TITLE: *World according to Dicæarchus*
DATE: *300 B.C.*
AUTHOR: *Dicæarchus of Messana*
DESCRIPTION: Pytheas (ca. 320-305), a contemporary of Alexander the Great, is significant for extending geographic knowledge of Western Europe, especially the coasts along the English Channel, and for his use of astronomical observations to compute latitudes. A navigator and astronomer from the Greek colony of *Massalia* [Marseilles], he explored the Ocean west of the European mainland and recorded his journey and observations in the work entitled *On the Ocean*, now lost but quoted and criticized by Strabo. Pytheas' claim to have explored "in person" the entire northern region of Europe "as far as the ends of the world" met with disbelief by Strabo who accused him of shameless mendacity. Nonetheless, other writers used his observations. Most modern scholars agree that his journey in fact occurred, yet there is no consensus regarding its date or time or scope—perhaps reaching to islands north of Scotland, to Norway, to Jutland, or even to Iceland.

Pytheas sailed from *Massalia* through the *Pillars of Hercules* {Straits of Gibraltar] up the Iberian coast to the *Tin Islands* (*Cassiterges*, whose location is contested) and across to Britain; next probably the coast to Scotland, its Northern Isles, and the island of *Thule*; then back east to the Baltic, where he found the source of amber on the island of *Abalus*. He described Britain as a triangle, and with reasonable accuracy he estimated the island's circumference at more than 40,000 *stadia*, a length considered excessive by Strabo but accepted by Eratosthenes. Using a *gnomon* (the part of the sundial which casts the shadow), Pytheas calculated the latitudes of *Massalia* and other places he visited. He observed that the summer solstitial day lengthened as he ventured northward, and he may have been the first to connect latitude to the duration of a place's solstitial day. At a place 9,100 *stadia* north of *Massilia* (*Mona*, the island of Anglesey?), he observed that the winter solstice sun rose only to six cubits (12 degrees) and that daylight on the summer solstice lasted nineteen equinoctial hours.

Describing *Thule* as a place where land, sea, and air lose their distinctive properties—"congealing together in substances resembling a sea-lung (probably comb jellies), upon which one can neither walk nor sail"—Pytheas observed (or theorized) that this island was the northernmost point of the British chain, where "the circle of the summer tropic is the same as the arctic circle." He knew from the geometry of the sphere that there must be some point on the globe where the sun would shine for a full day at the summer solstice. He also noted that the amplitude of ocean tides depends on lunar phases, and that the celestial North Pole is marked not by a single star, Polaris, but rather by a rectangle of Polaris together with three faint stars.

While there is no record that Pytheas produced a map, both his theoretical approach and his assemblage of data greatly advanced the science of cartography. Pytheas creatively exploited the abstract and precise language of mathematics and astronomy together with a mass of carefully gathered empirical evidence. He extended Greek knowledge of the geography of the European northwest and, despite Strabo's scorn, laid the foundation for incorporating parallels of latitude into maps.

A contemporary of Pytheas who, in contrast, gained recognition for making a significant contribution to cartography was Dicaearchus of Messana in Sicily (fl. ca. 340-290). A polymath who studied under Aristotle at Athens, he established the foundation of a coordinate system by imposing onto the *oikoumene* an axis with a meridian (through Rhodes) and a parallel, or line of latitude (*diaphragma*), extending from the Straits of

Gibraltar, through Sicily, and along the Taurus Mountains to Mount Himaeus (in the Himalayas). He described the *oikoumene* in his *Periodos Ges* [Circuit of the Earth], which was probably accompanied by a map. Following Democritus, Dicaearchus adopted the ratio of 3:2 for the *oikoumene's* extent. He reported distances between certain places and measured the heights of mountains, which he then compared with the size of the *oikoumene* to show that they did not significantly affect the earth's sphericity. In addition, he correctly oriented the eastern extent of the Taurus Mountains along an east-west coordinate, instead of diverting them to the north, as had earlier Greek geographers.

This monograph discusses the world view by the Greek Dicæarchus of Messana (Messina) (ca. 326-296 B.C.) and a 20th century reconstruction of his world concept. A pupil of Aristotle and a contemporary of Theophrastus (ca. 370-285 B.C.), Dicæarchus is acknowledged by both ancient writers and by modern historians of cartography and geography to have made a significant contribution. Strabo places him, with Democritus, Eudoxus, and Euphorus, among philosophers of the "second age" who were responsible for considerable advances in geographical science (Homer, Anaximander, and Hecatæus are identified by Strabo as representatives of the "first age", and the "third age" comprises Eratosthenes, Polybius, and Posidonius). Dicæarchus spent most of his life in the Peloponnese, especially at Sparta, and wrote various works on politics, literature, history, and philosophy.

