

TITLE: *Crates' Globe*

DATE: 180-150 BCE

AUTHOR: *Crates of Mallos*

DESCRIPTION: It appears to have been the grammarian Crates of Mallos, a contemporary of Hipparchus, and a member of the Stoic School of Philosophers, who made the first attempt to construct a terrestrial globe, and that he exhibited the same in Pergamum, not far from the year 150 BCE. It seems to have been Crates' idea that the earth's surface, when represented on a sphere, should appear as divided into four island-like habitable regions. On the one hemisphere, which is formed by a meridional plane cutting the sphere, lies our own *oikoumene*, or known habitable world, and that of the *Antoeci* in corresponding longitude and in opposite latitude; on the other hemisphere lies the *oikoumene* of the *Perioeci* in our latitude and in opposite longitude, and that of the *Antipodes* in latitude and longitude opposite to us. Through the formulation and expression of such a theory the idea of the existence of an antipodal people was put forth as a speculative problem, an idea frequently discussed in the Middle Ages (see #201, #207, #217), and settled only by the actual discovery of antipodal regions and antipodal peoples in the time of great transoceanic discoveries.

Since no original artifact has survived, the illustrations contained herein show modern reconstructions of the globe of Crates of Mallos. However, the various measurements of the earth's size by Eratosthenes (190 BCE) raised a curious problem because the known dimensions of the *oikoumene* were too small relative to the estimated size of the earth sphere, the *oikoumene* occupied only one quadrant of the sphere. Such an imbalance in a spherical object was contrary to the Greek sense of symmetry. Crates, therefore, solved the problem on his globe by drawing three other "continents" (an anticipation/prediction of the existence of the Americas, all of Africa, Antarctica and Australia) to provide the necessary "balance" and symmetry. Here was born the concept of the *Antipodes*, or the great southern continent, the *Terra Australis*, that would be conjured up in medieval and renaissance period maps.

As Tomislav Bilic states specifically in his "*Orbis quadrifarius: The transmission of Crates' theory of quadripartite earth in the Latin West*", Crates' theory of four great land-masses separated by equatorial and meridian oceans survived down to late antiquity and was well known in mediaeval period. It was transmitted by two immensely popular late-antiquity authors, Macrobius and Martianus Capella, but the history of its transmission in the Latin West during the late Hellenistic period and the first three centuries of Christian era remains rather obscure. The emphasis here is not on authentic citations of Crates' words or expositions of the system derived from his actual writings (neither Macrobius nor Martianus Capella mention him by name in their respective expositions of the scheme), but rather on the transmission of knowledge of the concept of four habitable land-masses separated by two perpendicular oceans. Crates, who wrote among other things on Homer and the wanderings of Odysseus, visited Rome. He was professionally interested in the city's drainage system, but while exploring the *Cloaca Maxima* broke his leg. He used the period of recovery to give lectures in Rome, which are said to have created a great impression. His view of terrestrial mapping was that the shape could only be right if it was drawn on a globe,



