

Cp1 CLAUDIUS PTOLEMY: Falsification, Regimentation or Symmetry?

The map of Britannia examined, and the turning of Scotland resolved

SYNOPSIS:

Both translators and researchers of the methodology and text of '*Claudius Ptolemy: Geographia*¹' have commented upon the apparent oddities which occur with the form of Britannia when using his co-ordinates and questioned the veracity of the details. *Stevenson (1932)*¹ stated: '*The remarkable fact, however, is that he was so nearly accurate in his records; that Ptolemy purposely falsified his records is hardly to be entertained for a moment*'. *Rivet (1974)*,² makes the comment: '*the excuse that Ptolemy had his names in the wrong order--- a council of despair*'. There is a falsification and mis-presentation of the data, both original and through copyist error. This can be illustrated by the presentation of a map of Geographical Britannia, redrawn to *Ptolemaic* parameters, and then by comparative research.

Caution; The text as translated by Stevenson has many errors. Some are original and others may be taken as later editors errors. Many are easy to spot. It must be stated quite clearly that a second translation or set of maps should always be consulted to obtain a balanced view.

PTOLEMY'S ERA

Diagram Cp1D01.

The present consensus is that *Claudius Ptolemy* was established in Alexandria, Egypt, producing his many works of scientific exploration between cAD146 and cAD170. It is also accepted that the majority of the information utilised to produce his tables for his '*Geography*', other than the stated use of the work by *Marinus of Tyre*, was from official sources, i.e. the Roman governance system². In Britannia, by AD146, both the *Hadrianic and Antonine* walls had been constructed and the legionary fortresses rebuilt in stone (*Salway 1993*)³. The *Civitates* were established along with *Coloniae*, and life had settled down to a steady pattern. After a century of occupation, *Britannia* south of the *Antonine* wall was a country being developed more and more by the infrastructure of the road network. These roads were surveyed, aligned and constructed under the '*Agrimensors*' watchful eyes (*Margary 1955*)⁴. Those same *Agrimensors* knew the distance and bearing of destinations via a triangulation system of tangent ratio, and thus the overall disposition of the '*POLEIS*' or '*CIVITATES*'. This of course included any associated Legionary or ordinary forts (*Ferrar/Richardson 2003*)⁵. Thus, there was a nucleus of information to be collected and collated. How long that process took, how long the transference from Britannia, to Rome, to Alexandria took, is not known. But, if AD146 is utilised as the *terminus ad quem* for such a transfer, the knowledge cannot be overstated.

That the Romans knew the tangent ratio bearing of *Poleis* many miles apart is illustrated exactly as *Rivet*² chose to do in his 1974 paper with the alignment of the *Gartree Road* from *Ratae* [Leicester] to *Camulodunum* [Colchester], as well as the *Stane Street* from *Londinium* [London] to *Noviomagus* [Chichester]. What *Rivet*² chose not to state was that the *Gartree Road* forms a perpendicular to the *Foss Way* route (which is from *Lindum* [Lincoln] to *Lindinis* [Ilchester]) at *Ratae*, and that the '*Stane Street*' design profile is parallel to the *Foss Way*, all set out to a 3:5 tangent ratio north, as **Cp1D01** illustrates. These are not the only parallels, but it illustrates a well organised and capable survey team within the Roman system. (See BAR 359, 2003⁵ for a complete discussion and explanation of the Roman survey.)

Thus, for geographical evidence, we can look to the work of the Romans, the location in the landscape of the original forts and their inter-distances and alignments. These works, all well prior to AD146 will serve to illustrate the survey details which may have been transferred through the Roman State archives to *Claudius Ptolemy*. [Draft papers by this author to be included in the website are, " 60 Miles, a Five Day March"⁶, "and its complimentary paper, " *From the Dee/Humber to the Solway/Tyne; AD79*". They investigate the phenomena, and, the equally planned road layout.

THE DATA AVAILABLE TO CLAUDIUS PTOLEMY

Diagram Cp1D02

The simplest of surveying tools to utilise for a large scale survey plot or positioning plot in the countryside is the triangle. It locates and defines in one operation. It has been stated many times that

'Rome' used a square for land division and surveying (Dilke 1971)⁷. But, to form that square two triangles are necessary and are an accuracy check, even if a *Groma*⁷ is utilised! From a given point or base line, tangent angles can be utilised to produce alignments, parallels and other triangles, all of which interlock to form a whole. Thus we are able to retro-survey plot the positions of the original forts in the landscape and calculate, or measure, their inter-distances.

Using the timescale of the *CLAUDIAN* invasion of *Britannia*³ which commenced in AD43, through the *AGRICOLAN* campaigns from cAD70 to cAD84, and then the later *HADRIANIC* campaign period of cAD118 to cAD138, a series of diagrams or plots of the Fort positions and the beginnings of the road network can be drawn. The inter-distances are all calculated from Ordnance Survey co-ordinates given within the booklet⁸ "*O S Map of Roman Britain, third edition*". These are part kilometre co-ordinates, enabling both latitudinal and longitudinal calculations to be made, as well as direct distances to be calculated, via the *Pythagorean* method. A study of **Cp1D02** and the appendix list will indicate that there are repetitions of direct distances, and, that there is an obvious preference for certain distances, circa 60 and 105 Roman miles, i.e. 4 and 7 x 15RM. The regularity of the plot, the use of the surveyors' triangle in all instances and the simplicity of the survey details to be transmitted (to Marinus of Tyre and latterly) to *Claudius Ptolemy* must have enabled the formulation of an accurate base plot for the overall map of *Britannia*. That of course ignores the fact that the Roman Army was preparing its own maps, and in all probability copies were transmitted to Rome and thus may have been available in Alexandria in this period (Sherk 1974⁹). If we add to that the simplest of observations, the latitude of a fort by the "*Pole and Shadow*" method, taken on auspicious days of the year, there is a doubling of the information with respect to a forts position in the landscape, and, another accuracy check.

