GREEK AND ROMAN MAPS

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CHAPTER XI

THE DEVELOPMENT OF PTOLEMAIC MAPS

The legacy of Ptolemy's *Geography* lasted well over thirteen hundred years. As mentioned above (p. 80), he only once says that for his *Geographike Hyphegesis* (Manual of Geography) he has had maps made. Chapter headings in manuscripts such as 'Map 1' could perhaps be later interpolations. Elsewhere Ptolemy criticizes Marinus' map-making in detail. J. Fischer believed that the extant maps are derived by repeated re-copying from maps of the second century AD.[1] This theory was attacked by L. Bagrow[2] and others, but still has its devotees today. We do not hear from any ancient sources except Agathodaimon (p. 80) of a map relating to Ptolemy's *Geography*, though Cassiodorus may well be thinking of one (see below). Agathodaimon mentions only drawing a world map from it; we do not know whether he also drew regional maps. If neither he nor others did, readers could only visualize Ptolemy's topography if the work had maps or if they also possessed Marinus' work, unless the co-ordinates can be considered to have offered sufficient mental image. This could explain why Marinus' treatise long continued in circulation despite Ptolemy's criticisms: it is even mentioned in Arabic works.

LATER GREEK AND LATIN USE OF THE *Geography*

Pappus of Alexandria (*fl.* 379–395) is quoted by the Armenian geographer ps.-Moses of Chorene as having 'followed the individual map [or sphere] of Claudius Ptolemy'.[3] Fischer took this as proving that Ptolemy maps existed in the time of Pappus, whom he wrongly dated to one hundred years after Ptolemy. Ziegler, however, points out that the *Chorography of the oikumene*, as Pappus' title may be rendered, was probably a complete re-working of Ptolemy,[4] and Bagrow maintains that the Armenian

word involved means 'sphere', not 'map', and that Pappus 'described the universe on the basis of the sphere made by Ptolemy'; though the title seems to rule out such a suggestion.

Some have thought that Marcian (p. 141) must have worked from regional maps based on Ptolemy, whether composed by a predecessor or by himself. It would certainly have helped him enormously to have had a world map at least, as has been seen in connection with north Britain. But the other source which he quotes apart from Ptolemy, the *Measurement of Stades* by one Protagoras, who presumably lived after Ptolemy, could have made maps less necessary for him. This mathematical geographer could have obtained figures of distance from Place A to Place B by reducing longitude by the cosine of the latitude.[5] Marcian's own contribution evidently lay in checking known distances against Protagoras' conversion of Ptolemaic co-ordinates.

Cassiodorus (*c.* 487–583), who was minister to Theodoric, King of the Goths, in Italy, advocated the study of Ptolemy. He founded a monastery at Vivarium near Squillace, south Italy, which clearly possessed a manuscript of the *Geography*, presumably in Greek, with or without maps. After commending first cosmography, then works on Constantinople and Jerusalem, he writes: 'Learn up the *pinax* [map] of Dionysius (Periegetes) . . . . Then, if you are inflamed by pursuit of this noble form of knowledge, you have a codex of Ptolemy, who so clearly drew [or described: the Latin is *tam evidenter descripsit*] all places that you may judge him to have been almost a native of every region. In this way, though established in one place as monks should be, you may mentally digest what one man's travel has collected with the greatest toil.'[6] In a letter from King Theodoric composed by Cassiodorus, the writer reminds Boethius that among the works which the latter had translated into Latin was the astronomy of Ptolemy.[7] Whereas Cassiodorus was a tolerably good Greek scholar, the Ravenna Cosmographer, although he quotes Ptolemy as an authority for the Roxolani and the R. Vistula, shows a lack of knowledge of Greek institutions by confusing him with Ptolemy I of Egypt or one of his successors.

