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Marinus, Ptolemy and the Turning of Scotland

By BARRI JONES and IAN KEILLAR

One of the most puzzling problems of ancient geography relates to the turning of Scotland, whereby in Ptolemy's map of the British Isles Britain (or Albion) is abruptly turned to the east from approximately Ptolemy's latitude 59° north, effectively the Tyne/Solway line. As a result the area we now refer to as Scotland is shown coherently through its coefficients but overall at approximately right-angles to the southern part of the country. Ptolemy's account of the geography of ancient Britain is fundamental to any study of the province, and particularly the military campaigning in the North. It is therefore essential as a subject of study for anyone involved in the evolution of the province or, at a very different remove, the underlying problems of understanding the contribution of ancient geographers to what Ptolemy himself called 'chorography', the geography of a region or particular area.¹

These two streams of thought, one focused on the particular problems of the province and the other more related to overall problems of understanding Ptolemy's *Mappa Mundi*, have meant that the problem presented by the evidence from North Britain has been studied in very different ways, effectively reviewed by Smith and Rivet in their study, *The Place Names of Roman Britain*.² In this context, therefore, they may be summarised in terms of approach. Bradley, for instance, put the problem down to the map existing in three sections with the northern component being misplaced.³ In 1893 Rylands attempted to understand the Geography, notably through the contribution of Muller and Fischer to the creation of an improved text.⁴ The Middle Eastern archaeologist Flinders-Petrie approached the problem,⁵ but the first sustained attempt to provide a solution was by the late Professor Sir Ian Richmond in 1921 when he argued that the distortion was due to observation of the lunar eclipse in Scotland providing a longitude that was in conflict with that already established and reported by Ptolemy for London.⁶

Richmond sought to rotate the map north of the River Wear (rather than the River Tyne) at a right-angle and converted latitude to longitude with what Rivet and Smith described as 'fairly satisfactory' results as far north as the Forth/Clyde line. Significantly, however, his mathematical reversals made it easier for him to argue that *Castra Pinnata*, to adopt

¹ G.D.B. Jones and D.J. Mattingly, *An Atlas of Roman Britain* (1992), 16–23, figs 2.2, 2.3, 2.4, 2.6.

² A.L.F. Rivet and C. Smith, *The Place Names of Roman Britain* (1981), 103–47.

³ H. Bradley, 'Ptolemy's Geography of the British Isles', *Archeologia* xlvi (1885), 379–96.

⁴ T.G. Rylands, *The Geography of Ptolemy Elucidated* (1893), based on the text of the *Geography* edited by C. Muller and C.T. Fischer (1883).

⁵ W.M. Flinders-Petrie, 'Ptolemy's Geography of Albion', *PSAS* lii (1917), 12–26.

⁶ I.A. Richmond, 'Ptolemaic Scotland', *PSAS* lvi (1921), 288–301.

the usual infelicitous translation, Ptolemy's *περωτὸν στρατοπέδον*,⁷ could be equated with the legionary fortress at Inchtuthil, which is now, however, increasingly agreed to have been termed *Victoria* after the Legion XX Valeria Victrix, its most likely garrison. During the latter part of his life Richmond abandoned some of these arguments, notably the astronomical aspects of his theory which do not appear in his revised publication of 1958.⁸

In 1959 Tierney reviewed all the evidence to argue first that Ptolemy had no astronomical data for the British Isles at all; second that the position of Britain was established by a series of measurements from the accepted latitude of Marseilles; and third that the overall shape of Britain, including the apparent turning of Scotland, was dictated by the tradition of an obtuse-angled triangle reflected in the length of the three sides as stated in Diodorus Siculus (V.21), derived in turn from the early Greek geographer, Eratosthenes. It is important to note that Tierney assumed that Ptolemy had no astronomical data for the British Isles.⁹ Tierney's approach was taken on board by Rivet and Smith in their standard place-name study where, to a large extent, they achieved the important development of studying Ptolemy's text both in overall terms from a philosophical as well as a geographical point, and the problem of Scotland is presented in some detail. It must be said, however, that in establishing Ptolemy's northern hemisphere, unlike Tierney, Rivet and Smith immediately quote the *Almagest* to show the calculations available to establish latitude as far north as Thule at 63 Ptolemaic degrees with only one more northward latitude, namely that for the Scythians at 64° (*Almagest* II.6).

