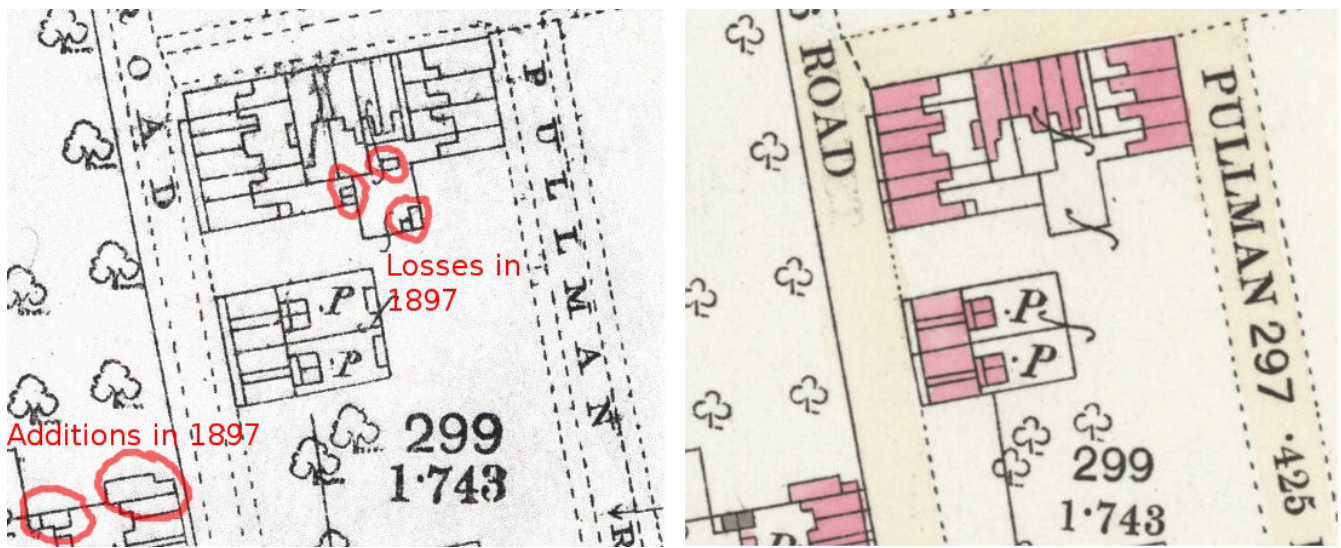


Fig 1: Development between Clarke's Road and Pullman Road: (a) as shown 1886, (b) 1897

in 1886 and this was repeated in 1897, although the letter proportions are different. A change was made with regard to parcel numbers and areas: these were now put within the street, so we have, for example 'PULLMAN 297 .425 ROAD'. This rather unsatisfactory arrangement was (almost) retained in the following edition, becoming '253 PULLMAN ROAD .305'. (The areas changed because the road was redrawn and their parcels redefined to include only the carriageway, except where the sidewalks were bounded by fences).

Generally, there is no change in the words, only in size and positioning. One exception is that the 1897 reprint marks 'MIDLAND RAILWAY' south-east of the station, where the 1886 state has nothing. It seems unnecessary: the name is given elsewhere. Perhaps there was a standing instruction that the name of a railway should be repeated after a junction, to make it clear that no change had occurred. Presumably also, the name appeared in that position on the MS drawing. In that case, this may count as another 'error corrected' albeit a trifling one.

The only ornament that is relevant concerns trees. New designs for tree punches had been introduced in 1893-4, so the trees on the 1897 reprint look different, but for every isolated³ tree on the 1886 printing there is an 1897 tree in more or less the same position. In respect of orchards, the reprint improves considerably on its predecessor: the new 'fruit tree' symbol is more distinctive and it seems to be used more precisely. If one looks at places which cannot be orchards (like shelter belts) one still finds some use of the 'fruit tree' symbol, but there are fewer than on the 1886 printing. Thus, although trees have been reproduced on a one-for-one basis, the type of tree used may have been determined by referring back to notes on the MS.

³ Spinneys have been excluded from the comparison; they often use a wider mix of tree stamps.

So what?

The main deduction that can be made from this is that the method by which these sheets was produced was liable to errors of omission. *All* printings are subject to this, including the initial one. If such an error is suspected, then it is worth searching for printings of a different date and comparing them.

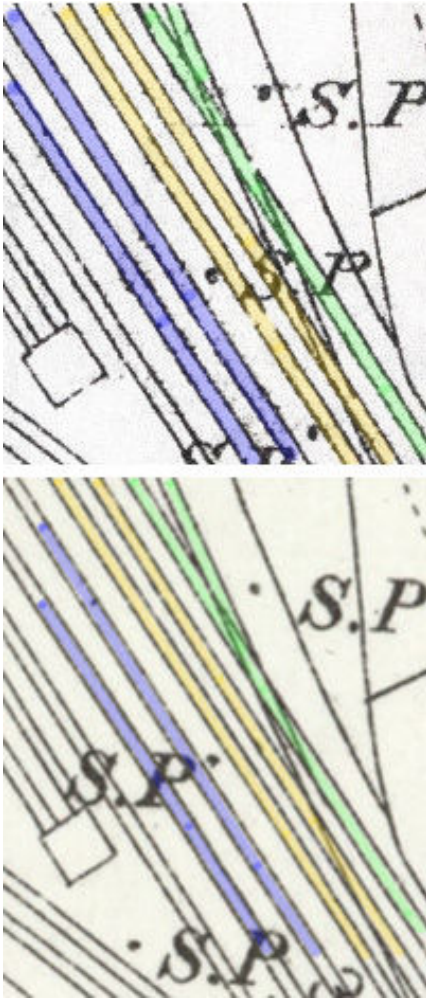


Figure 2: Crossover from Goods lines to Up Fast: (upper) as shown 1886, (lower) 1897

In this case, the original motivation was the means by which traffic on the goods lines proceeded southwards. *Figure 2* shows the two printings; in the interest of clarity, the Fast lines have been coloured blue, the Goods lines yellow, and the Up⁴ sidings green. It will be seen that the 1886 printing shows a proper crossover from the sidings to the nearer of the Goods lines. This is continued showing only a single rail (the western one) and this line continues (off the edge of the figure) until it reaches the eastern rail of the Up Fast. In contrast, the 1897 printing only shows a single rail (the western one again) from the sidings as far as the second Goods line, where it stops. There can be no doubt that the tracers had difficulty in making out the rails in question and lacked the understanding that would cause them to question what they had drawn. It seems likely that the MS drawing did show the crossover properly, but this cannot be proved.

In this case, the tracer in 1897 was more prone to error than his predecessor. It is possible that there is a general tendency for later reprints to suffer more errors.

