



Sheetlines

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“Parallel to the meridian of Butteron Hill -
do I laugh or cry”

Brian Adams

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The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

**"Parallel to the Meridian of Butterton Hill"
— do I laugh or cry?**

Brian Adams

There was something rather comforting about the inscription "Parallel to the Meridian of Greenwich" found against the eastern borders of a number of the Old Series One-inch maps in southern England, from Kent to Hampshire, and the meridian line itself engraved across or outside the north and south borders of a column of these maps extending from Sussex to the East Riding. This suggested that Britain's first comprehensive series of reliable maps was firmly based upon Britain's own prime meridian, that of its Royal Observatory, which was subsequently adopted as the international zero meridian at a Washington conference in 1884. But the big drawback about Greenwich was that it was nowhere near the north–south centre line of Britain and would therefore have been most inconvenient as central meridian of a national map series, and so the sheet lines of Old Series Part II, Devon, were made parallel/perpendicular to an unspecified west country meridian.

For reasons which I detail in a technical section below, the early Ordnance topographical survey was computed in several portions centred on different triangulation stations across southern England, and in the area of Devon it was referred to Butterton Hill (near Ivybridge) and its meridian of longitude. The line of this meridian, from which base all the map detail was drawn in, was engraved in the southern margin of sheet 24 and the northern margin of sheet 27. Parts III and IV of the Old Series abutted Part II on its west and east sides respectively, and all the sheets in these parts had east or west borders labelled "Parallel to the Meridian of Butterton Hill", on the evident assumption that the borders of Part II had been made parallel to that meridian.

But what no–one, myself included up to now, seems to have noticed is that the meridian of Butterton Hill, as indicated by the markers on sheets 24 and 27, runs across Part II at an angle to the east and west sheet lines. Consequently, neither these lines nor any of those in Parts III and IV were parallel to that particular meridian, whilst those in Part IV were not even parallel to those in Parts II and III (apart that is from the western borders of sheets 17 and 18 which were common with the eastern borders of sheets 21 and 22).

As I conclude in the technical section, the sheet lines of Parts II and III were probably made parallel/perpendicular to the meridian of 3°W , whilst those of Parts I, V, VI and VIII, excluding sheet 10, were similarly related to 0° (Greenwich). This left Parts IV and VII to be fitted in between converging sets of sheet lines, with the results that all their sheets were both narrow and tapering. This is the reason for the lack of parallelism in Part IV referred to above, and was also responsible for the two columns of narrow, tapering sheets stretching right up to numbers 88 and 89 (sheets 11 and 13 were also narrow with 45 to 87 narrow and tapering).

I am at a loss to understand how the labelling error could have come about in such a compact organisation as the nascent Ordnance Survey, especially as the map detail was correctly laid down in relation to the true orientation of the sheet lines. But, whilst my immediate reaction to *Parallel to the Meridian of Butterton Hill* is now: "Don't make me laugh", it must be considered tragic that this mis-description has gone unnoticed for so long, and has been taken as gospel by those relatively few writers who have attempted to investigate the construction of the Old Series maps. One further thought: what if there had been Trading Standards Officers in 1813?

Preliminary Investigations into the projections of the Old Series One-inch Maps

The few mathematical cartographers, myself included, who have attempted to evaluate the above projections have been daunted by the sheer magnitude of the investigations which would be required. But to provide our Chairman Yolande Hodson with some background to the projection used for the Popular Edition maps, which would assist her research into that series, I did some preliminary work on the Old Series which brought to light *inter alia* the startling facts about Butterton Hill meridian recorded above. To avoid overloading the main article with the more technical aspects of the investigations, I separated them out and discuss them here.

1. The calculation and setting down of the early surveys. It was realised in the early years of the Ordnance Trigonometrical Survey that not enough was then known about the size and shape of the Earth to carry out a rigorous adjustment of the main triangulation, but it was still necessary to calculate the positions of the triangulation stations in terms of rectangular co-ordinates so that they could be plotted on the copper plates of the new maps. At that time, too, the calculations were carried out by first adjusting the angles of each triangle to total two right angles, and then doing the computing as though the area concerned was flat.

William Mudge decided, very probably in consultation with Isaac Dalby, that the best way to take account of these factors was to divide the survey into several portions, in each of which one triangulation station was selected as an origin to which the rest were referred in terms of feet from the meridian and from the perpendicular; in other words in feet east or west and north or south. Mudge initially chose six origins spread across southern England at intervals of about sixty miles,—Greenwich, Beachy Head, Dunnose, Black Down, Butterton Hill and St. Agnes Beacon, although Beachy Head was only used for a comparatively small area.; as the survey proceeded northwards four more origins were selected at Clifton Beacon, Delamere Forest, Moel Rhyddlad and Burleigh Moor (from the second of which "Forest" was conventionally dropped by mid-century). The principal stations having been computed, co-ordinates for the secondary stations were calculated on the same origins, and the detail surveys were then fitted in, making the way clear for the One-Inch mapping to be plotted from those origins.

But, referring specifically to southern England, the origins other than Greenwich were not used in constructing the Old Series sheet lines, and hence, though without any surviving evidence of the actual draughting of those sheets, it is evident that the positions of the origins and the directions of their meridians had first to be set down within the sheet lines before the rest of the detail could be drawn in relation to those origins. So we find the lines of these meridians engraved in the borders

and/or margins of the southern swathe of Old Series maps, Greenwich on 5 and 6, and 1 and 47 (of which more below), plus 65, 69, 84, 85 farther north, Dunnose on 10, 11, 12, Black Down on 17, 18, 19, Butterton Hill on 24 and 27, and St Agnes Beacon on 32, 31, 30 and 29. If only this practice had been continued, investigation into the Old Series projections could have been much facilitated.