Eminent professors have argued for and against Star sights (Tierney 1959)¹⁰ to locate the latitudes of these same places. It matters not how the latitude was established, only that in all probability it was! Thus the accuracy of the data and the simple inter-location of the forts, via a surveyor's triangle, would and should have provided *Claudius Ptolemy* with adequate details to establish the proper latitudinal degree distance and the correct shape of *Britannia*.

***SURVEY DETAILS WHICH CAN BE PROVEN TO BE BY THE ROMAN ARMY FROM STRATEGIC TO LOCAL PLANNING; CUMBRIA* Diagrams Cp1D02AB, Cp1D02C**

The AD79 campaign of *Agricola* to subdue and conquer the northern lands was perhaps based upon a two prong assault. Commencing from Wroxeter [*Viroconium*] and Chester [*Deva*] with the Legion XX *Valeria Victrix*, and, from York [*Eburacum*] with the Legion IX *Hispana*, they would have made a northerly advance on either side of the Pennines.

(However, this appears to have followed an initial incursion by *Cerialis*, a planning invasion. See bibliography A, B and C for book details, and the Roman invasion progress).

Then, these two lines of advance joined finally at an east west crossing of the Pennine Range [now the A66], from Barnard Castle to Brough [*Verteris*], and thence the Eden Valley, at Brougham [*Brocavum*]. The Eden Valley was then utilized as the route to Carlisle, from whence it was a south westerly advance to the Cumbrian littoral.

Preceding [and also with] this advance, the surveyors would be assessing and confirming decisions regarding the landscape, for road routes and fortification points. The Eden valley from Brough has on its eastern flank a series of low hills, generally 250 metres above sea level. Thus there is the opportunity to use these as a set of survey points with which to ascertain direct alignments. Hence, we can plot one of the simplest, a 45 degree or 1/1 ratio alignment based upon a north/south distance of precisely 24 Roman miles from Brough to Wreay, (south of Carlisle,) both sites of Roman forts. The proof of this putative survey line, its credibility, comes from the analysis of the sub-spacing of the forts along its length.

Diagram Cp1D02AB illustrates the alignments and inter-distances now described.

Between Brough and Carlisle, the direct distance is c57Km or c39RM, and this distance is subdivided by the Roman Forts as follows; Brough to Kirkby Thore to Old Penrith to Carlisle are one third distance spacing or c13RM apart, whilst from Brough to Brougham to Carlisle are equidistant at c19.5RM, placing Brougham centrally to the survey line.

But these Roman Forts are not situated upon the survey line; they are sited to suit local conditions from a strategic plan. Thus Kirkby Thore is 1.75RM west; Brougham is 5RM west; Old

Penrith [*Voreda*] is 2.5RM west, with Carlisle, 1.5RM east of the line.

Thus the survey line, Brough to Wreay and thence Carlisle, can be shown to be a planning tool for the disposition of forts and the alignment of the main arterial road.

To emphasize this 45 degree alignment, at the two thirds point, Old Penrith [*Voreda*], a perpendicular alignment can be drawn, which has at c13RM from the original survey line the accurately positioned fort at Troutbeck.

A second perpendicular drawn from Carlisle positions the Fort at Caermote, some 18.55RM south west; [whether this should have been c19.5RM and hence the midpoint can be speculated upon, because northwest of Caermote is Beckfoot Roman fort. In the area south west of Carlisle there are, Old Carlisle, Caermote, Papcastle and Parton/Moresby Forts, and they have a planning layout such that Old Carlisle to Papcastle is parallel with Carlisle to Caermote, both at 45 degrees, and that Caermote is situated mid way between Carlisle and Parton. **Diagram Cp1D02AB**

But, the distance between Carlisle and Kirkbride is 476 Actus, and Carlisle to Old Carlisle is 486 Actus. Then, Kirkbride to Beckfoot is 462 Actus and Beckfoot to Caermote is also 462 Actus. Similarly, Old Carlisle to Caermote and Caermote to Papcastle are both 300 Actus, and then, Papcastle to Parton/Moresby is 466 Actus. The Acti, plural Actus is a measure of 116.706 statute feet, or 120 Roman Pes/Pedes. The other distances, which all exhibit surprising similarities, are indicated upon **diagrams Cp1D02AB and Cp1D02C**.

The alignment node northing of Wreay Fort, OS 549.6N, is similar to Beckfoot at OS 548.8N; they are 35.2Km or 23.8RM [24] apart. The alignment from Beckfoot, OS 309.0E, to Ravenglass, OS308.8E can be considered due north/south, distance 52.6Km or 35.56RM [36]. Hence it can be shown that there is a planning triangle having side ratio 2:3, based upon a 12RM distance. The calculated distance would be 11.9RM. But if a grid plot is constructed based upon this right angle, (already shown that Wreay is located some c24 Roman miles west of Brough), there is a significant planning grid of some 48 x 36 Roman miles in the landscape. This planning grid is therefore part of the original survey line from Brough to Wreay, as diagram **2C** illustrates.

The next alignment, Maryport to [Papcastle] Ambleside to Watercrock, has calculated angles of; Maryport to Ambleside, 44.83 degrees [and as such may be considered parallel to the original Brough/Wreay alignment], and a distance of 31.93RM. The Maryport to Watercrock line is an angle of 44.51 degrees and a distance of 45.035RM. The perpendicular distance between these two alignments is 24.67RM.

