

**GEOGRAPHICAL AND  
MATHEMATICAL DISCUSSION OF  
PLUTARCH'S ACCOUNT OF  
ANCIENT VOYAGES TO THE NEW  
WORLD**

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Geographical and mathematical discussion of Plutarch's account of ancient voyages to the New World by Verplanck Colvin

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**VERPLANCK COLVIN**

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PLUTARCH'S ACCOUNT OF ANCIENT VOYAGES TO THE  
NEW WORLD

CONSIDERED FROM THE STANDPOINT OF NAUTICAL ASTRONOMY, AND AS  
A POPULAR STATEMENT OR ABBREVIATION OF ANCIENT SAILING  
DIRECTIONS OF THE GREEKS, PHENICIANS OR CARTHAGINIANS.

By VERPLANCK COLVIN.

[Read before the Albany Institute April 4th, 1893.]

At this time, when we are as a Nation celebrating the four hundredth anniversary of the discovery of this continent by Columbus, everything relating to similar voyages, particularly whatever may explain the brief references by Homer, Solon, Aristotle, Pliny, and other ancients to "distant lands beyond the great ocean," possesses unusual interest. This interest is not aroused by idle curiosity, but is based upon the historical value which the ancient data may afford to enable the student of civilization to judge of the accuracy and extent of astronomical and geographical knowledge in most remote times of which there are any records; data affording a check or test on the accuracy of such records and, by a study of man's past achievements, giving some idea of what we may hope for in the future.

Many years ago I was surprised to find, in one of Plutarch's philosophical disquisitions, what was evidently an account of voyages across the Atlantic to what must have been the continent on which we now reside.

The particular interest which attaches to this record by Plutarch consists in the references to astronomical phenomena, to the position of the sun and planets, to the statements of courses and distances, which, though couched in general language, constitute, I find by computation, almost exact sailing directions for the navigation of a ship from the Old World to the New: a faithful, accurate account, worthy of the great Plutarch.

The exact period when these sailing directions were in use, the time when the voyages were made, is lost in the dim vistas of the past. Whether the adventurous sailors of the period were Phœnicians or Carthaginians, Asiatics or Africans, is not certain, though a reference to a return to "Carthage," as the closure of the traverse, points to that city as the place of beginning.

Whoever these ancient navigators were, it is clear that they possessed a knowledge of astronomy sufficient for purposes of navigation, and that they had remarkably accurate information as to the periodic position of at least one of the planets of our solar system, together with ability to set forth and explain the "sailing directions" used by them on voyages to this continent. Whatever is obscure in the account of these voyages, which we are now considering, was perhaps intentional upon the part of these navigators, unwilling to reveal what, to them, were commercial business secrets, though some of the vagueness may be attributed to the misunderstanding of the navigators by those who obtained the information or communicated it to the historian; and he, in turn, was probably not sufficiently versed in navigation to detect these imperfections.

Plutarch tells the story of these ancient navigators so briefly, that it may be well to first call to mind some of the many references to the existence of a continent beyond the "great ocean" in the ancient writings already referred to; but, as my purpose is to particularly discuss the outgoing and return voyage described by Plutarch, and to mathematically consider the courses and distances he mentions, I will omit consideration of those words of other historians which merely confirm the belief that this country was known for ages before the Christian era; accepting the early knowledge of this country by these ancient navigators as a fact established; and devote my attention to identifying the localities visited by Plutarch's voyagers from the statements made in his narrative.

In the study of the distances used, in the sailing directions of such an ancient voyage, the first essential, in considering the "reckoning," is to obtain the unit of measurement correctly, and some proof as to the distances actually sailed in those days.

An idea of the distances sailed by the ancient navigators may be had from Homer, who, in his *Odyssey*, tells us: "Ogygia is an island far out at sea" [*Ατλαντος* in the Greek text], "where the daughter of Atlas dwells" [*i. e.*, in the great gulf], "crafty Kalypso, a fair-haired powerful goddess," etc.; and he tells how Odysseus, having sailed "eighteen days" across the sea, eastward or homeward, was guided towards Europe by keeping the pole star; [the text says "the Bear"] "at his left," according to the instructions of the goddess.

