

16 · Cartography in the Ancient World: A Conclusion

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In reaching a concluding assessment of the conceptual and practical status of cartography in the ancient world, several themes emerge. Even if allowance is made for the severe lack of map artifacts from the period, it is possible to conclude from literary evidence that no one civilization had a monopoly on a particular variety or function of map and that the number of map functions was considerable. In Mesopotamia and in Egypt, as well as in the Greek and Roman centers, both celestial and terrestrial maps existed. Large-scale maps, fulfilling a multitude of functions, were also found in all these societies, although it must be said that there is more evidence for the use of maps in the Roman period than in other periods of antiquity. These functions included the use of maps as cadastral and legal records, as aids to the traveler, to commemorate military and religious events, as strategic documents, as political propaganda, and for academic and educational purposes. Whereas up to about 170 B.C. maps were apparently unfamiliar to most Romans, after that date their use increased steadily. But while the evidence for the use of maps in Roman society is more plentiful, it should not be forgotten that similar uses are likely to have been present in civilizations normally regarded as having a less practical bent—such as classical Greece.

Maps varied considerably in scale, from depictions of the cosmos and the universe at one end of the continuum to large-scale plans of rooms or tombs at the other end. The extent to which the makers of maps in the ancient world were aware of the concept of a metrical scale is still not settled. We have apparently accurate Babylonian plans of properties, houses, temples, cities, and fields from about 2300 to 500 B.C., and there is evidence of the use of some sort of graphic scale on the plan on the statue of Gudea (ca. 2100 B.C.). But it is not until later in the period that a clear concept of ratio is explicit, when an instruction in the *Corpus Agrimensorum* is thought to refer apprentice surveyors to a scale of 1:5,000, corresponding to one Roman foot to a Roman mile, and the *Forma Urbis Romae* may have been consciously planned at a general scale of 1:240 or 1:250. We now know that at the Temple of Apollo at Didyma architects worked at a scale of 1:16.

The orientation of these early maps varied. Unlike one Babylonian map (the clay tablet of Nuzi), classical maps do not contain an explicit indication of the cardinal points, but north must have been at the top in the archetypes of Ptolemy's maps and in the Peutinger map. The widespread use of globes in Hellenistic Greece, with the inhabited world occupying an upper quadrant and the *climata* in parallel zones perpendicular to the earth's axis, may also have encouraged the early use of north as a primary orienting direction. South and east may also have been favored in the Middle East long before their established use by Arabic and Christian mapmakers.

The accuracy of maps in this early period varied appreciably. The Greeks were great sailors and astronomers whereas the Romans were above all road makers, soldiers, and farmers. Perhaps had more Egyptian maps been preserved, we should find in at least some of them the degree of accuracy manifest in the pyramid measurements. Since calculation of distances on sea routes was always more difficult and astronomical bearings were used rather sporadically, we may expect greater accuracy, where this mattered, in Roman than in Greek maps. Distances given in texts or on maps usually indicated the maximum length and width of a province, region, or island. Marinus, for instance, included some land distances as well as coordinates. His coordinates may have been based on a longitude running east of the Canaries, like Ptolemy's, and a latitude that either was similar to Ptolemy's or was based on Rhodes, though he was never consistent in giving both latitude and longitude. The idea of the use of coordinates was developed first in celestial cartography, itself a Greek rather than a Roman concern, and was later adapted for terrestrial use. It must be pointed out, however, that the precision of Ptolemy's coordinates of places, estuaries, and promontories was largely illusory, since few scientific measurements of longitude or perhaps even latitude had been made. Most of the figures were based on estimates of land or sea distances derived from sources of varying reliability.

It is not until the classical period of Greek cartography that we can start to trace a continuous tradition of theo-

retical concepts about the size and shape of the earth. To appreciate how this period laid the foundations for the developments of the ensuing Hellenistic period, it is necessary, as we have seen, to draw on a wide range of Greek writings containing references to maps. In some cases the authors of these texts are not normally thought of in the context of geographic or cartographic science, but nevertheless they reflect a widespread and often critical interest in such questions. Aristotle's writings, for example, provide a summary of the theoretical knowledge that underlay the construction of world maps by the end of the Greek classical era. At the time when Alexander the Great set off to conquer and explore Asia and when Pytheas of Massalia was exploring northern Europe, therefore, the sum of geographic and cartographic knowledge in the Greek world was already considerable and was demonstrated in a variety of graphic and three-dimensional representations of sky and earth.