Despite Rivet and Smith's acceptance of Tierney's arguments, the theory cannot be said to have gained universal acceptance and more root and branch proposals have recently been put forward by Mann.¹⁰ His argument cuts the Gordian knot by saying that Greek map-makers had no real conception of the mechanics of ancient map-making. Therefore, where the climate made it impossible to survive through excessive heat or excessive cold, they concluded that there would be no need for land in those areas, and thus evolved a theory that the continents did not stretch south of about 10° north of the equator simply because, in their opinion, land to the south was too hot to support life. Similarly Mann argues that they apparently reached the conclusion that human life would not be possible beyond 60° north on Ptolemy's scale, and thus that there would be no land north of that latitude. When Ptolemy's relevant source, Marinus of Tyre in turn collected information, as is generally agreed, from Flavian military sources, his attitude, according to this argument, would have been coloured by these assumptions. Whereas elsewhere Ptolemy was able to use astronomical observations of the elevation of the sun for latitude and lunar occultation for longitude, Mann argued that it is improbable that Ptolemy had any such

⁷ R. Rebuffat shows that the more correct transliteration should be the better attested – *castra cum pinnis*, 'the camp with merlons', *Latomus* xliii.1 (1984), 10–15. The authors think it unlikely that this term could have been applied by Ptolemy's sources to a marching camp. In this context nineteenth-century antiquarian sources show that the well-known bull reliefs from Burghead derive not from the interior of the site but from demolition of the rampart. Moreover, most of the recorded examples (many of which are now lost) fall within a similar size range. Their recovery from the rubble of the seaward-side of the rampart and the comparable size suggests that they formed either decorative features of the upper course of the stone revêtement or merlons along its crest. This argument will be developed in a separate article.

⁸ I.A. Richmond, *Roman and Native in North Britain* (1958), 3–27; see also R.M. Ogilvie and I.A. Richmond, *Cornelii Taciti de Vita Agricola* (1967), 31–46.

⁹ J.J. Tierney, 'Ptolemy's Map of Scotland', *JHS* lxxix (1959), 132–48.

¹⁰ J. Mann, *PSAS* cxx (1990), 61.

observation for Thule or places in the north of Britain, and instead was reliant on measurements from bases further south. When Ptolemy found that these measurements would take him well north of 63° , he decided that this would take Thule and parts of Britain well into the uninhabitable zone. Since Ptolemy apparently thought this could not be conceptually correct, Mann argues that Ptolemy decided that the direction of his northern measurement was wrong and turned the northern part of Britain through 90° to the east. This allowed him to place Thule on the habitable limit of 63 degrees north. Mann's last supposition is at least questionable because it is not likely that Marinus of Tyre lacked observations in the northern latitudes thanks to Demetrius' circumnavigation of northern Scotland in the early A.D. 80s (see below) and because Ptolemy's *Almagest* shows quite clearly such calculations (II.6.24–30) for all the major points north of Catterick as far as the north of Scotland, the Isles of Ebudae, generally thought to be the Inner Hebrides, then Thule,¹¹ and finally a reference at 64° on the Ptolemaic scale to the Scythians.