Strabo in his *Geography*, following Polybius and with 300 years of additional data, criticizes some distances supplied by Dicæarchus, such as the 10,000 *stades* from the Peloponnese to the Straits of Gibraltar, or the estimate of over 10,000 *stades* from the Peloponnese to the head of the Adriatic Sea. Strabo, questioning these dimensions, criticizes Dicæarchus for having underestimated the length of the inhabited world and the overestimation of its breadth. John of Lydia's *Liber de mensibus* criticized Dicæarchus for making the river Nile "flow uphill" from the Atlantic Ocean.

The main cartographic innovation pioneered by Dicæarchus seems to have been the insertion on a map, possibly for the first time, of two lines representing a parallel and a meridian to divide the known world. According to Agathemenus' *Geographiæ informatio*, the parallel drawn by Dicæarchus, albeit somewhat imperfectly, extended eastward at approximately 36°N from the *Pillars of Hercules* [Straits of Gibraltar]. It passed through Sardinia, Sicily, Caria, Lycia, Pamphylia, Cilicia, and along the Taurus Mountain range as far as *Mount Himæus* [the Himalayas]. Various authors have stated that Dicæarchus applied the term *diaphragma* to this arrangement in the sense of a division of the inhabited world into approximately two equal parts north and south of this line. It represented an attempt to give his map an east-west coordinate axis crossed by a perpendicular meridian passing approximately through Rhodes. Eratosthenes, working a century later, took up the idea and developed it much further *(see #112)*. Specifically Dicæarchus gave the following estimated distances:

From	To	Stades
Pillars of Hercules	Straits of Messina	7,000
Straits of Messina	Peloponnese	3,000
Peloponnese	Head of the Adriatic	over 10,000

Another step toward geographical reality reflected in Dicæarchus' map was that he sketched in the eastward extension of the Taurus Mountains along a parallel, unlike earlier terrestrial maps in which the eastern part of the chain deviated considerably to

the north. Eratosthenes, although wanting to make a complete revision of these early geographical maps, was to follow Dicæarchus' idea that the Taurus Mountains stretched in a straight course on the parallel of Athens.