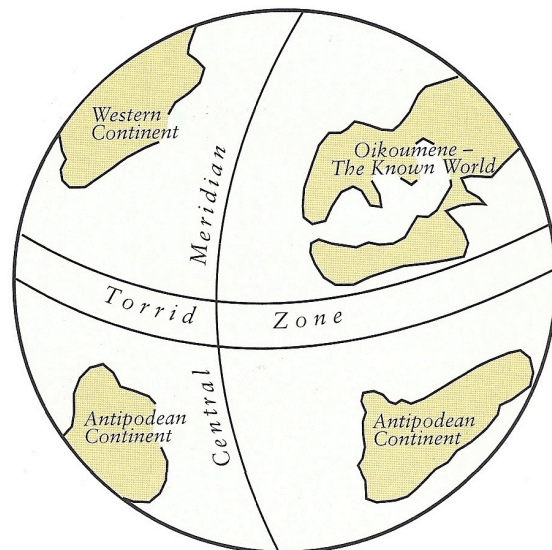
and eventually that the scale could only be effective if the globe was at least ten feet in diameter. In designing his 'orb', if indeed he put his theory into practice, Crates favored an unusual form of symmetry. There were, he said, separated by two intersecting belts of ocean, four symmetrical landmasses: (a) the known *oikoumene*, including its three continents Europe, Asia and the part of Africa known at that time; (b) the land of the *Antoikoi* [those who live opposite], parallel to the *oikoumene* in the southern hemisphere south of them; (c) west of them, the *Perioikoi*, [those who live around], parallel to the *oikoumene* on the western part of the globe; (d) south of the *Perioikoi*, the Antipodes [opposite feet], parallel to the *Perioikoi* in the southern hemisphere. The break between the landmass known at that time and that of the *Antoikoi* came, according to him, at a belt on each side of the equator, and there were *Ethiophians* (*Aethiopes*, 'black-faces') on each side of this water divide. Homer had written of the *Ethiophians*, split in two, some in the East, some by the setting sun. Later Greek writers interpreted this passage in various ways. No doubt, as a Homeric scholar, Crates was more concerned to give a plausible account of Homeric descriptions than to investigate explanations which suggested the existence of a continuous African landmass stretching across the equator. The idea however, was taken up by Cicero in the *Somnium Scipionis* [Dream of Scipio], which he incorporated in his *De republica*. When Macrobius wrote a commentary on the *Somnium Scipionis* about 390 CE, he defended and amplified Crates' theory, aspects of which thus found their way into medieval cartography; the *Perioikoi* and *Antipodes* were then omitted, although discussed by Cicero and Macrobius (see monograph #201).

Pliny the Elder (24-79 CE) promoted this idea and suggested that the entire sphere was inhabited, including the *Antipodes*, although this raised a new problem:

Human beings are distributed all round the earth and stand with their feet pointing toward each other, and the top of the sky is alike for them all and the earth trodden under foot at the center in the same way from any direction, while ordinary people enquire why the persons on the opposite side do not fall off - just as if it were not reasonable that the people on the other side wonder that why we do not fall off. (Plin. HN 2.161)

Such ideas remained purely academic, and were produced by intellectuals exploring scientific premises and conclusions. At the same time, however they inflamed the popular imagination.

Narrowing our focus, we now consider the geographical divisions within the *oikoumene*. The Greeks recognized three continents within the inhabited world: Europe and Asia first, and then *Lybia* [Africa]. Hypotheses about other continents beyond the Ocean, for example Plato's lost *Atlantis* – were mere fantasies. How did the concept of a continent develop? The basic distinction that emerges from the earliest Greek sources is between land and sea. This distinction was then refined to include a differentiation between mainland and islands, reflecting a mental opposition between territorial connectivity and isolation. Giving specific names to larger



landmasses eventually yielded the three individual continents as the ancients knew them. There was thus nothing essentially unique about a continent in comparison to any other topographical unit, and in particular to large islands such as Sicily, Crete and Euboea. As islands had names, so too did continents, which were defined geographically by topographic features marking their limits, even if there were occasional arguments about the exact location of these limits. A continent's precise borders were not always agreed, particularly as some authors were aware of earlier geological situations. For example, C. Acilius (fl. 155 BCE), a Roman historian writing in Greek, explained that Sicily was part of the mainland in prehistoric times, but that a flood had made it separate. Even when the division was permanent, there were different methods for defining borders between continents.

It was thought that Africa did not extend to the equator, or at least it was not habitable to the equator. Below the equator there was thought to be water but beyond the uninhabitable and impassable torrid zone, a habitable region existed. The map of Lambertus (*see monograph #217*) well represents this early theory. Pomponius Mela (#116) called the inhabitants of this southern region *Antichthoni*, their country being unknown to us because of the torrid zone intervening. Pliny, and after him Solinus, says that for a long time the island of *Taprobana* [Ceylon/Sri Lanka] was thought to be the region occupied by the *Antichthoni*.