There is also the simple alignment between Low Burrow Bridge and Hardknot Fort, having OS northings of 501.2 and 501.5 respectively. They are 26.5RM apart thus reflecting the c13RM planning distance of the Brough/Wreay alignment.

DISCUSSION: The landscape of Cumbria is not so conducive as to allow major planning alignments. But, by using the Eden Valley for the original landscape alignments and then transferring that alignment via a perpendicular, it can be shown that a large quantity of surveying data was collected prior to the final fort dispositions. The Cumbrian littoral from Carlisle to Parton/Moresby has a closely planned set of inter-distances between forts, which in terms of early landscape planning is quite enviable.

The basis of that planning, probably a 13RM square, would appear to delimit the coast at Silloth and then possibly at Ravenglass. However, a rectangle set from Ravenglass to Beckfoot via Wreay, has Low Burrow Bridge at the point of forming a square which would have a side distance of 36RM. But it can be shown that this is in fact no more than an expansion of the original survey grid to form the 45 degree alignment. **Diagram Cp1D02C**

Thus an easy survey tool is indicated. A 12RM square would have a c17RM diagonal [16.97RM] and in terms of notation mimics the *Agrimensors* basic land division square, the *Acti Quadrati*, of 120 pedes per side. The diagonal of an *Acti Quadrati* is actually 169.706 pedes, but, if 170 pedes were utilized, the error is only 0.2944 pedes or 3.5 uncia, which in 2040 uncia, is a very manageable discrepancy. This triangle is however a false Pythagorean unit, in that $2 \times (12 \times 12) = 288$, and $17 \times 17 = 289$. But, with many other similar pseudo triangles, it is an easy mathematical calculation to make in the field when surveying.

Thus it can be shown that in the strategic and local planning of the dispositions of forts, both alignment and distance were of the paramount importance. The alignment enables the surveyor to

establish a map or 'Forma' of the terrain, at the same time as enabling the positioning of the forts, at required distances, for mutual support and protection.

That the Roman Army surveyors achieved so much in such terrain is a tribute to their skills.

It is also possible to postulate that as the Roman Mappa Mundi, (described fully in the paper "With Michael from Italy to Ireland", Ferrar 2007¹¹), was in existence and exhibited in Rome, that, the accurate survey of Britannia would allow the final part of the Roman Empire to be correctly shown.

PTOLEMY; WHAT WERE HIS AIMS?

Within the 'Geographia', *Claudius Ptolemy*¹ commences his text, chapters 1 and 2, entitled respectively, "In what Geography differs from Chorography" and "What presuppositions are to be made use of in Geography". It is worth quoting in full the first four paragraphs of chapter one:

'Geography is a representation in picture of the whole known world together with the phenomena which are contained therein.// It differs from Chorography in that Chorography, selecting certain places from the whole, treats more fully the particulars of each by themselves- even dealing with the smallest conceivable localities, such as harbours, farms, villages, river courses, and such like.// It is the prerogative of Geography to show the known habitable earth as a unit in itself, how it is situated and what is its nature; and it deals with those features likely to be mentioned in a general description of the earth, such as the larger towns and the great cities, the mountain ranges and the principal rivers. Besides these it treats only of features worthy of special note on account of their beauty.// The end of Chorography is to deal separately with a part of the whole, as if one were to paint only the eye or the ear by itself. The task of Geography is to survey the whole in its proportions, as one would the entire head. For as in an entire painting we must first put in the larger features, and afterward those detailed features which portraits and pictures may require, giving them proportion in relation to one another so that their correct measure apart can be seen by examining them, to note whether they form the whole or a part of the picture. Accordingly therefore it is not unworthy of Chorography, or out of its province, to describe the smallest details of places, while Geography deals only with regions and their general features',

The immediate impression gained from these paragraphs is of a person using a visual representation of a country/world, **a picture**, and seeing beauty in that visual representation. Thus, comments made which cast doubt upon *Ptolemy's* actual drafting of the maps would appear to be misplaced. Likewise, when we find within various papers comments like, "despite the modernity of the Legionary list, there is no trace whatever on the maps of Hadrian's Wall"², we must ask ourselves if *Ptolemy's* explanation was in vain. That he obviously had far more information available and chose which to use to practice his *Geography*, and not *Chorography*, is amply illustrated later.

PTOLEMY, A MIND ALREADY MADE UP?

Assuming that the information concerning the disposition of the Roman forts and *Poleis* was transmitted to *Claudius Ptolemy*, and it is more a rhetorical assumption because his map locations include the Legions, the question to be posited is, 'why did these details not force *Ptolemy* to revise the latitudes of *Britannia*'? That it did not is probably explained by *Rivet's*² comment regarding the turning of Scotland. He states, 'the general picture was already established in his mind: in particular, the latitudes for the north point of Britain [which, although it is not specifically stated, works out at 60° 20'] suggests that the turning of Scotland through an angle of 90° to the east had already taken place when the *ALMAGEST* was written'. The *Almagest* of *Ptolemy* preceded the *Geography* by as much as 10 years.

That *Ptolemy* utilised the work of *Marinus of Tyre*, (who it appears extended the northern limit of *Britannia* to 66N) is actually stated by *Ptolemy*. However, he was probably of Greek descent and thus imbued with their view of the world and its habitable limitations, as discussed by Jones/Keillar¹² (1996). It must also be accepted that many problems would have occurred with translations from Phoenician and Latin, to Greek, the language in which it is believed *Ptolemy* wrote his treatises. But, if he had already made up his mind regarding those facts, then what followed may be considered a fabrication and a falsification of the details.