In contrast, the change in tree symbols in 1893-4 may have led draughtsmen to pay more attention to the difference between fruit trees and ordinary deciduous trees. Even if this is not the case, the modern user interested in orchards is likely to find

reprints of 1894 onwards clearer to use than earlier ones.

Recognising facsimile reprints

The conclusions above apply to the great majority of sheets, where the plates were not kept. In the case of those, predominantly urban, sheets where the plate was retained, most reprints will be facsimile reprints and there is no value in looking at multiple printings. (One comes across exceptions where, for example, administrative boundaries have been altered; but in other respects these are still

⁴ 'Up' is used here in the modern sense, meaning towards London. The Midland Railway used 'Up' to mean towards Derby.

facsimile reprints).

That raises the question: how is the user to decide whether he is dealing with such a case? The answer, for Leicestershire, is *tree recognition*. The main stamps used for trees changed in 1893-4 (*Figure 3*), so if a reprint of after 1894 uses the old trees, it is a facsimile reprint. (I have disregarded here the trees in spinneys, where some more exotic specimens can be found.) *Figure 3* also shows a couple of tree stamps that appear on certain Leicester sheets where it is thought that the plates were retained. For one of these sheets (Leics 37.2) it was possible to compare two printings of different dates to observe directly that no redrawing had taken place.

The use of different tree stamps on sheets where the plate was to be retained suggests that the drawing process was organised differently, or at least employed different draughtsmen.

It is worth emphasising that the categorisation of tree types in *Figure 3* applies specifically to Leicestershire. Even though the Lincolnshire survey overlapped considerably in date, the normal Lincolnshire deciduous tree is the very leafy type seen in Leicestershire only on facsimile-reprint sheets (although north-west Lincolnshire does use the normal Leicestershire type with the forked trunk). And trees on the early counties like Hampshire are altogether different. There is clearly scope for a lot more work on tree stamps.



Figure 3: Tree stamps: deciduous / orchard / coniferous as used on Leics 1:2500 sheets for isolated trees: (a) up to 1893, (b) 1894 onwards. (c) shows varieties seemingly found only on facsimile reprints.

With thanks to NLS for 1897 map extracts and tree symbols; and to ROLLR for 1886 extracts

Can you trust a facsimile? The Ordnance Survey and the Gough Map

Damien Bove and Catherine Delano-Smith

It used to be the map engraver who had the last word in creating the printed image.¹ Until, that is, photography brought in an allegedly less subjective process of map reproduction. This note on the Ordnance Survey's first attempt at reproducing a large manuscript map photographically is a bye-product of a long-term research project on the map of Britain known after its eighteenth-century owner, the antiquary Richard Gough.² The original map, in coloured ink and pigment on two parchments stitched together to give a surface of c. 55 × 116 cm, is oriented lengthwise with east at the top (*Figure 1*).



Figure 1: The Gough Map (c.1400). Oxford, Bodleian Library, MS. Gough Gen. Top. 16. 55 × 116 cm. East is at the top. © The Bodleian Library, Oxford.

Executed probably by or around 1400, it is now in the Bodleian Library, Oxford. The Ordnance Survey's much reduced photograph was only the second time the map had been reproduced in print.³ The present note, which is based on

¹ See Catherine Delano-Smith, 'Signs on printed topographical maps c.1470 to c.1640', in David Woodward (ed.), *History of Cartography*, Volume 3, *Cartography in the European Renaissance*, (Chicago, University of Chicago Press, 2007), 528–590, esp. 534.

² 'Understanding the medieval Gough Map (?c.1400) through physics, chemistry and history' is a Research Project funded by The Leverhulme Trust (RPG-2019-070) with workshops supported by British Academy. The current project developed from the preliminary, unfunded, investigation reported in C. Delano-Smith *et al.*, 'New light on the medieval Gough Map of Britain', *Imago Mundi*, 69:1 (2017), 1–36.

³ Henry James, *Facsimiles of National Manuscripts of Scotland* (Edinburgh, 1872), Part III. The first known reproduction of the Gough Map in any format, the engraving in Gough's *British*

work in progress, is to draw attention to significant differences between the medieval map and the OS's photo-zincograph of 1871/2, which resulted from altered negatives and that belie the notion of a facsimile as necessarily an exact replication of an original.

In 1783, the author of the *The Scotsman's* review of Part III of *National Manuscripts of Scotland* picked out the Gough Map for particular praise, describing the reduced facsimile as 'really accurate and trustworthy' and comparing it favourably with James Basire's 1780 engraving of the map.⁴ The writer was echoing a report made to Parliament a few months earlier by William Basevi Sanders, the Assistant Keeper of the Records who had been sent to Southampton from the Tower of London to oversee the Ordnance Survey's production of the Domesday Book facsimiles.⁵ Sanders had recorded that 'The very curious old map of England and Scotland, belonging to the Bodleian Library... was another document [among those prepared for the Scottish Part III] that gave us very great trouble' but assured the reader who made the comparison that they would 'have no difficulty in deciding to which belongs the palm of merit; or of judging between the laboured and distorted hand fac-simile and the copy printed by the sun'.⁶

The Process

Sanders had been disingenuous. The description of the new facsimile as a 'copy printed by the sun' implies directness and an absence of human intervention quite at odds with the 'very great trouble' the map had actually caused. In a report a decade earlier he had sought to make a clear, and in the event telling, distinction between prints made directly from the negatives, which he saw as (presumably true) 'fac-similes of the original', and the published versions. Describing the production of the Domesday Book facsimiles, he outlined the different steps involved, noting that the silver prints taken from them inevitably reproduced not only the desired cartographical details but also all 'defects and discolouration even to the grain of the parchment' that, if printed in carbon ink, would render the pages unreadable.⁷ To obviate this, he explained, recourse was made to "duffing", a process that consisted in the 'stopping out of the negatives, by means of lamp-black, of so much of the objectionable matter as could be got

Topography (London, T. Payne and Son and J. Nichols, 1780, 2 vols), vol. 1, plate VI, will be discussed in the book being produced for the Gough Map Project.

⁴ *The Scotsman* (1860-1920); Jul 1, 1873; ProQuest Historical Newspapers: *The Scotsman*, 2. For Basire's engraving see Note 3 above.

⁵ On the Ordnance Survey's publication of Domesday Book, see Rob Wheeler, 'Sir Henry James' Domesday Book', *Sheetlines*, no.113 (2018), 42-7. The first volume of Domesday Book (Cornwall) was published in 1861. Sanders supervised the production of the remaining volumes before going on a series of facsimiles, including *National Manuscripts of Scotland* and *National Manuscripts of Great Britain and Ireland*.

⁶ Thirty-Third Annual Report of the Deputy Keeper of the Public Records (HMSO, 1872.), Section III, v.