In sum, Mann's proposed solution based on a supposed Greek-derived Alexandrian metaphysical view of the world fails to carry conviction in a number of ways, not least the visually obvious distortion of the far north-west (FIG. 1) when portrayed in the reconstruction of Ptolemy's world in e.g. the A.D. 1480 edition of the striking *codex Neapolitanus* or the Rome edition of ten years later.¹² At a more detailed level it is difficult to impune major error in the far northern latitudes in the face of the surprisingly accurate depiction of Ireland, an area that, of course, never lay within the Roman Empire and the northern tip of which is accurately shown at 61 Ptolemaic degrees of latitude. More significantly perhaps the *Ebudae*, the isles of the inner Hebrides, are given coefficients that not only place them relatively correctly in relation to northern Ireland, but also to their actual position. The survival of such an accurate detail, as opposed to the Ptolemaic distortion of the Scottish landmass, suggests that the origin of the distortion actually has an arithmetical base. To examine this avenue further we must analyse the overall world of Ptolemy in comparison with that of his main source, Marinus of Tyre. The difference between the two, which has not been considered previously in this context, may help explain Ptolemy's misrepresentation of the Scottish landmass.

Ptolemy attacked his principal source, Marinus of Tyre (*floruit* A.D. 90–110)¹³ in one major respect. Ptolemy accepted a circumference of the earth of approximately 180,000 stades despite the relatively accurate circumference already available from Poseidonius. Ptolemy's approach was theoretical, based on a modified conic projection, and involved the same kind of debates and errors that were castigated, *mutatis mutandis*, by the Committee of Enquiry set up in Salamanca to investigate Columbus's claims in 1492. In that case Columbus claimed that existing calculations of the west–east size of Asia were very considerably underestimated. Conversely, in this case, Ptolemy's west–east measurements of the known world running from the Canaries, his Fortunate Isles, to Sera Metropolis (China) covered a distance of 180 Ptolemaic degrees, 45° less than Marinus' calculations of 225° of longitude. More relevantly, for our present purpose, Ptolemy attacked Marinus for overestimating the north–south extent of the world and reduced

¹¹ *op. cit.* (note 2), 111.

¹² Claudii Ptolemaei, *Cosmographia Tabiulae* (1990), with introduction by L. Pagnani; A.E. Nordenskiöld, *Facsimile Atlas* (1973), 142–4.

¹³ *op. cit.* (note 2), 1 and 6.