This can be illustrated by analysing the latitudes and longitudes *Ptolemy* has given to the coastal and interior *Poleis* of *Britannia*. There are 63 coastal features and 61 inland features [includes 3 islands], listed in *Stevenson's*¹ translation. **Appendix 2** illustrates the latitudes and longitudes used by *Ptolemy* and the number of sites on each graticule; these vary from the singular to eight sites. Within the 20 degrees of

longitude, only 11 are actually listed from 15 to 27, and these account for 57 sites. This represents slightly more than 25 percent of the total graticules having more than 50 percent of the sites.

Even though the first and second diagrams in this paper, (the Roman Fort dispositions,) indicate a planned environment, it is still a comparatively random set of sites compared to the dispositions indicated by the *Ptolemaic* figures. It would therefore appear that the sites chosen by *Claudius Ptolemy* for the *Poleis* have been deliberately sanitized from a natural but planned disposition as shown by the Roman forts. In other words, there is certainly a falsification, regimentation, or need for symmetry within the *Britannia* map of *Claudius Ptolemy*, which can be explained by his decision regarding Scotland and therefore the re-alignment of *Britannia* from a westerly slope to a northerly aspect. Notwithstanding the most obvious mistake made by *Claudius Ptolemy*, the size of the world. But the falsification may be the result of a mistrust of the details transmitted to him, because of that world dimension, and his own Greek antecedents.

THE MAP OF CLAUDIUS PTOLEMY

Various writers have noted that *Britannia* is the only list of sites which does not have interspersed within the coastal list, *towns/Poleis*. The neighbouring island of *Hibernia* has *towns/Poleis* listed.

Firstly, study the map of Roman Britain⁸ with the mind focussed upon the timeline from AD43 to pre AD 146. Such an investigation will make it hard to find a coastal site upon the map which would suit '*Ptolemy's Geography*' and not his '*Chorography*'. Thus the list should be accepted as a correct transference of data, indicating that there were no coastal *Poleis* noted by the *Agrimensors* to enthrone *Ptolemy* for inclusion.

Secondly, the *Ptolemaic* map of *Britannia* should be drawn using the given co-ordinates, upon an 11:20 ratio graticule. This should be carried out ignoring the visual data of the medieval *Ptolemaic* maps¹² and in fact, even ignoring the Ordnance Survey map of Britain, to concentrate solely upon the descriptive text of *Ptolemy*.

But, if an attempt is made to draw the map of *Britannia* using the coastal points only, it will be found that there are several *Poleis* which affect that coastal plot. If a draughtsman follows the instructions of *Claudius Ptolemy* disaster could ensue. There are seven *Poleis* which affect the coastal plot, namely, *Alauna* [10], *Alauna* [14], *Pinnata Castra* [18], *Salinae* [38], *Camulodunum* [41], *Iscaelis* [51], and *Dunium* [54]. **Diagram Cp1D06** illustrates this problem.

Thus it can be speculated that *Claudius Ptolemy* wrote, or dictated the text with completed maps, **his pictures**, for reference. Although probably realising that *Britannia* had no major coastal *Poleis* to illustrate each subdivision of the island, he failed to recognise that there would be a conflict for future draughtsmen. A map can thus be drawn.

This has been attempted upon numerous occasions with similar results, but it is the comparison with the medieval map, **Codex Lat. V F. 32**¹³ which illustrates both presentation and accuracy with possible variant co-ordinates. There are several medieval copies of the *Geography* and even a claim that the whole is a *Byzantine* compilation; therefore we must expect discrepancies and copyist errors.

LOCATING BRITANNIA

There are several ancient authors, who within their texts have indicated the location of the island of Britain, viz., a European [Gaulish] littoral. The list commences with PYTHEAS of MASSALA [4th BC] and includes POLYBIUS 203BC-120BC; JULIUS CAESAR 100BC-44BC; DIODORUS SICULUS [1st BC]; STRABO 63BC-AD21; LIVY 59BC-AD17; PLINY AD23-AD79, and TACITUS AD55 to AD118.

Basically, there is agreement in the texts that *Britannia* was triangular in shape. However, the main agreement is that *Cantium Promontorium*, the nearest point to *Gaul* is the defining geographic feature and is used to locate the island viz., Europe. Thus, *Claudius Ptolemy* gives this promontory the precise co-ordinates of 22^o east and 54^o north. If the ancient writers and geographers considered *Cantium Prom.*, to be so important, even to the extent of dimensioning the journey from *Gaul* to *Britannia* at this point, would *Ptolemy* have chosen another as the prime locator?

Thus the prime locator for *Britannia* is in all probability also the defining prime point for the geographical locations of the coast and the *Poleis*. *Rivet*² argues in his paper [confirmed by *Strang*¹⁴], that

London was perhaps the focus and tabulates the *Poleis* from there, indicating a concurrence of direct distances, but not angular bearings. However, *Cantium Prom.*, 22E:54N, to *London*, according to *Ptolemy* (at 20E:54N), is a mere 550 *stadia*, 101.2 Km, 63 miles, 68 Roman miles, and, a precise geographical 110Km, 68 miles or 75 Roman miles. Hence any such calculation for *London*, which is quite accurately positioned in the circumstances, would equally apply to *Cantium Prom.* However, *London* did not have a major geographical profile prior to AD146. Its fort is early second century and although it is becoming a major player in the life of *Britannia*, it is much later that it becomes the provincial headquarters.