⁷ Twenty-Fourth Annual Report of the Deputy Keeper of the Public Records (HMSO, 1863.), Section IV, ix.

rid of without interfering with the text' while taking care not to block out what needed to be printed.⁸ However, anyone unable to read or understand the original inscriptions were liable to confuse letters and words, contractions and stops and to render them unintelligible. Seeing this, Sanders offered to supervise the stopping out, admitting that the result could not be perfect as the necessary letter-by-letter examination involved demanded more time than was available. James agreed and appointed a staff of sappers and civilians to be employed exclusively on the work.

Sanders' Report continues to describe the process in detail: 'In the first place, the carbon print of each page, as it was taken, was submitted to me, carefully read over, and every suspicious-looking portion compared with the original. Whenever a slight omission, such as a point or contraction, was discovered, it was made good by hand, and all marks of dirt, which had escaped the eyes of the "duffers," stopped out with paste. In cases of important errors, words or letters being imperfect or wanting, a new negative was taken. After this examination, the carbon prints were transferred to the zinc plates, and a first proof handed to me. This underwent a similar supervision to that given to the carbon print ; upon completion of which, the rubrication was supplied by hand, and a second proof pulled, the red being produced by double printing, and made the subject of a separate examination. The second proof was then examined by myself to see that the alteration I had marked on the first had been made upon the plates, the rubrication again looked over, and, if all appeared correct, a final proof was ordered, which, upon being approved by me, was sent to Captain Scott for his approval, and from him to Sir Henry James, by whom, if the result appeared to him to be satisfactory, the county was ordered to be printed. It will thus be seen that each page has undergone six separate examinations, and, although in the copy of a book so full of minute points and contractions as Domesday, it is impossible but that errors may exist in spite of great care in guarding against them, yet I trust that they will be found few and comparatively unimportant'.⁹

Thus, whereas photozincography was regarded as a purely mechanical process, and photozincographs were promoted as faithful reproductions of the image, the production of a facsimile as a record of the historical document was the outcome of a number of human interventions that were subjective and liable to human error.

The Result

Those familiar with the original manuscript, will readily see that the Gough Map, with its subtle shades of colour, its flaked and faded pigments, and its cracked and uneven surface, must have confronted the Ordnance Survey with a much greater challenge than had the Domesday Book. Sanders made no attempt to describe the creation of the Gough Map facsimile other than to note the trouble it

⁸ Ibid.

⁹ Ibid.

gave, but it is clear from the published map that the actions taken for the Domesday Book volumes were also applied to it, despite improvements in photography that were reducing the need for them. In particular, the process of ‘duffing’ has left its mark across every part of the Gough Map facsimile. Indeed, it would have been impossible to produce the image without recourse to the stopping out and detailed corrections by hand that duffing entailed, even if all was done under Sanders’s watchful eye.

Printing in more than one colour required each colour to have own its own negative, on which everything not wanted in that colour was stopped out, and its own printing plate.¹⁰ By 1863 the OS was able to reproduce, in monochrome, subtle gradations of shade, which allowed James to claim that ‘The photographic processes employed on the Ordnance Survey have now been brought to a very high degree of perfection’.¹¹ For a colour reproduction of complex and graduated shades such as those of the Gough Map, however, it was essential to simplify the image and the rich and varied tones of the original were replaced in the final product by a restricted palette of brown, red and green (*figure 2*).



Figure 2: The Ordnance Survey’s photo-zincographic facsimile of the Gough Map. Reduced by some 57 per cent. From Henry James, Facsimiles of National Manuscripts of Scotland (Edinburgh, 1872), Part III, no. 2. © The Bodleian Library, Oxford. 31.4 cm x 66.9 cm.

¹⁰ A similar sequence of colour separation and stopping out is evident on the negatives for the Bodleian Library’s collotype reproduction in two sheets: *The Map of Great Britain circa A.D. 1360 known as the Gough Map Preserved in The Bodleian Library, Oxford*. (Oxford, Oxford University Press for the Bodleian Library and the Royal Geographical Society, 1958), vol. IV in Reproductions of Early Manuscript Maps series. With text by E. J.S. Parsons and Sir Frank Stenton.

¹¹ A. de C. Scott and H. James, *On Photo-Zincography and other photographic processes employed at the Ordnance Survey Office, Southampton* (London: Longman, Green, Longman, Roberts, & Green), 1862, iii.

The Gough Map is the only document in *National Manuscripts of Scotland* to have been printed in three colours, although one attempt had been made to do the same in the English volumes for a smaller, simpler document.¹² The tripling of the printing process was laborious and costly, but for the Gough Map no effort was spared and the attention given to the facsimile may explain why the map was eventually published in a volume dedicated mostly to documents relating to Early Modern Scotland; it was just not ready in time for the preceding volumes.¹³

Misrepresenting the Gough Map

In the case of the Gough Map, the ‘duffing’ process appears to have entailed extensive redrawing and rewriting. It might be assumed that where the script on the original is dark and legible, the letter forms would have been captured clearly on the negative and exactly reproduced on the facsimile, yet even where they seem to be clear many place-names on the facsimile are little more than an approximation of the original. Where the name on the parchment is faded, the facsimile gives a quite different name or simply omits it altogether.

It would surely have been easier to ensure more accurate replication had the OS staff been able to refer to the original map, but they were relying instead entirely on the negatives. Nearly a third of the documents reproduced in *National Manuscripts of Scotland* (presumably like those in the English volumes) had not been photographed at Southampton, but at their respective institutions.¹⁴ Sanders explained that he ‘had therefore to trust entirely to the negatives, and, although these were to be relied on as being the best that could be obtained... yet there are often points in an original that cannot be represented in a simple photograph, colours for instance’.¹⁵ He went on to complain that ‘the absence of the Manuscripts themselves threw much difficulty in my way in trying to arrive at a satisfactory conclusion as to the accuracy of the carbon print copies of them’.¹⁶ If that was also the case with the Gough Map, and OS staff were relying entirely on the negatives without sight of the original, it is scarcely surprising to discover error after error in the facsimile.

¹² ‘Letter Obligatory from the Black Prince (1357)’ in *National Manuscripts of England from William the Conqueror to Queen Anne* (1865), Part 1, Plate XXVIII. The manuscript text is in black; the title, description, page border and seals are red; the discolouration of the vellum is brown.

¹³ Putting a sheet through the press three times increases the risk of misalignment, and all the examples we have seen are affected to some degree by imperfect registration.

¹⁴ Sanders reported that ‘Out of the entire number of eighty-six contained in the volume, twenty belong to the British Museum, one to the Library of Balliol College, Oxford, five to the Bodleian Library, four to the Library of Corpus College, Cambridge, one to the Library of St. John’s College, Cambridge, and three to the Cambridge University Library, and these were photographed at their respective repositories.’ *Thirty-First Annual Report of the Deputy Keeper of the Public Records* (HMSO, 1870), Section IV, v.