ARAB USE OF PTOLEMY

Muslim geographers seem to have acquired and used copies of Marinus' map and Ptolemy's *Geography*, not necessarily complete

and possibly in Syriac translation, as early as the eighth century. In the early ninth century al-Ma'mun, Caliph of Baghdad AD 813–833, set up an Academy of Science, which among other things produced a world map (lost) and 'improved tables', i.e. modernized co-ordinates. What is meant by the latter may clearly be seen from the *Kitab Surat al-Ard* of al-Khwarizmi (d. after 850).[8] This is thought to have been derived from a Syriac text and maps through the medium of an Arabic world map, the latter being either by al-Khwarizmi himself or by Ma'mun. Text and maps are preserved in a Strasbourg manuscript,[9] but the maps are thought to be later than al-Khwarizmi. They include one of the Nile valley, with south at the top in contrast to north on Byzantine Ptolemaic maps.[10] Two main sources of the Nile, from the south, and one subsidiary source, from south-east, are shown, and after many meanders it forms a delta with six distributaries, the westernmost near Alexandria. In the text the places are arranged according to their *klimata*,[11] starting with *Klima I* in the south, and are given longitudes and latitudes as in Ptolemy, in an Arabic form of the Milesian numeration.[12]

Some places are Ptolemaic, and here the co-ordinates more often disagree than agree, some non-Ptolemaic. It had been carefully revised so as to include new places. Kairouan, for example, did not exist in Classical times. We can see from the context that the latitude is not correct but is worked out in relation to adjacent Ptolemaic places, no doubt by reference to the Ma'mun map.

Ptolemy	*al-Khwarizmi*	*Longitude*		*Latitude*	
		Ptol.	*al-Kh.*	*Ptol.*	*al-Kh.*
Kulkul	Kulkul	28°30′	28°30′	31°15′	31°
—	al-Kairuwan	—	31°	—	31°40′
Bulla Regia	Rigiya-on-sea	30°40′	31°40′	31°30′	31°30′

The fact that some Egyptian places are entered doubly is thought to be due to revisions being incorporated without the original entries being deleted. There was in the time of al-Mas'udi (d. *c.* 956) at least one copy of Ptolemy's *Geography* with coloured maps containing according to him 4530 cities and over two hundred mountains. As the names of seas (and presumably other place-names) were in Greek, he says, he could not read them. But clearly

we are dealing with regional maps and not merely a world map.[13] Al-Battani of Raqqa, Syria, included lists of towns with revised co-ordinates,[14] compiled about 901, in his astronomical tables.

Al-Biruni (973– after 1050) used the same method as is thought to have been used by the geographical mathematician Protagoras (p. 155) to calculate distances from Ptolemaic co-ordinates. In all, about 12,000 place-names are given co-ordinates of Ptolemaic type by various Arabic geographers, and these are in course of being collated at the American University of Beirut.

BYZANTIUM

In the late thirteenth century it was Maximus Planudes (*c.* 1260–1310) who in Constantinople revitalized Ptolemy's *Geography*.[15] He was a learned monk at Chora monastery, whose church with fine mosaics is still preserved as a museum on the outskirts of Istanbul. Unlike most Byzantine scholars of the period, he had a good knowledge of Latin. He was also interested in Greek astronomical and geographical works; he revised the *Phaenomena* of Aratus and collated old manuscripts of Strabo. He searched for manuscripts of Ptolemy's *Geography*, and his search was rewarded in 1295, but it was not as exciting as he had hoped. As he explains in a letter and in some verses,[16] after at last finding what he knew was a neglected work, he was disappointed to discover that it had no maps. He therefore set about providing maps to accompany the text. We almost certainly possess the manuscript which Planudes then encountered, since codex Vaticanus graecus 177, of the late thirteenth century, indicates that he was its owner. The only reference to a drawn map in that manuscript is the note inserted by Agathodaimon. But it seems not unlikely that Planudes had heard or read of maps earlier extant. For example, Vaticanus graecus 191 is a good manuscript of the same period or a little later. It has no maps, yet there is a note to the effect that there are twenty-seven maps instead of twenty-six, the tenth map of Europe having been divided into two. The obvious explanation seems to be that this is a note copied from a preceding manuscript which had maps.