Would Poleis have been used by Ptolemy for a prime locator?

Surely, if the information sent to *Claudius Ptolemy* required to be synthesized to enable the lists of coastal sites and *Poleis* to be produced, it would be to a major geographical feature, i.e. *Cantium Promontorium*, that the inter-relationship would be assigned.

It should also be noted that *Cantium Prom.*, and the adjoining coastline was the main entreport for *Britannia*. *Rutupiae* is just to the north and *Portus Dubris*, adjacent to the south. There are also Roman lighthouses atop the white cliffs of *Cantium Promontorium* and this area was the early nucleus of the Roman system.

That *Cantium Prom.*, is in all probability the geographical locator can be illustrated in the most simplest of terms by the drafting of two maps; the first of *Britannia* based upon Ordnance Survey co-ordinates for ease of calculation, as **diagram 2** illustrates, but, drawn to the 11:20 ratio of Longitude to Latitude and delimited by a single point, that of *Cantium Prom.* The second is *Claudius Ptolemy's* map, to the same scale.

A NEW BASE MAP OF BRITANNIA FOR PTOLEMAIC MAP COMPARISONS

The map of Britain '*geographical*' can be redrawn to match the *Ptolemaic* presentation by first calculating from the Ordnance Survey co-ordinates a Longitude west of *Cantium Prom.*, based upon 275 *stadia* of 0.184 Km per degree and a Latitude north/south of *Cantium Prom.*, based upon a 500 *stadia* degree. Each coastal feature as named upon the *O S map of Roman Britain*⁸ can be located, as well as the *Poleis* of *Ptolemy*. The calculations are as **table 2, diagram Cp1D07**. Having drawn that map, the corresponding *Ptolemy* map can be overlaid with the one single point of correspondence at *Cantium Prom.*

Then, the actual geographical movement of each feature can be expressed by a straight line from point to point, and, that movement analysed for compatibility of coastal and *Poleis* positioning in a given area. But, because of the visual complexity of a single map with 63+61 individual lines, they have been separated into the coastal and *Poleis* plots, as listed by *Ptolemy*. See **Cp1D03 A+B and Cp1D04A+B**.

PTOLEMY'S SCOTLAND: RESOLVING THE RE-ORIENTATION

SCOTLAND: A Contorted land.

Diagram Cp1D05

Prior to discussing in detail the plot for *Britannia* below the River Wear there is one question which requires to be answered with regard to the extra-ordinary positioning of Scotland by *Claudius Ptolemy*: 'How did he achieve the contortion, and locate the coastal points and *Poleis* afterwards?'

If the putative geographical map of *Britannia*, with the *coast/Poleis* points calculated to the single point of *Cantium Prom*, is aligned to the matching *Ptolemaic* map at *Cantium Prom*, the comparison can be made. Surprisingly, from *Cantium Prom* to *Novantarum P+P* is a precise 45 degree alignment, and as such no doubt formed the crux of the *Ptolemaic* re-orientation.

However, there is an extra-ordinary prominence is given to *Novantarum Prom* and *Peninsula* on the *Ptolemaic* map. It is a prominence that in visual terms is far in excess of its geographical significance. This is of course the crux of *Ptolemy's* contortion of Scotland.

Therefore, if a comparison between the putative geographical position and the *Ptolemaic* position is made, it will be found that *Novantarum Prom* and *Peninsula* moves diagonally via a triangle of 3:4:5 side ratios, with distances based upon 3 and 4 degrees of 500 '*stadia*'. Thus points align to the original graticule, with 57N=22E of the Geog/Ptolemy *Britannia* putative plot, and 20E=58N of the *Ptolemy* plot. (**Diagram Cp1D05**)

This, the simplest of devices to move a geographical point enables calculations to be made apropos the original *Ptolemaic* plots for Scotland. *Coastal sites, 1+ 12-16* [see 3B] are determined by the

original contiguous map plot, along with *Poleis*, 1+ 4-6 [see 4B]. With *O S Britannia* turned east/west and the coincident points of *Novantarum Prom.*, and *Peninsula*, aligned to both maps, *coastal plots 2-4 and 44-46* are easily located.

NOTE: there is no pivot point at [46] *Vedra Fluvium*, it in fact moves 210 *stadia* east and 310 *stadia* north.

The *Poleis* are of the *Agricolan* period and correspond to original forts as listed. **These are not necessarily the poleis of RIVET** et al, but a new appraisal of the possibilities **generated solely** by the comparison of the two map plots. These comparative plots question the veracity of the accepted naming of many Roman sites, but do not infer they are wrong. However, it is quite possible that *Ptolemy* has mis-copied some of the details. There are after all many sites with the same or similar names in the Scottish landscape.

A study of the coastal and *Poleis* plot will indicate a distinct east/west [north/south] set of alignments, and a rather precise coincidence of the coastal plot on both maps along the north Grampian coast on the longitude 27E. The Great Glen [see 3B] is also aligned parallel to its correct position, with remarkable accuracy.

There is the obvious problem of Cape Wrath, as **diagram Cp1D06** illustrates. It being omitted from the list, but would appear to be a simple copyist error between [9] and [10], and corrected by the insertion of [9a] as 31⁰ 00'E/60⁰ 45'N and [10] as 31E not 30E. In several places it can be seen that the copyist has interchanged latitudes and longitudes when one or the other is the same reading on adjacent sites.

Thus we can confirm the methodology of *Ptolemy* and how he maintained the coordinates, to ensure that Scotland, as indicated, is a reasonably accurate map plot. It also indicates that the Roman Army on reaching this most northerly point in their advance and conquest, still found time to survey and map the landscape.