This proves (1st) that in the days of Homer, or rather before his time, navigators traveled thousands of miles out into the Atlantic, and back across it; and (2d) that they were guided in their voyages by the stars. The distance thus traveled in eighteen days, in ordinary weather, may be ascertained from accounts of the speed of vessels in ancient times given by the father of history.

Herodotus says, telling how he got his distances for geographical purposes (Book IV, § 86): "In a long day a vessel generally accomplishes about 70,000 fathoms; in the night about 60,000." That is to say, about 420,000 + 360,000 feet, which equals 147 miles per day. Hence in eighteen days, multiplying by 147, a distance of more than 2,646 miles might have been sailed in those times, and how much further before strong Atlantic gales we are at liberty to estimate.

The longitude of Barbadoes, in the West India Islands, is 59° 37' west; that of the Cape Verde Island, St. Vincent, 25° 17' west, and the difference of longitude is about 34½ degrees, equal to 2,294 statute miles — or over 352 miles less than the distance recorded by Homer, but it must be remembered that the Cape Verde Islands are only 350 miles from the coast of Africa,\* the approximate easterly shore of the continent to which Odysseus returns; and 2,294 + 350 = 2644.

The fame of Homer's story probably made all islands or lands found in the Atlantic "Ogygias," so that Plutarch's island was, probably, only one of many claimed as the island which Homer mentioned.

These references suffice to show that Homer and the other ancient writers had a fairly accurate knowledge of the distance to the West Indian islands, and that the sailors of those times must have made voyages into our seas in order to have had such an accurate knowledge.

As to the passenger accommodations and size of ships in those days we learn that, before the time of Plutarch, a vessel in the Mediterranean had carried "Two hundred three score and sixteen souls." †

With this introduction, we may take up the detailed account of the voyage given in Plutarch's *Morals*, Vol. V, pages 281-284 (8th edition, Boston: Little Bros. & Co., 1878), where, in his dialogue about our satellite, the Moon, he says:

‡(1) "AN ISLE OGYGIA LIES IN OCEAN'S ARMS," § distant about five days' sail westward from Britain; and before it there are three others, of an equal distance from one another and also from that, (2) bearing north-west, where the sun sets in summer. In one of these the barbarians feign that Saturn is detained prisoner by Jupiter, who, as his son, having the guard or keeping of those islands and the adjacent sea, named the Saturnian, has his seat a little below; and that (3) the continent, by which the great sea is circularly environed, is distant from Ogygia about five thousand stadia, (4) but from the others not so far, men using to row thither in galleys, (5) the sea being there

\* Bonavista I. to Cape Verde.

† Acts of the Apostles, Ch. 27, verse 37.

‡ The figures inserted in this text refer to corresponding passages in the commentary which follows.

§ Quoting Homer.

low and ebb, and difficult to be passed by great vessels because of the mud brought thither by a multitude of rivers, which, coming from the mainland, discharge themselves into it, and raise there great bars and shelves that choke up the river and render it hardly navigable; (6) whence anciently there arose an opinion of its being frozen. Moreover, (7) the coasts of this continent lying on the sea are inhabited by the Greeks about a bay not much smaller than the Maeotic, the mouth of which lies in a direct line over against that of the Caspian Sea. (8) These name and esteem themselves the inhabitants of the firm land, calling all us others islanders, as dwelling in a land encompassed round about and washed by the sea. And they think that (9) those who heretofore came thither with Hercules and were left there by him, mixing themselves with the people of Saturn, raised up again the Greek nation, which was well near extinguished, brought under and supplanted by the language, laws, and manners of the barbarians, and made it again flourish and recover its pristine vigor. And therefore in that place they give the first honor to Hercules, and the second to Saturn. (10) Now when the star of Saturn, by us called Phaenon and by them Nycturus, comes to the sign of Taurus, as it does once in the time of thirty years, they, having been a long time preparing what is necessary for a solemn sacrifice and a long voyage or navigation, send forth those on whom the lots fall to row in that vast sea, and make their abode for a great while in foreign countries. (11) These men then, being embarked and departed, meet with different adventures, some in one manner, others in another. Now such as have in safety passed the danger of the sea go first ashore in those opposite islands, which are (12) inhabited by the Greeks, where they see that the sun is scarce hidden one full hour during the space of thirty days, and that this is their night, of which the darkness is but small, as having a twilight from the going down of the sun not unlike the dawning of the day; that (13) having continued there ninety days, during which they are highly caressed and honored, as being reputed and termed holy men, they are afterwards conducted by the winds, and (14) transported into the Isle of Saturn, where there are no other inhabitants but themselves and such as have been sent thither before them. For though it is lawful for them, after they have served Saturn thirty years, to return home to their own countries and houses, yet most of them choose rather to remain quietly there; some, because they are already accustomed to the place; others, because (15) without any labor and trouble they have abundance of all things, as well for the offering of sacrifices (16) and holding festival solemnities, as to support the ordinary expenses of those who are perpetually conversant in the study of learning and philosophy. (17) For they affirm the