2. The graduated border round Part I. The first Old Series sheets showed evidence of transition between the privately produced eighteenth century county maps and the scientifically based 'General Survey of England & Wales'. Initially they mapped particular counties, but were already distinctive in being completed to the neat lines across adjoining counties; in addition Part I was provided with the then familiar graduated border, not constructed in conformity with the surveyed detail on the map, but quite probably drawn round the four-sheet map after completion. Technically, the graduation was constructed on the Modified Plate Carrée projection, on which the parallels of latitude were equally spaced horizontal lines and the meridians of longitude were equally spaced vertical lines.

Referring to the draughting methods outlined in section 1, Greenwich Observatory was plotted in its correct latitude and the meridian of Greenwich ran correctly through it, but the further one departed from the zero meridian, the greater the discrepancies between the notional vertical meridians and their true paths across the mapped detail, and between the notional straight parallels and their true curved equivalents. The somewhat obscure note below the south-west corner of sheet 1⁸ was presumably intended to warn the map user of these points, but I advance it as a purely personal suggestion that it may also show evidence of an early Ordnance Survey controversy as to the propriety of the inclusion of a noticeably inaccurate border on a properly surveyed map of the new national survey.

3. The sheet lines of the earlier Old Series sheets. As I say in my opening paragraph, the sheet lines of Part II were parallel and perpendicular to an unspecified meridian; but the longitude of that meridian can be deduced from the angle between the sheet lines and the marked meridian of Butterton Hill, known as the convergence of those meridians. It must be appreciated that precise figures cannot be obtained from measurements made on a mounted copper proof, which has shrunk in the proving process and been distorted in the mounting process, but figures accurate to within ten minutes of orientation should be possible. As my measurements suggest that the sheet lines of Part II were parallel and perpendicular to the meridian of 3° 04' West, there seems little doubt that the chosen meridian was, in fact, 3°W.

The sheet lines of Part III were parallel to those of Part II, and were therefore also parallel and perpendicular to the line of 3°W, and I remark here that it was the fact that the meridian of St Agnes Beacon, as indicated by the markers in the margins, appeared to run across Part III at much too great an angle that first alerted me to the fact that the sides were not parallel to the meridian of Butterton Hill as they were labelled.

Returning to the eastern side of the country, as well as Part I, the sheet lines of Parts V (excluding sheet 10), VI, VIII, and X farther north, were all firmly based on the Greenwich meridian, and it is in the area between the sheet lines parallel to 0° and those parallel to 3°W that the real complications start. Not only were the bounding sheet lines of this area converging towards each other northwards, but their distance apart was nowhere near a multiple of a standard sized sheet. What the thinking ahead had been when Part II was schemed can hardly even be guessed at, except that longitude 3°W must have been seen as a reasonable central meridian for the western part of

⁸ The scale of Latitude and also that of Longitude around this Map, being drawn & graduated on a plane projection, the Latitudes and Longitudes deduced therefrom, can only be nearly true near to the Meridian of Greenwich.

Britain as a whole, for it ran quite near the edge of Part II and 4°W would have been more central to that part if a round degree had been thought desirable for its own central meridian.

Dealing first with the particular case of sheet 10, the Isle of Wight, although belonging to Part V it was treated very much as a special sheet and was displaced from the basic sheet pattern. Well known to be the first map to be labelled "Ordnance Survey", my measurements show its central meridian to have been remarkably 1° EAST. This choice must surely have been made to dispose the island more neatly within the sheet lines, a course to which I for one take no exception. Proceeding north to sheets 11 and 12, I have already indicated that they were constructed on the Greenwich meridian and they were rectangular, as sheet 13 was also; they were, however, narrow, the space between sheets 9 and 21 having been divided into three to accommodate sheets 11, 15 and 18, through which two tapering columns of sheets rose from 17 to 89 and from 16 to 88, whilst the third only tapered from 45 to 87.

A short cogitation on those facts will indicate that some very peculiarly shaped sheets could be found in this central trapezium, compounded by the fact that additional origins were brought into use in its northern part. It is in this area in particular that much more work, including some very detailed measurements, needs to be done before any conclusions can be reached on the projections, or possibly lack of projections, involved.

From Sheetlines 50 dated December 1997

A regrettable error crept into my piece '*Parallel to the meridian of Butterton Hill - do I laugh or cry?*' which appeared in *Sheetlines* 38. Nine lines down on page 19 I stated that (*Old Series*) sheet 13 was 'also rectangular', whereas in fact its north border slopes downwards to the east at an angle of 0° 51' to the horizontal. The important thing in the context was that the main body of the sheet is rectangular so that the western and eastern borders are parallel, and, as stated, the third column of narrow sheets only tapers from 45 to 87. However, the reference in *Sheetlines* 38 as it stands is erroneous, it should not have occurred, and I apologise for it.

The angle of 0°51' may sound very small, thinking of a school protractor, but it does mean that the eastern border of the sheet is shorter than the western by 0.43 inches (1.1 cm). The sloping border must have been incorporated to accommodate the tapering column of sheets to the north, and therefore indicates that sheet 13 was not schemed until the shape of things to come had at least been provisionally determined. This is just one more lead towards solving the puzzle of the compilation story of the central *Old Series* sheets.