COASTAL PLOT: ENGLAND AND WALES, A BRIEF DESCRIPTION.

The re-orientation of Scotland, determined by the re-positioning of *Novantarum P+P* has automatically necessitated the re-orientation of *Britannia* south of *Vedra Fluvium*, from its westerly slope to the northerly shape it has on *Ptolemy's* map. Thus we must expect the longitudes of the coast and *poleis* to be further east than on the *Geographical Ptolemy* plot.

It is not this author's intention to list all possible points of conflict, but to select those which establish the basis for future study. **Diagram Cp1D07** lists the sites and comparisons.

Commencing with [1] *Novantarum Peninsula* and *Promontorium* [21E/61.666N] the next point [12] *Abravanus* river [19.333E/61N] would appear to indicate Glenluce and the [13] *Iena* Estuary, Wigtown Bay. The [14] *Devas* river and [15] *Novius* river are then shown to be part of a parallel set of geographical movements. **See diagram Cp1D03A+B for comparative coastal plots and Cp1D04a + 4b for the comparative Poleis plots.**

Farther down the west coast [18] *Setantiorum* harbour is the Lune Estuary to Lancaster, [which later will be shown to be one of the *Poleis*], and indicates a similar movement for the [19] *Belisama* or Ribble Estuary.

The [24] *Tuerobis* river [15E/55N] in Wales can then be shown to be the Afon Teifi at Cardigan and similarly the [27] *Ratostabius* river [16.5E/54.5N] is the Cardiff Taff/Esceley river.

The south coast of Britain indicates the first copyist mistake in that [60] *Alaunus* river [17.667E/52.667N] and [61] *Iscas* river [17.667E/52.333N] are in fact transposed by their latitudes. This has the immediate effect of placing the *Iscas* river and *Poleis* [58] *Isca/Exeter* [17.5E/52.75N] in the correct juxtaposition and delineates the River Dart as the [60] *Alaunus* river of *Ptolemy*. Then using the [62] *Tamarus* river [15.667E/52.167N] as a guide the [63] *Cenio* river is shown to be Carrick Roads to Truro.

The east coast of Britain south of the [46] *Vedra river* [20.16E/58.5N] has four parallels and the location of [48] *Gabrantuicorum bay with many harbours* [21E/57N] is shown to be the area south of Scarborough, Cayton Bay and Filey Bay, just north of Flamborough Head. (see diagram 8 for alternative discussion]

The last coastal plots which are at variance are [57] *New Harbour* which can be shown to represent Lympe or Portus Lemanis and not as suggested or rather posited by *Rivet*,² quote, "and *Novus*

Portus must surely be Dover, later known as Portus Dubris but then in process of development as an alternative port to Richborough". The [58] *Trisantonis* river can thus be shown to be the River Rother at Rye.

Finally, the coastal plot of England provides a simple confirmation for the name and location of [60] *Toliatis* or *Tanatis* island, as the Isle of Thanet, and by parallel lines, that the Isle of Sheppey is [61] *Counus* Isle, as discussed in *Rivet's*² text.

THE POLEIS PLOT OF ENGLAND AND WALES

Diagrams Cp1D04A and Cp1D04B

The **diagram Cp1D04A+B** indicates the geographical movement of the *poleis* and produces a logical visual representation of the movements necessary to form the *Ptolemaic map*. It also indicates **the illogical and transposed co-ordinates for certain Poleis**.

A] Indicated, are the adjustments made from geographical position to *Ptolemy's* ideal. It appears that it is an ideal plot because of the excessive number of *Poleis* found on one longitude, as appendix 2 indicates. If it was a random positioning, as with natural villages, then the number of Poleis, given there are only 58, is mathematically abnormal for these longitudes. There is also a problem within the confines of latitudes 57N and 58N as **diagram Cp1D06** illustrates. The Cumbrian and Yorkshire sites indicate the possibility of parallel moves eastwards. It does not appear that Slack is *Camulodunum* [*Rivet p70*], but this is discussed later, see **diagram Cp1D08**, it does not fit, but Healam Bridge may. However it is probably as the map shows, Overborough. *Rigodunum* is then possibly Lancaster/Long Preston, with an outside chance for Elslack.

Epiacum could thus be *Petriana/Luguvalium* [see **diagram Cp1D06** for alternatives]

Binchester/Vinovia is then shown as a due south movement, but it is more likely to be Low Burrow Bridge which is the diagram match. Then from *Catterick* to *Ilkley* there are parallel moves [to exact ¼ and 1/3 degree positions].

York is a due E/W movement by *Ptolemy*, which indicates that the Roman Army gave a rather precise latitudinal reading for it.

B] There was a transposing of latitudes for *Mediolanum* and *Brannogenium*, the logical movement is parallel to *Deva* or E/W, not northeast across the *Deva* line. See **diagram Cp1D04B**.

C] It appears that *Bullaeum* has just been misnamed originally by *Ptolemy*, showing that he had a lot more information available, and, as this is *Geography* not *Chorography* he did not use it all. *Bravonium* is the most likely candidate for the error.

D] *Luentinium* is probably Pennard and not *Dolaucothi* or *Llandovery* as *Rivet* suggests on page 70.

E] *Iscalis* is possibly Topsham, but more likely Caerwent. [*Iscalis* is also *Exeter*]

F] *Dunium* is possibly Dorchester and/or Ilchester, which are diagram aligned. But it could equally be the *Moridunum* of the *It. Ant.*; however Dorchester is preferred.