¹⁵ Ibid.

¹⁶ Ibid.

Figure 3 (right) shows a selection of the many instances where the facsimile departs from the original, sometimes significantly. Take something as simple as the coast, where one might expect the lines to have been faithfully, not just approximately, reproduced. At Dundee, for instance, the coastline, the outline of the place sign, the name of the place, the rendering of the red script and the texture of the green infill of the sea on the facsimile (right) all deviate from the original form and one of the red roofs seems to have been stopped out with lamp-black in error (*Fig. 3a*). In Kent, the four red dots that are assumed to indicate the battlements of an uncompleted sign for Leeds Castle are rendered in black on the facsimile (*Fig. 3b*). Moreover, they have been redrawn in a different pattern, clear evidence of human action rather than an accident of photographic process. The regional cartouche also seems to have been redrawn, and the county name rewritten rather than merely doctored. On the original map, at Liverpool, the red distance line terminates some way short of the inked place sign, respecting marks on the parchment indicating that a



Figure 3

tower was to have been drawn adjacent to the cottage sign (*Fig. 3c*). On the facsimile, however, not only does the red line close the gap but the red dots at the top of the missing tower are lacking. Moreover, the lettering seems to have involved some interpretation by OS staff. Not far from Liverpool is Denbigh, whose originally uncoloured roof has been ‘corrected’ by printing it in red (*Fig. 3d*). The comparatively dark script of the name, which should have been easily legible, has been omitted altogether and the red script is mere approximation. Finally, an example from the shipwreck scene in the North Sea, which shows that the person lying on the bale has been redrawn to face in the opposite direction (*Fig. 3e*).

What’s in a Facsimile?

It is hard to say exactly how much of the photographic image taken by the Ordnance Survey remains in the published ‘fac-simile’. Probably very little; further examination is needed before the differences can be quantified. Our detailed comparison of the original manuscript and the nineteenth-century facsimile has, however, revealed a sufficient number of discrepancies to demonstrate that the facsimile is far from being a faithful imitation of the medieval map. We have also been able to give an idea, from contemporary records detailing the production of *National Manuscripts of Scotland*, how the disjuncture came about. We would also suggest that the techniques employed made it virtually impossible to achieve anything approaching verisimilitude. The unavoidable conclusion is that by no stretch of the imagination can the first photographic reproduction of the medieval map of Britain be described as an ‘accurate and trustworthy’ replication of Mr Gough’s ‘curious old map’.

The myth of the facsimile as an imitation of the original dies hard, however. A standard aid to researchers and commentators on the Gough Map—the full-size uncoloured facsimile derived from the image made for *National Manuscripts of Scotland* and published in 1935 with modern place-names added in red—continues to be relied on as if an accurate reproduction of the original.¹⁷ How many other ‘reliable’ facsimiles, one wonders, fail as significantly as those of the Gough Map to serve students unable to access the original adequately? Far from being directly ‘printed by the sun’ the Ordnance Survey’s photo-lithographic replication is a record of human intervention.

¹⁷ Ordnance Survey, *Facsimile of the Ancient Map of Great Britain in the Bodleian Library, Oxford. A.D. 1325–1350*. Made by Major General Sir Henry James, R.E., F.R.S., & Director (Southampton, Ordnance Survey.1935). 49 × 103 cm.

Ivor Gurney's map therapy

Andrew Darling

A middle-aged lady arrives at the City of London Lunatic Asylum at Dartford, in Kent, on a day in 1932. She has travelled down by train from Victoria station, with her hands 'full of flowers'. Before she can be permitted to see the man she has come to visit in this place (which, she remembers, looks like – 'as indeed it was' – a prison), she must complete the formalities. Then, she is taken by a warder into the depths of the building. Doors are unlocked for her so that she can pass, and then locked behind her. And then, facing her, gaunt and dishevelled in his pyjamas and dressing gown, is the man she has travelled here to meet. "He gazed with an intense stare into my face, and took me silently by the hand. Then I gave him the flowers, which he took with the same deeply moving intensity and silence. He then said, 'You are Helen, Edward's wife, and Edward is dead.' And I said, 'Yes, let us talk of him.'"

The visitor was Helen Thomas, widow of the celebrated poet Edward Thomas, who had been killed fifteen years earlier, on the first day of the Battle of Arras, Easter Monday, 1917. The man she had come to see was another poet, Ivor Gurney. Gurney never knew Edward Thomas, but he knew his poetry, and loved it. It sprang from the same well as his own verse (and his own music; for Gurney was a composer whose talent bordered on genius. At the Royal College of Music, where he had been a student before the war with the likes of Ralph Vaughan Williams and John Ireland, his tutor Charles Villiers Stanford had said of him that he was potentially "the biggest of them all – but he was unteachable").

The war killed Edward Thomas, and ultimately it put Gurney in the asylum. Suffering from shell-shock on top of his already precarious mental health, he had been committed firstly to an institution in his native Gloucestershire, and then in 1922 to Dartford. He spent the rest of his life there, dying of tuberculosis on Boxing Day, 1937.

Like that of his hero Edward Thomas, Gurney's poetry was rooted in a profound love of the land and of the natural world. These lines are from *Crickley Hill*, composed circa 1918 while Gurney was a patient at Lord Derby's War Hospital:

The orchis, trefoil, harebells nod all day
 High above Gloucester and the Severn Plain.
 Few come there, where the curlew ever and again
 Cries faintly, and no traveller makes stay,
 Since steep the road is,
 And the villages
 Hidden by hedges wonderful in late May.



Helen Thomas's visit to Dartford followed a request by Gurney's friend and champion, Marion Scott, who thought a meeting with the widow of his poetic hero would provide the tormented man with some comfort. It was the beginning of a poignant and moving episode in the lives of both of them – founded on Ordnance Survey maps.

On her second and subsequent visits to Dartford, Helen took with her some of her late husband's OS maps, which had been much used in his pre-war ramblings and writings about the English and Welsh countryside.

Left : Pte Ivor Gurney, 2/5 Bn Gloucestershire Regiment. (Gloucester Libraries)



City of London Pauper Lunatic Asylum, Stone, near Dartford, shown on Kent IX.7 (Darenth; Dartford; Stone) 25-inch map of 1897 (NLS)

In her memoirs,¹ Helen Thomas recalled how Gurney longed “more than anything else” to be able to return to Gloucestershire. Prevented by the authorities from leaving the asylum, he could only dream of “the country that he knew and which Edward knew too, and he evidently identified Edward with the English countryside, especially that of Gloucestershire.”

Armed with the maps, Helen returned several times to Dartford and Gurney eagerly spread them out on the bed in his room. “He and I spent the whole time I was there tracing with our fingers the lanes and byways and villges of which Ivor Gurney knew every step and over which Edward had also walked.