That Strabo (#115), at a later date, had this *Pergamenian* example in mind when stating certain rules to be observed in the construction of globes seems probable, since he makes mention of Crates' globe. Strabo alone among ancient writers, so far as we at present know, treats terrestrial globes practically. He thought that a globe to be serviceable should be of large size, and his reasoning can readily be understood, for what at that time was really known of the earth's surface was small indeed in comparison with what was unknown. Should one not make use of a sphere of large dimensions, the habitable regions in comparison with the earth's entire surface, would occupy but small space. What Strabo states in his geography is interesting and may here well be cited.

Whoever would represent the real earth as near as possible by artificial means, should make a sphere like that of Crates, and upon this draw the quadrilateral within which his chart of geography is to be placed. For this purpose however a large globe is necessary since the section mentioned, though but a very small portion of the entire sphere, must be capable of containing properly all the regions of the habitable earth and of presenting an accurate view of them to those who wish to consult it. Anyone who is able will certainly do well to obtain such a globe. But it should have a diameter of not less than ten feet; those who cannot obtain a globe of this size, or one nearly as large, had better draw their charts on a plane surface of not less than seven feet. Draw straight lines for the parallels, and others at right angles to these. We can easily imagine how the eye can transfer the figure and extent (of these lines) from a plane surface to one that is spherical. The meridians of each country on the globe have a tendency to unite in a single point at the poles; nevertheless on the surface of a plane map there would be no advantage if the right lines alone which should represent the meridians were drawn slightly to converge.



New entry in Archimedes museum in Olympia Greece. Archaeologists reconstructed Crates of Mallus (2 BCE) earth globe according to Eratosthenes measurements

Crates' motive for his cartography was partly literary, interpreting Ulysses' wanderings, and partly historical, rather than purely scientific. As a Stoic, he proclaimed Homer the founder of geography, crediting him with belief in a spherical earth and commenting on his poems accordingly. To explain Homer's line, "*The Ethiopians who dwell sundered in twain, the farthest of men*", Crates argued that on each side of an equatorial ocean there lived the Ethiopians, divided by the ocean, one group in the Northern Hemisphere, the other group in the Southern, without any interchange between them. Again Strabo reports:

Crates, following the mere form of mathematical demonstration, says that the torrid zone is "occupied" by Oceanus, and that on both sides of this zone are the temperate zones, the one being on our side, while the other is on the opposite side of it. Now, just as these Ethiopians on our side of Oceanus, who face the

south throughout the whole length of the inhabited world, are called the most remote of the one group of peoples, since they dwell on the shores of Oceanus, so too, Crates thinks, we must conceive that on the other side of Oceanus also there are Ethiopians, the most remote of the other group of peoples in the temperate zone, since they dwell on the shores of this same Oceanus.

The scientific thinking behind the geography of Crates' globe was derived directly from the teaching of Eratosthenes about the relative size of the known world. By combining the geometric approach of his predecessor with his own interpretation of Homer (#105), he represented four inhabited worlds on the surface of his terrestrial globe. Two were in the Northern Hemisphere, the one where the Greeks lived, occupying far less than half of the Northern Hemisphere, and another symmetrically situated in the other half. Two other inhabited worlds are found in the Southern Hemisphere, symmetrical with the two north of the equator. These four worlds were separated by oceans along the equator (occupying the torrid zone made uninhabitable by heat) and along a meridian. The inhabited areas were thus islands, with no communication between them.

It is clear that this concept of four symmetrical land areas was a direct consequence of the geometry of the sphere and the size Eratosthenes attributed to the inhabited world in relation to the total globe. Crates demonstrated this by drawing the four areas on the surface of his globe and suggesting that the three unknown lands could be similar to the known one. To give it further credibility, he also drew in the main parallel circles, emphasizing those defining the zones: these were the tropics (at 24° distance from the equator), between which flowed the Ocean as envisaged by Homer, and the two polar circles (at 66° distance from the equator).

Crates' globe was thus a product of theoretical mathematical cartography, communicating an image of the world that was very far from reality. Our understanding of the globe's physical characteristics is meager, and there is no evidence to suggest how or of what material it was made, but its influence on the history of cartographic thought has been considerable. The concept of the equatorial ocean was transmitted to medieval Europe through Macrobius' commentary on Cicero's *Dream of Scipio* (#201). Scholars of later times also vied eagerly to give adequate names to these unknown worlds, but on the whole they did not doubt their existence.