G] *Salinae* is possibly at the end of the road east out of *Lincoln*, but equally *SALT* could have been taken from the sea salt pans around *Brancaster/Branodunum* or from the southerly coastal fringes of *The Wash*.

H] *Urulanium*, (*Verulamium* or *St Albans*) would appear to be another mis-named site by *Ptolemy's* scribes when copying from the available data. *Durobrivae*-*Godmanchester* is an important site on the *London/Lincoln* route. *St. Albans* is too close to *London* to be an example required for *Geography* and not *Chorography*. However if it is a simple copy error and the latitude should read one degree further south, then the plot is quite acceptable.

THE TEXT OF CLAUDIUS PTOLEMY: EAST COAST

Diagram Cp1D08

The coastal list of *Claudius Ptolemy*, east coast, south of *Vedra Fluvium*, is as follows;

46;	mouth of the Vedra river	20 10	58 30
47;	Dunum bay	20 15	57 30
48;	Gabrantuicorum bay with many harbours	21	57
49	Oculus promontory	21 15	56 40
50;	mouth of the Abi river	21	56 30
51;	Metaris estuary	20 30	55 40

52; mouth of Gariennus river 20 50 55 40

Note: although *Ptolemy* is practising *Geography* and not *Chorography*, a major coastal feature, Flamborough Head has been omitted! This is not the only major feature omitted, but it is significant, as is now illustrated.

The list of *Poleis* by *Ptolemy*, east coast, equivalent to the coastal area is as follows;

	24;	Caturactonium	20	58
	26;	Isurium	20	57 40
	29;	Eboracum, Legio VI Victrix	20	57 20
	30;	Camulodunum	18	57 45
		Near which on the Opportunum bay are the PARISI and the town of		
		Petuaria	20 40'	56 40'
Later in list	38;	Salinae	20 45'	55 50'

From the lists, it is immediately evident that there is NO *Opportunum bay* mentioned in the coastal listing, and, 30; *Camulodunum* is probably out of place in a logical southerly listing. See **diagram 8** for the comparisons.

If we consider the positioning of *Opportunum bay*, it is in all probability south of 48; *Gabrantuicorum bay with many Harbours*, yet north of *Ocelus promontory*, Spurn Head. Obviously the only contender is **Holderness Bay** with its lost towns or *poleis*, as diagram 8 illustrates. By actually drawing a Bay between those two locations, we find automatically a headland is formed which of course corresponds to the 'lost' Flamborough Head.

If we also accept a mis-copy for 30; *Camulodunum*, 57 45' north as listed in *Ptolemy*, and replace it with a more likely 57 15' north, a move of half a degree south, there is a very good correspondence upon the map with the putative **Holderness bay**.

This southerly movement would also place 30; *Camulodunum* in a position viz., the *poleis*, to give greater credence to the assertion by *Rivet* that it equated to Slack.

Whilst dealing with the east coast, it is necessary to look at the location of 52; mouth of the *Gariennus river*, 20 50' : 55 40' and it's curtailing of the bulge of *Anglia*. This is undoubtedly another mis-copy. By altering the longitude from 20 50' to 21 50' the bulge re-appears, and, when equated to the putative *OS PTOLEMY Geographical Plot* indicates a rather good and quite extraordinary match.

It would therefore appear, that an assertion of this paper, that *Claudius Ptolemy* had much more information available than he has utilised is borne out by his own words. It also appears from the text that he probably dictated it whilst looking at a '**picture**', a map, and missed the nuances of the original drawn plot.

Add to this the mis-copy of longitude and latitude references over the centuries and we arrive at the necessity for a method of evaluating those which appear contradictory. The *OS PTOLEMY Plot* provides for that evaluation.

CONCLUSION

The placing of the two plots, *Coastal/Poleis* as overlay to each other provides for a comparison of movement in a given area. These appear to have a logic that is consistent throughout the English, Welsh and Scottish landscapes.

There is little doubt that the shape of *Britannia* was pre-conceived and is not the result of a plot using survey details supplied through the Roman governmental offices. To achieve the desired result, the manipulation of the survey details to fit the desired plot had to be logical and capable of repetition. A random selection or movement of coastal plot and *Poleis* plot would therefore have been unacceptable. Thus it must be considered that *Ptolemy* had supplied or had drawn, in map form, the information presented via the Roman authorities prior to the production of his maps. This enabled him to manipulate its form to suit the required latitudinal measures. Thus, the straightening of *Britannia* is a direct result of the positioning of *Novantarum peninsula and promontory* which allowed Scotland to be rotated through c90 degrees, and laid on its side.

There is no doubting the genuineness of his desire to accurately portray the oikoumene, but, only as he perceived it. Mistakenly of course!

It is therefore plausible that the Roman survey of *Britannia* provided for an accurate map of Britain, and thus accurate information available to *Claudius Ptolemy* prior to cAD146. That *Ptolemy* persisted with his world size of 180,000 ‘*stadia*’ and thus the shoe-horning of the continents into a reduced area, probably illustrates a closed mind, a decision taken, and, regardless of the evidence available, it was adhered to.

But, in the turning of Scotland we see a mathematician at work, using a triangle with side ratios of 3:4:5 to achieve a falsification of the map, and an adherence to false latitudes.

However, as diagrams **Cp1D03A+B** and **Cp1D04A+B** indicate, when a proper comparison between maps, drawn using the same parameters is made, the work of *Claudius Ptolemy* is as Stevenson¹ remarked, “*so nearly accurate in his records*”. Had he chosen to use the world size of *Eratosthenes*, 252000 *stadia* of 157.5m, the resultant map would have been fantastic.