Terrestrial maps and celestial globes were widely used as instruments of teaching and research. It has been shown how these could have appealed to the imagination not only of an educated minority—for whom they sometimes became the subject of careful scholarly commentary—but also of a wider Greek public that was already learning to think about the world in a physical and social sense through the medium of maps. If a literal interpretation was followed, the cartographic image of the inhabited world, like that of the universe as a whole, was often misleading; it could create confusion or it could help establish and perpetuate false ideas. The celestial globe had reinforced the belief in a spherical and finite universe such as Aristotle had described; the drawing of a circular horizon, however, from a point of observation, might have perpetuated the idea that the inhabited world was circular, as might also the drawing of a sphere on a flat surface. There was evidently no consensus between cartographic theorists, and there was a gap in particular between the acceptance of the most advanced scientific theories and their translation into map form. In spite of the assertions of Democritus, Eudoxus, and Aristotle, maps of the inhabited world remained circular, with their outer limits very vague. Knowledge even of the Mediterranean was incompletely established. Although just before the invasion of Sicily (415 B.C.) average Athenians may have been able to sketch the outline of the island and indicate Libya and Carthage in relation to it, they generally knew little about its size. It can be said, with hindsight, that by the end of the classical Greek era the need to find a means of drawing maps to scale, and of making a systematic study of the inhabited world, was urgent.

The importance of the Hellenistic period in the history of cartography in the ancient world has thus been clearly established. Its outstanding characteristic was the fruit-

ful marriage of theoretical and empirical knowledge. It has been demonstrated beyond doubt that the geometric study of the sphere, as expressed in theorems and physical models, had important practical applications and that its principles underlay the development both of mathematical geography and of scientific cartography as applied to celestial and terrestrial phenomena. With respect to celestial mapping, the poem about the stellar globe by Aratus (though removed in time from Eudoxus) had encouraged the more systematic study of real globes such as that on the archetype of the Farnese Atlas or those constructed by Archimedes. The main constellations on these artifacts were equated with religious beliefs or legends, mainly in human or animal form. This practice in turn had stimulated a closer study of the sky and its groups of stars. By the end of the Hellenistic period, the celestial globes, although they were artistically decorated, were regarded as credible scientific representations of the sky that in turn could be given astrological uses, as in the compilation of horoscopes, in Greek society at large.

In the history of geographical (or terrestrial) mapping, the great practical step forward was to locate the inhabited world exactly on the terrestrial globe. Eratosthenes was apparently the first to accomplish this, and his map was the earliest scientific attempt to give the different parts of the world represented on a plane surface approximately their true proportions. On his map, moreover, one could have distinguished the geometric shapes of the countries, and one could have used the map as a tool to estimate the distances between places.

Thus it was at various scales of mapping—from the purely local to the representation of the cosmos—that the Greeks of the Hellenistic era enhanced and then disseminated a knowledge of maps. By so improving the *mimesis* or imitation of the world, founded on sound theoretical premises, they made other intellectual advances possible and helped to extend the Greek vision far beyond the Aegean. To Rome, Hellenistic Greece left a seminal cartographic heritage—one that, in the first instance at least, was barely challenged in the intellectual centers of Roman society.

The culmination of Greek cartographic thought is seen in the work of Claudius Ptolemy, who worked within the framework of the early Roman Empire. Our review of Ptolemaic scholarship offers nothing to revise the long-held consensus that he is a key figure in the long-term development of scientific mapping. The present *History* has not set out to identify the “cartographic geniuses” who “revolutionize” mapping. Yet Ptolemy—as much through the accidental survival and transmission of his texts when so many others perished as through his comprehensive approach to mapping—does nevertheless stride like a colossus over the cartographic

knowledge of the later Greco-Roman world and the Renaissance. This is perhaps more remarkable in that his work was primarily instructional and theoretical, and it remains debatable if he bequeathed a set of images that could be automatically copied by an uninterrupted succession of manuscript illuminators. Ptolemy's principal legacy was thus to cartographic method, and both the *Almagest* and the *Geography* may be regarded as among the most influential works in cartographic history. It would be wrong to overemphasize, as so much of the topographical literature has tended to do, a catalog of Ptolemy's "errors": what is vital for the cartographic historian is that his texts were the carriers of the idea of celestial and terrestrial mapping long after the factual content of the coordinates had been made obsolete through new discoveries and exploration. Finally, our interpretation has progressively come down on the side of the opinion that Ptolemy or a contemporary probably did make at least some of the maps so clearly specified in his texts.

When we turn to Roman cartography, it has been shown that by the end of the Augustan era many of its essential characteristics were already in existence. Drawing on the theoretical knowledge of Greek scholars and technicians, both geographical maps at a small scale and large-scale cadastral maps were brought into more regular use. The primary stimulus to the former seems to have been the recognition by the Roman rulers not only that maps were of practical assistance in the military, political, and commercial integration of the empire, but also that a publicly displayed map of its extent could serve for the people as a symbol of its reality and territorial power. Similarly, the cadastral maps, given the force of law by the end of the period, were designed to record and to help uphold a system of property rights and agrarian production in which the state had a vested interest. Maps had thus become the tools of statecraft at a number of territorial scales. It was these motives, rather than disinterested intellectual curiosity, that led to an extension and diversification of mapping as the empire was further consolidated in the period from Tiberius to Caracalla.