The two fullest accounts of the Crates' system were provided by the two very influential early fifth-century authors already referred to above, Macrobius and Martianus Capella, near-contemporaries of Pseudo Probus and Agenn(i)us Urbicus. The former divides the earth on an upper, diurnal hemisphere and a lower, nocturnal one, that is, a western and an eastern one, with respect to the diurnal course of the sun. He further claims that our *antoeci* are separated from us by the torrid zone; that the unnamed antipodes are directly opposite us, living in the lower (inferior) part of their (southern temperate) zone; finally, that the unnamed inhabitants of the region that have our *antipodes* for their *antoeci* live in the lower (*inferiora*) part of our (northern temperate) zone and that our *antoeci* are separated from our *antipodes* by the antarctic zone, while we are separated from our unnamed *perioeci* by the arctic zone. Martianus Capella similarly, if less coherently, described the upper hemisphere beginning at the place of the sun's rising, and the lower hemisphere at the place of its setting, thus defining the hemispheres with respect to the diurnal solar motion, even though he elsewhere claimed that two hemispheres are separated by the equator. Then he placed our region in the northern, and the region of the *antoeci* in the southern part (of the upper hemisphere), with the *antipodes* and *antichthones* occupying the lower (i.e., western) hemisphere,

defining the position of the *antichthones* as directly opposite our *antoeci*; but he described them both as actually occupying the southern hemisphere, characterized by opposite seasons, inversion of solstices and the invisibility of the Bear, which is true only for the *antipodes*. Finally, Martianus claimed that our *antipodes* experience the same seasons as we do (which would place them in the northern hemisphere), but with long days in winter and long nights in summer (which is impossible, if our winter and summer are not meant – then the description applies to the southern hemisphere), never seeing the Bear (which would again place them in the southern hemisphere); while the *antoeci*, with a view of the south pole, have the same seasons as their *antipodes* (which would place the latter in the southern hemisphere), who never see the south pole (which would place them in the northern hemisphere).

The afterlife of Crates' system was thus ensured by future popularity of these two authors. However, graphic representations accompanying their works seem to ignore it. Thus, on the mediaeval zonal maps accompanying the manuscripts of Macrobius' *Commentary* (#201), which were intended to depict the Cratetian system, there is no trace of a representation of the quartered earth, not even on those on which the system is explicitly expounded in the inscriptions on the maps themselves. These maps are certainly of mediaeval date, but their origin could be sought for in either Macrobius' original work or in early mediaeval manuscripts that are chronologically closer to late antiquity. The illustration nearest to these depictions is that on a map accompanying the *Liber Floridus* of Lambert St-Omer (late 11th early 12th century, #217), where a relatively large island is situated in the extreme west, opposite to the *Terrestrial Paradise*, with an inscription "*here live our antipodes*", and a large continent, equal in size to our *oikoumene*, is depicted in the southern temperate zone. However, even this depiction is nowhere near the quartered globe illustrated on coins and other media. Thus the cartographic tradition, perhaps stemming from late antiquity, seems definitely unfamiliar with the 'quartered earth' motif.

LOCATION: (*this globe only exists as a reconstruction*)

REFERENCES:

Bilic, Tomislav, "*Orbis quadrifarius: The transmission of Crates' theory of quadripartite earth in the Latin West*", *Geographia Antiqua*, XXV, 2016, pp. 129-146.

Bagrow, L., *History of Cartography*, p. 33.

Bunbury, E., *History of Ancient Geography*, Chapter V.

Dilke, O.A.W., *Greek and Roman Maps*, p. 36-37.

*Dueck, D., *Geography in Classical Antiquity*, pp. 77-78.

Landström, B., *Bold Voyages and Great Explorers*, p. 43.

*Raisz, E., *General Cartography*, p. 10.

*Stevenson, E., *Terrestrial Globes*, p. 7.

*illustrated