But why did this extra-ordinary man not seek to validate the size of the world?

M J Ferrar, 2009

Note.

This text is the first of four which explains the Geography of Marinus the Tyrian and Claudius Ptolemy. The second text is entitled: *The Mediterranean Sea of Marinus of Tyre and Claudius Ptolemy. An investigation of the methodology and distance measures utilised.* The third text is entitled: *India intra et extra Gangem + Sinae and Taprobane. The maps of Claudius Ptolemy explained with the resolution of place-names including Cattigara Sina.* The fourth text is entitled: *The text of Marinus the Tyrian and Claudius Ptolemy, Geographia, Book 4, chapters 1, 6, 7 and 8. The west coast of Libya explored and the zero longitude determined.*

APPENDIX: ROMAN PLANNING

Diagrams Cp1D01 and Cp1D02

These diagrams represent the Roman development of Britannia from AD43 to cAD130. They indicate the direct distances calculated from the Ordnance Survey co-ordinates in Roman Miles. The Roman Mile is 0.919118 statute miles or 1.4791 Km.

There is a repetition of c60, c105 and c120 Roman mile distances as the schedule of distances which follows indicates.

The diagram **2** indicates the following;

- 1] Establishes the first bases after the march from Cant Prom via the London ford.
- 2] Establishes London and Wroxeter as sites and Watling Street commences.
- 3] Includes extension to York and establishes part of Foss Way and more of Watling Street
- 4] Extends the plot to include Deva (Chester) and Exeter [Isca]
- 5] Extends the plot to Catterick, an important fort and road junction, and includes Ratae (Leicester) and Mancunium (Manchester).
- 6] Extends into Wales and the Hadrianic Wall line with other important sites of the era.

What becomes so very apparent is the use of latitudinal lines across country with two parallels through 1) *Camulodunum to Glevum and Maridunum*: 2) *Lindum to Deva to Segontium*.

Excellent diagrams illustrating the timescale of the Roman occupation are to be found in; CORNELLI TACITI, DE VITA AGRICOLAE, edited by *Ogilvie* and *Richmond*, Oxford, (1983). In chapter 5, pages 31 to 46, entitled “*Tacitus and the Geography of Britain*”, there is an excellent critique of the work by *Claudius Ptolemy* and a summation of the information available.

The second remarkable planning tool is the congruent triangle. There are two apparent on the plot, as **diagram Cp1D05 illustrates**.

Also there is the Deva planning triangle with side ratios 3:4:5 based upon 50 Roman miles, and the Manchester 45 degree triangle, all of which tend to illustrate a cohesive geometrical pattern which underpins the whole Roman layout.

SCHEDULE OF DISTANCES

C40 RM

Wroxeter to Deva, 41RM: York to Catterick, 40RM: Catterick to Arbeia, 47RM

Deva to Manchester, 36RM: Glevum to Burrium, 33RM

C50RM

London to Colchester, 51RM: Isca to Dorchester, 53RM: Dorchester to Venta, 57RM: Colchester to Venta I, 55RM

C60RM

Cant Prom to Colchester 60RM : Gloucester to Wroxeter, 63RM : Lincoln to York, 60RM : York to Manchester, 64RM :

Venta to London, 67RM : Chichester to London, 60RM : Deva to Segontium, 62RM : Burrium to Carmarthen, 66RM

Wroxeter to Ratae, 69RM : Carlisle to Arbeia, 65 RM : Carlisle to Catterick, 68RM.

C100RM

London to Glevum, 108RM : Wroxeter to Lindum, 105RM : Deva to Lindum, 106RM : Deva to Glevum, 104RM : Glevum to Isca, 105RM : Ratae to Colchester, 109RM : Deva to York, 100RM : Deva to Catterick, 105RM : Lindum to Venta I , 97RM : Glevum to Carmarthen, 96RM : Carmarthen to Segontium, 96RM
 Ratae to Venta I, 112RM: Burrium to Deva, 112RM: Manchester to Carlisle, 112RM: Deva to Petuaria, 111RM: Deva to Brocavum, 110RM
 C120RM
 Colchester to Lindum, 120RM: Wroxeter to York, 120RM: Glevum to Manchester, 121RM: Deva to Carmarthen, 120RM
 C130RM
 Glevum to Lindum, 130RM: Lindum to London, 130 RM: Deva to Carlisle 129RM
 C140RM
 Colchester to Glevum, 146RM: London to Wroxeter, 147RM
 C170RM
 Colchester to Wroxeter, 174RM: London to Isca, 174RM: London to Deva 180RM: Deva to Colchester, 199RM

Appendix 2; Repetitive Use of Certain Longitudes.

Longitudes	Coastal	Poleis	Totals
15	21, 24	56, 57	2 + 2
17:30'	17, 19	54, 58	2 + 2
18	14	27, 30, 37, 45, 54	1 + 5
19	13, 59	1, 3, 6, 25, 28, 46	2 + 6
20		5, 24, 26, 29, 47	0 + 5
20:10'	46, 54	2, 13	2 + 2
20:30	2, 51, 55	40	3 + 1
21	1, 48, 50, 57	15, 41, 48	4 + 3
23	6	11, 14, 60	1 + 3
24	5, 43	16, 20, 61	2 + 3
27	8, 37, 39, 40		4 + 0

The coast and town numbers are as diagram 7, and the list covers the land area below a line from *Vedra Fluvium* to *Ituna Aest.*, numbers 46 and 16 of the coastal plot. Thus there are only 33 coastal plot points and 36 *town/poleis* points considered.

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