“He spent that hour in revisiting his home, in spotting a village or a track, a hill or a wood, and seeing it all in his mind’s eye, with flowers and trees, stiles and hedges, a mental vision sharper and more actual for his heightened intensity. He trod, in a way we who were sane could not emulate, the lanes and fields he knew and loved so well, his guide being his finger tracing the way on the map. It was most deeply moving, and I knew that I had hit on an idea that gave him more pleasure than anything else I could have thought of. For he had Edward as companion in this strange perambulation, and he was utterly happy.”



Revised New Series one-inch sheet 234 Gloucester, published 1898 – doubtless one of the maps in Edward Thomas’s collection. (NLS)

¹ Helen and Myfanwy Thomas, *Under Storm’s Wing*, Carcanet, 1988. Lines from ‘Crickley Hill’ from Gurney, *Collected Poems*, both reprinted with the kind permission of Carcanet Press Ltd.

The Rutherford Hall Mystery

John H Watson MD

It was during that interminable spring and early summer of 'twenty when, in common with most of the rest of the world, we were 'locked down' in our home to escape the wretched plague, that I discovered the remarkable knowledge my friend Mr Sherlock Holmes possessed of the maps of the Ordnance Survey.

I have written, as readers of my accounts of his exploits in *Strand* magazine and elsewhere may recall, of his extensive use of them as aids to deduction. Two examples from the past will perhaps suffice to demonstrate the point. Upon my return to 221b Baker Street one evening, I discovered him enveloped in the acrid fumes of strong coarse tobacco, the atmosphere so thick that I thought a fire had broken out. "Where do you think I have been?" he asked; and swiftly provided me with the answer: "I have been to Devonshire." I suggested that his visit had been in spirit, rather than in person.

"Exactly. My body has remained in this armchair, and has, I regret to observe, consumed in my absence two large pots of coffee and an incredible amount of tobacco. After you left, I sent down to Stanford's for the Ordnance map of this portion of the moor, and my spirit has hovered over it all day. I flatter myself that I could find my way about."

"A large-scale map, I presume?"

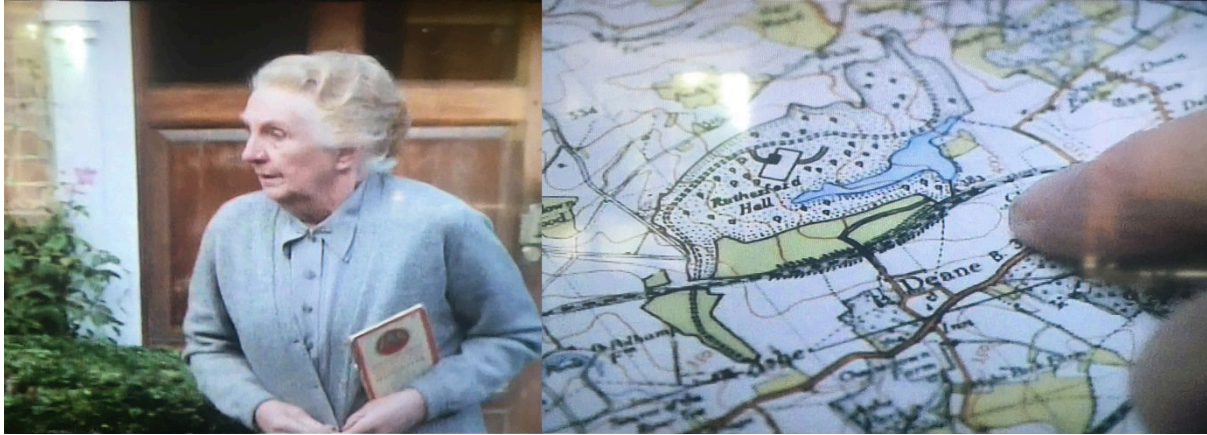
"Very large." He unrolled one section and held it over his knee. "Here you have the particular district which concerns us. That is Baskerville Hall in the middle."

On another occasion, investigating the abduction of the Duke of Holderness's son from the Priory School, he obtained a large ordnance map of the neighbourhood, "and this he brought into my room, where he laid it out on the bed, and, having balanced the lamp in the middle of it, he began to smoke over it, and occasionally to point out objects of interest with the reeking amber of his pipe."

So much for the past. To the present. I had taken, during the 'lockdown', to passing the long hours by watching television programmes, often those portraying the activities of other detectives; insofar as it was possible, I enjoyed them, and they were a welcome relief from Holmes's violin. I say 'insofar as possible' because if ever the programme succeeded in attracting my friend's attention, he would only need to watch the first few minutes before announcing (invariably correctly), the identity of the perpetrator (s) of the crime. On one occasion, however, a programme led to a quite unexpected response.

We were watching a BBC production of one of the cases investigated by Miss Marple: 'The 4.50 From Paddington.' At a point in the programme where Miss Marple emerges from her cottage in St Mary Mead clutching

an Ordnance Survey map, Holmes leant forward in his armchair, staring intently at the screen. A few moments later, when Miss Marple is seen examining the map in the company of the village post-mistress, he leapt to his feet, demanding that I should ‘freeze’ the programme, the better to examine the document.



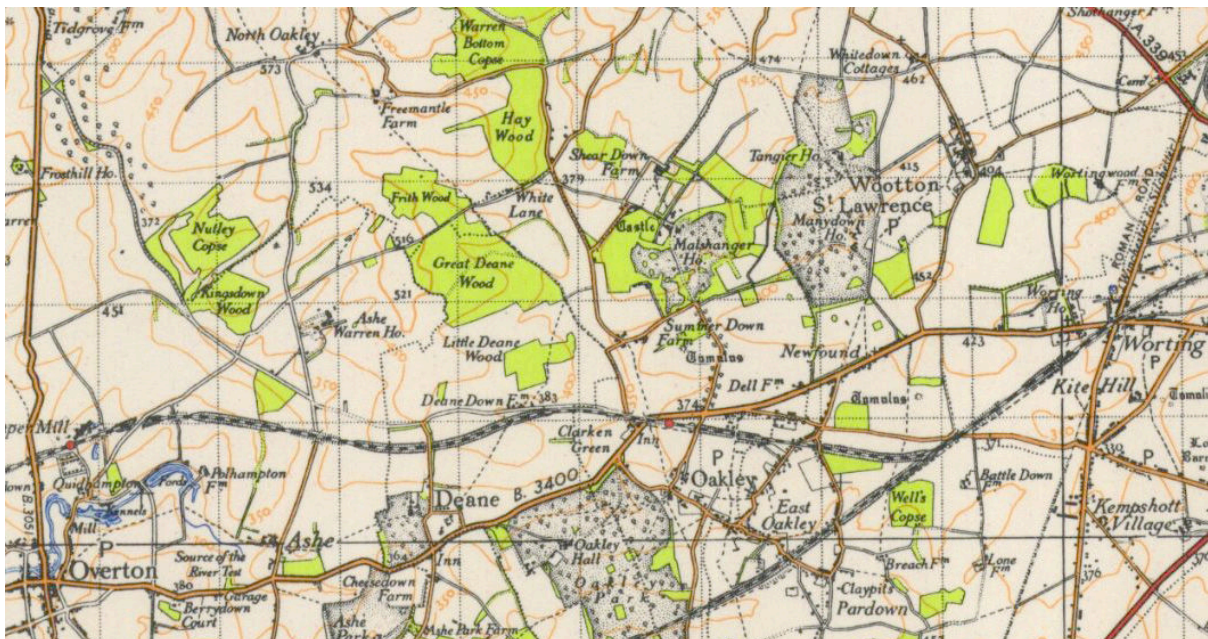
After a minute’s intense scrutiny of the screen through his glass, Holmes relaxed and returned to his armchair, a somewhat satisfied smile on his face.