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

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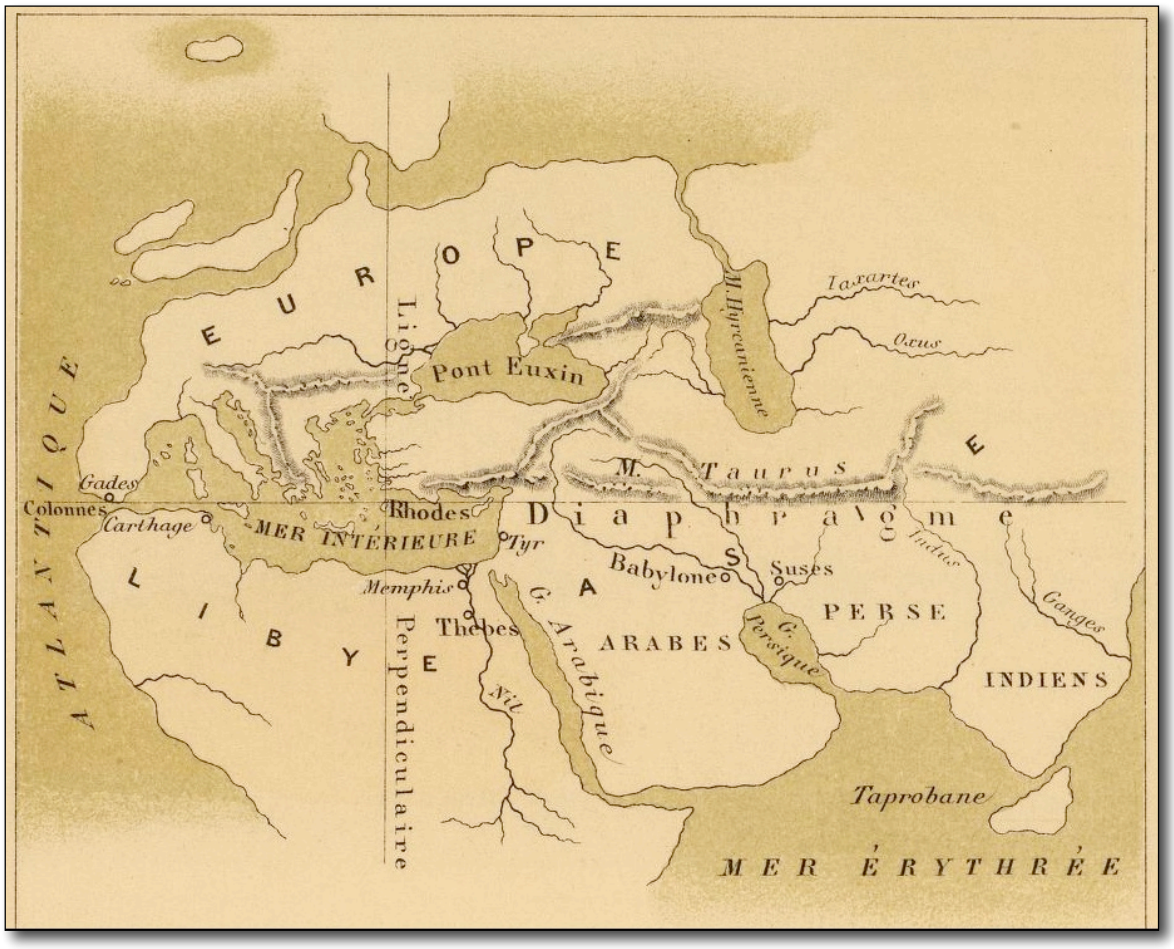
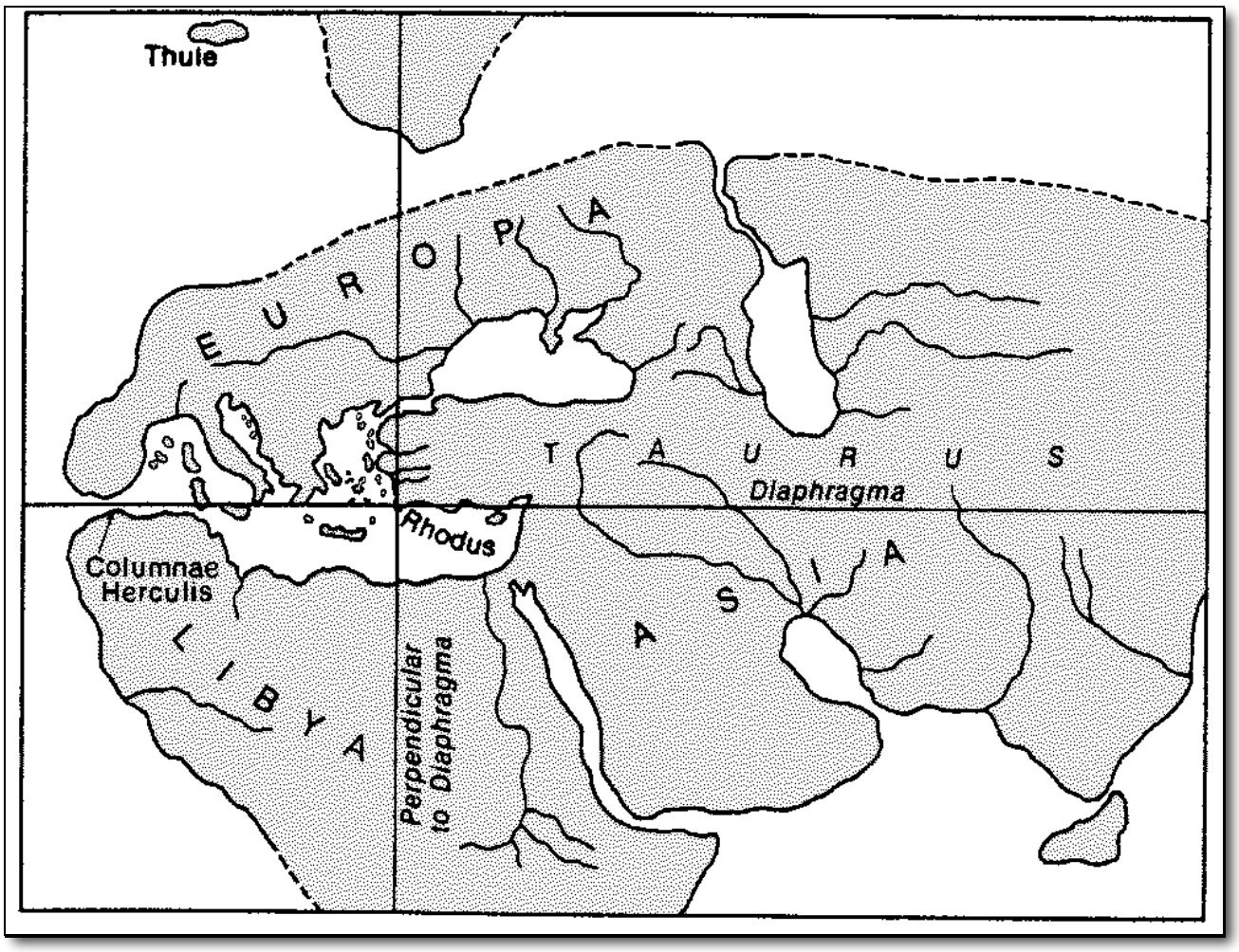
*illustrated





Reconstruction of the world view according to Dicæarchus