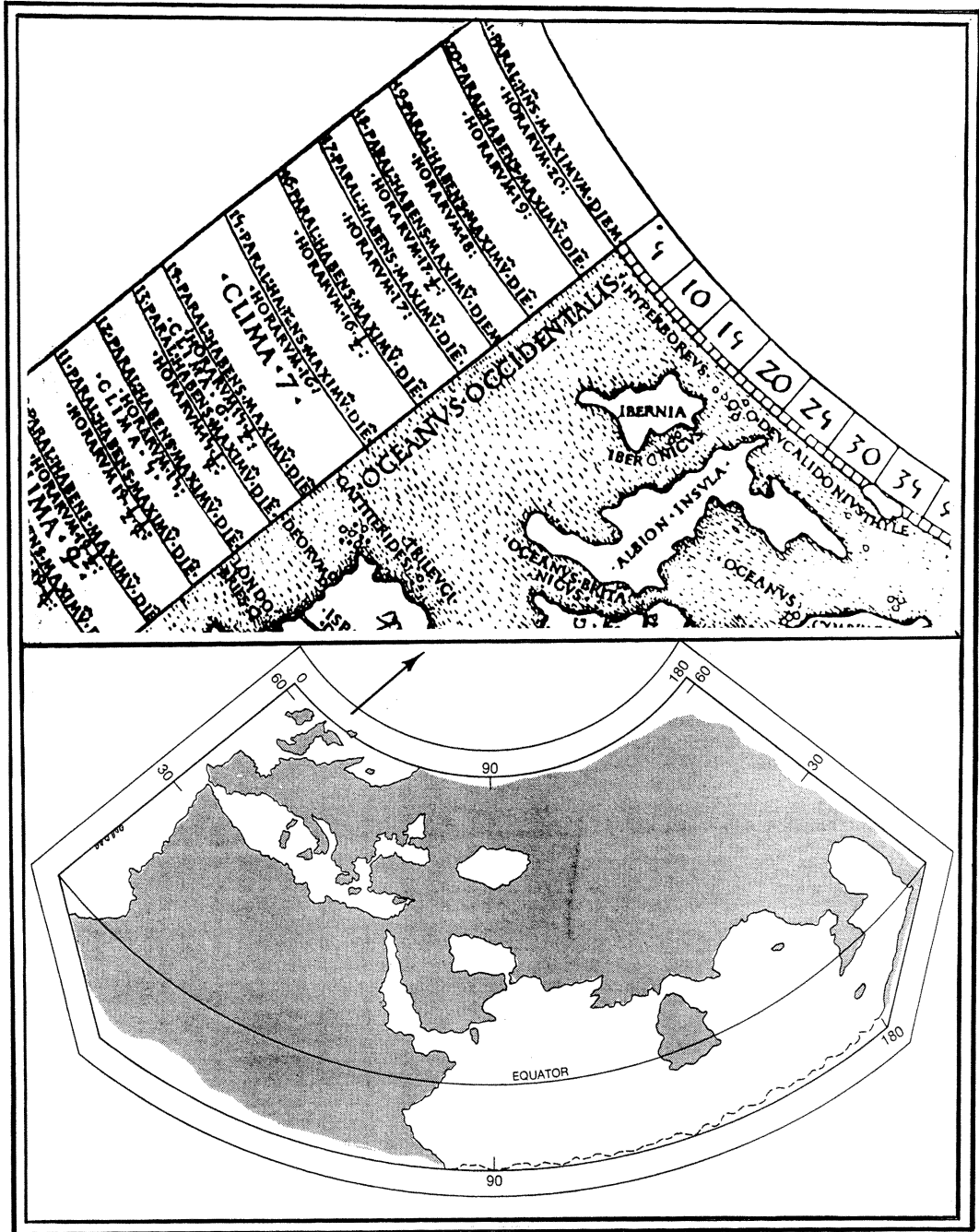


FIG. 1. (a) Detail of the north-western corner of Ptolemy's *Cosmographia* Tav. I in 1490 Rome edition; (b) Ptolemy's projection of the world.

Marinus' northern limit of 87° north to $79^{\circ} 25'$. This latter figure can be calculated by adding his southernmost latitude of Agysimba at his latitude $16^{\circ} 25'$ south from his meridian to the northern limit of Ptolemy's map, 63° north on his scale; i.e. reducing Marinus' work by $7^{\circ} 35'$ on the Ptolemaic scale.

Ptolemy's attack on Marinus for extending his northward extent may also contain a hint of the solution to the problem, given that Ptolemy's southward measurements are based on relatively long-established patterns of coastwise cruising down the Red Sea and south of the Horn of Africa in the better known area of the Indian Ocean logged, for example, in the *Periplus of the Erythraean Sea*.¹⁴ Uncertainties are, therefore, intrinsically more likely to occur at the northern limits of a world as seen from Alexandria. Ptolemy's world extends northwards across 79° Ptolemaic degrees $25'$, that of Marinus for 87° . Therefore there appears to be a $7^{\circ} 35'$ difference between the two projections of the northern hemisphere. This seven degrees difference represents, it is suggested, the solution to the displacement of Scotland south of Ptolemy's arbitrary limit of latitude 63° north. On these lines one could argue that the turning simply represents the cramping of previous available coefficients within a theoretical framework advocated by Ptolemy contra Marinus (see the reconstructed projection of Marinus in FIG. 2).