“A forgery, Watson,” he said. “A good one, certainly. But nevertheless, a forgery.”

“Indeed?” I said.

“Oh yes. That is Sheet 168 of the New Popular Edition, covering Winchester and adjoining neighbourhoods. Rutherford Hall does not exist. You will find the forgers have created it by felling the trees of Great Dean Wood, near Oakley. A shocking waste of timber.”

No doubt my face betrayed my exasperation. I had been enjoying the programme. Holmes smiled again. “Incidentally,” he said, with a nod towards the television set, “the doctor did it. Elementary.”



Kerry musings

David Archer

Do I have a favourite Ordnance Survey map? No. End of *Kerry musings* for this week.¹

¹ I thought that it would be fairly straightforward: propose the question and answer it as a musing, giving a gushing endorsement for a cartographic rectangle, which might or might not be familiar to most readers. But even I would fail to fill a couple of pages writing about a non-existent map. So, I repeat, no musing this week. Sorry.

How did I ever think of such a silly idea? Well, I am sure that you all know how it goes; you start doing something and end up thinking of maps. Check the spare wheel on the car, MOT maps; drive from town into the country, Land Utilisation maps; watch an aeroplane pass over, aviation maps; water the tomatoes in the greenhouse, Irish quarter-inch 1905. And so it was that we were talking about the word 'favourite', and whether we could apply it to anything in our lives. Something that would be chosen above all else, every time. Favourite colour, no; favourite restaurant, no, favourite song, no. The nearest I could get was to say that when eating out, if available, I would always choose the hors d'oeuvres as a starter, and if away from home for a night, would always have a full cooked breakfast in the morning. Because I really like them. But I could not decide whether the word favourite came into it. Favourite in that situation probably. And during the conversation, knowing I had to fill a couple of pages, favourite map came to mind, a subject I have merely skirted previously. Do I have a favourite map? A question that is easier to read than to answer. Do *you* have a favourite map? See what I mean? No, I do not have a favourite map, otherwise I would be musing.

I might not have a favourite map, in the sense that Atkinson Grimshaw's *Liverpool quay by moonlight* was my favourite painting long ago, but I am more fond of certain maps than others. For example, England and Wales Half-inch sheet 15, Barmouth, in the layered and hills shaded version. This sheet fascinates me. I consider it the prime reason why the series should never have been issued. If you thought the dense dark hachuring on some northern sheets of the Old Series made them illegible, just look at this sheet, which looks as if a jug of melted chocolate has been poured over it. The only names that can be read easily are those for the two lakes, Bala and Vyrnwy. Terrible map. Lovely map. A favourite of mine, but not the favourite. In *Sheetlines* 63 I spoke highly of Seventh Series sheet 154 Cardiff, of which I am still exceedingly fond, as I am of the striking red, white and blue crest covers in some Fifth Relief maps, not to mention the modern glossy covers on the society's own map reprints. I am more than fond of all of these, yet none can claim to be my favourite.

If I lack a favourite map, I most certainly have a favourite map symbol : the small green lolly-pop style trees found on the early large sheet half-inch maps. The green has a wonderful lightness of tone and colour, whilst the symbols are so delicate, and a lovely shape, especially in groups, as on the half-inch sheet 15 mentioned above. Brown hachures also give my spine a tingle whenever I see any on an Ordnance

Survey map. As many will have noted, I am particularly fond of certain colours on maps, green tree symbols, brown hachures, certain reds and the blue for motorways are all special in my book. And when they are on flat sheets in bright crisp condition, nothing can beat them. The only folded maps that enter into the running are those lovely soft dissected maps in the white covers with the labels pasted on to the outside surfaces. A most satisfactory item to hold; but do not even consider the word favourite.

It would be too complicated and boring to go into the finer etymology of favourite and preference, but if forced to, I could come up with examples of maps that I prefer to others. We all could. At a very basic level, most members appear to prefer Ordnance Survey maps to those issued by John Bartholomew. The maps in Bartholomew atlases are exquisite, so finely engraved, bettered by the OS only with early six-inch engraved sheets, yet the name Bartholomew almost always brings to mind only their very useful, and popular with cyclists, half-inch series. Which is a great shame. Should I have to indicate preferences, I would probably say that I shy away from series maps with a lot of sheets such as the Seventh Series with 190 sheets, and prefer the half-inch series with far fewer sheets. I also prefer series having several specifications, again the England and Wales half-inch with a hills shaded series, a layered series and a layered and hills shaded series. The half-inch also attract me because they are far less collected than one-inch maps, and because they are not snapped up as quickly they usually cost less.

Maybe I began with the wrong question, do I have a favourite map? A better, and possibly more revealing way of looking at things would be to ask what would be my last remaining map, should I get rid of everything. Which is not quite as simple as it sounds, as we still have a lot of stock remaining from our business, sometimes making it hard to distinguish 'my maps' from 'ex-business maps'. So, let us assume that an exceedingly large transit van with strengthened axles takes away all the 'ex-business maps', leaving me with a small box of folded maps and a plan chest of flat sheets. They, shall we say, are my personal map holdings. I will not consider a filing cabinet drawer, and two drawers in the plan chest of local maps, as these are held for a different purpose, and will never be disposed of.

So, a small box of folded maps, and a plan chest of flat sheets. What would go first and what last? Having just spent a couple of hours looking at the aforesaid material, I honestly do not think that I could decide what would go, map by map, so the maps would be jettisoned *en bloc*. Leaving me with only local maps. Sad? Not really, as my interest in the Ordnance Survey has never focused solely on their map output. Again, as I have mentioned elsewhere, I am not unlike many members, who get a tingle just from seeing the words 'Ordnance Survey', no matter what they appear on. And if I was without any OS maps, I would still have my collection of OS related books and ephemera, which are certainly more attractive to me than the maps that would have gone first.