In the course of the early empire large-scale maps were harnessed to a number of clearly defined aspects of everyday life. Roman surveyors were capable of constructing complex maps to a consistent scale. These were used particularly in connection with the land attached to colonies, settlements often set up to provide veterans with smallholdings. In the countryside, although only a few fragments of stone cadaster have survived—and none of the bronze maps that recorded land ownership—many thousands of such maps must originally have been made for centuriation and other schemes. Similarly, in the towns, although only the *Forma Urbis Romae* is

known to us in detail, large-scale maps were recognized as practical tools recording the lines of public utilities such as aqueducts, displaying the size and shape of imperial and religious buildings, and indicating the layout of streets and private property. Some types of Roman maps had come to possess standard formats as well as regular scales and established conventions for depicting ground detail. Yet it is perhaps in the importance accorded the map as a permanent record of ownership or rights over property—whether held by the state or by individuals—that Roman large-scale mapping most clearly anticipated the modern world. In this respect, Rome had provided a model for the use of maps that was not to be fully exploited in many parts of the world until the eighteenth and nineteenth centuries.

Maps in the period of the decline of the empire and its sequel in the Byzantine civilization were of course greatly influenced by Christianity. In its most obvious aspect, the exaggerated size of Jerusalem on the Madaba mosaic map was no doubt an attempt to make the Holy City not only dominant but also more accurately depicted in this difficult medium. Pilgrims from distant lands obviously needed itineraries like that starting at Bordeaux, giving fairly simple instructions. But more realistic geographical maps were not entirely lacking: the choice in the fifth century A.D. for a depiction of the Roman world would perhaps lie between the map commissioned by Theodosius II, which may have revised that of Agrippa, and one based on the ancestor of the Peutinger map.

Continuity between the classical period and succeeding ages was interrupted, and there was disruption of the old way of life with its technological achievements, which also involved mapmaking. Some aspects of a partial cartographic heritage, however, may be suggested. When we come to consider the mapping of small areas in medieval western Europe, it will be shown that the Saint Gall monastery map (pp. 466–68) is very reminiscent of the best Roman large-scale plans. Similarly, it will be made clear to what extent the *mappaemundi* were indebted to a number of classical sources, including Greek maps showing *climata* and the simple tripartite T-O maps (which may have arisen in Roman works involving Africa in the first century B.C.), together with, probably, the map of Agrippa as a common archetype. However, the maps of Marinus and Ptolemy, one of the latter containing thousands of place-names, were at least partly known to Arabic geographers of the ninth to the tenth century. But the transmission of Ptolemy's *Geography* to the West came about first through reconstruction by Byzantine scholars and only second through its translation into Latin (1406) and its diffusion in Florence and elsewhere. In the case of the sea charts of the Mediterranean, it is still unresolved whether the earliest por-

tolan charts of the thirteenth century had a classical antecedent. If they had, one would suppose it to be a map connected with the periploi (sea itineraries). But none of these either has a map or, in the present state of our knowledge, can be shown to have ever had one.

The Byzantine Empire—though providing essential links in the chain—remains something of an enigma for the history of the long-term transmission of cartographic knowledge from the ancient to the modern world. In both western Europe and Byzantium relatively little that was new in cartography developed during the Dark Ages and early Middle Ages, although monks were assiduously copying out and preserving the written work of many past centuries available to them. Some maps, along with other illustrations, were transmitted by this process, but too few have survived to indicate the overall level of cartographic awareness in Byzantine society. While almost certainly fewer maps were made than in the Greco-Roman period, nevertheless the key concepts of mapping that had been developed in the classical world were preserved in the Byzantine Empire. The most ac-

complished Byzantine map to survive, the mosaic at Madaba, is clearly closer to the classical tradition than to maps of any subsequent period. But as the dichotomy increased between the use of Greek in the East and Latin in the West, the particular role of Byzantine scholars in perpetuating Greek texts of cartographic interest becomes clearer. Byzantine institutions, particularly as they developed in Constantinople, facilitated the flow of cartographic knowledge both to and from western Europe and to the Arab world and beyond. Our sources point to only a few late glimpses of these transfers—as when Planudes took the lead in Ptolemaic research, for example. But in order to reach an understanding of the historical processes involved in the period, we must examine the broader channels for Christian, humanistic, and scientific ideas rather than a single map, or even the whole corpus of Byzantine cartography. Viewed in this context, some of the essential cartographic impulses of the fifteenth-century Renaissance in Italy are seen to have been already active in late Byzantine society.