The emperor (1282–1328) who acted as patron of map-making based on Ptolemy was Andronicus II Palaeologus. He was impressed by Planudes' maps and asked Athanasius, retired Patriarch of Alexandria, who from 1293 to 1308 was living in

Constantinople, to have made for him a special copy of the *Geography* with maps. There seems little doubt, despite the lack of any dedication, that this is the famous codex Vaticanus Urbinas graecus 82, reproduced in facsimile with extensive commentary by J. Fischer.[17] It came to the Vatican in 1657 from the library of Guidobaldo, Duke of Urbino, who is thought to have inherited it from his predecessor, Duke Federico da Montefeltro, and must be considered one of the world's masterpieces of cartography. It measures 57 × 41.5 cm, and is richly illustrated. The colours on the maps are the traditional ones of blue for sea and rivers, outlines of coasts and rivers being drawn rather schematically, brown for mountains, usually shown as straight ridges or gently curving ridges; these colours are very well preserved. The world map, at the end of Book VII, is on Ptolemy's first projection (simple conic), with the oikumene surrounded by a conic frame. Outside this frame are winds, shown as faces blowing horns, and signs of the zodiac in red circles. There are 26 regional maps, comprising 10 of Europe, 4 of Libya (= north Africa) and 12 of Asia; these are interspersed in the text of VIII.3-28. As intended by Ptolemy, they are rectangular, each being given the proportion of latitude to longitude appropriate to the region. Meridians appear every 5 degrees, half-degree marks being shown in the outer frame. Parallels appear at every quarter-hour of maximum sunlight, a method adopted by Ptolemy in Book VIII; whereas in the marginal frames degrees of latitude are given, as in his co-ordinates. Place-names entered, whether civilian or military, have their centre indicated by a rectangle, which in the case of those considered important[18] is elaborated into one with castellated top. In a heavily populated area the large number of rectangles and names results in a somewhat cluttered effect. Special features like altars and columns are, as in the Peutinger Table, given conventional signs.

One set of conventional signs deserves particular notice. In areas of western Europe where the Romans had institutionalized native tribes of a province into *civitates*, Ptolemy's text, although it gives no indication of boundaries, allocates to individual tribes the places for which co-ordinates are given. Thus an extract from the British section reads as follows: 'Further south than these [the Damnonii] are the Otadini [= Votadini], in whose area are the following places:

Curia	20°10′	59°
Alauna	23°	58°40′
Bremenium	21°	58°45′ '.[19]

Plotting such places on the map, given their longitude east of the Canaries and their latitude, presented no problem to the Byzantine scholars, despite their unfamiliarity with Britain. But in the absence of boundaries a method was needed for indicating the attribution of *poleis* (places, literally 'cities') to tribes. This was effected in the Urbinas by a system of small conventional signs, originating in astronomical writings, attached to each place-name in these provinces. We may therefore think of the Urbinas in these regions as the father of political maps, since the first printed editions of Ptolemy devised boundaries to replace the symbols. The existence of these signs does not provide evidence of copying from previous maps whose archetype was in or shortly after Ptolemy's time, since with a reliable text the whole visual system could have been reconstructed, probably with no maps, certainly with only a world map to act as basis.

Such a degree of accuracy was not followed in other Ptolemaic maps, apart from the Latin translation (p. 161) which was modelled very closely on the Urbinas. The two codices with maps whose text and format most closely resemble the Urbinas[20] are in Istanbul (Seragliensis 57) and Copenhagen (Fabricianus graecus 23, only a double folio preserved). These may have been private copies made for Planudes and Athanasius. It is a pity that Planudes was not

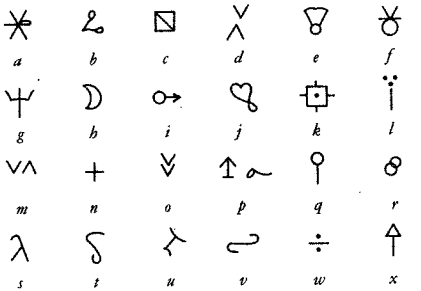

Fig. 28. Ptolemy: conventional signs for British tribes in Codex Urbinas graecus 82, Vatican: (a) Atrebates, (b) Belgae, (c) Brigantes, (d) Cantium, (e) Catuvellauni, (f) Coritani, (g) Cornovii, (h) Damn(on)ii, (i) Demetae, (j) Dobunni, (k) Dumnonii, (l) Durotriges, (m) Iceni, (n) Novantae, (o) Ordovices, (p) Parisi, (q) Regni, (r) Selgovae, (s) Silures, (t) Taexali, (u) Trinovantes, (v) Vacomagi, (w) Vennicones, (x) Votadini.