Only if you feel the same way, will any reader understand how seeing those two words on a scrap of paper can excite. And they always have, right from the beginning of my relationship with OS maps. An early example was when I was looking through the box of maps in a Dartford bookshop, and found a cloth backed scrap of paper, obviously roughly cut from a full sheet, with some blue sea and a

corner of land plus the words 'Ordnance Survey' printed in the margin. It was obvious the French coast was shown, but in those early days I had no idea that the Ordnance Survey dealt in any foreign mapping. Intriguing. Books produced by the Ordnance Survey have always caught my attention, beginning with OS catalogues, which were a major source of information before the flow of books from our Society. Indeed, early catalogues are still of great use, especially the lists of miscellaneous maps available at the time. Annual reports from the nineteenth century are not that easily found, but again offer a wealth of information, and are quite exciting to find and satisfying to collect. I admit that one cannot as easily go out and find OS related books as one can the maps, but when they do appear, the thrill is totally different : *The Ordnance Survey and the war 1914-1919*, 40 copies printed, or *Instructions to field examiners on the orthography of Welsh names, with rules for compounding, initialing, (sic) and accenting under various conditions*, June 1883. Even having praised them, these would be next in line to go, after the maps.

But not all books, as I would keep all the cartobibliographies and Roger Hellyer's *Ordnance Survey small scale maps : indexes 1801-1998*. Why? Because I just love lists, especially lists of maps and map series. If you have a good cartobibliography, you have all the details you need for any map, except of course the map itself. Like reading a holiday brochure, you can dream. For anything I am interested in, I like to be able to see the whole picture, and cartobibliographies are a great help. Just as when visiting somewhere, most of us buy the local map, as we want to know whether it might be worthwhile going in one direction rather than another.

And then there is ephemera, usually printed paperwork only intended to be of use for a short time, and certainly not thought worthy enough to be kept, let alone collected years later. I suppose that monthly updates to OS catalogues are a good example, in that when the next full catalogue appears, they will have become redundant. OS ephemera of some sort exists in most members' collections. They cannot help it; they come across an old leaflet and keep it, even if they only admit to collecting maps. Many years ago, I went to the National Library of Wales to look through their collection of early twentieth century Ordnance Survey catalogues. I must have been the only person to have done so, as about a dozen prize OS leaflets fell out during my visit. Things I had never seen before. I told Robert Davies, the then Map Librarian, who said that they would keep them together in a more secure place. Only last week I looked through some old Alan Godfrey catalogues and found a leaflet advertising the formation of the Charles Close Society. Tucked away for the future.

For me, the best examples of ephemera are the pre-1940 leaflets with a splash of red writing on them. My addiction to colour, I suppose. These most certainly will be the last things I ever give up. I could probably put together a list of my favourite pieces of OS ephemera, and as I typed, each one would be my all time favourite. So, maybe I should start again : Do I have a favourite piece of Ordnance Survey ephemera? No. I am incapable of choosing one from the many. There goes next week's piece as well.

Letters

Stephen Hall's article (*Sheetlines* 118, 27-35) reminds me of another unusual bridge, although so ephemeral that I am unable to find it on any of the OS mapping available on the superb National Library of Scotland website. Indeed the only map, plan or photo of it of which I am aware is in 'By Rail to Victory – the story of the LNER in wartime' by Norman Crump, published by the LNER in 1947.

I refer to a bridge constructed on rollers and thrown across the temporary avoiding line for the East Coast Main Line to the west and north of the modern Northallerton station, between it and the Castle Hills Junction to the Wensleydale branch.

The illustration shows the necessity for the bridge to be moveable as the clearance between the levels of the temporary line and the south-to-west branch from the permanent ECML onto the Wensleydale

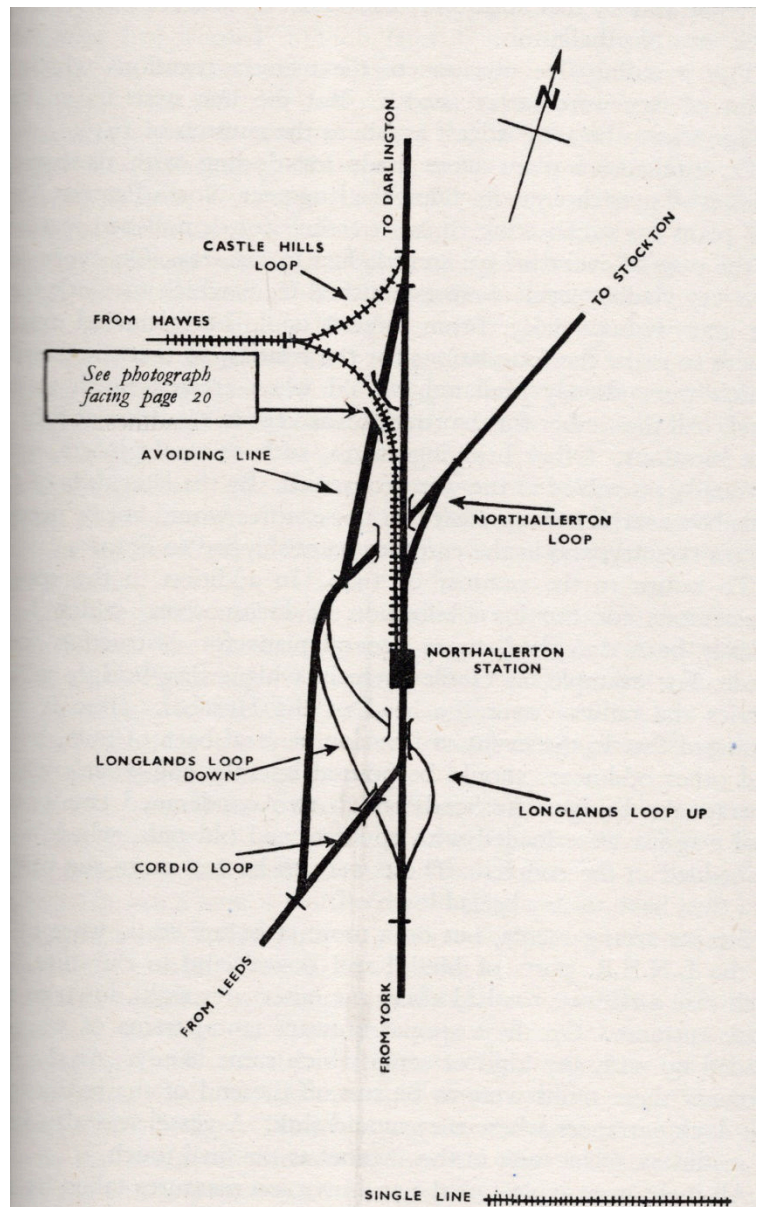
railway (itself at that time a useful route north/south avoiding the north-east conurbations and river crossings) was only just over three feet.