Yet one can go further to observe a remarkable coincidence, if such it is, between the two calculations available. The difference of $7^{\circ} 35'$ on Ptolemy's scale of $62\frac{1}{2}$ miles per degree spans approximately 440 miles. Across this zone, again *contra* Mann's argument, there clearly existed astronomical observations from the north of Britain. These are indeed set out in the *Almagest*, an earlier work than the *Geography*, again from the hand of Ptolemy.¹⁵ The measurements may derive from the geographer Demetrius' maritime survey expedition of A.D. 81–3 attested in Plutarch, and from an inscription at York, or the midsummer recordings of the Flavian army mentioned in Tacitus and generally agreed to be transmitted via Marinus' near contemporary account.¹⁶ *Almagest* II.6 shows the latitudes as demarcated northwards at approximately quarter-hour intervals from southern Britain, through the specifically mentioned site at Catterick, the northern tip of Ireland, the Hebrides, Thule, and last of all the unknown peoples of the Scythians. The significant point in this context is that to locate the northern tip of Britain in relation to the northern limit of the world in Ptolemy roughly 2° need to be subtracted from the 7° of difference to allow for the Scythian peoples and for Thule. First, 1° from the Scythians to the latitude of Thule, whether that is to be interpreted as the Shetlands or elsewhere,¹⁷ and then a second degree southwards from Thule to the north of Scotland. Following Ptolemy, therefore, 2° need to be subtracted from the 7° giving a figure of 5° and $35'$ for the length over which northern Britain is spread pivoting from the Tyne/Solway line, rather than the Wear as Richmond preferred in his 1921 article.¹⁸

¹⁴ Most recently edited by M.J. Casson (1989).

¹⁵ *Almagest* II.6. It is generally thought that the work was written up to c. A.D. 141 prior to the *Geography*. Differences between the two works include changing names for Britain and Ireland, Great and Little Britain of the *Almagest* giving way to *Albion* and *Inertia* in the later work.

¹⁶ Plutarch, *De defectu oraculorum*, 410A and 434C (A.D. 83–84); *RIB* 662; Tacitus, *Agricola* 10.4.

¹⁷ *op. cit.* (note 2), 42; *Thule* was located by Pytheas in the late fourth century B.C., but apparently not thereafter relocated. Subsequently it came to be treated in secondary sources as simply the proverbial world's end. Any attempt at more detailed identification needs to take account that it lay 'six days sailing northwards from Britain' and very close to the Arctic circle as attested by reference to the phenomenon of the midnight sun.

¹⁸ *op. cit.* (note 6).

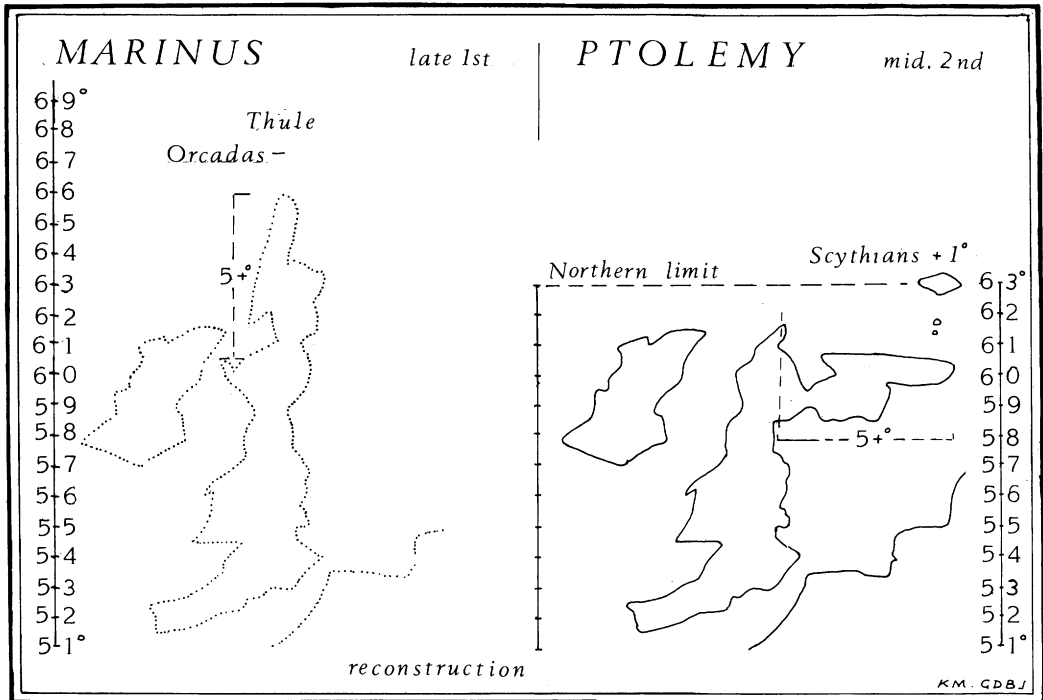


FIG. 2. A reconstruction of Marinus' co-ordinates for the British Isles in comparison with those of Ptolemy.