able to follow up his rehabilitation of the *Geographia* by a visit to the chief centres of learning in the West. Such a journey might well have resulted in the dissemination of manuscripts of a Latin translation a hundred years before it actually happened. As things were, it is premature to speak of a general renaissance of Classical cartography at this time.

Mention should also be made of Vatopedi 655, of the early fourteenth century. Vatopedi is an old and famous monastery on Mount Athos. The text of this manuscript, which includes Strabo and minor Greek geographers, is of some interest. But the maps have been shown to be poor copies of the Urbinas, obviously made before the latter found its way to Italy. Moreover the manuscript has been dismembered to some extent. The map of the oikumene, in simple conic projection, was abstracted by the Greek collector Simonides in the nineteenth century and is now in the British Library;[21] while several folios were said by Bagrow to be in a Leningrad museum.[22]

In addition to manuscripts with twenty-six or twenty-seven maps, which are known as those of Recension A, there are somewhat later manuscripts, known as Recension B, which have sixty-five maps. The earliest of these extant is in Florence, Laurentianus XXVIII.49, of the early fourteenth century. It is of smaller format and its whole arrangement of maps is different. Maps of Europe, in Books II–III, number twenty-five; of Libya, in Book IV, number eight; of Asia, in Books V–VII, number thirty-one. This gives a total of sixty-four, followed by a map of the oikumene in a simple conic projection. Conventional signs for towns tend to be different from those of Recension A, including from one to three towers. There are a number of other manuscripts with Recension B maps, dating from the fourteenth and fifteenth centuries, including some with 'modern' maps. One cannot say that the great increase in number of maps in B as compared with A improved the cartographic detail: on the contrary, the Urbinas maps of Recension A remain the most detailed and accurate.

LATIN TRANSLATIONS

Contact between Byzantine and Western scholarship was only sporadic until late in the fourteenth century. In 1395 Manuel II Palaeologus sent the scholar Manuel Chrysoloras (*c.* 1350–1415) to

Venice, whose help he was soliciting as an ally against Turkish inroads.[23] In Italy he made contacts with Classical scholars, and returned to Constantinople with his gifted student, the Tuscan Jacopo d'Angelo da Scarperia. Two years later they were back in Florence, where Chrysoloras had been invited for two years to teach Greek. Although they had brought manuscripts with them, there was an obvious need for the translation into Latin of such works as were unfamiliar in the West.

Chrysoloras, who translated Homer and Plato, himself intended to translate Ptolemy's *Geography*, but delegated the task to Jacopo d'Angelo,[24] who from 1401 was secretary to the Papal Curia. The Greek manuscript used by Angelo for his translation has not been identified. The translation was completed in 1406 and originally dedicated to Pope Gregory XII; this may be seen from the earliest manuscript,[25] whereas others have a dedication to Alexander V (1409–10). In his introduction Angelo praised the author of the *Geography* for drawing the earth on a flat surface while keeping the size of regions in relation to each other and to the whole earth relatively proportionate, and for incorporating a practical system of latitude and longitude co-ordinates. He was, however, no mathematician, and his comprehension of the mathematical content of the work was criticized later in the fifteenth century by Toscanelli and Regiomontanus.[26] For Ptolemy's title *Geographike hyphegesis* he substituted *Cosmographia*. This was an unfortunate choice, since it would most naturally be taken as describing the mapping of the universe. Nevertheless, it continued to be used in successive editions of his translation, and it was not until the late fifteenth century that the alternative title *Geographia* was substituted.