nature of the island and the mildness of the air which environs it to be admirable ; and that there have been some persons who, intending to depart thence, have been hindered by the Divinity or (18) Genius of the place showing himself to them, as to his familiar friends and acquaintance, not only in dreams and exterior signs, but also visibly appearing to them by the means of familiar spirits discoursing and conversing with them. For they say, that Saturn himself is personally there lying asleep in the deep (19) cave of an hollow rock, shining like fine gold, Jupiter having prepared sleep instead of fetters and shackles to keep him from stirring ; but that there are on the top of this rock certain birds, which fly down and carry him ambrosia ; (20) that the whole island is filled with an admirable fragrancy and perfume, which is spread all over it, arising from this cave, as from an odoriferous fountain ; (21) that these Daemons serve and minister to Saturn, having been his courtiers and nearest attendants when he held the empire and exercised regal authority over men and gods ; and that having the science of divining future occurrences, they of themselves foretell many things ; but the greatest and of the highest importance, when they return from assisting Saturn, and reveal his dreams ; for whatever Jupiter premeditates, Saturn dreams ; (22) but his awakenings are Titanical passions or perturbations of the soul in him, which sleep altogether controls, in order that the royal and divine nature may be pure and incontaminate in itself. (23) This stranger then, having been brought thither, and there serving the god in repose and at his ease, attained to as great skill in astrology as it is possible for any one to do that has made the greatest progress in geometry ; as for the rest of philosophy, having given himself to that which is called natural, (24) he was seized with an extraordinary desire and longing to visit and see the great island ; for so they called the continent inhabited by us. After therefore his thirty years were passed and his successors arrived, having taken leave of all his relations and friends, he put to sea, in other respects soberly and moderately equipped, but having good store of voyage-provision in vessels of gold. (25) Now one day would not suffice to relate unto you in particular what adventures befell him, how many nations he visited, through how many countries he passed, how he searched into sacred writings, and was initiated in all holy confraternities and religious societies, as he himself recounted it to us, exactly particularizing every thing. But give ear, I pray you, to what concerns the present dispute. (26) For he continued no small time at Carthage, a city not a little also esteemed by us, where he found certain sacred skins of parchment, which had been secretly conveyed thither when the old town was sacked, and had there long lain hidden under ground."

## COMMENTARY.\*

(1) Plutarch omits the courses and distances through the Mediterranean and the Atlantic to the coast of Britain, as though sufficiently well known, and takes up the journey at the point where the navigators leave the coast of Britain for the Island of Ogygia. (Land of the Titans, Ogres, Caribs, Cannibals or Man-eaters?)†

Five days' sail, at the rate mentioned by Herodotus, is 174 miles  $\times$  by 5 = 870 miles; or by the minimum speed of ships mentioned by Herodotus = 136 miles per day would make the total distance for the five days 680 miles.

American "clipper" ships have sailed 200 miles per day. Allowing that ships in the time of Plutarch were half as swift as these modern ships, the minimum distance to Plutarch's "Ogygia" would be 500 miles. This distance for 5 days would make the sailing rate 100 miles per day "*westward from Britain—north-west where the sun sets in summer.*" (To this we may add the coasting distance.)