The necessity for the avoiding line comes from the realisation that a single bomb placed under or near the railway bridge immediately north of Northallerton station would have severed all east coast rail connections between London and the north-east and Scotland.

Mr Crump's book states the avoiding line, built in 1943, was still there in the autumn of 1946, other sources suggest the track had been removed by 1947. Today the alignment of the avoiding line and site of the bridge are unrecognizable in the landscape.

The book, by the way, is the most gripping read of the almost casual nerve, courage and ingenuity of ordinary people during wartime I have read and I would commend it to anyone whether interested in railway matters or not.

Peter Haigh





Moveable bridge at Northallerton. Photograph (and plan on previous page) from 'By Rail to Victory – the Story of the LNER in Wartime'

In his opening paragraph describing the OS mapping of certain tramways,¹ John Ambler reiterates the common error of thinking that the flanges on the wheels are what guide the vehicles. This is not how steel wheels on steel rails work. The running surfaces of the wheels that bear on the rails are in fact made to a conical form with an angle to the horizontal of about 1 in 20 (Wikipedia describes this as about 20°, but it's actually a bit less than 3°). Thus, the effective diameter of the wheel is greater closer to the flange. In the railway, the rails are supported at a corresponding angle to the vertical, so that the bearing surface slopes to be parallel to the coned wheel. The pair of rails slope inwards, towards each other, making the track into a very shallow V-formation. At rest, the flange remains about an inch away from the nearest part of the inner face of the rail.

Because it takes energy for a wheel of this shape to run up the sloping surface of the rail, and because a mechanical system left to itself runs in that configuration that uses the least energy, the pair of wheels connected by an axle tends to dispose itself symmetrically between the rails; and while the track continues in a straight line or round very large-radius curves, the flanges don't get near the rails at all.²

The coning was originally an outcome of the casting process for cast-iron wheels, allowing the pattern to be removed from the sand without disturbance;

¹ *Sheetlines* 117, 30.

² I like to think of this as almost an intuitive example of what the physicist calls the principle of "least action."

only later, as speeds rose, did the mechanical benefit become apparent.

Sheetlines is not the place to go into a detailed discussion of the actual purpose of the flanges, including the dynamics of tighter curves, nor of the construction and layout of points and crossings; but let it be said that the fundamental difference between railways and tramways is that the latter use grooved rails, minimising the disturbance to the surface of the street. The rails are not laid sloping, but the bearing surfaces are coned to match the wheels: an angle of less than 3° over about two inches is not noticeable, even on a bicycle with wet tyres!

Michael Spencer

On page 63 [of *Sheetlines* 118], you mention that the Seventh Series is viewable on the National Library of Scotland's website. Whilst this is indeed true, do you know that as wonderful as the NLS website is, it is not the largest freely available online repository of Seventh Series (or indeed New Popular Edition) sheets? The NLS has a single revision of each of the 190 sheets available, whilst SABRE Maps³ has many more available - over 450 individual revisions at present, with the eventual aim of having every revision published online once the final few drop out of copyright over the next four years.

Steven Jukes

SABRE Maps Co-ordinator

My introduction to, and subsequent membership of the Charles Close Society, came about because of my chance encounter with Foot Stick. I was looking at the place-names on sheet LXXI of the First edition 1:10,560 map and came across this at NH0148 63920 by Tagan. On searching on-line, apart from massage and printing devices, the only reference that I came upon possibly related to what I had found was in *Sheetlines* 89, 30, an article by Aidan de la Mare, 'A map in my collection'. A footnote referred to *Sheetlines* 63,55 and 64,57 [this should be 52] and stated, 'According to Richard Oliver: a tree trunk or pole forming a very narrow crossing of a stream, just adequate for someone on foot, rather than a flood gauge.' The latter reference, *Sheetlines* 64,52, seems quaint now with reference to the World Wide Web. My query is why the term is so rare (in everyday life if not on maps) when it usefully names a feature found where traffic is insufficient to warrant a bridge. Is there another term for a log over a burn?

Nevis Hulme



³ <https://www.sabre-roads.org.uk/maps>

Solution and solvers

The bus stations depicted in the *Sheetlines* 118 puzzle are (or were) at:

Airdrie	Ambleside	Buxton	Cardiff
Douglas	Dundee	Falkirk	Great Yarmouth
Littlehampton	Llanelli	Luton	Morecambe
Nottingham	Ramsgate	Reading	Salisbury
Seaton	Shrewsbury	Weston-s-Mare	Weymouth



Despite some deliberately misleading clues, there was another bumper bag of correct entries, many of which were received within a few days of publication. The Seventh Series evidently has many ardent fans; several solvers commented that they spent many happy hours working through their maps in numerical order seeking out the answers.

As usual, some contributors added interesting observations: *Roger Holden*:

Although the railways on the Isle of Man are all narrow gauge, OS uses what elsewhere is the standard gauge symbol. *John Savage*: No way Station Road Luton could be considered a bus station, it was just a road with about four stops and no facilities, as this mid-50s photo (above) shows. *John Cole*: Seaton could hardly be called a bus station, a former independent garage housing two single-deckers, taken over by Southern National. And I strongly suspect Luton as well. *Malcolm Parsons*: the two at Ramsgate were both coach stations; one used by independent services the other by East Kent coaches. *John Winterbottom*: Disappointing that Elgin (the most northerly bus station symbol on a printed map in the world?) did not make the cut! *Duncan Stewart*: Remarkable how a town can be 'hidden' by careful choice of extract. Great Yarmouth – obvious isn't it? Not if the image is chosen carefully. *Mike Parker*: That was a tough one! Douglas – that county boundary was a killer!

Congratulations to the winner, Philip Heselton, and to the other successful solvers, who are, in addition to those mentioned above, Peter Addiscott, Matt Ashley, Chris Bartlett, Martin Buckley, Donald C Clayton, Tony Colings, Andrew Cook, David Fairbairn, Ian Hardy (who added dates of closure), Chris Harvey, Bill Henwood, Bill Hines, Geoff Kent, Phil Pearson, David Purchase, Michael Richardson, Jonathan Roberts, Nigel Smith, Malcolm Stacey, Peter Strugnell, Chris Tennant, Dave Vaughan, Paul Waldron, Tony Walduck, Keith Warman, Dave & Caroline Watt, John Willacy, Anthony Wood, Caroline Wood, Alan Young.

This month's puzzle, overleaf, is again based on Seventh Series maps, courtesy of the NLS website. You are invited to name the castle locations, which are arranged alphabetically. Answers to the Editor by 28 February for the usual book prize.

Where are these castles?

(see previous page)