Angelo had not latinized the Greek wording on the maps, and may in fact have issued his translation without maps. Latinization was first executed in 1415 by Francesco Lapaccino and Domenico Boninsegni. They exactly copied the maps of Urbinas graecus 82, and their Latin maps are preserved in the extant Vaticanus latinus 5698. It has been conjectured that this manuscript, which contains only maps, was intended as a supplement to Parisinus latinus 17542, which has text only; but this cannot be proved.

The chief promoters of Ptolemaic cartography were Florentine humanists such as Palla Strozzi under Medici patronage. In 1434 Strozzi moved to Padua and continued his support from there.

Other areas of Italy too had their patrons: in Ferrara, for example, there was the Duke Borso d'Este. Church patronage was also important, particularly in the revision of Ptolemaic maps. Thus in the papacy of Pius II (Aeneas Silvius Piccolomini), 1458–64, cardinals saw to the supplementation of Ptolemaic maps by *tabulae modernae*, newly drawn maps to add to cartographic knowledge in selected areas of the world. Some of these, such as Scandinavia and Ethiopia, were beyond the reach of detailed Ptolemaic mapping, while others were within it but needed some updating.

One of the most famous names in the development of Ptolemaic cartography was Donnus Nicolaus Germanus (*c.* 1420–*c.* 1490),[27] a Benedictine monk of German origin at the Badia di Fiesole near Florence, who worked among others for the Vatican and for Borso d'Este. His greatest innovation was the use of trapezoidal projection for Ptolemaic maps. Ptolemy had said that he included his first as well as his second projection for the sake of those who through laziness were attracted to that easier method.[28] Donnus Nicolaus therefore began to think how he too could originate a new projection.

During the fifteenth and sixteenth centuries there was great demand for elaborately decorated Ptolemaic maps, especially in court circles. One of the most ornate, with magnificent calligraphy and illumination, is a copy made for Henri II of France and now in the Bibliothèque Nationale, Paris.

PRINTED EDITIONS

From the 1470s dawns a very different period, that of printed editions of the *Geography*. The earliest with maps were produced in Bologna (1477), Rome (1477–8) and Ulm (1482). The first printed text, that of Vicenza (1475), had no maps. Now vastly more copies could be produced and disseminated. The more they were used, the more they could be revised, criticized and ultimately replaced.

The Bologna edition[29] has the first maps to be printed from copper plates, a significant advance in the history of cartography. Unfortunately they are not as accurate or attractive as those of the Rome edition, the reason evidently being that the editors were rushing them out so as to anticipate their Rome rivals. The world map is on Ptolemy's first projection. Instead of the customary twenty-six maps of Recension A, there are twenty-five, parts of

Asia Minor being inserted in the tenth map of Europe. The Latin text and maps have many misprints, e.g. *n* for *m* in CLAVDII PTOLEMAEI | COSNOGRAPHIAE LI | BER PRINVS; and on the map of Britain ALBIVNINS | VLABERT | ANIA stands for *Albion insula Britannia*. Forests, as in some manuscripts, are represented as clumps of half a dozen or more trees. Town names are in capitals with a dotted circle to show the exact location; but on many maps, including that of Britain, only a selection is given. Sarmatia has RIPHEV. M. (*Riphaeus mons*) surmounted by Alexander's columns. Mythical attributions to Alexander's visits exist in Ptolemy's text, but there is here a confusion between his columns and his altar. From there south-west to the Carpathians are first one ridge of mountains, then in places up to four. The maximum length of daylight is given as well as latitudes.

Following hard on its heels was the Rome edition of 1477–8,[30] whose preparation clearly started long before that of Bologna. The promoter of this edition was Conrad Sweynheym, who about 1464 had set up at Subiaco the first printing press in Italy. Two letters from Domizio Calderini to Pope Sixtus IV give details of this. Referring to Sweynheym's activities from 1473 or 1474, he wrote: 'Calling in mathematicians [presumably to explain the projections], he taught how maps could be printed from copper plates. After spending three years on this labour he died.' The work was taken up by his associate Buckinck; but there was inevitable delay. The world map is on Ptolemy's first projection, and there are twenty-six regional maps. The lettering is in two sizes of very clear capitals, and the whole of the mapwork is carefully done. Altars surmounted by flames are large and prominent, and mountains have a distinctive inverse UUU shape. The area enclosing the Indian Ocean to the south is marked *terra incognita*.