(2) The course thus recorded by Plutarch, apparently in popular language, "*bearing north-west, where the sun sets in summer,*" is really quite precise, and admits of mathematical interpretation. Evidently the intent was to fix the course at a time when the sun changes its apparent position least, the bearing for this being the direction of the sun at sunset at the solstice preceding summer. If this was the intention, the record thus left of the course was very exact and the trigonometrical functions can be closely computed. That is, the language used means that this course is towards the sun at its extreme northerly declination, either in the time of Plutarch or at the time when the navigator fixed upon this course. As the narrative must have reached Plutarch when he was a man of mature years, the period can be approximately fixed. In the time of the Egyptian astronomer Ptolemy, 140 years after Christ, that astronomer observed the extreme northerly declination of the sun to be  $23^{\circ} 48' 45''$  (north of the equator).

Fixing the date when Plutarch wrote at about the year A. D. 100, and noting that the secular variation in the obliquity of the ecliptic changed but slightly at this time, being only 44 seconds of arc per century, with the probable error in the astronomer's observation much greater than the annual change in the obliquity, the extreme declination of the sun at midsummer, at the time when Plutarch wrote, may not have differed much from the angular value given by Ptolemy.

Computing into modern nautical form the course given by Plutarch, for the known latitude of Britain with Ptolemy's value for the declina-

\* To separate the quotations from Plutarch, from those of other authors, they are italicized.

† The "god or gods of the other world," considered as at the antipodes or "under world."

tion, by the formula for the sun's amplitude ( $=A$ ) which is the course; then  $\lg. \sin A = \lg. \secant \phi + \lg. \sine \odot$ 's declination. A simple computation; made, logarithmically, as follows:

Latitude of Britain $= \phi = 58^{\circ} 40'$ $\lg. \sec$ .....	0.2839632
Declination of sun $= 23^{\circ} 48' 45''$ $\lg. \sin$ .....	9.6061070
	9.8900702
Amplitude North of West, $50^{\circ} 55' 58''$ $\lg. \sine$ .....	9.8900702
or course North $39^{\circ} 04' 02''$ West -	

Which is the mathematical approximate course representing, about the year A. D. 100, Plutarch's "North-west, where the sun sets in summer," from the British islands. This is the course from the British islands to ICELAND to-day; the sun setting "over beyond" Iceland.

(3) and (4). Iceland, therefore, is Plutarch's Ogygia; and the "three other" islands, "before it" [is reached], must be the Faroe islands; "men using to row thither in galleys," i. e. from Britain to the Faroe islands.

It is to Iceland, then, that Plutarch refers as the place (Ogygia) from which "the continent is distant about five thousand stadia"—that is onward, westward. Where is this continent?

Assuming the stadia of those times at  $606\frac{2}{3}$  feet ( $=606.75$  feet), and multiplying this by the 5,000 stadia, we find the distance from Plutarch's Ogygia (Iceland) to "the continent" to be equal to 574.57 statute miles; which is, very closely, the distance from Iceland to Cape Farewell, Greenland; the historian giving the controlling points of the course. This "distance of 5,000 stadia" could not refer to the distance between Britain and Ogygia for that is  $74\frac{1}{2}$  miles less, being a total of about 500 miles, with the Faroe islands about midway between, or 250 miles north-westerly from Britain and about the same distance south-easterly from Iceland; besides the present voyage of  $574\frac{1}{2}$  miles is to a continent, and, the journey being continually westward, the only great headland of a continent at this distance westward of Iceland is in Greenland.

(5) Plutarch next leaps, in his narrative, to the coast of the northern continent of the New World; a not unnatural mixing up of the facts, as he wrote this narrative from hearsay—we cannot tell how many times repeated—but the description applies accurately to portions of our coasts southerly from Labrador.

The words, "the sea being there low and ebb, and difficult to be passed by great vessels because of the mud brought thither by a multitude of rivers," give us several conditions to be filled by the localities we seek.

Certainly Plutarch does not refer to Greenland at Cape Farewell, where the tide rises to a height of 12.5 feet; nor to Ungava bay, in