In Ptolemy the spread is east–west on the northern limit of his map. But that need not be, indeed cannot be, the same in Marinus' scheme as we can reconstruct it from Ptolemy's subtraction, i.e. with Thule at *c.* 69° and the North of Scotland 1–2° further to the south. In short by abandoning Ptolemy's attack on his main source and reconstructing Marinus' latitudes, we can, in fact, restore Scotland's north–south axis with surprising accuracy.

Five degrees on Ptolemy's scale equals 314 miles. That is effectively the distance between the Tyne and Cape Wrath (Norse: the turning point) or an arc drawn from Tynemouth through Scapa Flow and the Pentland Firth. This means, therefore, that allowing for the two degrees in the *Almagest* to cater for the Scythians and Thule, Ptolemy's figures of 5° for the length of Scotland and, therefore, the length of the pivoted landmass, tally within a matter of a few miles, certainly within the degree of tolerance of ten Roman miles and possibly within an error of half that distance. This hardly seems chance if we accept that the Scottish landmass is bent through a right-angle to accommodate Ptolemy's theoretical, and erroneous, modification of Marinus. Thus we can see both the origin of the turning of the landmass and at the same time a remnant measurement that is still reflected in the distance between the Tyne and the Pentland Firth or Cape Wrath, either being interpretable as the north of Scotland. This approach, therefore, sees Ptolemy's faulty correction of Marinus' northward co-ordinates as the explanation for the disarrangement of the north British landmass and would claim to see surviving distances, apparently derived from Marinus, and implied by the *Almagest* and the *Geography*, still reflected in the coefficients surviving from the latter.

There remain the problems within the two sources of the text relating to North Britain, namely that acquired on land and that derived from naval exploration between which a clear division has rightly been drawn by early commentators.¹⁹ But that is another story, and in assessing Marinus' and the Flavian contribution, it is essential to remember that many names surviving from early exploration in the *Ravenna Cosmography* do not recur in Ptolemy's *Geography*, testimony enough to the loss of knowledge that evidently occurred with loss of military contact.²⁰

Meanwhile by establishing Ptolemy's erroneous modification of Marinus' co-ordinates, themselves perhaps derived from a combination of Demetrius' hazardous exploration and its military follow-up in the north of Scotland, we may come to a more coherent view of how Northern Britain was first more correctly mapped at the turn of the first century A.D. than in the mid-second-century co-ordinates given by Claudius Ptolemy.²¹

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¹⁹ The evidence of this kind is clear on the east coast as far north as the Moray Firth. The name *Varar* given by Ptolemy is identifiable with the River Farrar (Strathfarrar, etc.) evidently the earlier nomenclature for the Scoto-Norman *Beaully*, a name that supplanted it for the lower reaches of the river and estuary. While this represents the adoption of an indigenous nomenclature, the occurrence of a purely Latin term, *Alta Ripa*, nearby is of parallel interest. The given co-ordinates suggest that it should be identified with the North and South Sutor, the cliffs guarding the approach to the Cromarty Firth rather than the Ord further north on the Sutherland coast.

²⁰ *op. cit.* (note 1).

²¹ We would like to thank those who have helped the gestation of this article, not least Parva Books, Wigton, Leicester, whose magnificent colour reproduction of the 1480 *Codex Neapolitanus* set our thoughts in train. Keith Maude of the Department of Archaeology, University of Manchester, kindly prepared the figures. The text, which was delivered to the inaugural Roman Archaeology Conference at Reading University, has seen many improvements through the scrutiny of Patricia Faulkner, Richard Gregory, and Keith Maude.