The Ulm edition,[31] the first printed edition of the *Geography* to appear outside Italy, had maps designed by Donnus Nicolaus Germanus (p. 162), as we can read in the colophon. The world map is on Ptolemy's second projection, with a few additions north of the 63° latitude; these were amplified by him in subsequent recensions. Many of the maps are noticeable for the reversed И, possibly serving as a sort of trademark. The regional maps are in Donnus Nicolaus' trapezoidal projection, except that the map of Spain is rectangular and that of Egypt-Ethiopia is in the form of a double trapezium widest at the equator. In addition to forests,

there are conventional signs for altars, shrines etc. Undoubtedly in certain respects the maps served an antiquarian purpose, being over a thousand years out-of-date for some considerations. Thus, for some regions, including Britain, tribal boundaries are shown, presumably inserted somewhat arbitrarily from a map which had conventional signs indicating distribution of towns to tribes. Britain also has far more entries than in the Bologna edition, with little inaccuracy. Whereas the Bologna edition labels its mountains, the Ulm edition puts wording, such as *taur 9 mons* for the Taurus range, by the side of a range in minuscules. The result is that empty white spaces are all that is left on the ranges, which make them look rather like lakes. Those early editions were all printed in black and white, but could be hand-coloured.[32] Such hand-colouring could be done with a manuscript as model. In order, however, to provide for uncoloured copies, better solutions for showing mountains proved to be shading or hachuring.

PTOLEMY IN THE AGE OF DISCOVERY

The Portuguese discoveries sponsored by Prince Henry the Navigator had resulted by 1445 in the rounding of Cape Blanco and Cape Verde, and geographers began to take a new look at Ptolemy to see if Africa could be rounded to reach the Indian Ocean. Even if reports of early circumnavigations of Africa were unknown or disbelieved, the theoretical idea of an encircling ocean was extremely ancient. But the enclosing of the Indian Ocean by a strip of land extending from east Africa to the Malay Peninsula is found in Ptolemy's text[33] as well as in the late Byzantine and Renaissance regional maps and some of the world maps (p. 178). Eventually it was the voyages of Bartolomeu Diaz, more correctly Dias (1487), and Vasco da Gama (1497) that necessitated changes from Ptolemaic cartography. As in the north, these were sometimes effected by means of *tabulae modernae*, when the usual practice was to include the old map as it was and add a new one (though we still, for example, find the Ptolemaic shape of north Britain in a *tabula moderna* of Scandinavia, in the Rome Ptolemy of 1507[34]). In the intervening period there was some attempt at reconciling Ptolemy maps with the partial circumnavigation of Africa, as can be seen in the Martin Behaim globe of 1492.[35] But as marine discovery in the south and south-east progressed, maps

broke away from Ptolemaic shapes, and Taprobane, thought not to be Sri Lanka because it was too big, was reallocated to an island off the Malay Peninsula.

As cartographers came to realize, Ptolemy's view of the Old World had its defects. The principal defect was that he had wrongly calculated the length of the Mediterranean and the east–west length of the oikumene in terms of degrees of longitude. His length from the Straits of Gibraltar to the Gulf of Iskenderun amounts to 62°, whereas the actual length is 41°40′. His length from the Canaries to Cattigara amounts to 177°, and to Thinae 180°, whereas from the Canaries to Hanoi is actually 124°. The dimensions of the Mediterranean were much better calculated on some fourteenth-century portolans, but many maps continued to use the earlier measurements even as late as the seventeenth century. Secondly, there are numerous misconceptions, both within and outside the limits of the Roman Empire, such as have been mentioned in Chapter V.

The legacy of the *Geography* played a vital part in the discovery, or re-discovery, of America, and editions of Ptolemy were amended to include the newly known lands.[36] Christopher Columbus and his brother Bartholomew, a chart-maker, had access to Ptolemaic maps. By extending the east–west length of Eurasia to 225°, which had been Marinus' figure, and then adding 28° for the lands discovered by Marco Polo, plus 30° to the east coast of Japan, Columbus concluded that the voyage to Japan from the Canaries, for which he wrongly added another 9°, would occupy only 68° longitude.[37] An edition labelled as Ptolemy's *Geography*, that of Waldseemüller (1507), actually has the first naming of America as a continent. It is to be found both on the map and in a text of the same year intended to accompany the map but probably written by Waldseemüller's associate, the poet and humanist Matthias Ringmann.[38] In this text Ringmann, if it was he, wrote: 'Since a further fourth part of the world has been discovered by Americus Vesputius [Amerigo Vespucci] . . ., I do not see why anyone should object to its being called, from its shrewd discoverer Americus, "Amerige", as if "Land of Americus", or "America", since Europe and Asia have derived their names from women.' It is now obvious that this cannot be 'Ptolemy's *Geography*', as Ptolemy had no conception of such a world. It was not to be long before the new discoveries and a

general desire to break away from tradition caused a split between historical and contemporary cartography and an end to the practice of fathering world maps on Ptolemy.

So Ptolemy, having in Classical times influenced cartography and the recording of latitude, for example in portable sundials, had by the Renaissance come to be so esteemed that he had almost dominated mapping of the world, determined its exploration and therefore influenced its settlement. The advantages of his method were that one had detailed text and could have accompanying maps, plotting places by exact textual co-ordinates; that the regional maps were easy to construct, being orthogonal, and designed to reduce distortion to the minimum; and that the affiliation of towns to political areas could be indicated by conventional signs. The disadvantages were that his first world projection was an awkward contrivance even in Ptolemy's time and became more problematic with the southward extension of the known world, while the second projection had meridians whose curves were difficult to draw accurately; that rivers tended at best to be sketchily represented; that mountain ranges were inserted somewhat arbitrarily in the absence of detailed co-ordinates in the text, while individual peaks hardly appeared at all; and that coastlines were devised to link plotted coastal places rather than accurately surveyed. Moreover throughout the centuries there was a tendency to accord the *Geography* the type of infallibility accorded, for example, to Aristotle, so that it was a long time before editors had the courage to correct even features known to be incorrect. This attitude was, however, not that of the early Arab cartographers like al-Khwarizmi, whose aim was, by insertion of new material, to create a really up-to-date map. But these were often misunderstood by Europeans, and total map knowledge did not advance as a simple addition of the two. In fact they helped to compound Columbus' errors.

CHAPTER XII

FROM ANTIQUITY TO THE RENAISSANCE

THE LATE EMPIRE

There seems to be little doubt that with few exceptions the standard of cartography declined under the late Roman Empire. Assessment, however, is difficult, since some items known to have existed are lost, for example the geography or map which Alypius sent to Julian (Emperor 360–363) from Britain, while others are preserved only in late manuscripts. One example in the latter category is the Notitia Dignitatum,[1] a list, as its name implies, of civilian and military office-holders and administration, accompanied by maps of appropriate locations. Its dates are between 395 and 413, perhaps with later revision, and it is divided between Eastern and Western Empire. Even if the extant Notitia is not an official document but an unofficial copy, as some believe, one might expect it to have respectable maps, especially as there was a branch of the civil service in Rome at that time which dealt with maps. It was under the *comes formarum*,[2] though we know nothing of its activities. But instead of being influenced by such a department, the maps seem to have been compiled line by line from the text, by someone who had little topographical knowledge and who inserted place or province names in textual order. Perhaps this reflects greater difficulties of travel in the disturbed conditions of the late Empire.[3] It is even possible that they were invented in the Dark Ages: they go hand in hand with the other illustrations, which include very many emblems of the units described.[4]

An example of the method of compilation of maps is the British section. Inside a roughly shaped coastal outline are five provinces,[5] arranged one in the north, two in the centre and two in the south. The more easterly in the south, according to this map, is the province of Britannia Prima, which looks as if it were centred on London. But in point of fact we know that Corinium (Cirencester)